In-Transit Cleaning of Hulls

ITCH v2 - User Manual

rev 1.0

Shipshave

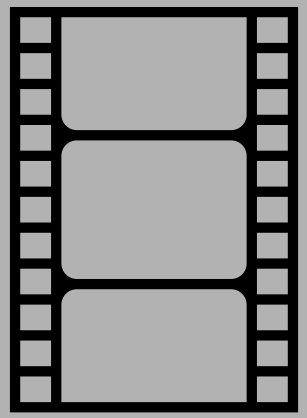
Table of Contents

Appendix

NB! Some of the images used in this User Manual may not be identical to the deliveries.

01 – Introduction of ITCH v2

View the demonstration video by
opening
«Shipshave-ITCH.mp4»
on the included memory stick



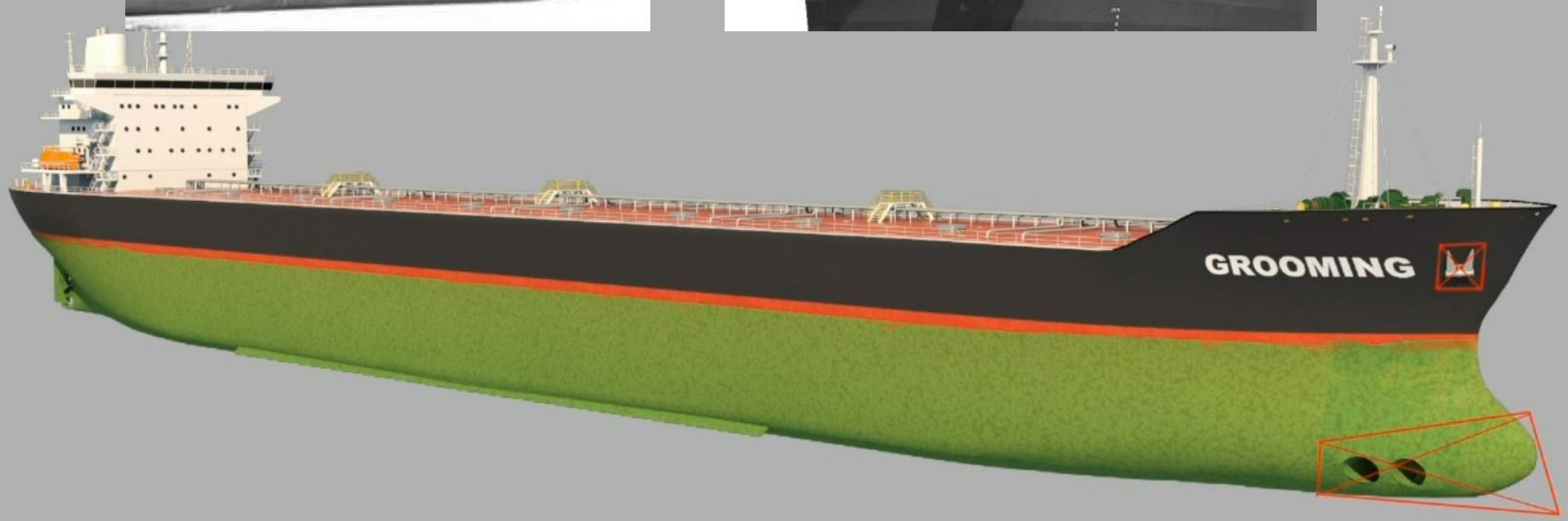
As an alternative you may access
the video via the web from:

www.shipshave.no

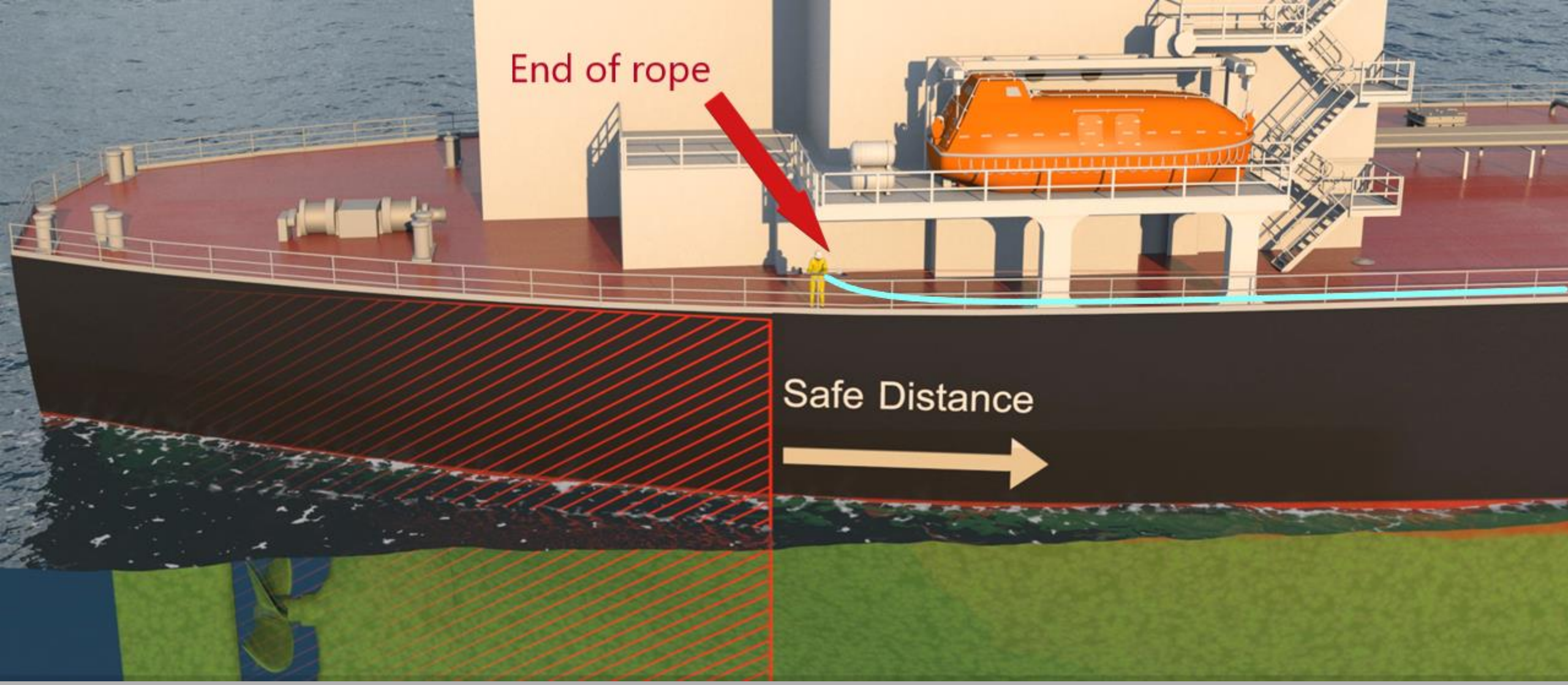
ITCH v2

02 –Before First Use

Review the supplied documentation to understand how to best utilize the ITCH to maintain the vertical sides free from fouling.
Contact Shipshave (support@shipshave.no) prior to commencing operations if you have any questions related to the instructions for use.



Assess the location of any obstructions such as thrusters and sea chests on the hull that can trap the robot. Identify the optimal locations for deployment and retrieval of the robot. The foremost chock will normally be the best location for deployment in order to ensure optimal coverage.



Rope setup:

Prior to first use of the ITCH, place the winch in the planned position, unspool the rope and pull towards the aft of vessel. Verify that the rope cannot reach the propeller. Cut or secure the rope length on the winch so that the ITCH robot cannot reach the propeller.

03 – Contents of ITCH Kit

ITCH Kit Contents

1x Shipshave winch

1x User manual

1x ITCH robot

1x Nose

1x Tail

1x Towbar assembly

1x Rudder

1x Accessory box

2x White brush

2x Black brush

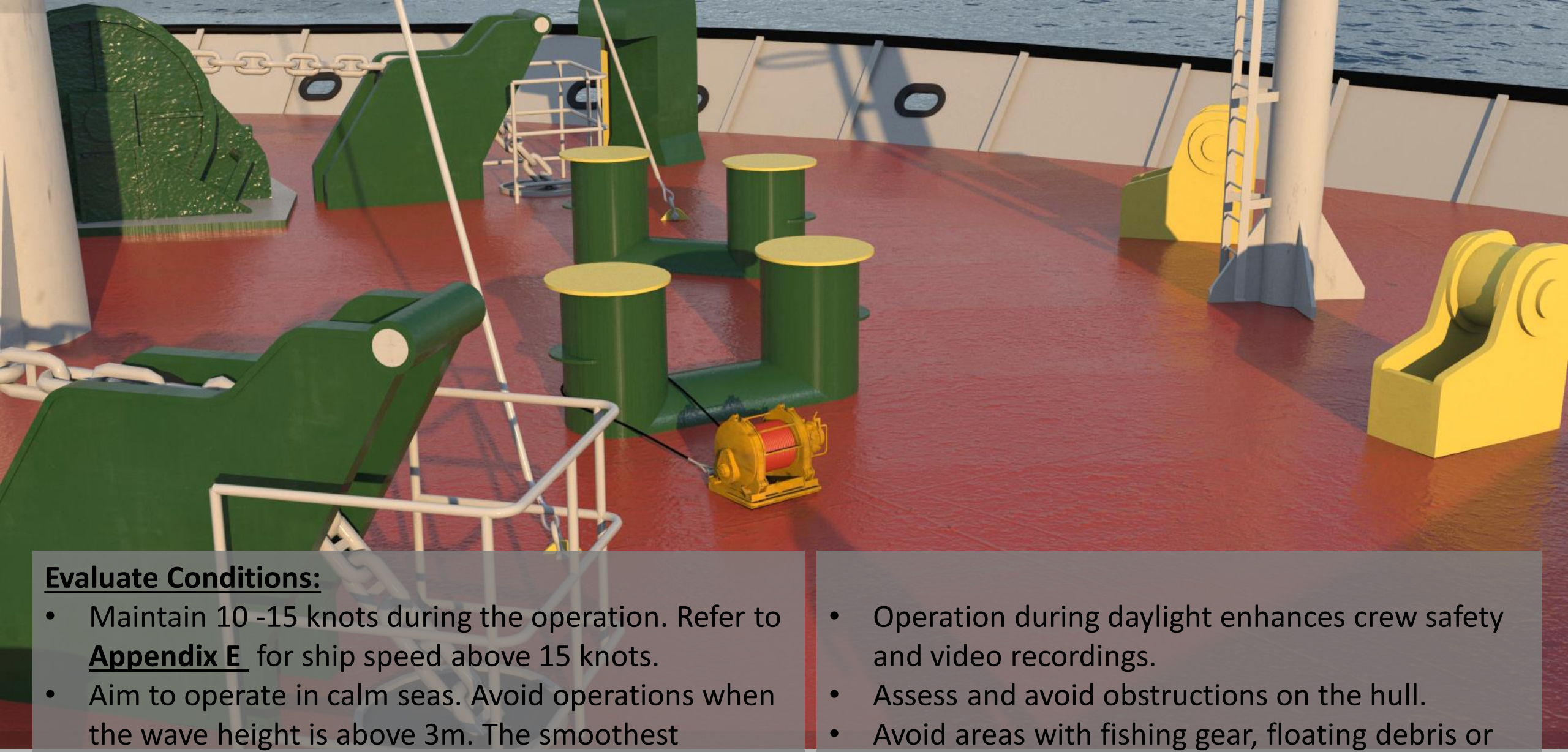
2x Blue brush

Tools & Accessories

- USB cable*
- USB C to USB A Adapter*
- USB Power Delivery charger*
- USB memory stick with software & user manuals*
- Spare screws and bolts*
- Carabiner with roller
- 17mm wrench (for towbar nut)
- 6mm hex key (for M8 bolts)
- 5mm hex key (for M6 bolts)
- Circlip pliers
- Torx screwdriver (for opening switch compartment)*

Items marked with* are in the Accessory box

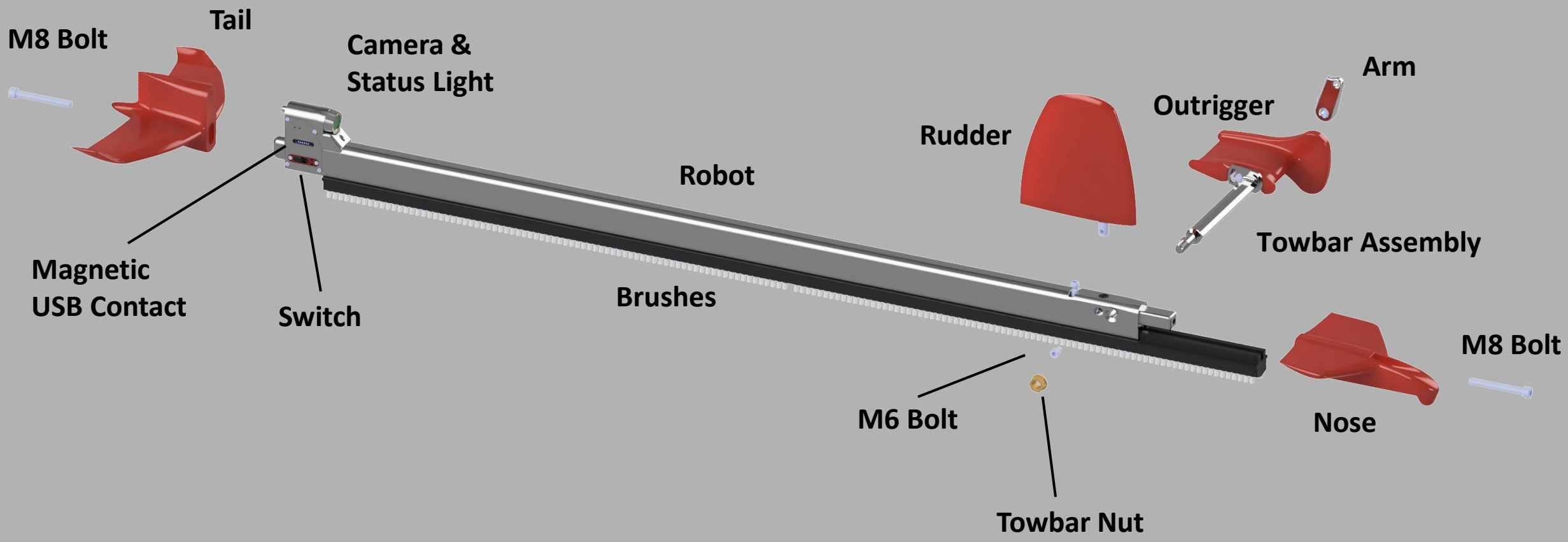
04 - Operating ITCH



Evaluate Conditions:

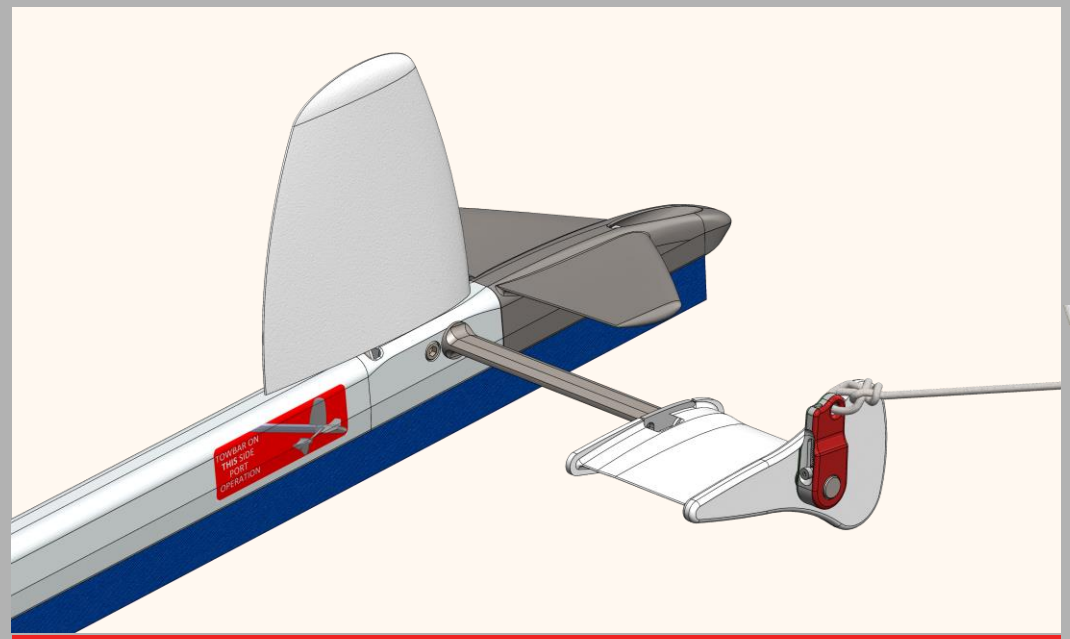
- Maintain 10 -15 knots during the operation. Refer to **Appendix E** for ship speed above 15 knots.
- Aim to operate in calm seas. Avoid operations when the wave height is above 3m. The smoothest operation will be on the leeward side of the vessel.
- Operation during daylight enhances crew safety and video recordings.
- Assess and avoid obstructions on the hull.
- Avoid areas with fishing gear, floating debris or marine vegetation.

Robot Assembly

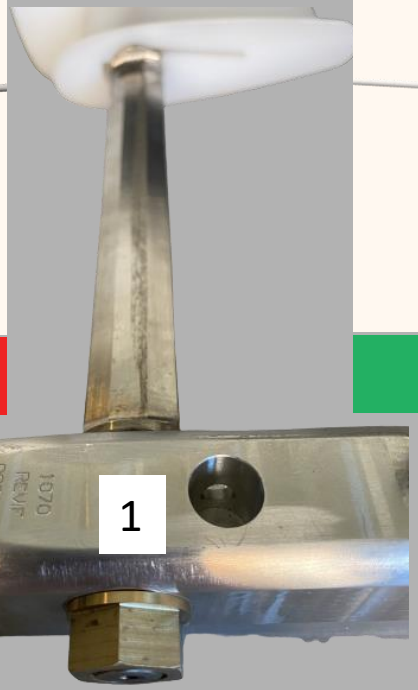


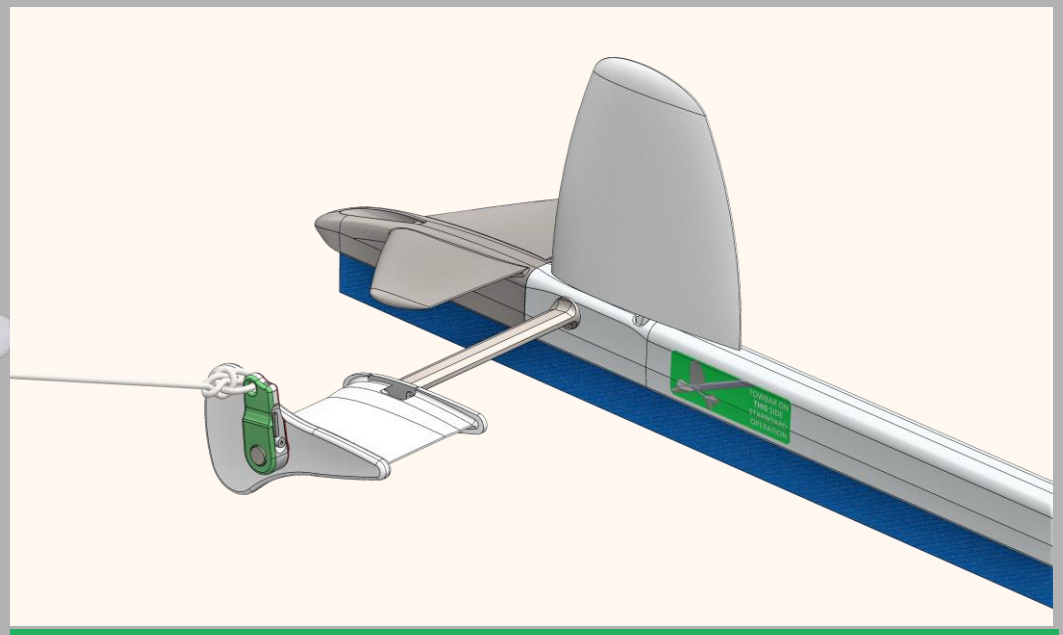
Assemble the ITCH robot using the tools and 3 bolts + 1 nut provided in the Accessory box.
Firmly hand tighten bolts and nut with the included tools. Tie the rope to the arm with a bowline knot.

Towbar Position



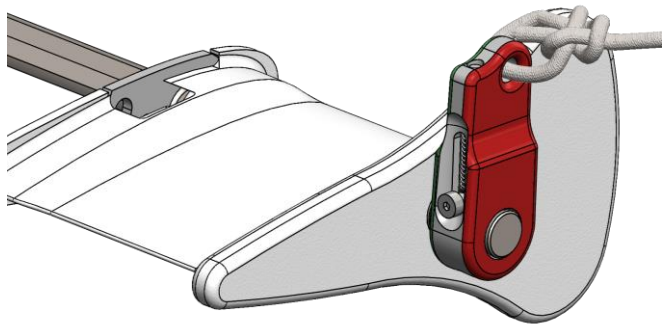
Port operation



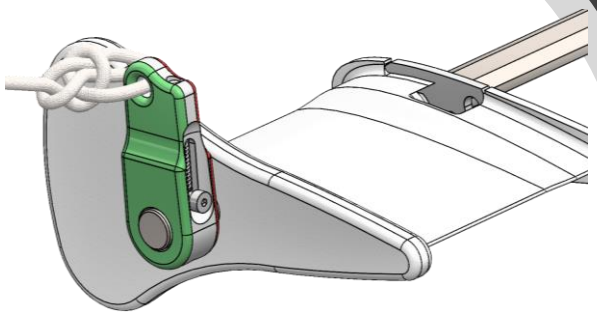


Starboard operation

The same towbar is used for operation on either side of the vessel.
Switch sides of the towbar to alternate between port and starboard side operation by unscrewing and fastening the nut (1).
The robot is clearly marked for Port and Starboard side operations.
Swap sides of the arm.



Arm position for port side operation

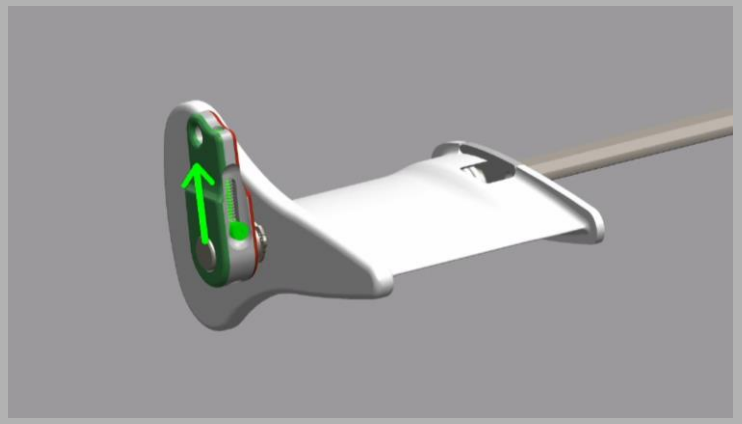


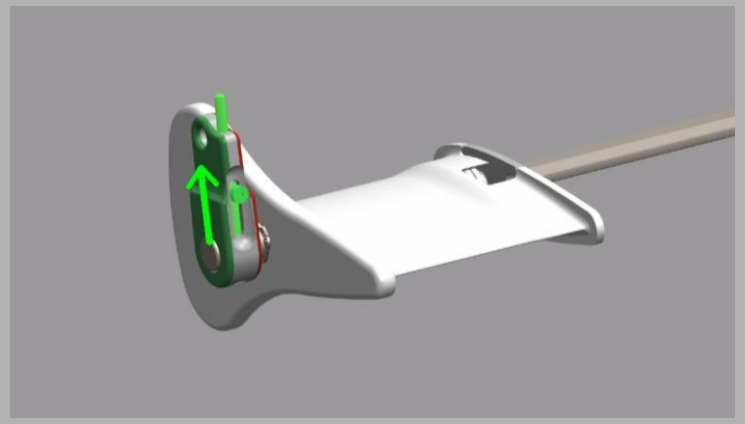
Arm position for starboard side operation

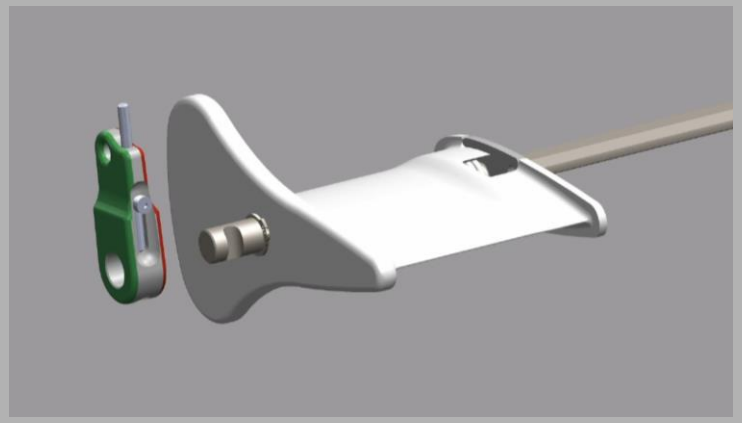
Arm Position

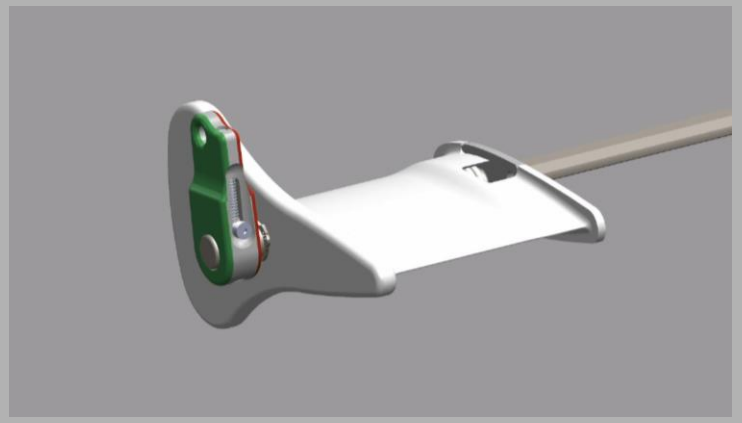
- Always check the rope for wear and cuts before tying to the arm.
  If needed, cut back the rope.
- The arm should be fitted to the towbar end as shown in the pictures.
- Avoid large knot loop to minimize the water resistance.
  The towing line is Dyneema rope with low friction.
- Use a bowline knot.

Fitting the Arm to the Towbar



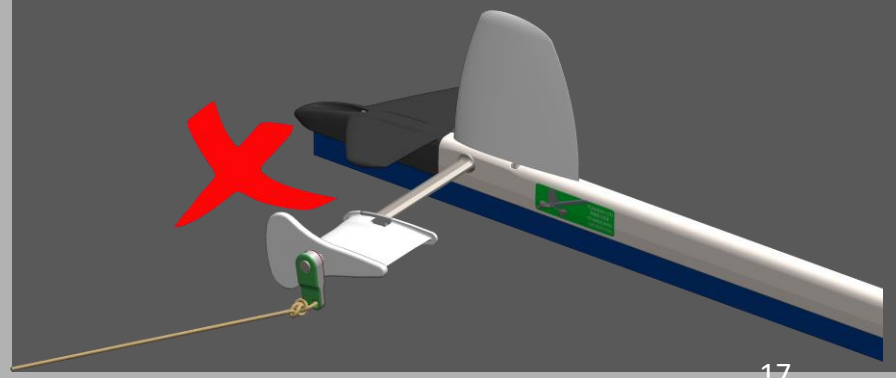






- Push the spring-loaded pin
- Insert the Arm to the towbar in the correct orientation
- Release the spring on the pin when the Arm is fitted
- Make sure the Arm is fixed to the Towbar and check that the locking pin is properly engaged

Caution: Do not fit the Arm upside down as shown in below image



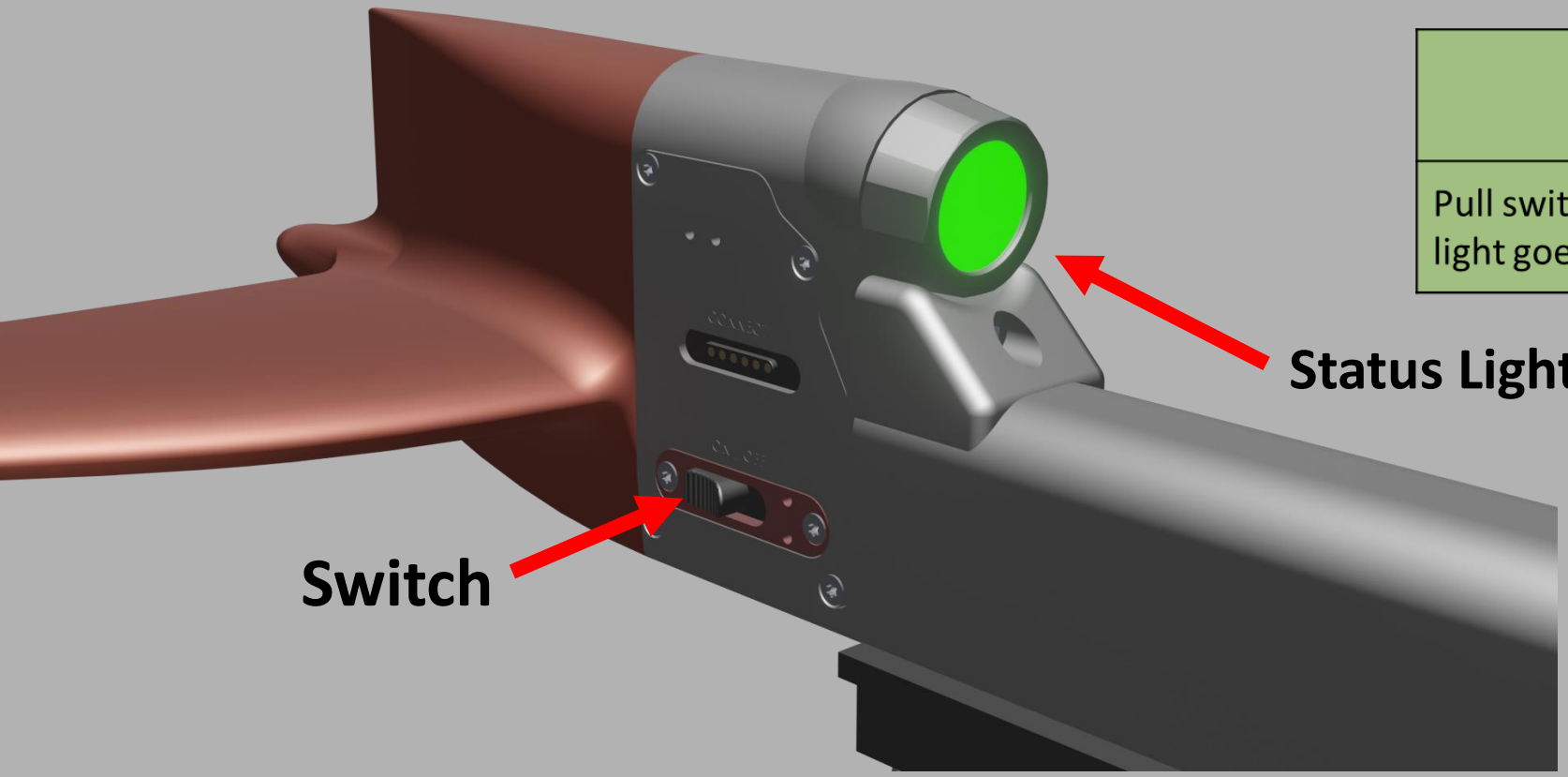
Setting up the winch

Assess which chock to use on the forecastle deck. For optimal coverage and smooth operation, deploy through the Panama chock in the centerline of the ship. Prepare a clear route for the rope to travel without obstructions or pinch points. Limit the number of directional changes to minimize friction. Connect the winch to the power source.

Position of the winch

The portable winch must be safely secured to a strong point, such as a bollard. Position the winch such that the rope follows a straight line between the drum and the chock. Keep the winch at least 5m away from the chock for efficient spooling.

Robot On / Off Switch



ON	OFF
Pull switch left until status light goes on (2-3 seconds)	Pull switch left until status light goes off (5-7 seconds)

Power on the robot by pulling the switch until the status light turns on.
A startup sequence will start, and the light will blink green while the rudder moves to calibrate its position.

The status light will be solid green, and the rudder will put itself into a dive position once ITCH is ready for use.

ITCH deployment through Panama chock

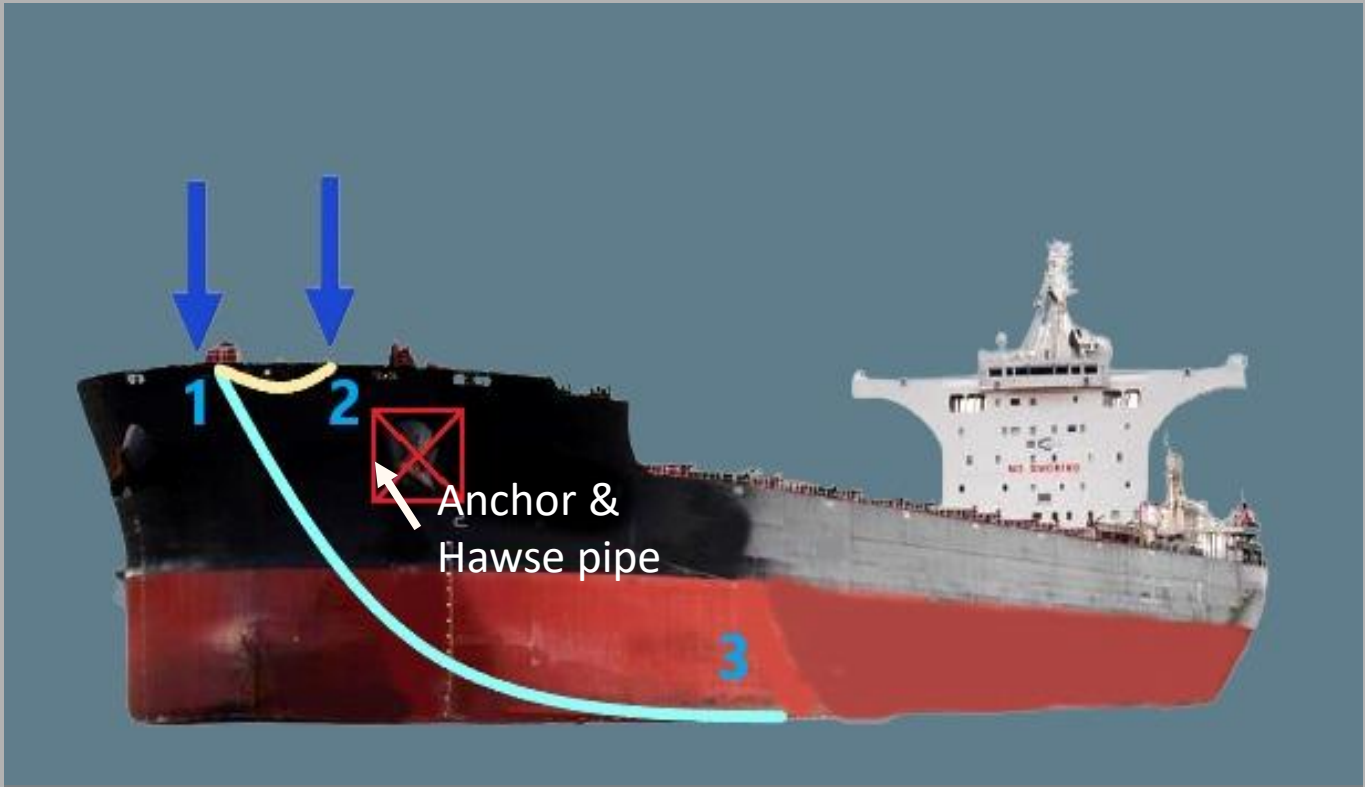


Illustration of the rope positions during Panama chock deployment. The illustration is for port side deployment .

1. Align the winch with the Panama chock, pull the end of the rope to the side and back on to the deck.
2. Connect the rope to the ITCH robot at ‘position 2’.
3. Release the ITCH and spool out the rope at ‘position 2’ till the ITCH robot reaches the water so that the rope follows the ‘position 3’ path.
4. Reduce and adjust the winch speed when the ITCH robot dives.

ITCH deployment through Panama chock

- During the deployment through the Panama chock, the rope will experience a higher friction on the rope.
- The friction on the rope can be reduced by using a sheave.
- A rope can be tied to a support structure and the other end to the sheave with a carabiner.
- The end of the rope from the winch needs to be passed through the sheave before attaching the ITCH to the rope.

Rope from the winch

Sheave with Carabiner

Deployment in the foreship

While observing over the side, deploy the robot with the winch spooling out at full speed until the robot dives. When the robot has dived, reduce the speed to the desired speed setting to ensure overlapping coverage. Verify the functionality by watching the rope go up and down and sensing varying tension in the rope.

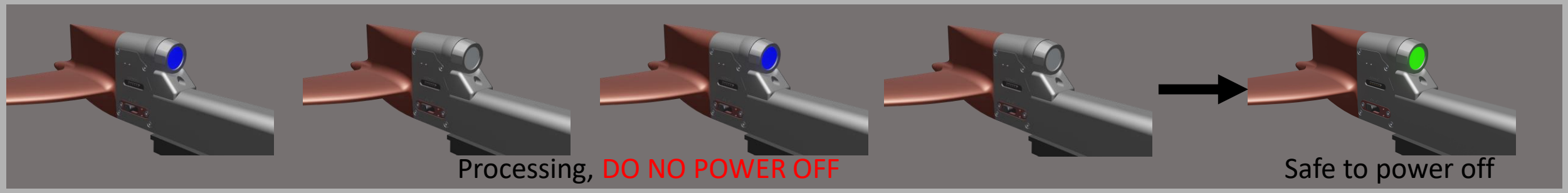
Keep watch during the operation.

When maximum length of rope is spooled OUT, change direction to IN. Continue at the lowest speed, bringing the robot forward.

If rope tension increases while spooling in, the robot is stuck and the winch stops.
Release 2-5m rope and spool in.

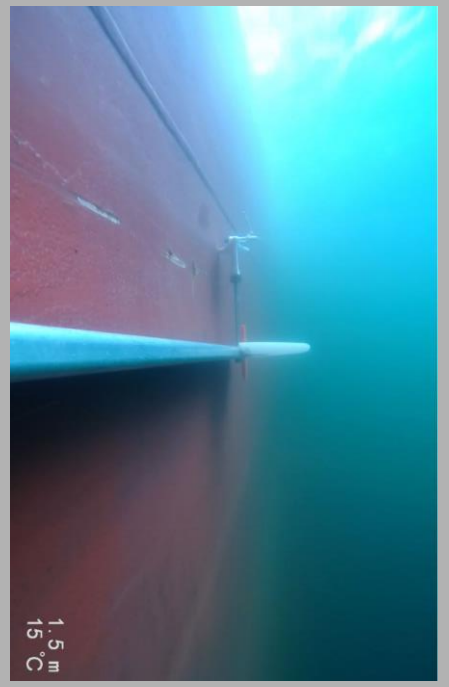
When the robot is back at the bow, prior to leaving the water, spool in at full speed.

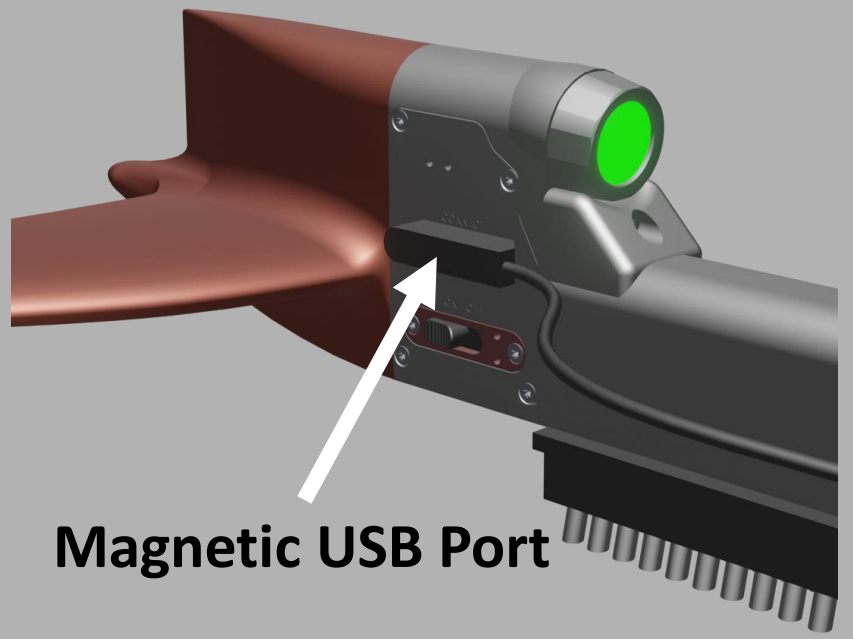
Stop the winch when the robot is above water and in safe distance from the chock. Take it onboard by hand.



After retrieval

1. Do not turn off the robot while blinking blue. Wait for solid green light.
2. Connect the USB cable and download the videos and log data using Slick.
3. Check outrigger and brushes for wear.
4. Clean brushes if necessary.
5. Move the Towbar and Arm to the other side and redeploy the robot to clean the other side of the vessel.





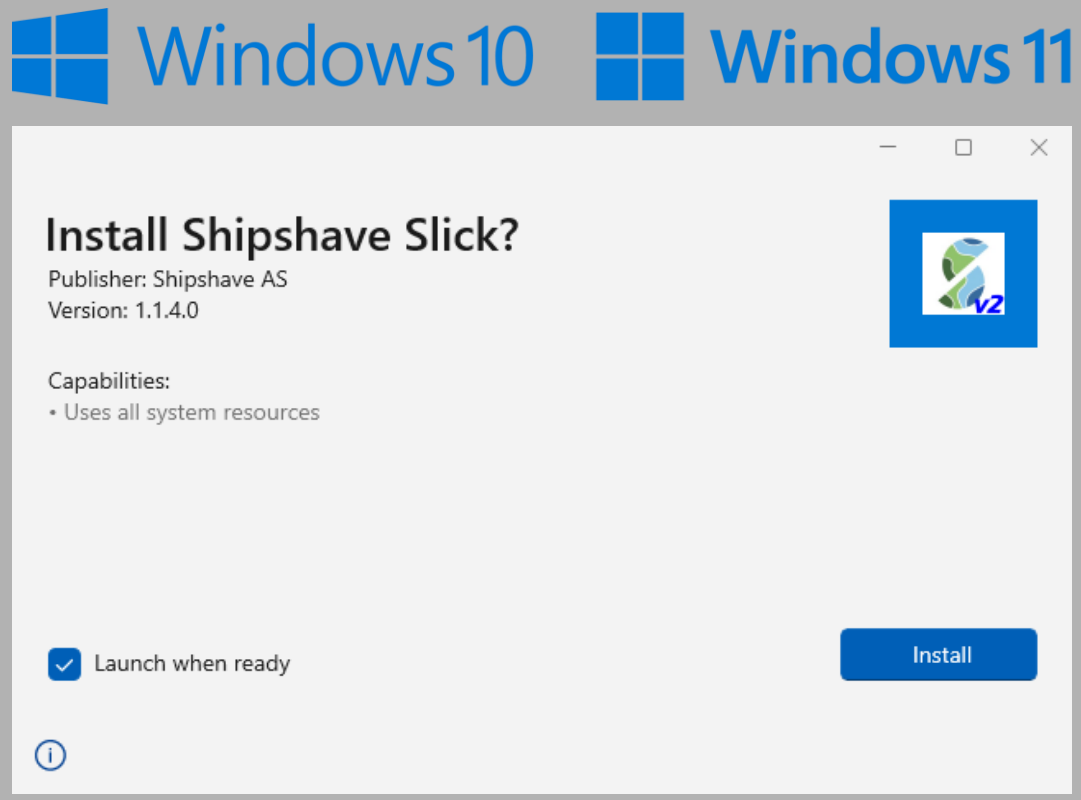
After cleaning operation is completed and before storing the equipment rinse the robot and winch in fresh water and dry off.
Spray with penetrating oil (WD 40/CRC 5-56 etc.)
Disassemble and charge the robot.
Fill in the feedback form available in the memory stick and email to support@shipshave.no with the dataset file.

05 – Slick User Application

Installation

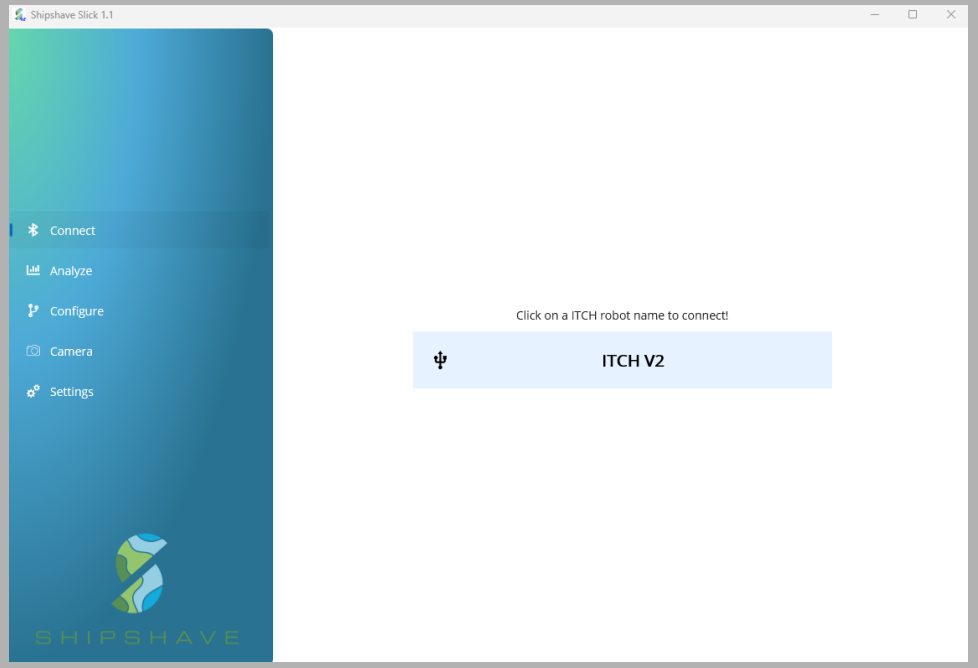
The user application for the ITCH system is called Slick.

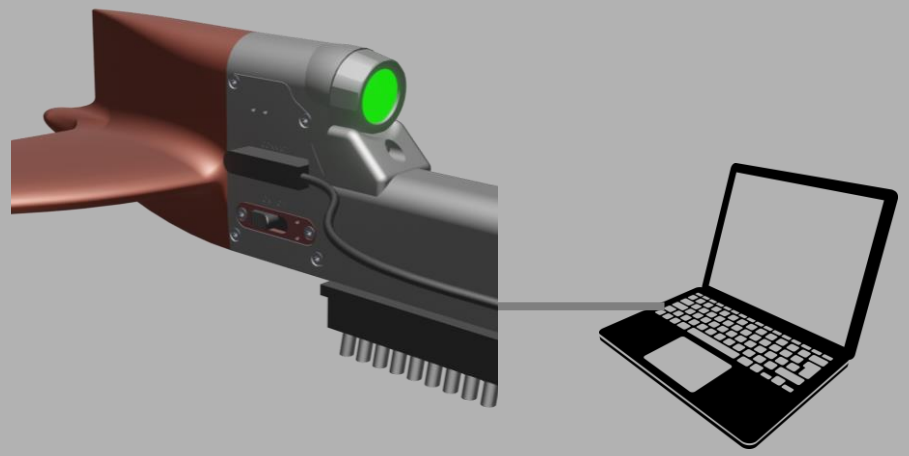
- Slick supports Windows 10, 11 and above.
- Download installation file from:
  - Included Memory Stick or support.shipshave.no
- Read the installation guide in the application packet and follow it to install Slick on your computer.



Connect to the Robot

- Power on the robot.
- Verify that the status light turns green.
- Connect the USB cable to the robot.
- Click on ITCH robot name in Slick to connect.





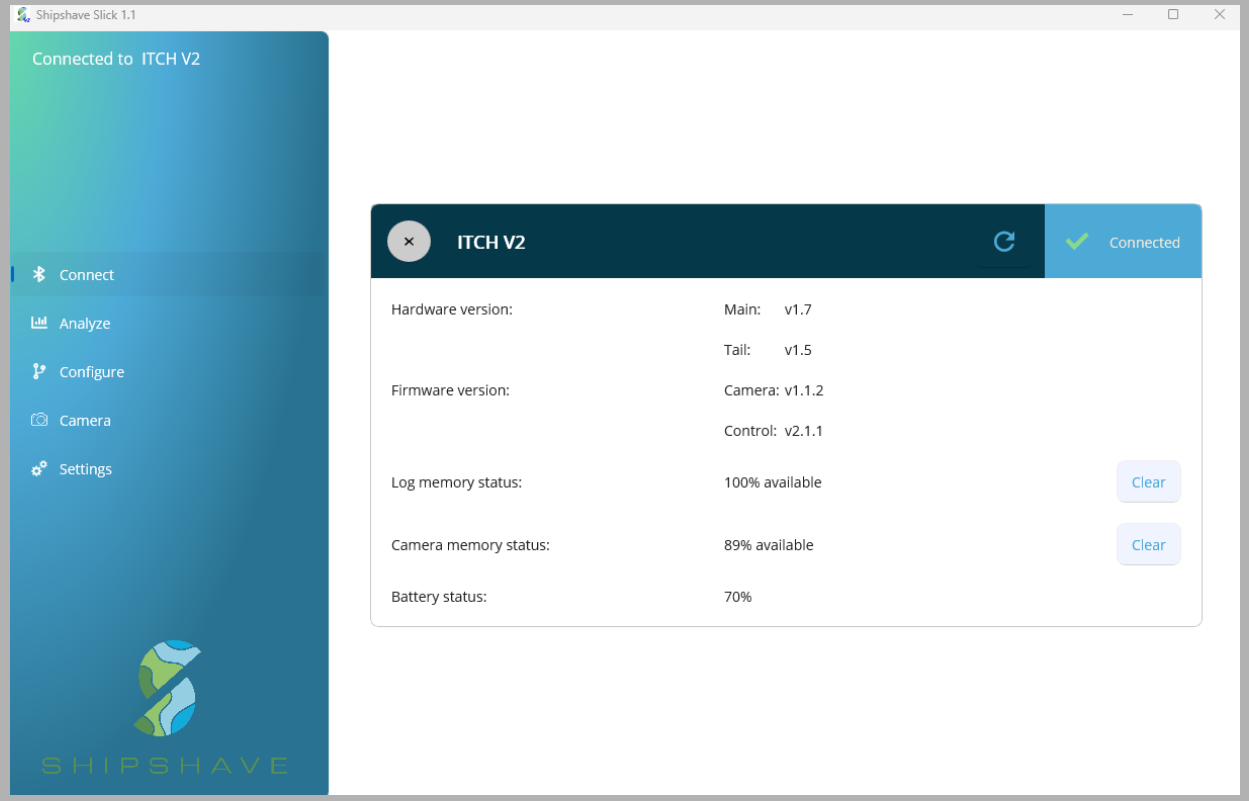
Robot Information

When connected, the connect page will show the following status information about the Robot:

- Robot Hardware Version
- Robot Firmware Version
- Memory Status
- Battery Status

The upper clear button allows you to clear the telemetry log memory of the robot.

The lower clear button allows you to clear the video memory of the robot.

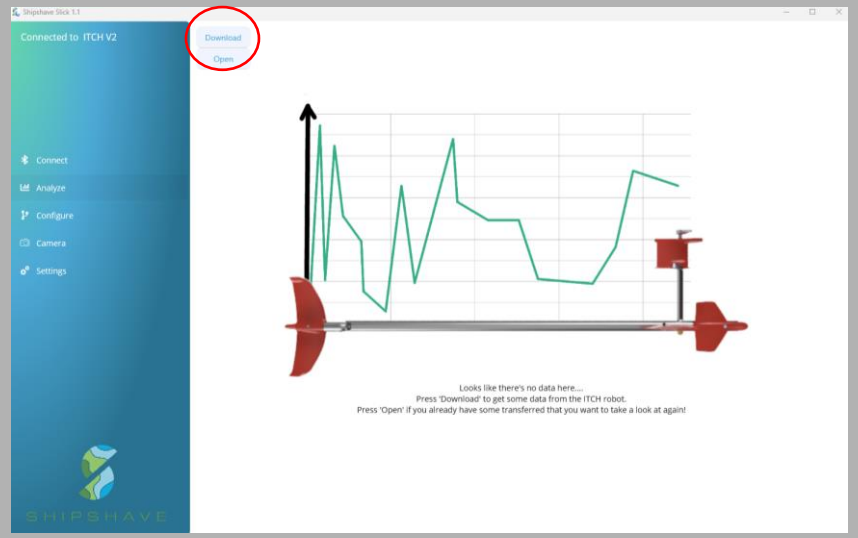


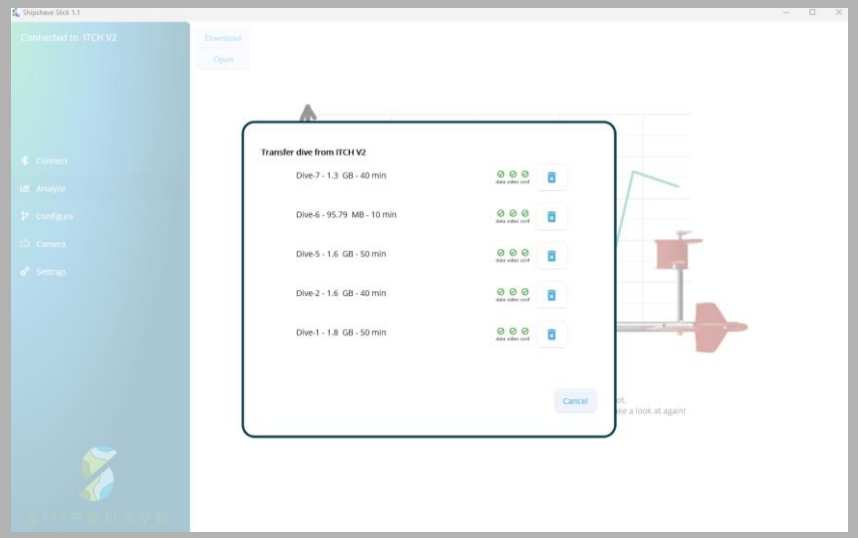
Download Videos and Logs from Robot

To assess the condition of the hull and the effectiveness of the cleaning, you can review the videos and log data recorded by the robot.

- Open Slick and connect to the ITCH.
- Go to the Analyze page and press “Download”
- Click the dive you want to download to your computer

You can access previously downloaded dive logs and videos by pressing “Open” and then the dive you want to show.



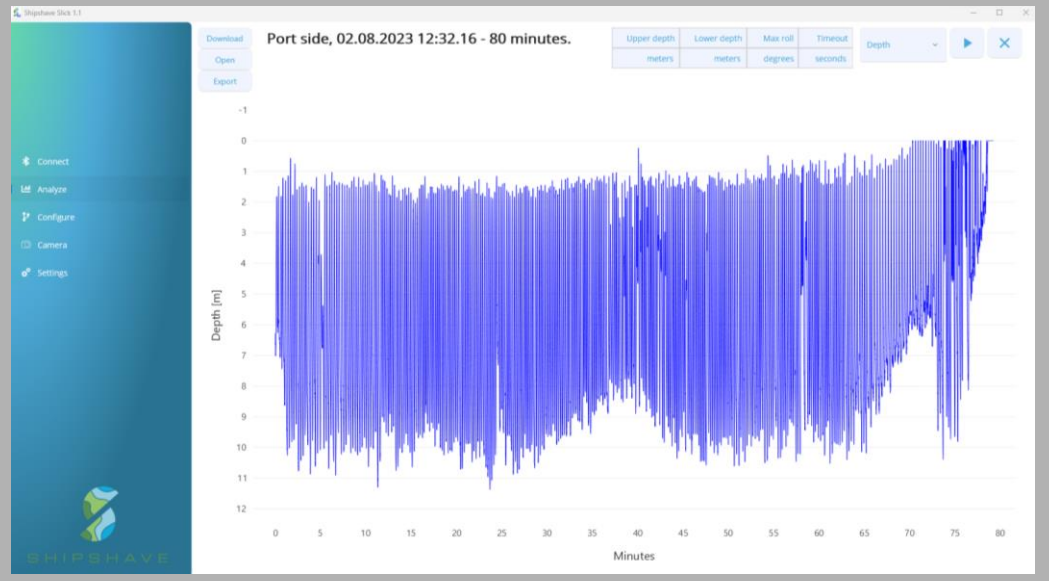


Review Videos and Logs from Robot

- View logs in the line graph. Select data to plot in the pull-down menu to the right in the window.

- View videos by pressing the play button. The robot will by default split the video into 10-minute clips.

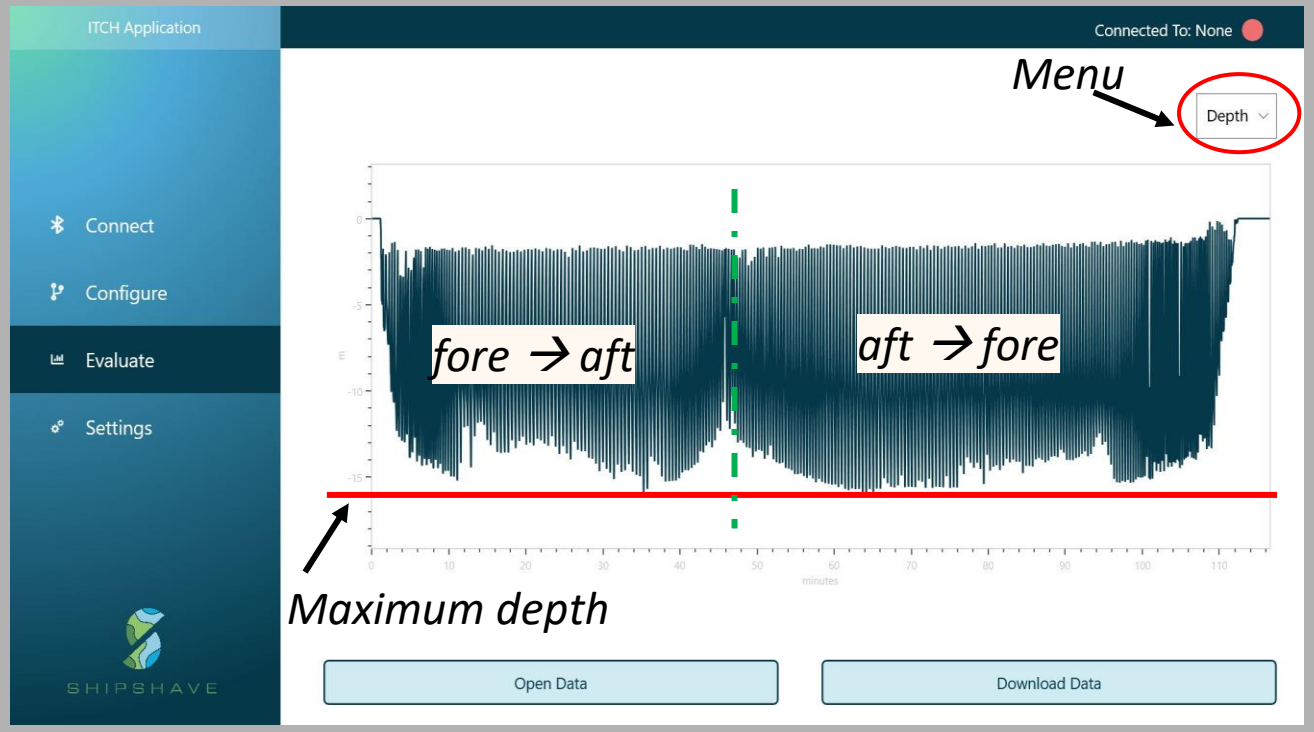
Tip: Hover the right side of the video-window to show all videos available in the dive.



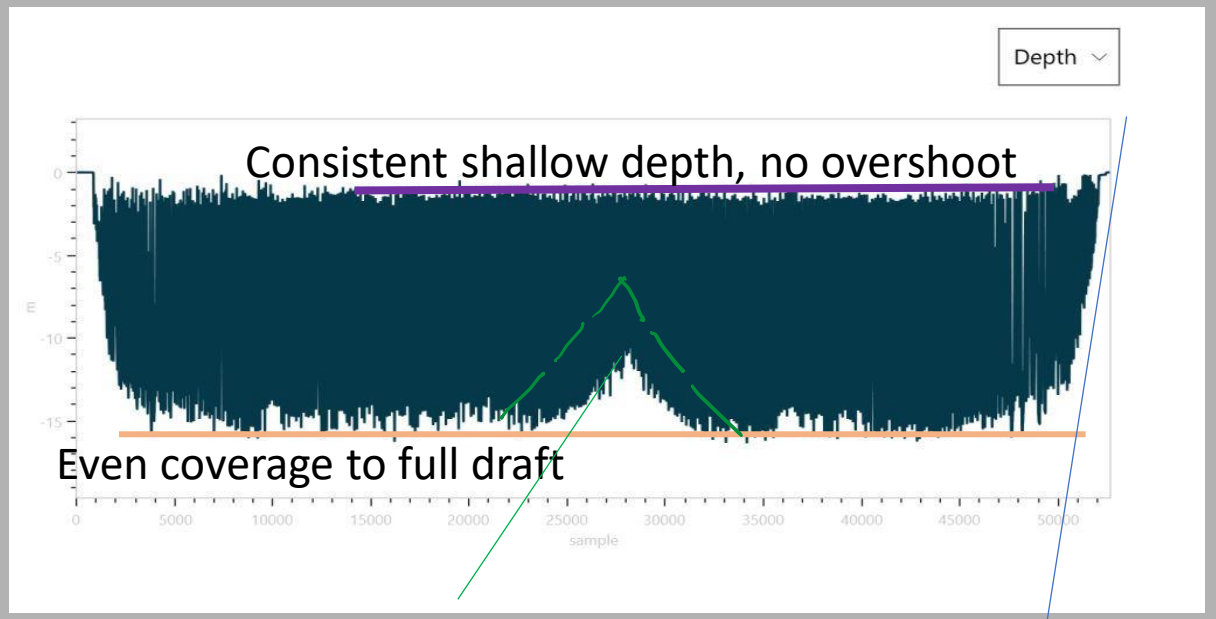
Evaluate Results

The image shows an example of the ITCH results for one run on the hull surface.

- When the Menu is set to **Depth**, the graph shows the coverage of ITCH on the hull.
- ***Maximum depth*** traversed by the ITCH can be read from the scale as marked in the image.
- When an ITCH operation is completed, the left half of the graph shows the ITCH movement from **fore → aft** of the vessel. Similarly, the right half shows the ITCH movement from **aft → fore**.
- The curvature of the hull is higher at the bow and aft compared to the parallel middle body of the hull. So, the depth coverage will be greater in the parallel middle body part of the hull than at the bow and aft.

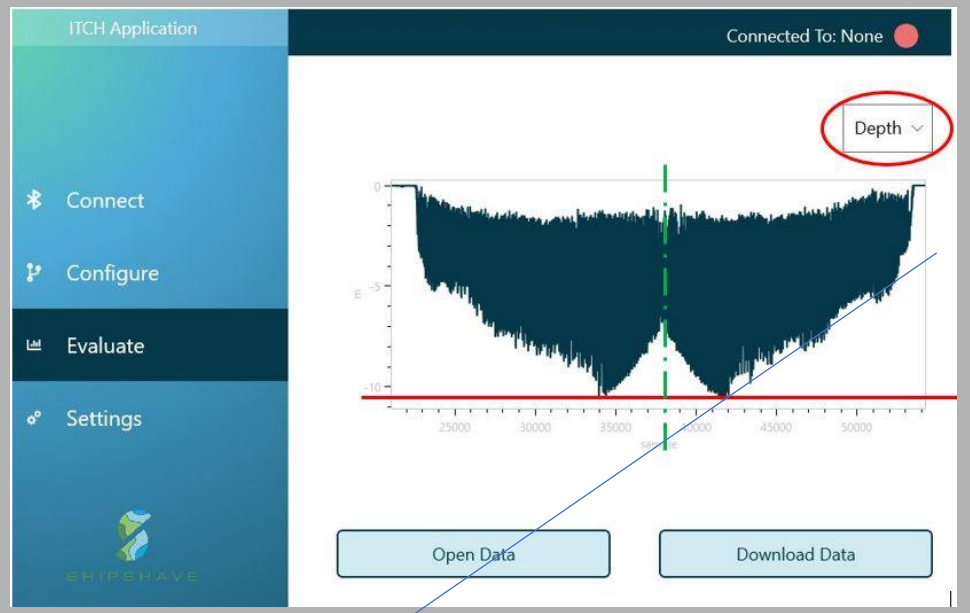


Enhanced coverage



Incomplete coverage in the aft, release more rope

Steep gradient, good bow coverage



Bad bow coverage, was ITCH deployed from foremost chock?

Depth and Overlap

The maximum depth ITCH reached during an operation can be seen using the “Analyze” feature in the Slick.

Following measures are recommended to improve the depth coverage of ITCH:

- Deploy ITCH through the Panama chock (*Refer Appendix D*).
- If the operation was carried out in ballast condition, deploy ITCH in fully loaded condition.

An illustration of the ITCH operation with overlap

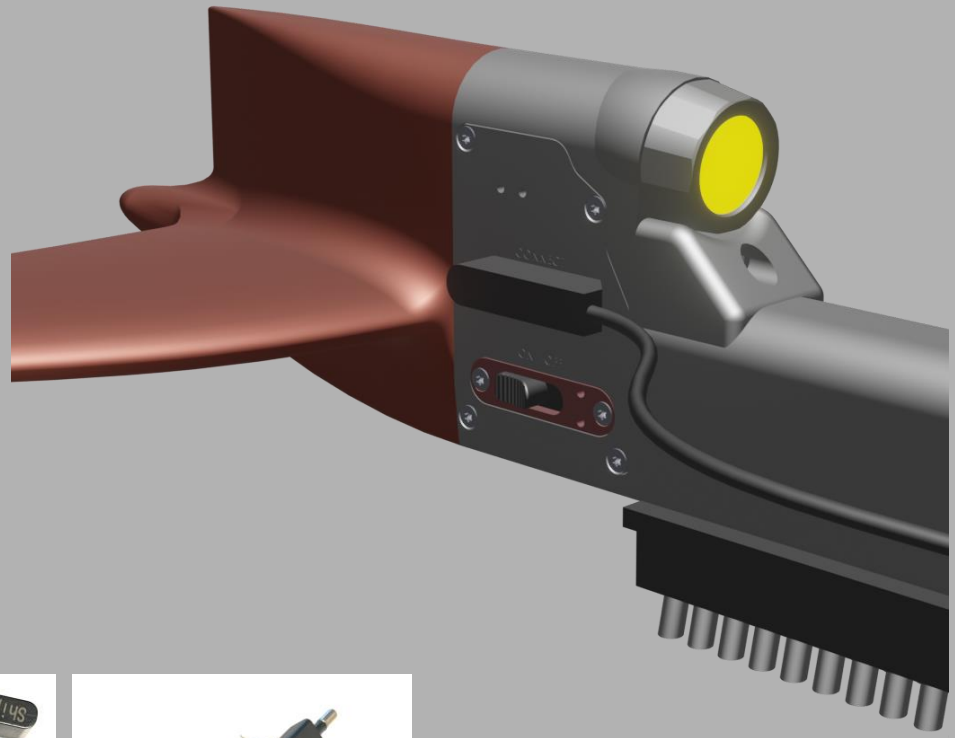
The efficiency of the ITCH operation is maximum when the robot movement on the hull overlaps. This can be checked from the recorded videos. The overlap of ITCH can be controlled by varying the winch speed.

- If the video shows poor overlap of ITCH operation, consider decreasing the winch speed. The recommended winch speed is 1m/min which provides the maximum overlap.

06 – Robot Charging & Status Lights

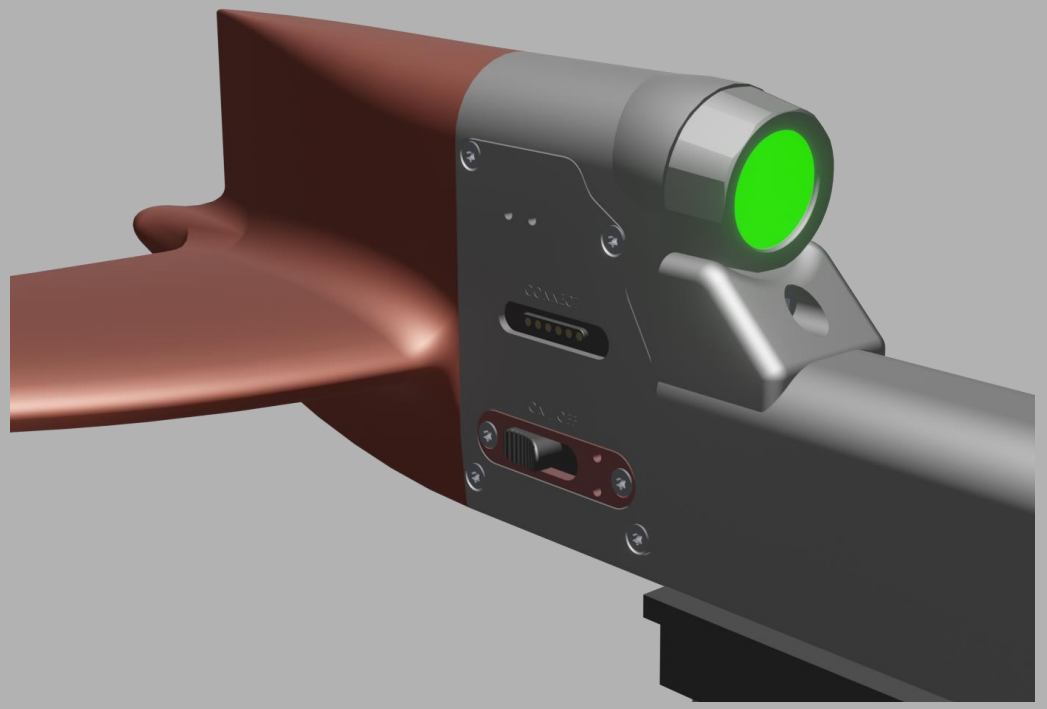
Robot Charging

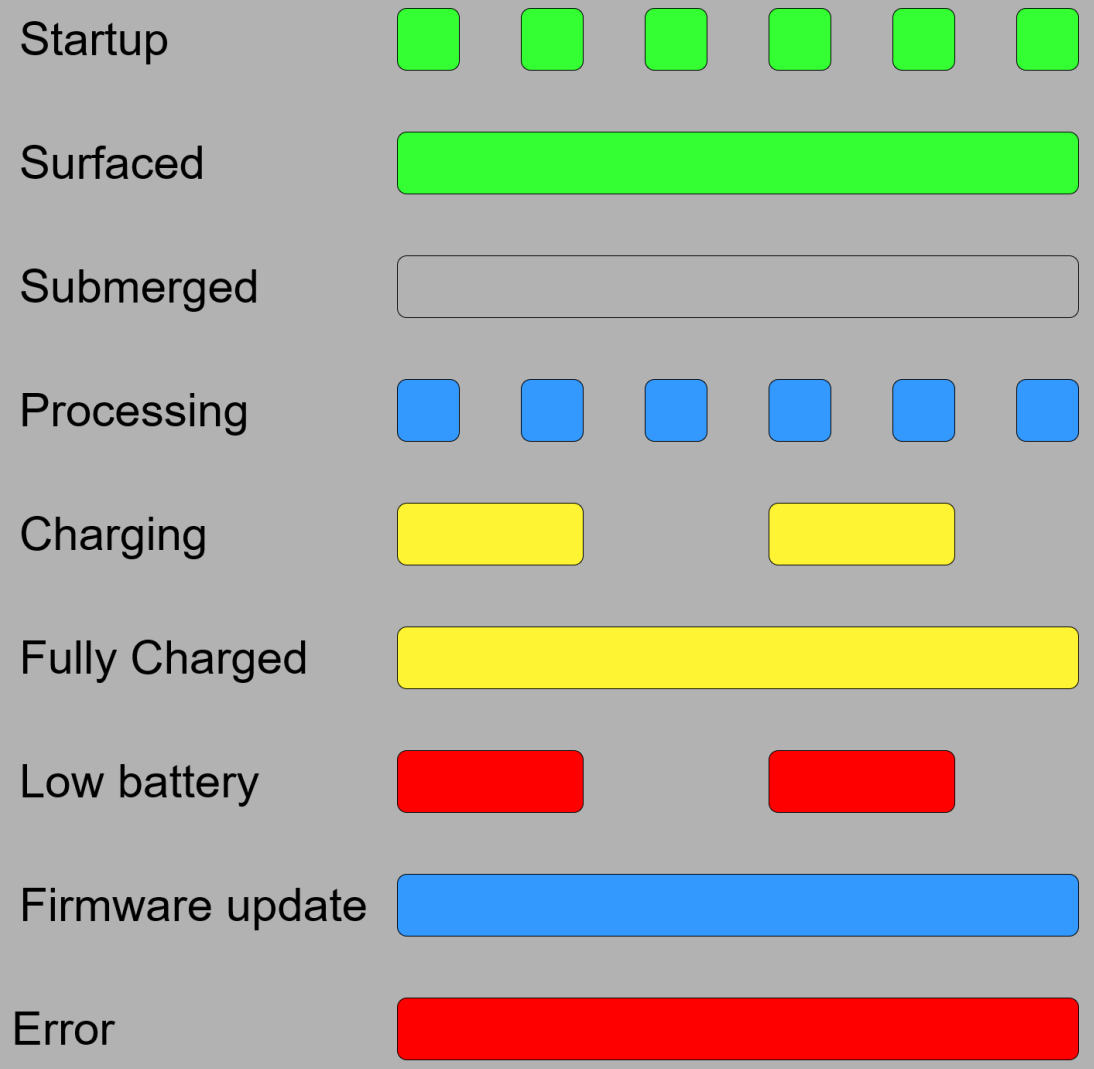
Charger LED	Status
Blinking yellow	Charging
Solid yellow	Fully charged



- Connect USB cable between robot and included USB PD charger

Robot Status Light





07 – Winch Operation

Ensure that the operator of the winch reads through the winch manual supplied.

Secure this end of the winch to a strong point

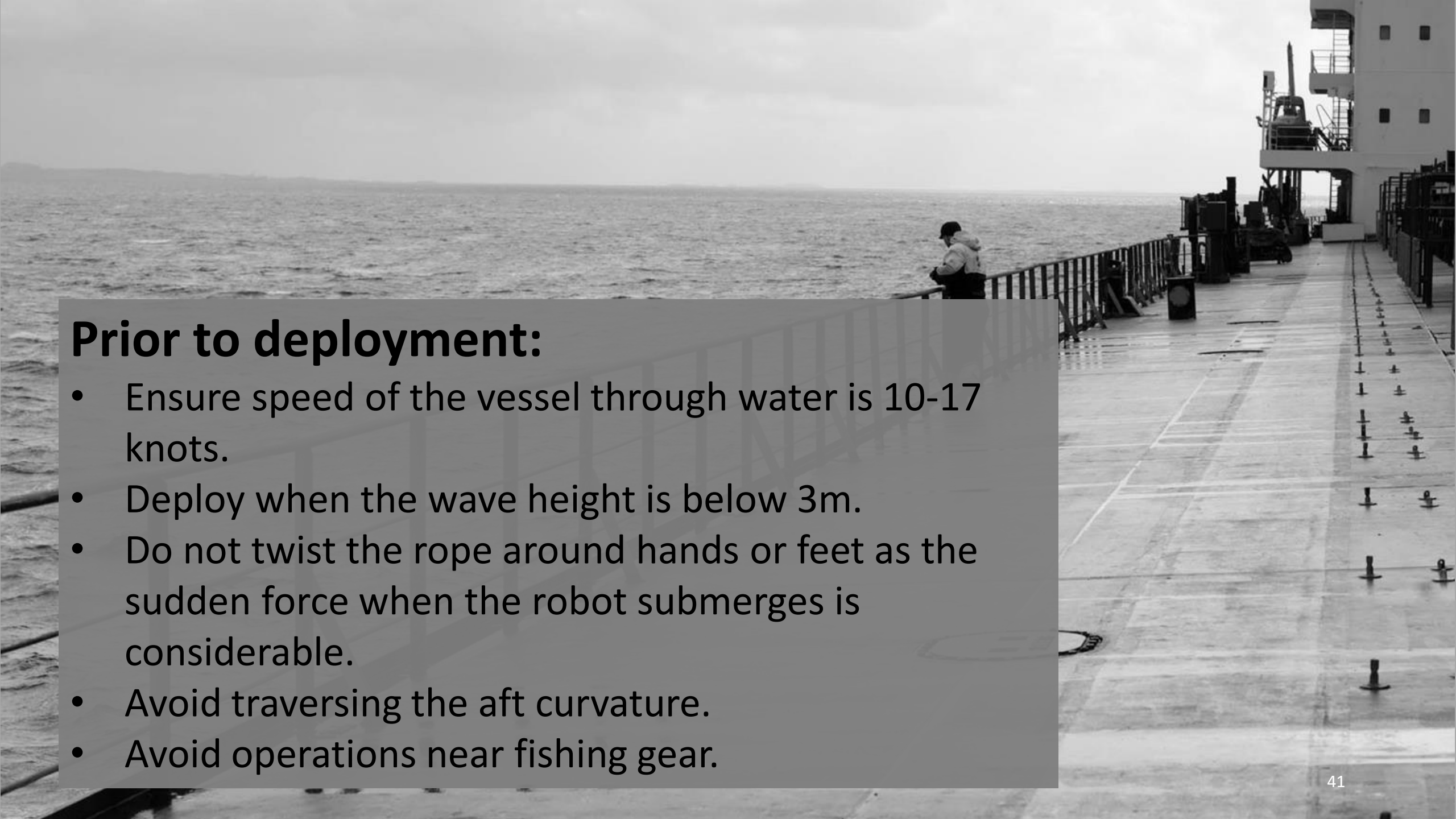
Tie ITCH to the end of the rope and lead directly overboard

Operating the portable Shipshave winch

Refer to the winch manual for detailed winch instructions.

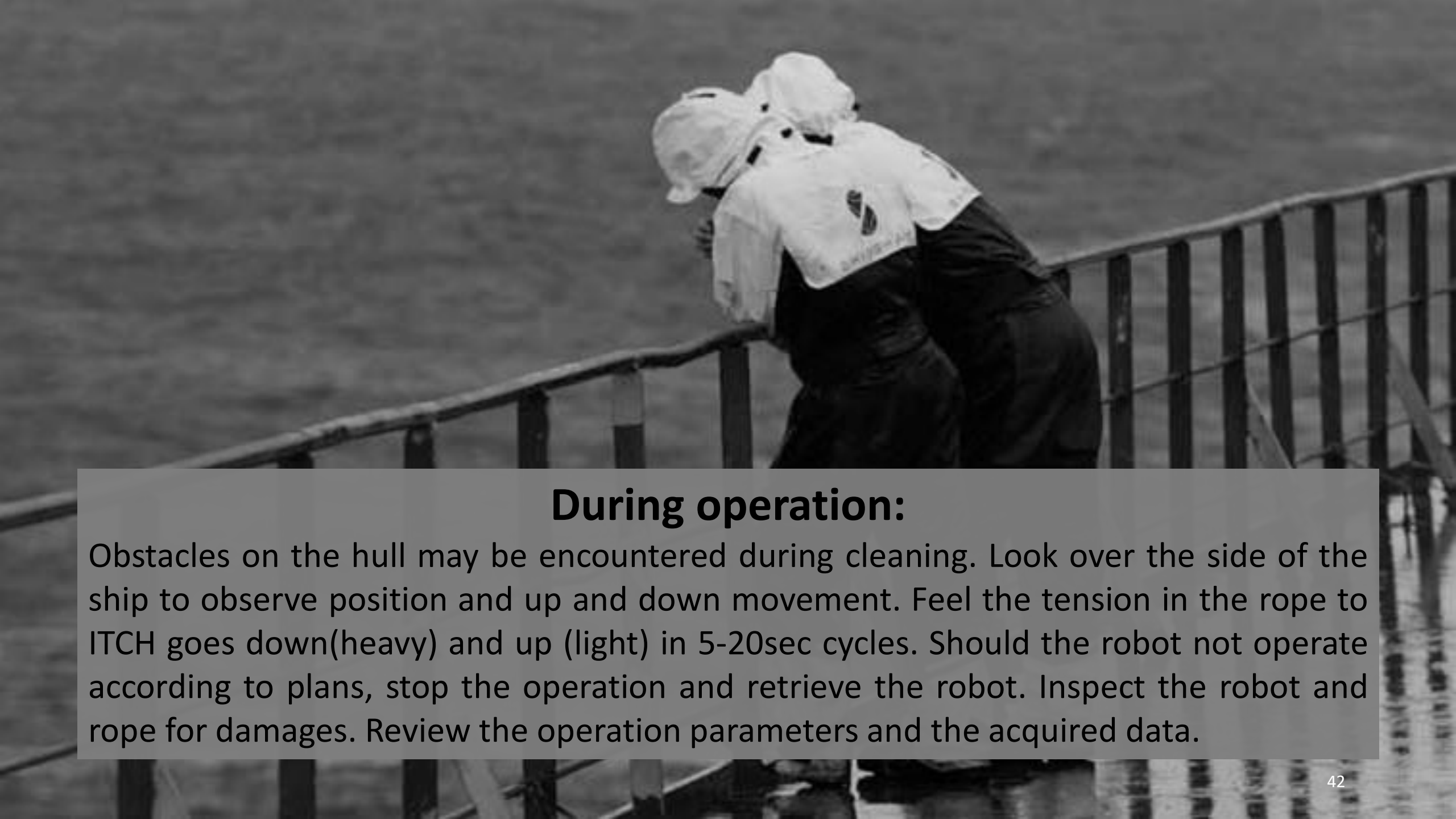
- The winch requires to be secured to a strong point, such as a bollard, and connected to a power source.
- Operating is done using the control panel which contains 3 functions (Stop/Speed/Direction).
- If overloaded the winch will stop. Switch direction to Neutral to reset the winch. Restart the winch by selecting direction (In/Out).
- The winch has a safe limit where it stalls. If the ITCH robot hangs up while spooling in, restart and release rope and spool in again.

08 - Safety Precautions



Prior to deployment:

- Ensure speed of the vessel through water is 10-17 knots.
- Deploy when the wave height is below 3m.
- Do not twist the rope around hands or feet as the sudden force when the robot submerges is considerable.
- Avoid traversing the aft curvature.
- Avoid operations near fishing gear.



During operation:

Obstacles on the hull may be encountered during cleaning. Look over the side of the ship to observe position and up and down movement. Feel the tension in the rope to ITCH goes down(heavy) and up (light) in 5-20sec cycles. Should the robot not operate according to plans, stop the operation and retrieve the robot. Inspect the robot and rope for damages. Review the operation parameters and the acquired data.

Rope safety:

During operation, the rope tension will vary from high to very low. Ensure the thin rope does not become trapped in small gaps which could damage the rope. Watch the spooling of the rope and adjust if required. Make sure the rope does not reach the propeller.

Winch:

The winch contains a powerful electric motor with a rotating drum. Stay away from moving parts and work from a safe distance. Avoid unessential personnel near the winch during cleaning. Avoid foreign objects close to the rotating parts of the winch. Always maintain 4 turns of rope left on the drum of the winch.

If you have any questions,
contact *support@shipshave.no*

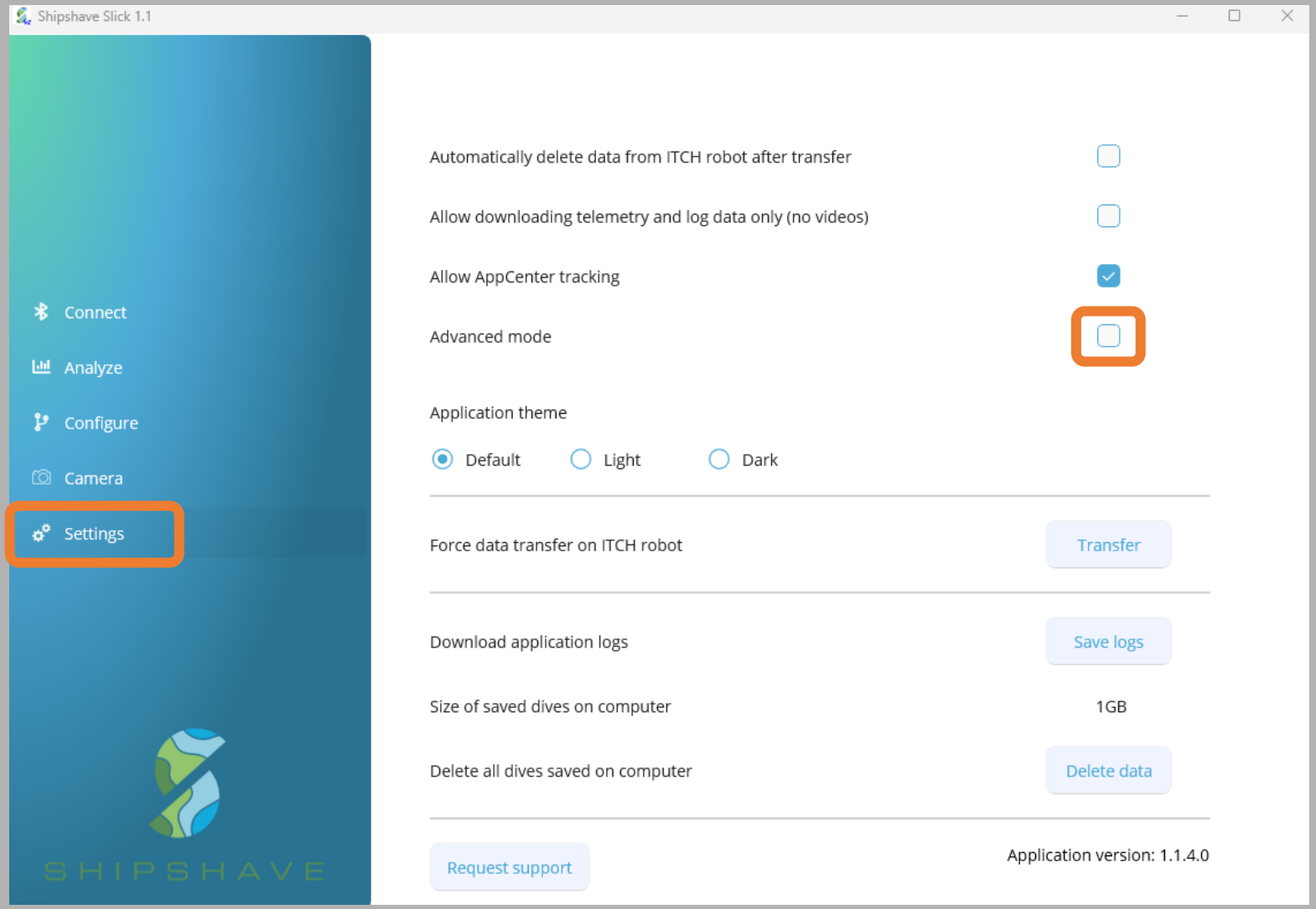
(Include the dataset file, a few images from the recorded video and your feedback in the email)

Shipshave

Appendix A
Advanced settings

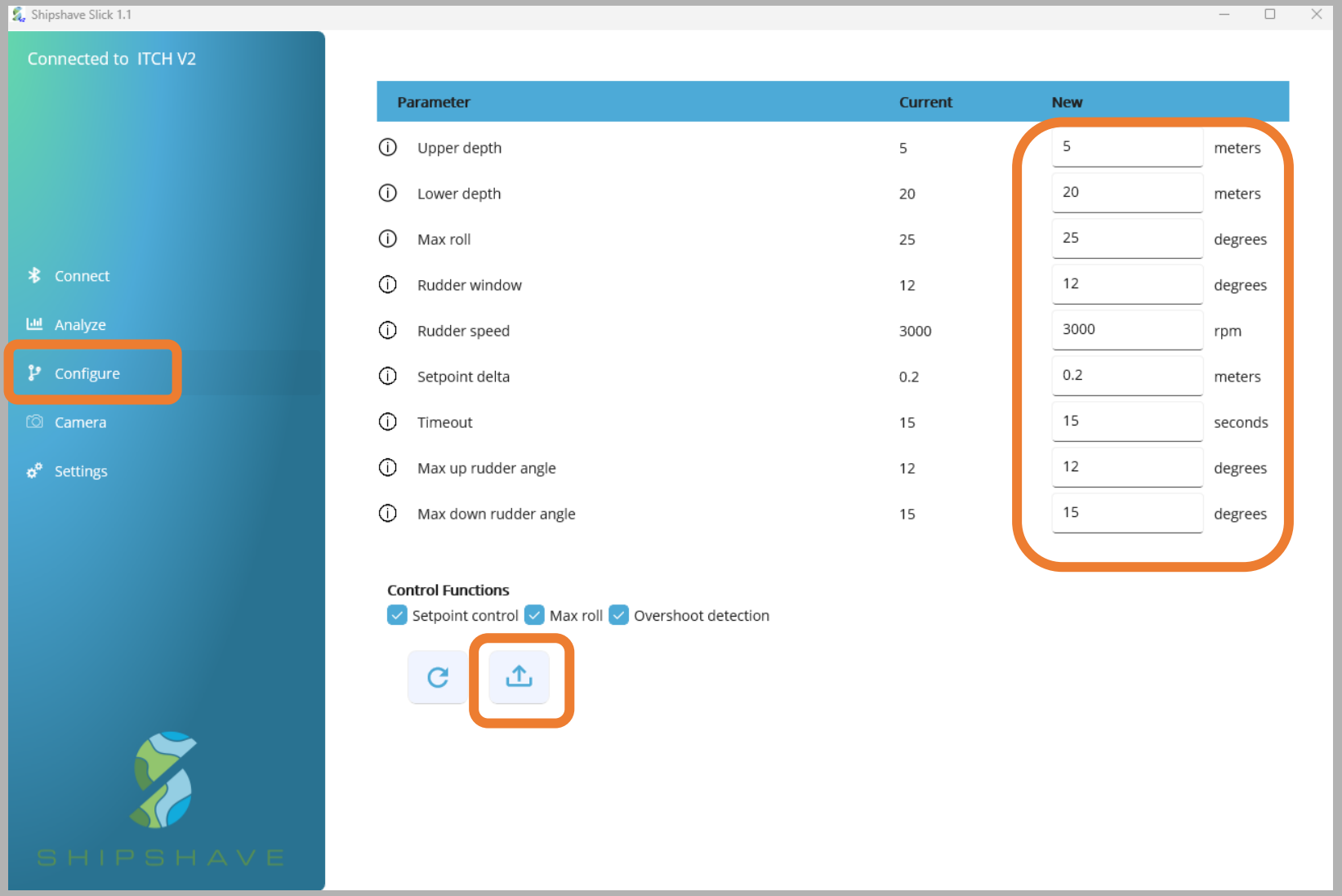
Advanced settings should only be accessed by trained personnel or as instructed by Shipshave. Altering these settings can result in unpredictable behavior.

Advanced mode in Slick



Step 1 of 3: Open Slick and go-to the Settings tab. Click the check box to activate Advanced mode.

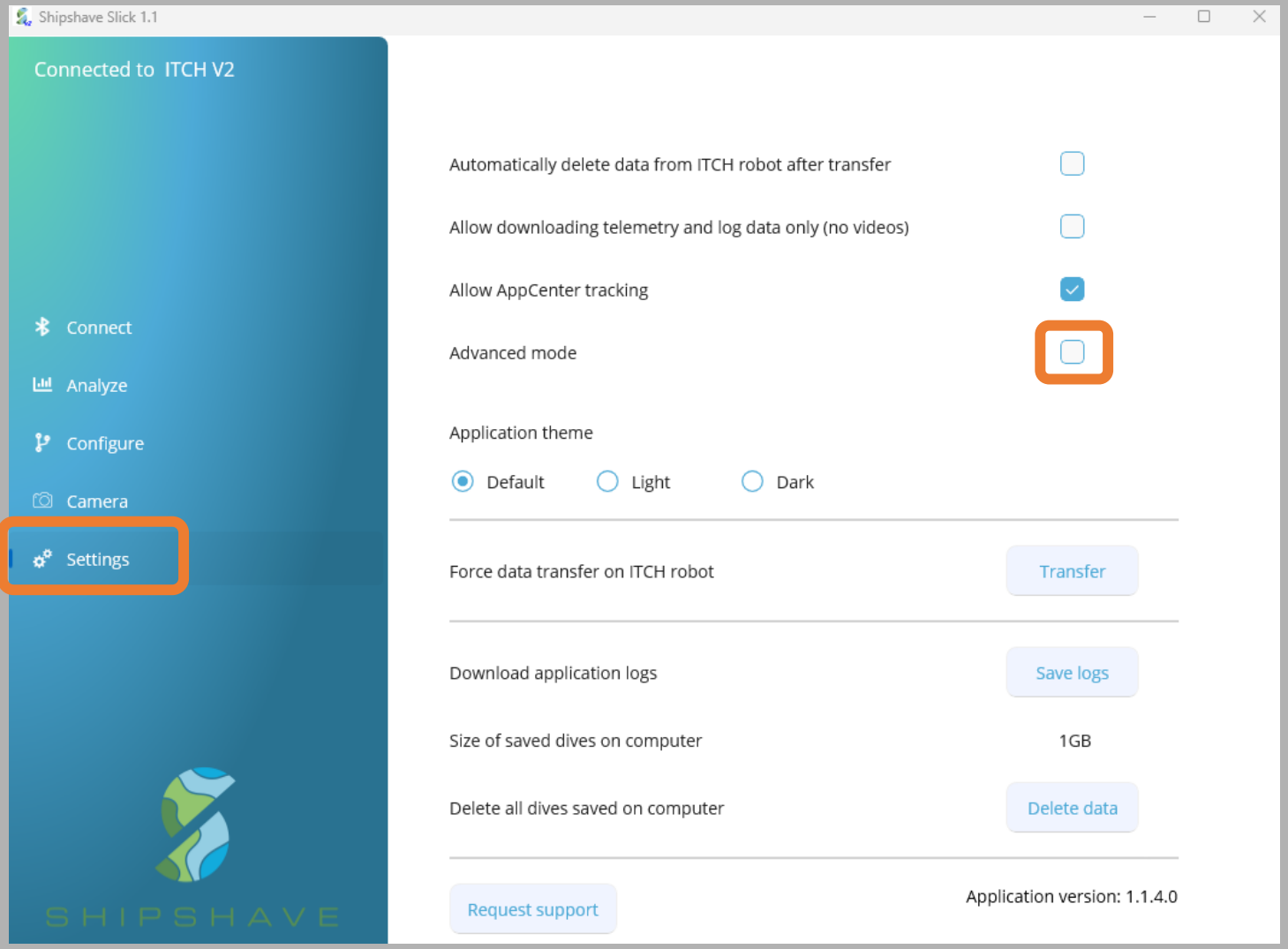
Advanced mode in Slick



Tip:
Right-click any field in the "Current" column for option to reset all values to default

Step 2 of 3: Click the Configure tab. Enter the new configuration values in the rows under "New". Then click the Upload button to activate the new configuration. Verify that the values under the "Current" column get updated.

Advanced mode in Slick

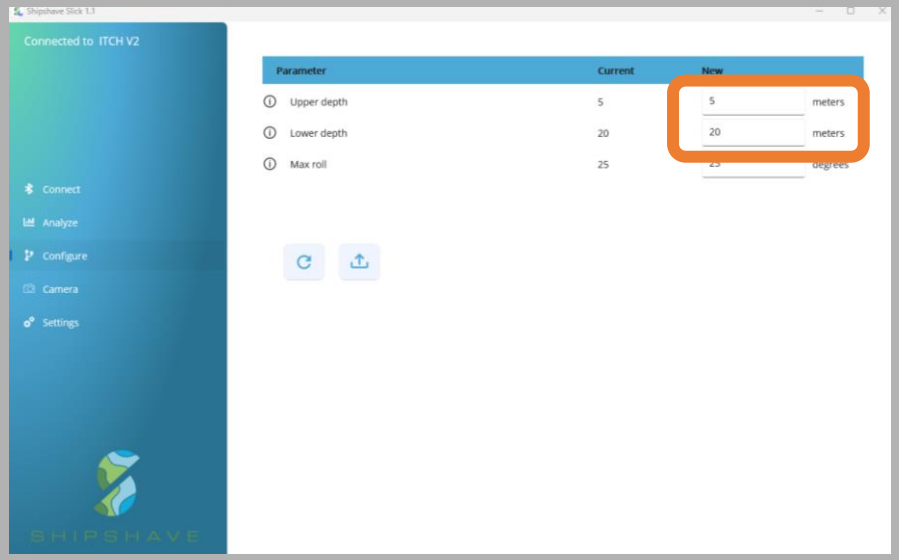


<u>Step 3 of 3:</u> Click the Settings tab again. Click and un-check the Advanced mode.

Appendix B
Custom Depth Settings

Custom depth settings

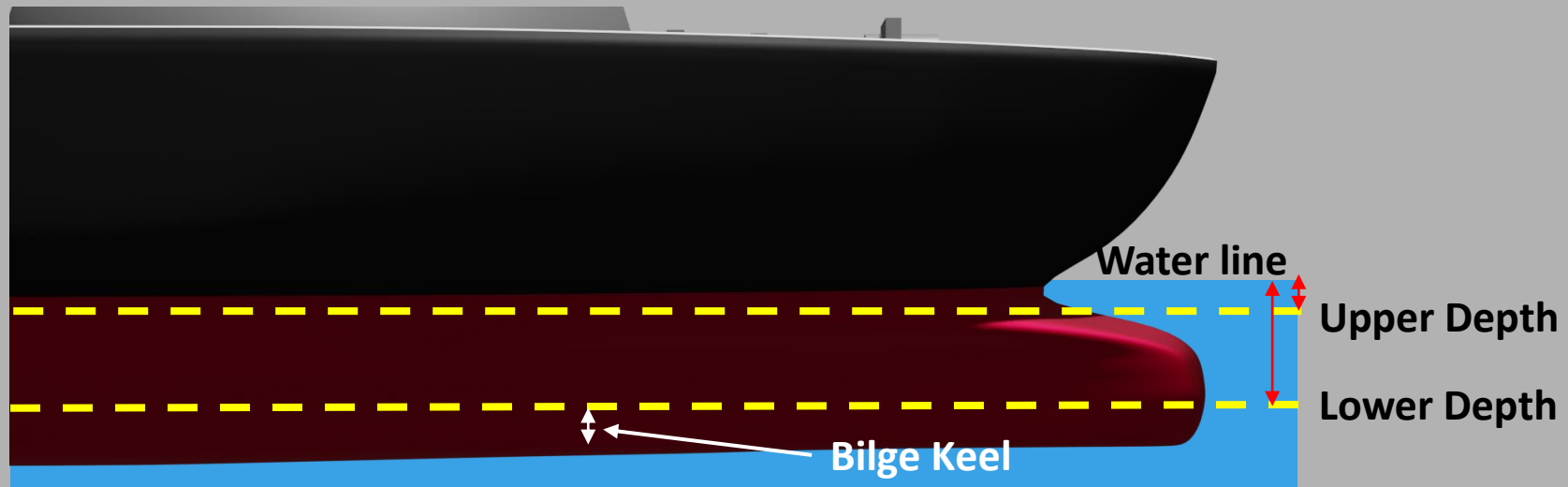
As default, the ITCH is programmed to oscillate between 1m depth and 20m depth.
The max roll ensures that the ITCH does not go deeper than the curvature.
It will change direction at the curvature near the flat bottom.



- **The Upper Depth** can be set shallower than 1m but note that ITCH may pop out of the water while going up. It may be set deeper to avoid cleaning hull surface area without fouling.

- **The Lower Depth** may be set to a certain depth to avoid obstructions on the hull, a correctly configured "Max Roll" value will prevent the ITCH from going past the curvature.

Verify that "Current" updates to the same as "New" after pressing the upload button.



Appendix C
High-speed Ships

Operating ITCH on High-Speed Vessels

Proposed ITCH Robot settings for ITCH on vessels capable of sailing at speeds above 15 knots:

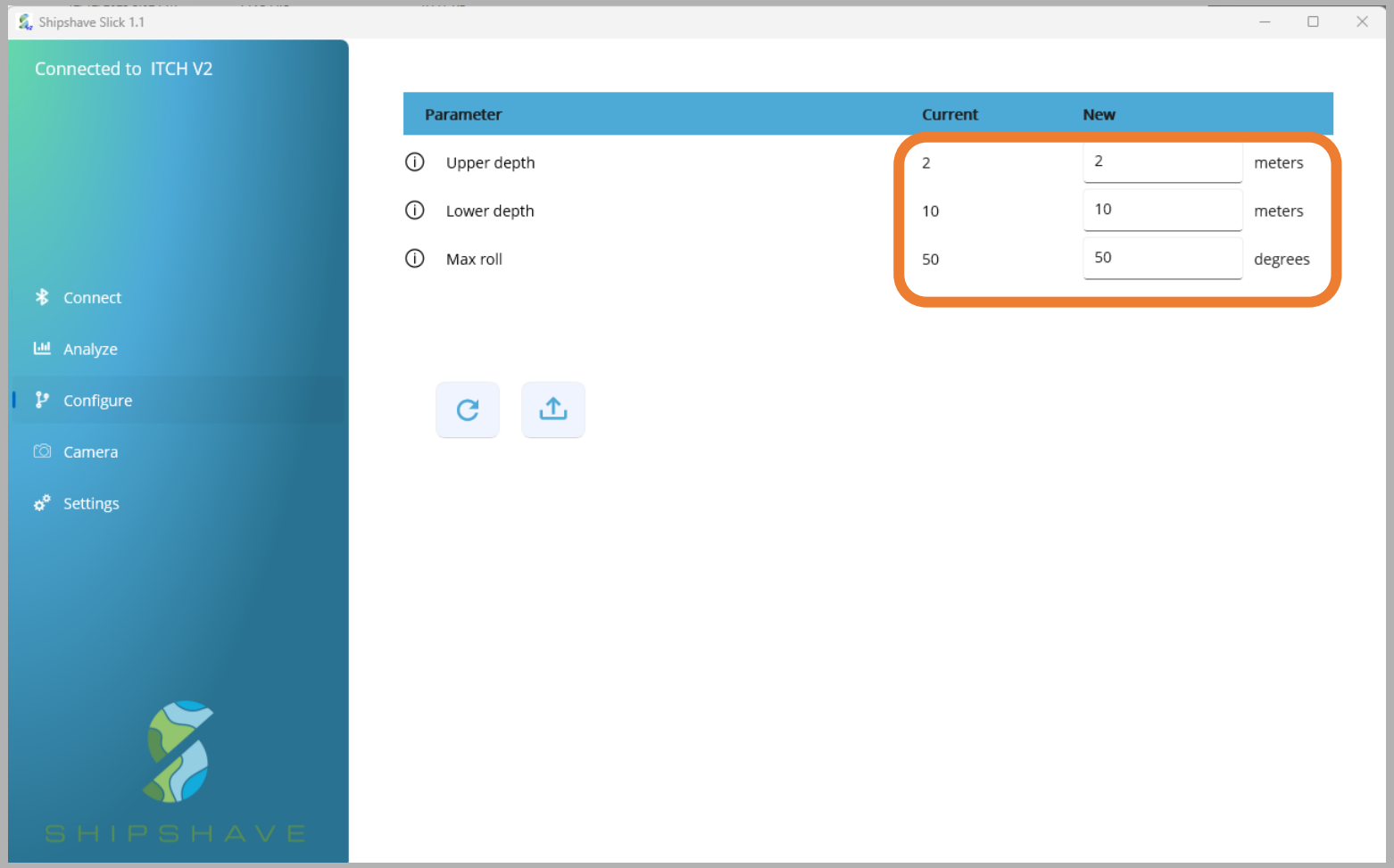
- **Configuration:** Set “*Max Roll*” to 50 degrees, “*Upper Depth*” to 2m and “*Lower Depth*” to 3m above the least of fore and aft draft of the ship.

- **Preparation:** Verify that the bow thruster is minimum 6m below the surface.

- **Deployment & Operation:** Deploy from center Panama chock. Make sure the rope has a clear path and doesn’t risk getting stuck in the anchor during deployment and retrieval. Refer to Appendix D for more information.

- We recommend performing the first cleaning at 12-14 knots and calm seas. Inspect the video after the operation, focusing on distance to thrusters and bilge keels. Use the information for next operation to optimize "lower depth".

If your vessel does not satisfy the above requirements contact support@shipshave.no for proposed deployment strategy for your vessel.



Example of high-speed configuration for vessel with draft of 13 meter

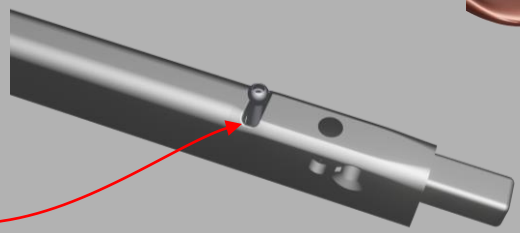
Operating ITCH on High-Speed Vessels

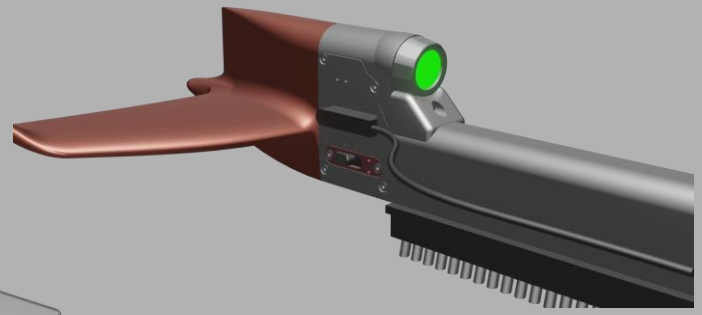
Appendix D
Maintenance

Maintenance of ITCH robot

- **After every operation**: Rinse the robot and winch with fresh water to remove salt.

  Spray with penetrating oil (WD 40/CRC 565 etc.)
  Flush the cavity for the rudder pin with fresh water and fill with penetrating oil.



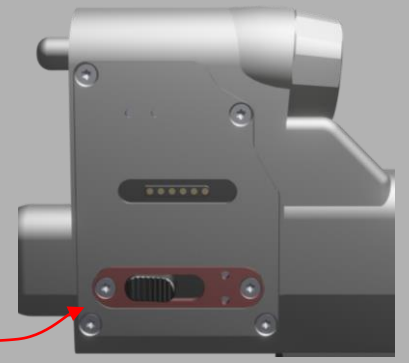


- **Rope on the winch**: Untie and check the rope after every operation for wear. If the rope is worn at the end where ITCH is tied, cut away the worn part. If the blue core is exposed, or significant wear is seen, replace the rope.

- **Brushes and outriggers:** Replace worn brushes and outriggers

- **Storage:** Store and secure the robot and winch where the ambient temperature is below 45°C.

- Open and clean red switch compartment using the included Torx screwdriver if switch gets stiff.



For replacement of ITCH, accessories or components, contact "support@shipshave.no"

Appendix E
Brush selection and fouling

- Low roughness hull paint minimize drag and fouling growth. Using soft brushes for ITCH v2 minimizes paint wear.
- Review video after use: if cleaning is unsatisfactory, assess brush selection and run ITCH again.

Hull condition	Brush	Brush color
New pain, silicone paint, light fouling	Soft black brush, softer white brush	
Established fouling, green grass	Blue V-brush	
Barnacles	Barnacle tool (order from Shipshave)	

Appendix F
Barnacles

- Barnacles are obstructions to flow and can occur on both the flat bottom and sides of the hull.
- Barnacles wears brushes and outriggers.
- Brushes have limited effect on barnacles.
- Order barnacle removal tools from Shipshave.