

# Ownership Guide

A GUIDE TO SUBMERSIBLE OWNERSHIP



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# INTRODUCTION



Dear Explorer,

As founder and chairman of U-Boat Worx, I am delighted to introduce you to our submersibles and the fascinating subsea exploration opportunities they provide. From the controls of a U-Boat Worx submersible you can experience awe-inspiring adventures. Exploring the dream-like, underwater world with family and friends is memorable. Witnessing underwater life first hand in safety and comfort, with a panoramic view, is literally “out of this world”.

Thousands of unexplored wrecks, numerous marine species, and beautiful coral reefs lie waiting to be discovered. Whatever your inspiration may be - research, private, or charter - our manned submersibles make every dive mission a success.

When choosing your own personal submarine, there is a wide variety of factors you need to take into account.

Many questions will arise throughout the process of selecting your perfect submersible and equipping it with the optimal add-ons for your own private missions.

Deciding which submersible to acquire is not an everyday decision, and to make your evaluation as straight-forward as possible we have created this guide to provide you with an overview of the most relevant decisions factors.

It informs you as to what a submersible is, and does; it provides several key factors that define successful dive operations; and it offers important selection criteria that will assist you in selecting the ideal submarine for your requirements.

I would like to welcome you to our world of underwater exploration.

If any questions may arise, please be in touch - we are ready to assist you.

We look forward to diving with you in the near future.

Sincerely yours,

Bert Houtman





# WHEN LIMITS DISSAPPEAR

The oceans cover the largest part of our world, and yet so little has yet been explored by mankind. Conventional SCUBA diving prevents us from going deeper than approximately 40 meters. After these depths, great risks and restrictions are introduced to the human body by the ever-increasing water pressure. With U-Boat Worx submersibles, it is possible to break through these limitations, as our submersibles maintain the same pressure inside as on the surface.

Once inside our submersibles you will find yourself gently suspended in one of the most private and luxurious environments on earth, surrounded by the vast, majestic oceans with an unimpeded vista.



# PRINCIPLES OF SUBS

## DIVE PHYSICS AND SUBMARINE ANATOMY

The first thing that comes to mind when thinking about submarines is often the concept of complex and bulky research submarines. By comparison, owning and diving in a U-Boat Worx submersible is very straightforward. However, backing our world-leading, industry-defining submersibles is a wealth of technical know-how and experience.

You can place your trust in U-Boat Worx to provide you with the best possible expertise, training, equipment, and support, permitting you to focus solely on enjoying your own personal under-sea exploration.

We wish to share our expertise with you by outlining a few fundamental design philosophies that have shaped our business and lie behind our acclaimed success.

## ONE-ATMOSPHERIC PRESSURE

In a U-Boat Worx submarine you will always experience the same pressure whilst diving as you do on the surface of the ocean. This allows you to descend and ascend as rapidly as possible without any risks of decompression (as can be experienced with SCUBA diving).

The "Pressure Vessel for Human Occupancy (PVHO)" is an elementary component in this respect. The PVHO withstands all pressure experienced at depth. As a result, the environment inside the PVHO will always remain at one atmospheric pressure.

This also means passengers can breathe normally and do not need any special masks or additional breathing devices. Oxygen (O<sub>2</sub>) and Carbon Dioxide (CO<sub>2</sub>) levels are automatically managed through the life support system which provides for care-free diving. Being able to breathe normally and converse normally with your fellow explorers in a one-atmosphere environment is a key feature of our fleet.

## HOW THEY FLOAT, HOW THEY DESCEND AND POSITIVE BUOYANCY

The air in the ballast tanks - or diving tanks - ensures that the submersible floats when resting on the surface. These ballast tanks - if properly designed - create stability and freeboard\*, which allows passengers to transfer on and off the submarine at the surface.

When air is vented from the ballast tanks, the submersible gently descends below the waterline. Once submerged the electrical thrusters power the submersible upwards and downwards.

All U-Boat Worx submersibles are trimmed with a slight positive buoyancy, meaning that in the event of the pilot releasing all the controls, the submersible will automatically rise back to the surface. Such positive buoyancy is easily overridden by the thrust generated by the propulsion system when you steer the submarine up or down.

*\*Freeboard is the distance between the waterline and the submersible's hatch opening when floating at the surface.*

## POWER AND PROPULSION

Without exception, our submersibles are battery-powered and run on electrical thrusters.

Battery technology has advanced greatly over recent years. Batteries have become much lighter and more powerful, thereby allowing U-Boat Worx to reduce the weight of the submersibles, offer longer endurance, reduce charge times, and support powerful air-conditioning systems and lights.



# ANATOMY OF A SUBMERSIBLE

## FREEBOARD EXTENDER

This system makes sure occupants can open the hatch at the surface even when weather is inclement.

## PROPULSION

4-8 thrusters are cleverly incorporated in the design, and give the submersibles maximum manoeuvrability, even in the harshest of underwater environments.

## POWER

Unlike most other submersibles with lead-acid batteries, all U-Boat Worx submersibles use the latest in Lithium-Ion Battery Technology, providing up to 18 hours of dive time.



## ENTRANCE HATCH

The large hatch allows access to the interior of the submersible.

## SINGLE LIFTING POINT

MOST of our submersibles feature a single point lift as standard, with mar-rated certification as optional, allowing launch and recovery under almost any weather condition.





# OPERATIONS

## PART ONE

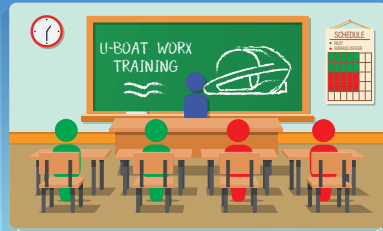
A submersible operation can be based either on a ship or on the shore. The best example for a shore-based operation is a tourist-based facility from resorts. Conventional examples of sea-based operations include the larger research expedition ships that we may see on Discovery or National Geographic television channels.

The most common situation is for a submersible to be launched from a support vessel. The support vessel can be a yacht, shadow vessel, research vessel, or cruise ship. The requirements for both shore-based and ship-based operations are very similar.

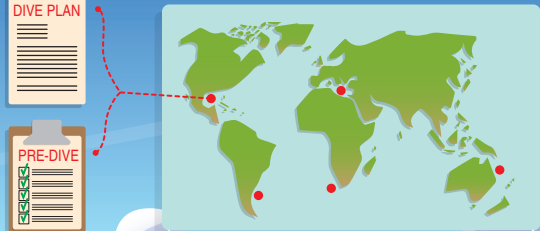
In Part One we will discuss all relevant aspects of the submersible operation that you need to take into account.



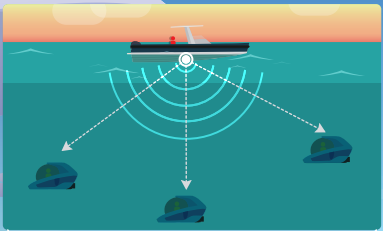




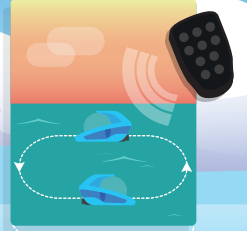
**CREW & TRAINING**  
Our comprehensive pilot training takes two weeks. U-Boat Worx could provide her own submersible crew if preferred.



**OPERATIONS MANAGEMENT**  
Trained crew is fully capable in planning and organising dives all around the world.

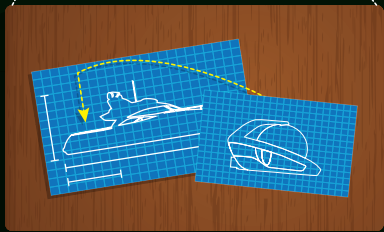


**SURFACE OPERATIONS**  
The surface officer tracks and stays in contact with the submersible from a chase boat.



**CAREFREE LAUNCH & RECOVERY**  
Whether launching from a ship or from shore. The wireless MARLIN Controller allows for navigation from outside while on the surface.

**POST-DIVE PROCEDURES**  
After a dive the submarine needs to be charged, filled and rinsed with fresh water. After that it's ready for the next day.



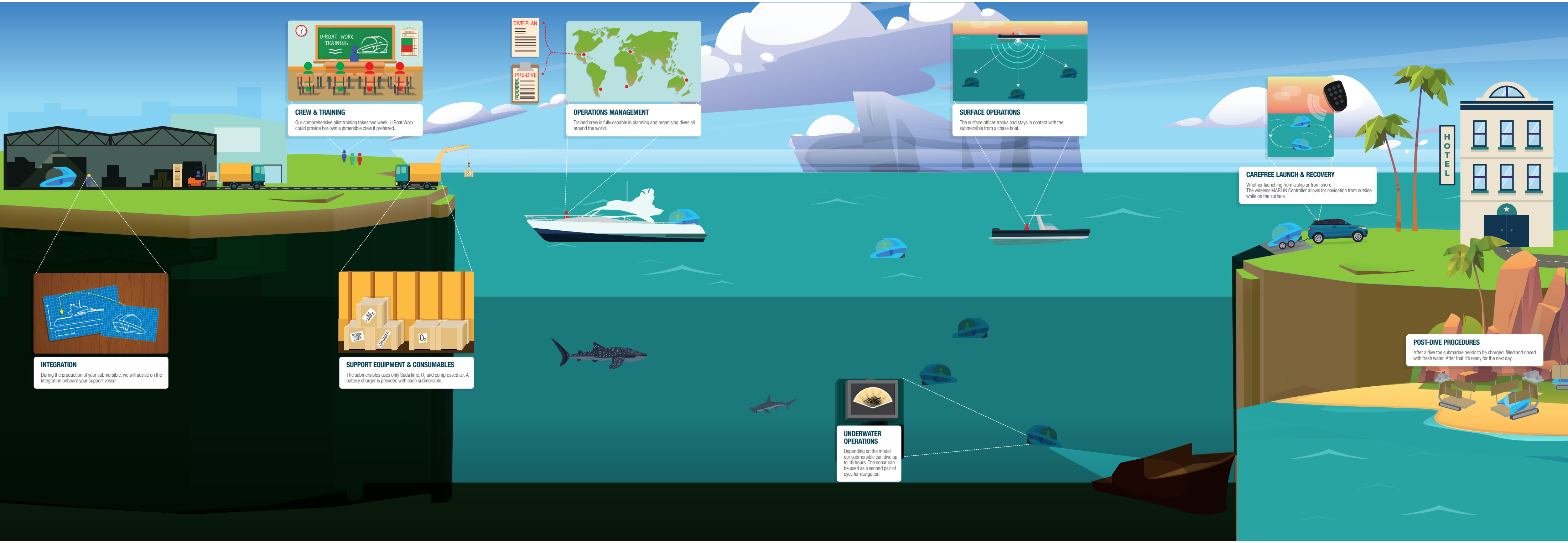
**INTEGRATION**  
During the production of your submersible, we will advise on the integration onboard your support vessel.



**SUPPORT EQUIPMENT & CONSUMABLES**  
The submersibles uses only Soda lime, O<sub>2</sub>, and compressed air. A battery charger is provided with each submersible.



**UNDERWATER OPERATIONS**  
Depending on the model our submersible can dive up to 10 hours. The sonar can be used as a second pair of eyes for navigation.





# Integration



## SPACE

A submersible may be placed on an open deck, inside a tender garage, or in a dedicated submarine hangar. Depending on the support ship's deck layout, the ideal location can be selected.

To save valuable space on your deck or in your garage, U-Boat Worx has made every design as compact as possible.

## DECK FIXATION

All U-Boat Worx submersibles stand on their own skids and do not require a special cradle. They can be positioned directly on the deck. We provide rubber strips to protect the deck, as well as to provide additional friction. Ample lashing options are offered to ensure that the submarine can be properly secured at sea.



## CRANE SELECTION

There are multiple methods that can be used to launch and recover a submersible from a ship. You may select a submersible platform or even a purpose-built ramp, but most typically a submersible is launched via a crane. There are many different types of cranes, and the most suitable will depend on your type of vessel, operational requirements, and budget.

You will need a crane that can handle the weight of your submersible. You can find the weight for each submersible listed on our website - [www.uboatworx.com](http://www.uboatworx.com).

As you may want to equip your submersible with optional extras, we would advise to allow for a crane that has a Safe Working Load (SWL) that is at least 100 kg over the weight of the submersible.

Last but not least, on some models there are custom lifting solutions available. U-Boat Worx has delivered submersibles with tailor-made lifting points that match with the existing dual-beam crane configuration, for example.





## LAUNCH SOLUTIONS

U-Boat Worx collaborates with various vendors worldwide to provide comprehensive solutions for launching your submersible. From launch trailers to beach launchers, a range of options is available for shore-based operations.





# Support Equipment & Consumables

## SUPPORT EQUIPMENT

There is little need for specialised equipment to support a submarine operation.

U-Boat Worx delivers each submersible with a specifically selected array of support equipment that contains all operational components required for your dive operation and maintenance.

Several items that are likely to be on board – for example a SCUBA dive compressor – can be used without modification to refill the high-pressure air tanks on the submersible.

Each submersible is delivered with a battery charger, as well as all other topside equipment including underwater communication sets and subsea tracking gear.

Any tender on board can be used as a chase boat. The chase boat shadows the submersible while diving, and accommodates the “surface officer” who is in charge of, and responsible for, tracking the submersible during each dive mission.

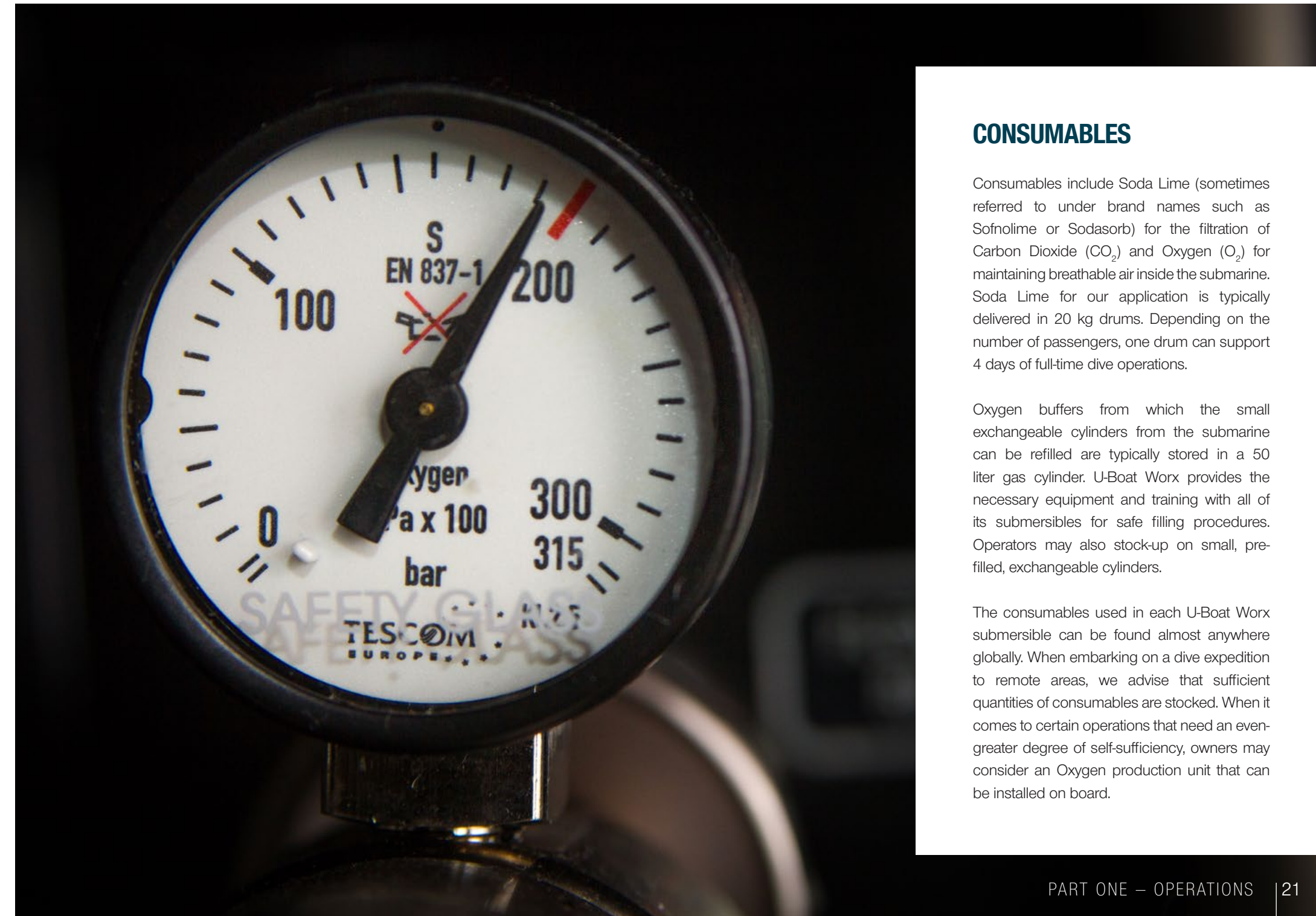


## CONSUMABLES

Consumables include Soda Lime (sometimes referred to under brand names such as Sofnolime or Sodasorb) for the filtration of Carbon Dioxide (CO<sub>2</sub>) and Oxygen (O<sub>2</sub>) for maintaining breathable air inside the submarine. Soda Lime for our application is typically delivered in 20 kg drums. Depending on the number of passengers, one drum can support 4 days of full-time dive operations.

Oxygen buffers from which the small exchangeable cylinders from the submarine can be refilled are typically stored in a 50 liter gas cylinder. U-Boat Worx provides the necessary equipment and training with all of its submersibles for safe filling procedures. Operators may also stock-up on small, pre-filled, exchangeable cylinders.

The consumables used in each U-Boat Worx submersible can be found almost anywhere globally. When embarking on a dive expedition to remote areas, we advise that sufficient quantities of consumables are stocked. When it comes to certain operations that need an even-greater degree of self-sufficiency, owners may consider an Oxygen production unit that can be installed on board.





# Operations Management

Each submarine dive operation involves a mission planning, a safety briefing, consumables management, and crew. Following our training course, the submersible crew will be fully prepared to take on these responsibilities while U-Boat Worx operations team provides hands-on support whenever needed. We will highlight the most relevant items of Operation Management to provide a better insight in the day-to-day tasks.



## CREW REQUIREMENTS

For a submersible operation, a minimum crew of two is required; a surface officer and a submersible pilot. The pilot is in charge of the submarine and guests while the surface officer is in charge of the overall dive operation.

The surface officer will remain on the surface throughout the entire operation, during which time he can continuously communicate with the pilot. U-Boat Worx provides a dedicated underwater communication set with the submarine. The surface officer also maintains contact with the shore base or the support vessel about passenger logistics and any changes in weather circumstances.

## MISSION PLANNING

Each dive - whether shore or vessel based - requires a specific mission (or dive) plan to be prepared by the pilot and the surface officer in consultation with the captain.

## DIVE SITE PERMITS

Before diving your submarine, you will need to consult the local authorities and possibly seek permission or obtain the relevant dive permits. Requirements vary globally. The classification certificate from DNV that comes with every submersible is usually requested to support your application. U-Boat Worx can assist in these permit applications, along with local agents.

## INSURANCE

Every U-Boat Worx submarine is delivered with a certification by DNV, the world's leading classification society and a recognized advisor for the maritime industry.

## SAFETY PLANNING

Each dive operation is accompanied by a safety plan. Important aspects are the self-help and external help plan, designed to correlate to the depth of the dive site. Based on this depth it is standard operating practice that the operator arranges stand-by resources that can come and assist the submersible in the unlikely case of problems. These resources typically include divers, a Remotely Operated Vehicle (ROV) or a second submersible. They can either be on the support ship and part of the operation, or they can be contracted externally with a certain response time.

## LOGISTICS

When operating from a dedicated support vessel, logistics are straightforward. U-Boat Worx submersibles are capable of manoeuvring on the surface under their own power or in tow. In the event of needing transportation, some U-Boat Worx models are designed to fit inside a shipping container.

## SUBSUPPORT

We take great care of our clients. Owning a private submarine is a seamless process. Your dedicated personal U-Boat Worx concierge is available worldwide, 24/7.

Selecting dive sites along your planned itinerary, providing our expert pilots, or arranging the annual survey – these are just a few examples of the many services we provide. We endeavour to ensure you always have the best possible dive experience.

## SUBCHARTER

U-Boat Worx has a wide network of charter brokers whereby owners can participate in our SubCharter facility to maximise income from their submersible and/or support vessel.



## Crew & Training

As an operator, training to pilot your personal submarine can be completed in under two weeks. U-Boat Worx has developed a comprehensive, hands-on professional training program that includes both theoretical sessions and training dives. The duration of the program is approximately two weeks, depending on the specific submarine model. You may choose to be a passenger in your own submersible, or simply take control alongside a certified pilot.

We also train surface officers, who manage the submersible operations from the chase boat and maintain radio contact with the pilot.

A full training course for two pilots and two surface officers is included with each submersible purchased (except for NEMO). You can also elect to use the training budget to hire a trained pilot/surface officer via U-Boat Worx' register. U-Boat Worx employs a number of experienced pilots, so we can assist with preparations and crew for your diving missions.

Pilot and surface officers may also be selected from your existing crew, who will have the benefit of advancing their career by training and becoming certified for this role.







## Dive Preparations

The surface officer will formulate a dive plan prior to each dive.

Within half an hour you can have your submersible in the water and ready for action. Before each dive you will go through a simple checklist to verify everything is in dive-ready condition.

After that, you are ready to launch!

For new passengers, there is a short safety briefing that explains how the submarine works, safety procedures, and what to expect during the dive.



## Launch & Recovery

To ensure straightforward launch and recovery operations from any type of ship, U-Boat Worx factors in a variety of specific solutions into the design framework of each model at the outset. This optimises the operational window of our submersibles.

Each submersible is delivered with a unique lifting arrangement, each having their own advantages. Our submersibles operate from a single lifting point, while some are equipped with multiple lifting/deployment arrangements. Optionally, for selected models we can integrate tailor-made lifting points that complement an existing configuration.

The submersibles are typically launched without anyone on board, although on many models we offer optional man-rated lifting certification.

Our submersibles are therefore compatible with any type of crane, whether an A-frame, a single or dual beam crane, a boom-knuckle, or others. Should man-riding lifting be required – please note that the lifting arrangement will also need to be certified for manned applications.

Our innovative design means that U-Boat Worx submersibles can avoid the need for using heavy spreader bars or multi-legged lifting slings.

On each submersible, integrated points that enable guidelines to be attached can be found. Guidelines are used to control the submarine's movement during lifting.



Another unique feature of each U-Boat Worx submersible is the MARLIN Controller. This wireless remote control allows the operator or pilot to steer the submarine while it is on the surface – allowing the submersible to be effortlessly guided away or back to the support vessel.



## Surface Operations

Even though submarines are primarily built to dive, it is important to select a submarine that excels both on the surface and underwater. A submersible needs to be able to move around freely on the surface.

Such freedom allows operators to dock next to the boarding platform of a ship, manage surface currents, and move independently away from a support ship or chase boat to the dive site.

To ensure safe and comfortable passenger boarding, two important factors must be considered - a stable platform from which passengers may board, and sufficient freeboard.

The stable, large top-deck with strategically placed handrails helps to embark and disembark safely and with ease.

Ergonomically placed steps and handgrips guide passengers through the hatch into their seating position in preparation for a comfortable dive experience.

With a high freeboard, you can be certain that your guests will easily board the submarine even in bad weather conditions.

These factors also determine the efficiency with which you can interchange passengers between dives, with short turn-around periods.







## Underwater Operations

To successfully complete your dive objectives, the overall performance of your submarine is key – including being prepared for a myriad of situations that you may encounter.

To navigate safely underwater, it is necessary to have the best possible view of your surroundings. Powerful and responsive thrusters enable precise navigation to the locations you wish to explore, regardless of the varying ocean conditions. U-Boat Worx submersibles are equipped with powerful thrusters and have a specially-designed, hydrodynamic shape which functions robustly under any conditions.

During every dive, the submarine's pilot is in constant contact with the surface officer. The surface officer tracks the precise position of the submarine, and keeps the pilot fully informed as to changing surface/weather conditions.

Given U-Boat Worx submarines are capable of operating for over 18 hours at a time, it is important that passengers experience their dive in the most comfortable environment possible. Ergonomically designed seats, powerful climate control, and surround sound (if desired) contribute to a memorable and enjoyable dive each time, every time.



## Post-Dive Procedures

U-Boat Worx submersibles are capable of up to 12 dives of varying duration every day.

Our submersibles are built from corrosion-resistant materials; however, as is the case with all ocean-going vessels, after each day's dive has been completed and when the submersible is safely stowed back on board, it will require a fresh water wash-down. After rinsing, the submersible can be recharged and refilled, ready for the next day's dive expedition.

Our "plug-and-play" connections swiftly recharge the submarines batteries and refill its pressurised air tanks. All connections are efficiently stowed away out of sight, but are easily accessible via the maintenance hatches.

Recharging the submersible's battery packs takes from 4 to 6 hours, and could even be done while the submarine is still in the water.

You can monitor the status of the submarine on its dedicated "surface tablet" device via a secure Wi-Fi connection.







## Maintenance, Support & Certification

To help keep your submersible in optimal working condition, U-Boat Worx has devised a preventive maintenance and service schedule.

Throughout the year, maintenance on the submersible is limited, and can be easily performed by the on-board crew. Periodical maintenance is straightforward, and follows the checklists provided in the U-Boat Worx maintenance manual.

Once a year, U-Boat Worx will visit the submarine in order to perform its annual service, which is typically combined with the requisite annual survey by DNV.

This combined service check-up and inspection by the classification agency, DNV, keeps the submersible safe, sound, and "in class", as is required for insurance.

U-Boat Worx achieves the highest quality and reliability. Each submersible is provided with a comprehensive One-Year Warranty; an extended warranty is available.

As builders of the world's most popular submersibles, we are renowned for delivering the best possible dive experiences, but also on the support side we ensure ease-of-ownership.

We can also help with selecting dive sites, all aspects of submersible insurance, arranging permission for access to specific dive sites, ensuring a ready supply of spare parts in stock, expert advice 24/7 globally, and more.



An underwater scene featuring a submersible with a large spherical viewing window. Inside the window, several people are visible, looking out. The submersible is surrounded by several large, flat fish with yellow fins. The water is a deep, clear blue.

# SELECTION

## PART TWO

In Part Two we introduce the most relevant selection criteria of a submersible. These are the key factor you need to keep in mind when deciding on your submersible.

This process naturally starts with the number of passengers, how deep you wish (need) to dive, your budget and your submersible's ideal size and weight.

But there is more to it. To guide you through the process of selecting the most suitable submersible, the next pages provide 11 points of attention.



# Total Safety

The ocean does not allow for compromise. Modern submersibles are without doubt the safest way to dive into the heart of our oceans. There are several important factors to take into consideration when evaluating the safety of your submersible – bearing in mind it must meet the most stringent, independent certification and safety regulations:

- **Classification and Certification**
- **Test Programmes**
- **Support**
- **Safety systems and Features**

## CLASSIFICATION & CERTIFICATION

Our submersibles meet the strictest international rules and regulations for manned submersibles globally. These rules are imposed by the most recognized classification society in the field of manned submersibles, DNV.

Other recognized classification societies like ABS and Lloyd's Register offer similar classifications, but the innovation and rigor of the German-Norwegian DNV is beyond repute. U-Boat Worx has a long-established working relationship with DNV.

## TEST PROGRAMME

Our submersibles excel under pressure. Each individual submersible is subjected to a series of stringent tests. During each of these, the submersible's pressure hull is placed inside a large tank, where the pressure surpasses maximum operating diving depth, with an additional safety factor margin up to 1.8 times beyond its certified requirements.

Following this, there is an extended series of prescribed test programmes, test dives, and sea trials with DNV surveyors, before a U-Boat Worx submersible is finally delivered, fully safety-certified, to its new owner.

## SUPPORT

Through our after-sales service, we keep all our submersibles fully operational and maintained to the highest standards. Maintenance and service undertaken correctly will ensure your sub is kept in perfect working condition. Well-documented procedures and an accessible support crew will attend to your every need as a valued customer.

## SAFEST SYSTEMS & FEATURES

There is a range of mandatory safety systems installed on our subs. These include releasable weights, a minimum of 96 hours of emergency life support, emergency underwater communication system, and redundant ballast air supplies.

Over and above these basic mandatory safety system requirements, U-Boat Worx has established a superior, new baseline as to defining safety. From concept design to delivery, U-Boat Worx has established a culture of absolute safety, quality and innovation. We have developed our own set of superlative safety design guidelines, systems and features, to assure safety is paramount, throughout every stage of every dive.

Each U-Boat Worx sub is created with an unimpeded view and a “zero-entanglement” design.

Furthermore, our submersibles are all operated under what is called “slightly positive buoyancy” – meaning that it will automatically float upwards when the pilot doesn't use the controls. In the unlikely event of a full electrical failure or total loss of all propulsion, the submersible therefore automatically and safely returns to the surface.







## Best View

One of the most impressive features of any submersible is the ability to witness unexplored sites and hidden submarine landscapes unimpeded. The extent to which you are able to see, determines how enjoyable the overall experience is. At U-Boat Worx, we understand that superb viewing capability is paramount; therefore our designs have incorporated unobstructed vistas from any seat, or angle.

In order to enjoy crystal-clear, undistorted viewing, the best materials are employed throughout the construction process. U-Boat Worx only works with state-of-the-art acrylic, specially crafted for underwater use in the United Kingdom.

Leveraging its extensive in-house knowledge, innovation and production techniques, U-Boat Worx has successfully manufactured numerous spherical windows that provide a level of clarity without peer.

All interior components of the submersible are strategically placed to allow for an unobstructed view of surroundings.



## Uncompromised Surface Capabilities

U-Boat Worx submarines have been carefully designed to ensure superior stability on the surface. Its decks provide easy and safe access for passengers. Ergonomically designed handles and supports make boarding easy.

Each submersible can be towed at speed or travel under its own power on the surface. Irrespective of sea conditions, U-Boat Worx submersibles maintain full responsiveness and power at all times, making docking alongside another vessel a simple task.







## Unparalleled Comfort

Ultimately the goal of any underwater dive experience is to enjoy the outside world while sitting in luxury and comfort.

U-Boat Worx submersibles have set the benchmark for luxury and comfort. Only top-quality materials and the finest design are used.

Every detail of the interior is carefully designed by our in-house experts, and may be complemented with a prospective owner's input to fulfil personal requirements, while reflecting individual taste and a signature style.

A powerful air-conditioning keeps the temperature consistently pleasant and removes moist from the cabin atmosphere.

To enhance the dive experience, passengers may listen to surround sound music while underwater.



## Effortless Control

The intuitive controls of a U-Boat Worx submersible are designed to simplify the pilot's workload, allowing for uninterrupted focus on the undersea environment.

One of the fun aspects of a U-Boat Worx dive is the opportunity for everyone to take a turn at steering the submersible. The intuitive MANTA Controller permits a passenger to navigate the submarine under supervision of the pilot.

Private explorers, professional filmmakers, and commercial tourist operators alike, all share a common desire to use the best available engineering solutions.

The U-Boat Worx tradition of industry-leading innovation has been established by adopting many smart engineering solutions.

The U-Boat Worx Information System (UIS) is the integrated monitoring system that conveys all the information the pilot requires onto a single, easy-to-read touch screen. This user-friendly interface was developed by our most experienced master pilots to ensure that all vital data is available at a glance and that secondary information can be displayed at the tap of a finger.

U-Boat Worx has developed a unique underwater navigation system based on Ultra-Short Baseline (USBL) technology. Reaching your targets underwater has never been easier.







## Unrivalled Mission-Adaptability

Having the right tools is key to performing any task properly. We know that the highest quality, safety and reliability is required, along with the ability to configure the sub to meet a wide range of objectives. Whether the mission is to collect exotic samples from the ocean floor, film marine life, run a tourist operation from a cruise ship or simply enjoy the underwater world, our submersibles are designed to achieve these ends.

submersible in the future to meet any new challenges. We have many standardised options and our in-house engineering department is available to develop any special custom solutions.

As U-Boat Worx evolves and advances, the latest design innovations and technological features are incorporated into our new and existing submersibles.

Each submersible can easily be equipped with an array of options, making your submersible uniquely capable of performing multiple tasks. Due to our modular design, operators can upgrade their





## Superior Endurance

A submersible should be capable of performing many successful dives each day in operation, in order for unrestricted exploration of the seas, whether for leisure, scientific or professional objectives.

U-Boat Worx' unmatched Lithium-ion Battery technology leads the evolution in the manned submersibles industry with dive operating times of up to 18 hours.

Oxygen (O<sub>2</sub>) and Carbon Dioxide (CO<sub>2</sub>) filtration capacity should not be a restricting factor for sub operators. High-pressure air capacity should allow multiple dives per day to be performed. Each U-Boat Worx submersible is capable of diving up to 12 dives per day.

At the end of each dive day, recharging and refilling can be quickly done with plug-and-play connections. It is even possible to charge the submarine while it is floating on the surface.







## Carefree Launch & Recovery

U- Boat Worx has perfected the technique for seamless launch and recovery.

Most of our submarines integrate a single lifting point. While many submarines are launched without passengers inside, there is an option for fully certified launching with the crew and passengers aboard. The unique single lifting point makes it possible to safely and quickly launch the submarine, while keeping all-round vision during each dive.

Flexible lifting arrangements allow for seamless integration into a yacht's garage.

Another handy feature is the MARLIN Controller, which further simplifies launch and recovery by remotely controlling the submarine while it is on the surface.



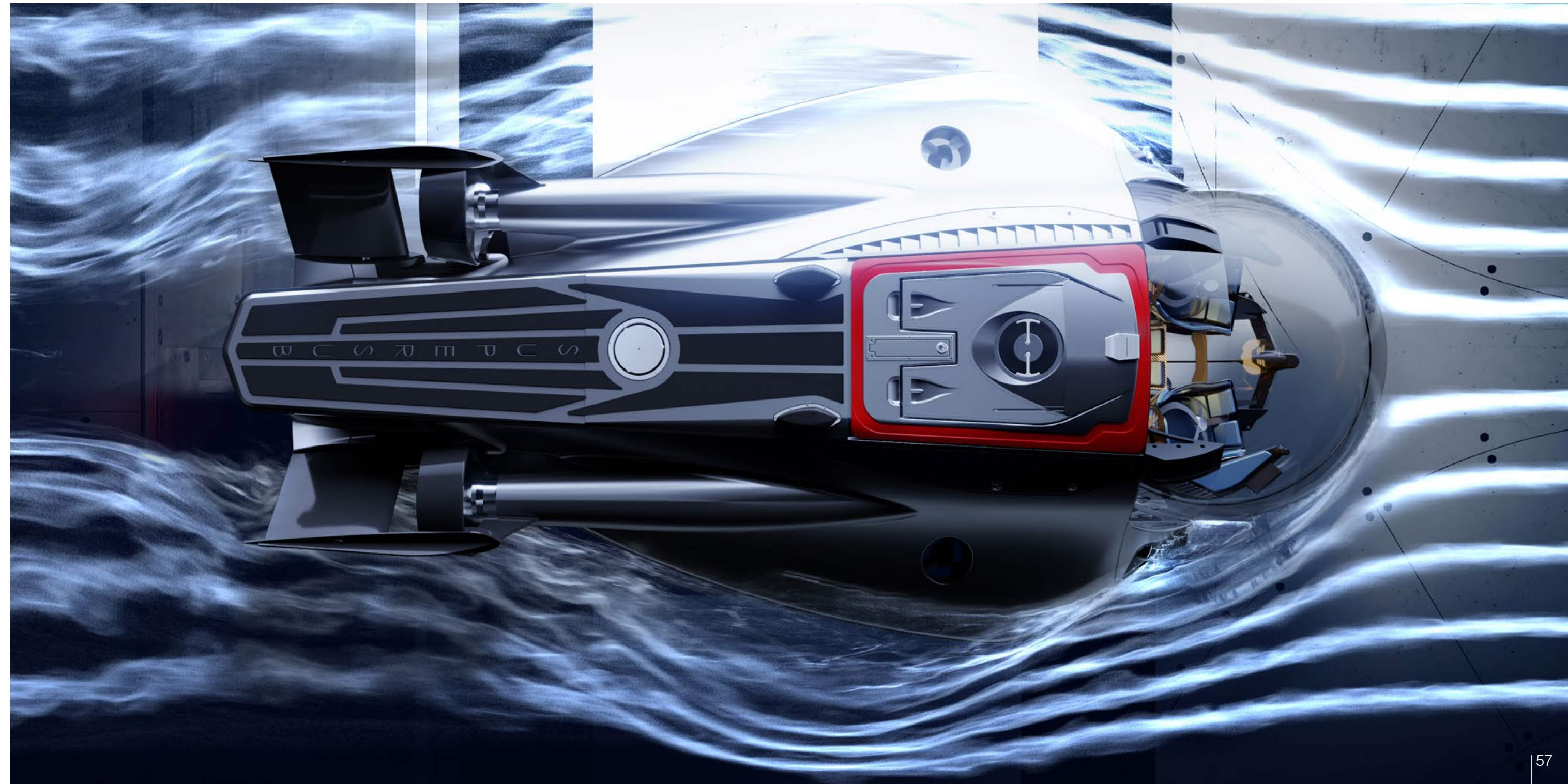
## Maximum Manoeuvrability & Speed

Manoeuvrability and speed of a submersible greatly influence the extent of each dive operation. By choosing the right submersible, you will find yourself diving in ever-more demanding and exciting conditions.

Once you have selected the most suitable submersible, the challenges and demands of each dive will be greatly influenced by speed and manoeuvrability. These facets of U-Boat Worx' continuous innovation and design are met by combining best of breed thrusters with superior components that maximise energy efficiency.

Descending to deeper levels requires adequate vertical speed capability. The powerful thruster units ensure that you reach the maximum depth in optimal time.

Lateral movement is an important factor that provides the passengers with the advantage of a continuous unimpeded view ahead while the submarine is moving sideways, a unique feature that emphasises the versatility of all U-Boat Worx submersibles.







## Ever-Ready

Before every dive, a pre-dive check needs to be completed. To ensure your submarine is always ready for action, the pre-dive preparations are easily and quickly executed by the sub's effective design and our efficient checklists that minimise launch times.

On completion of each diving day, all that is required is a fresh water wash-down, a recharge of the batteries and a refill of the air cylinders to get the submarine ready for the next mission.



## Real Depth

When designing a submersible there is an incredible number of safety factors to be considered. One of them is design temperature at depth. U-Boat Worx takes high safety margins and wants to make sure its clients can dive to the advertised depth in any part of the world.

Our submersibles are certified with a conservative depth-rating, meaning you will be able to dive anywhere in the world up to the full depth, without temperature limitations. This will guarantee you're able to dive in the Pacific, Red Sea and Caribbean to the full advertised depths. Competitors are known to advertise depth ratings with a temperature rating of 10 degrees Celsius. Meaning in warmer parts, like the Red Sea the acrylic won't be able to go the full "advertised" depth.







## COMPANY CONSIDERATIONS

### PART THREE

We have introduced the important aspects of the submersible operation and the selection criteria. Another important factor when selecting a private submersible is the manufacturer itself.

As leading manufacturer, U-Boat Worx assists its customers during every stage of submersible ownership. A dedicated U-Boat Worx team will be assigned to guide you through every stage of ownership, from the initial specification of the submersible, to the engineering and manufacturing, to the integration and start of operations on your ship.

Our team of specialists from across many disciplines is available for support 24/7. In the following part, you can read about our services before and after delivery.



## Built to the Highest Quality Standards

Each U-Boat Worx submersible is engineered and built to the highest standards, individually classed by leading Classification Society DNV and optionally certified by Flag States like the Cayman Island Shipping Registry.

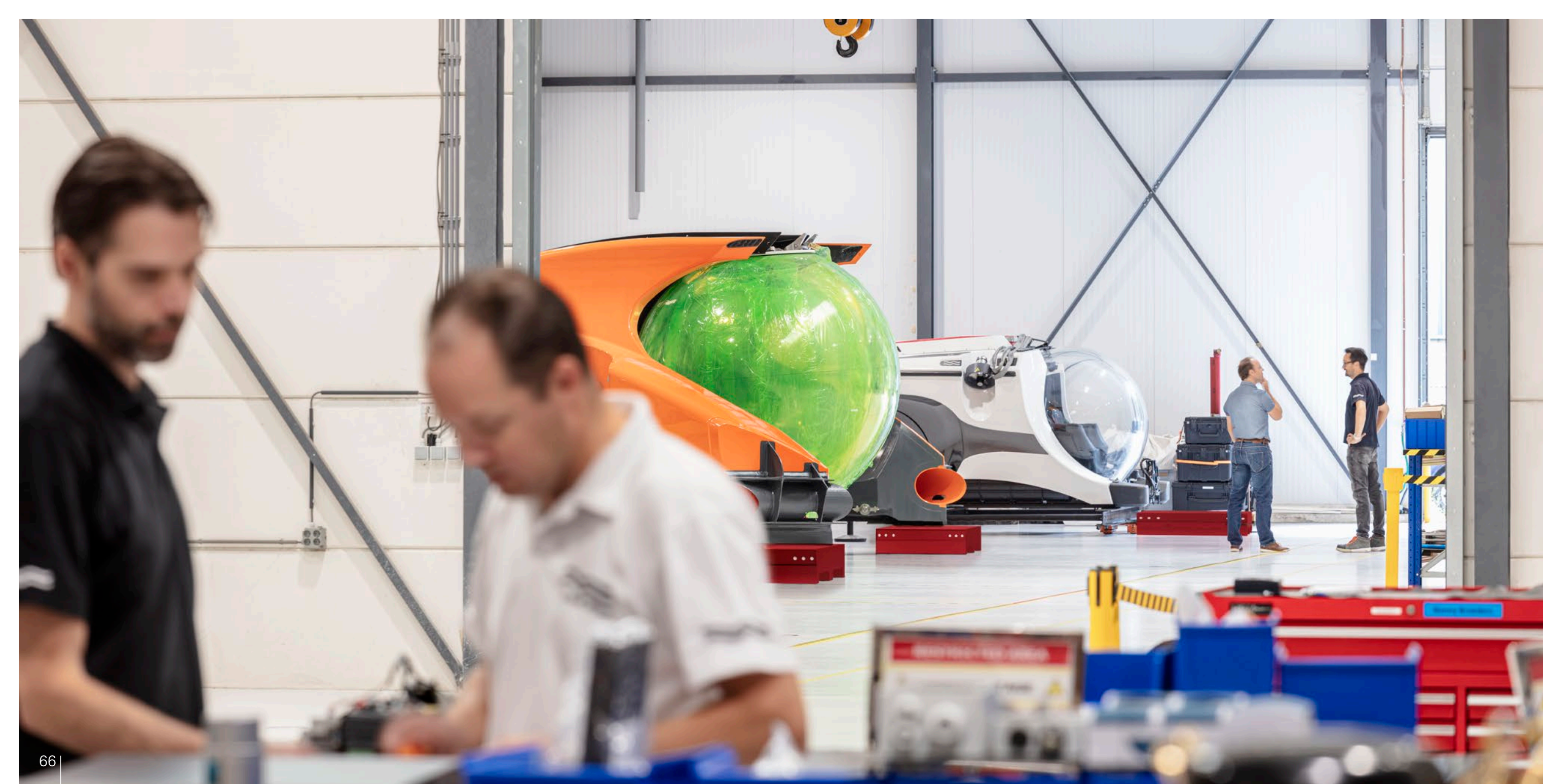
Besides U-Boat Worx' internal quality assurance process, each individual submersible is put through an extensive process of pressure tests, material tests, factory trials, harbour trials and final sea acceptance trials to ensure that each unit meets the highest global standard in manned submersibles.

Combining Dutch engineering with the best materials available results in the world's leading range of submersibles.

The craftsmanship evidenced in each of our submersibles ensures our operators/owners can dive in style using a proven and trusted product.







## In-House Engineering Capabilities

The full design and engineering of the submersible is accomplished by U-Boat Worx' experienced in-house design team. Making use of the latest in 3D design software and FEM software, our expert engineers have put together more proven core components and submersible models than the industry standards.

Need a modification to suit your particular application? Our range of subs can be customised to suit almost any operating conditions.



# Innovation

Being on the leading edge of technology is a carefully managed process in which U-Boat Worx has excelled since its first designs in 2005. U-Boat Worx submersibles are equipped with the very latest in submarine technology, making owning and operating a U-Boat Worx sub enjoyable and easy.

- **Largest manned submersible manufacturer in terms of annual output, numbers delivered, employees, and units in operation.**
- **Delivered more submersibles than the entire competition combined.**
- **First submersible manufacturer to take a series production approach.**
- **First fully certified manned submersible with lithium-ion battery technology.**
- **Designed and launched six different fully-certified models within 10 years.**
- **Accumulating thousands of dive hours all over the world with unblemished safety record.**
- **Largest number of submersible pilots trained.**
- **World leaders have dived in U-Boat Worx submersibles, verifying their faith in our absolute safety.**
- **Introduction of the MANTA Controller, allowing supervised passenger operation of our submersibles.**
- **U-Boat Worx submersibles are instant classics and have been recognised and awarded numerous times, including multiple prestigious Red Dot Awards.**
- **Introduction of the MARLIN Controller that allows remote, wireless control on the surface.**
- **New Pressure-Tolerant Battery System gives deep diving submersibles more than double the battery capacity while not increasing size or weight.**







## Series Production & Pricing

U-Boat Worx' range of submersibles are the only submersibles to be built in series, and with interchangeable componentry. This benefits our customers by providing customized solutions for deep sea exploration, together with the reliability and cost of an "off the shelf" product.

Our scalability allows us to build the very best submersibles at competitive prices. Our strategy of growth has provided us with the largest production facility in the industry, and this allows our clients to enjoy the best quality, highest reliability and bespoke design, at industry-defining prices.



## General Working & Stability

Led by an experienced management team, a relentless drive to create the best product, and a deep respect for our customers, U-Boat Worx meets every requirement that any discerning owner/operator may have.


In the twelve years since our inception we have proudly created a market for something previously unknown, and have set the standard for personal submersibles.

With our team of 50 professionals, we move into each new year financially secure and focusing on what we do best: designing, building and operating our world-class, industry-renowned submersibles.

We invite you to visit our factory in Breda, The Netherlands, to see first-hand what we have achieved, and to share in our ongoing success.







**U-Boat Worx B.V.**

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