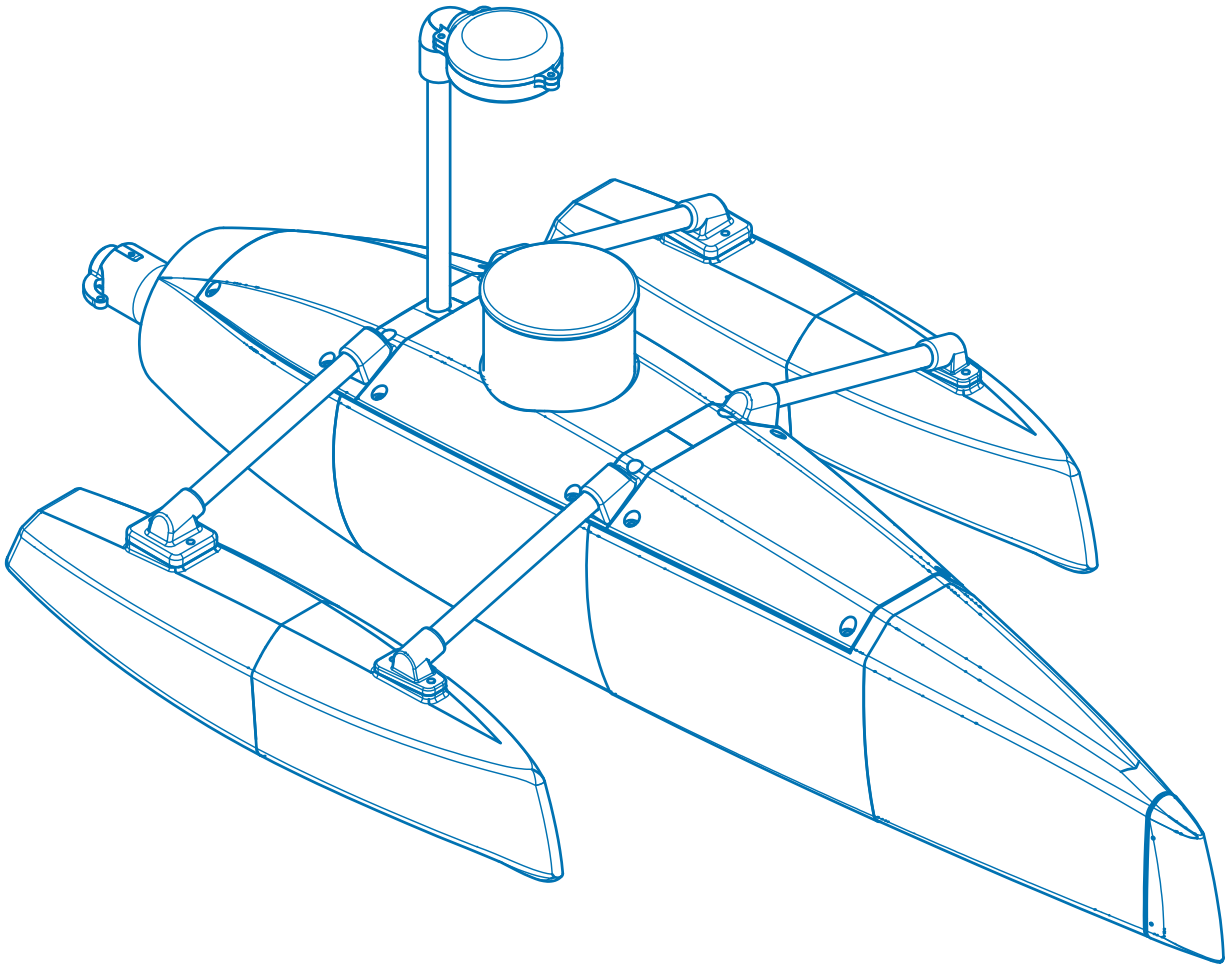
Trimaran Assembly Guide

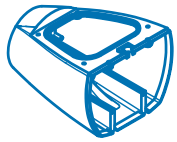
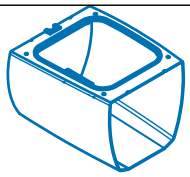
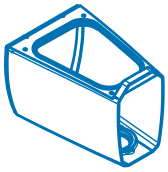
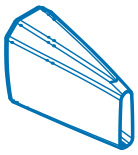
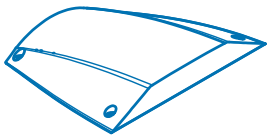
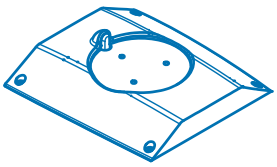
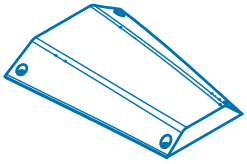
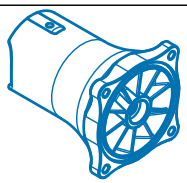
Autonomous Driving Boat



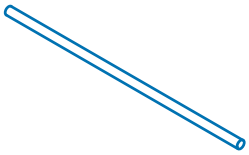
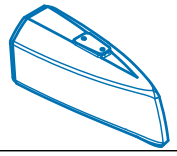
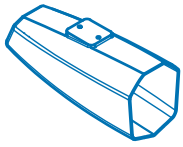
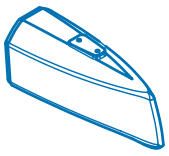
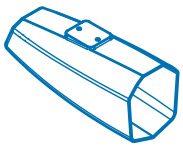
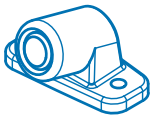
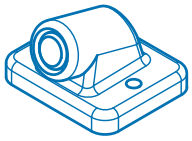
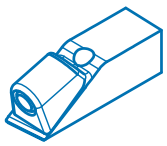
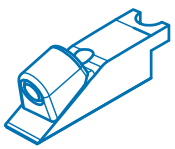
Release 2.0

31 July 2024

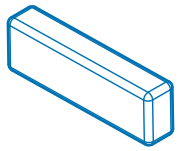
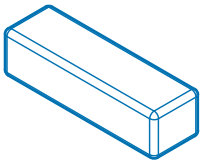
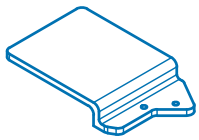
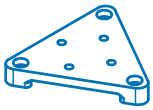
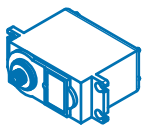
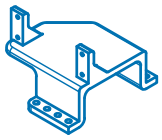
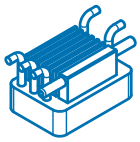
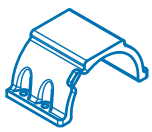
Bill of Materials

DIAGRAM	Part Name	QTY	Comment
	HULL REAR	1	Printed component. PLA/PETG/ABS. 20% Infill.
	HULL MIDDLE	1	Printed component. PLA/PETG/ABS. 20% Infill.
	HULL FRONT	1	Printed component. PLA/PETG/ABS. 20% Infill.
	HULL NOSE	1	Printed component. PLA/PETG/ABS. 20% Infill.
	NOSE TIP	1	Printed component. PLA/PETG/ABS/TPU. 20% Infill.
	LID REAR	1	Printed component. PLA/PETG/ABS. 10% Infill.
	LID MIDDLE	1	Printed component. PLA/PETG/ABS. 10% Infill.
	LID FRONT	1	Printed component. PLA/PETG/ABS. 10% Infill.
	JET STATOR	1	Printed component. PLA/PETG/ABS. 50% Infill.
	STEERING NOZZLE	1	Printed component. PLA/PETG/ABS. 100% Infill.

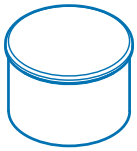
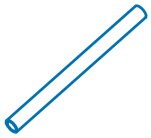
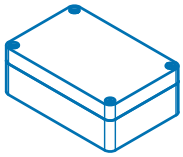
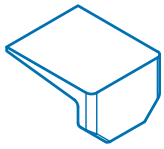
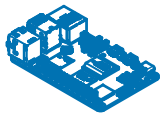
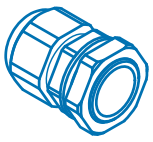
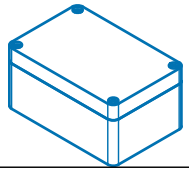
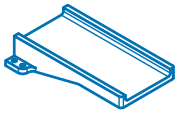
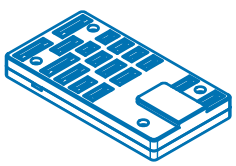
Bill of Materials

DIAGRAM	Part Name	QTY	Comment
	IMPELLER	1	Jet Impeller. 38mm Diameter
	IMPELLER SHAFT	1	Jet Shaft. Dimensions 4x130mm. SS304 or SS316.
	LEFT FRONT SIDE POD	1	Printed component. PLA/PETG/ABS. 20% Infill.
	LEFT REAR SIDE POD	1	Printed component. PLA/PETG/ABS. 20% Infill.
	RIGHT FRONT SIDE POD	1	Printed component. PLA/PETG/ABS. 20% Infill.
	RIGHT REAR SIDE POD	1	Printed component. PLA/PETG/ABS. 20% Infill.
	SIDE POD TUBE MOUNT FRONT	2	Printed component. PLA/PETG/ABS. 50% Infill.
	SIDE POD TUBE MOUNT REAR	2	Printed component. PLA/PETG/ABS. 50% Infill.
	HULL TUBE MOUNT FRONT	2	Printed component. PLA/PETG/ABS. 50% Infill.
	HULL TUBE MOUNT REAR	2	Printed component. PLA/PETG/ABS. 50% Infill.

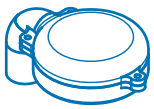
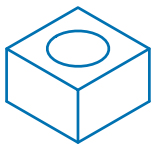
Bill of Materials

DIAGRAM	Part Name	QTY	Comment
	3S 5000mAh BATTERY	1	Lipo Battery
	6S 5000mAh BATTERY	1	Lipo Battery
	FRONT BOX MOUNT	1	Printed component. PLA/PETG/ABS. 20% Infill.
	SONAR RETAINER	1	Printed component. PLA/PETG/ABS. 20% Infill.
	SONAR	1	Ping2 Sonar.
	SERVO	1	Steering Servo Motor. Stall torque 3kg.
	SERVO MOUNT	1	Printed component. PLA/PETG/ABS. 50% Infill.
	MOTOR ESC	1	Motor ESC Controller. 120A Continuous Current.
	MOTOR MOUNT	1	Printed component. PLA/PETG/ABS. 100% Infill.
	MOTOR	1	BLDC 3660 Motor. 3180KV. Integrated water cooling jacket.

Bill of Materials

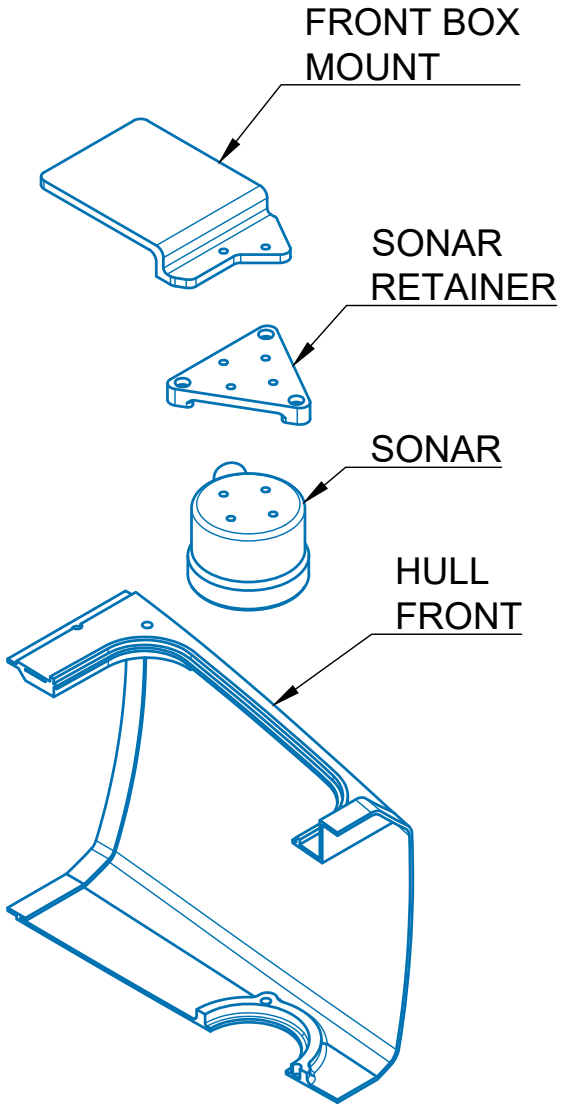
DIAGRAM	Part Name	QTY	Comment
	LIDAR	1	RPLIDAR A2
	SIDEPOD STRUT	4	Carbon tube connecting Side Pod to Main Hull. Dimensions 12x10x150mm.
	RPI BOX	1	Waterproof Box. Dimensions 105x70x40mm.
	RPI BOX MOUNT	1	Printed component. PLA/PETG/ABS. 20% Infill.
	RPI	1	RASPBERRY PI 5B
	GLAND	2	SIZE??
	GLAND	1	SIZE??
	FLIGHT CONTROL BOX	1	Waterproof Box. Dimensions 120x80x45mm.
	FLIGHT CONTROL BOX MOUNT	1	Printed component. PLA/PETG/ABS. 20% Infill.
	FLIGHT CONTROL	1	Pixhawk 4 mini

Bill of Materials

DIAGRAM	Part Name	QTY	Comment
	BEARING	2	MR104ZZ/2RS Bearing.
	GPS SENSOR	1	Pixhawk 4 mini GPS sensor.
	GPS HOUSING	1	Printed component. PLA/PETG/ABS. 20% Infill.
	GPS POST	1	Carbon Tube for GPS sensor. Dimensions 12x10x200mm.
	GPS POST BASE	1	Printed component. PLA/PETG/ABS. 20% Infill.

HULL FRONT ASSEMBLY

Installation of the sonar unit into the front hull section.

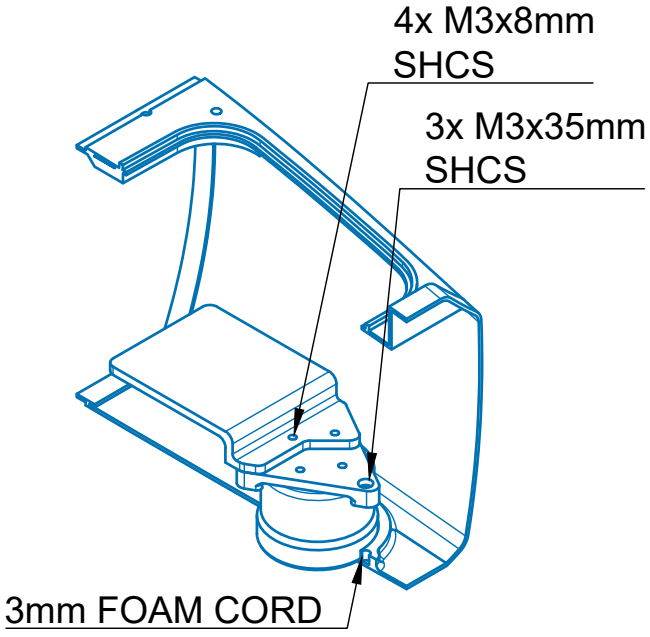


The sonar shall be installed directly onto the sonar retainer. The front box mount shall be placed on the upper side of the sonar retainer.

4x M3x8mm SHCS secure the front box mount and sonar to the sonar retainer.

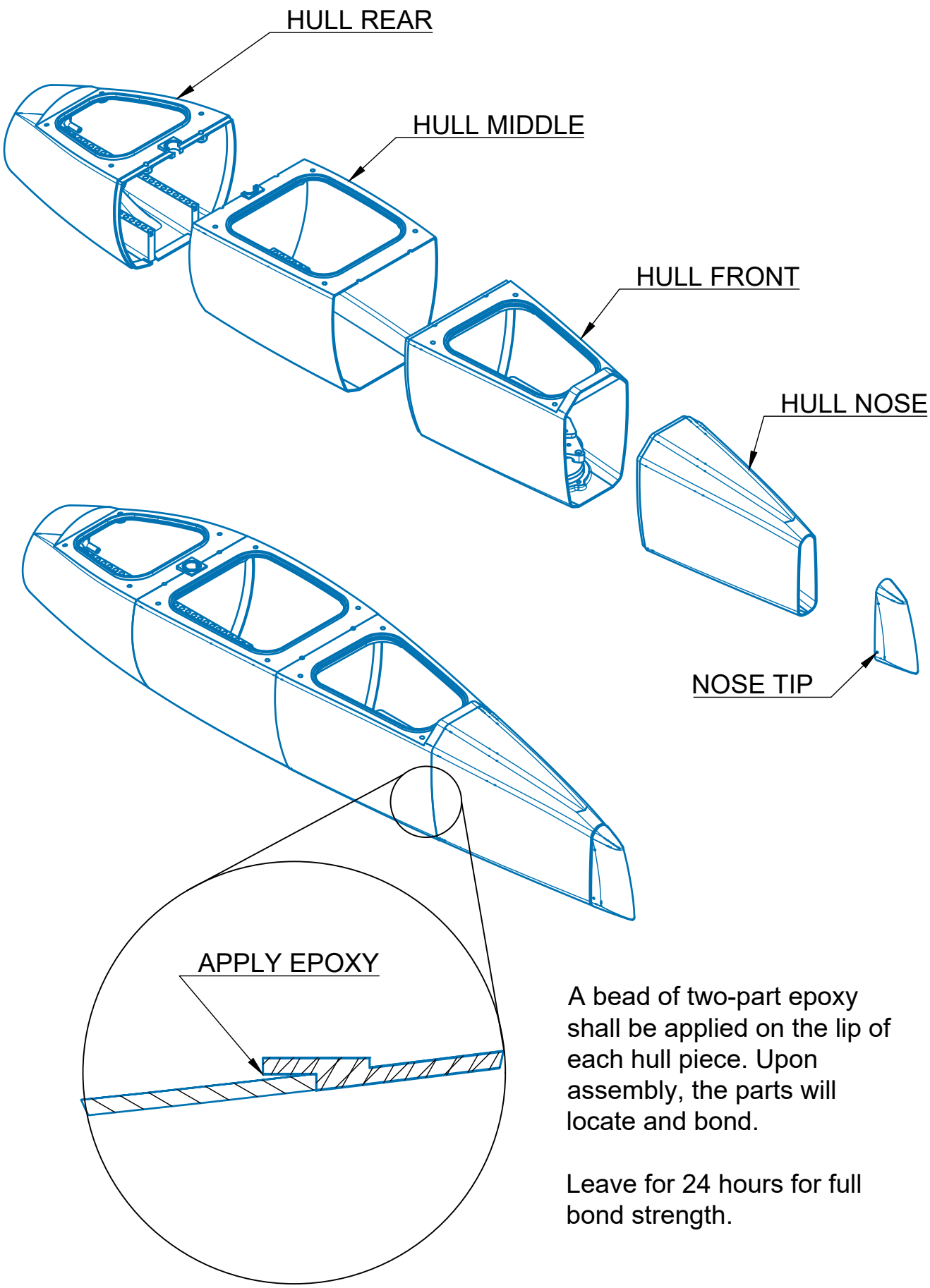
A 3mm foam seal cord shall be installed around the bottom opening of the front hull. Cut to size

The sonar retainer assembly shall be installed into the opening, and retained with 3x M3x35mm SHCS.



CENTRE HULL ASSEMBLY

The centre hull shall be glued together. The pieces are self locating.

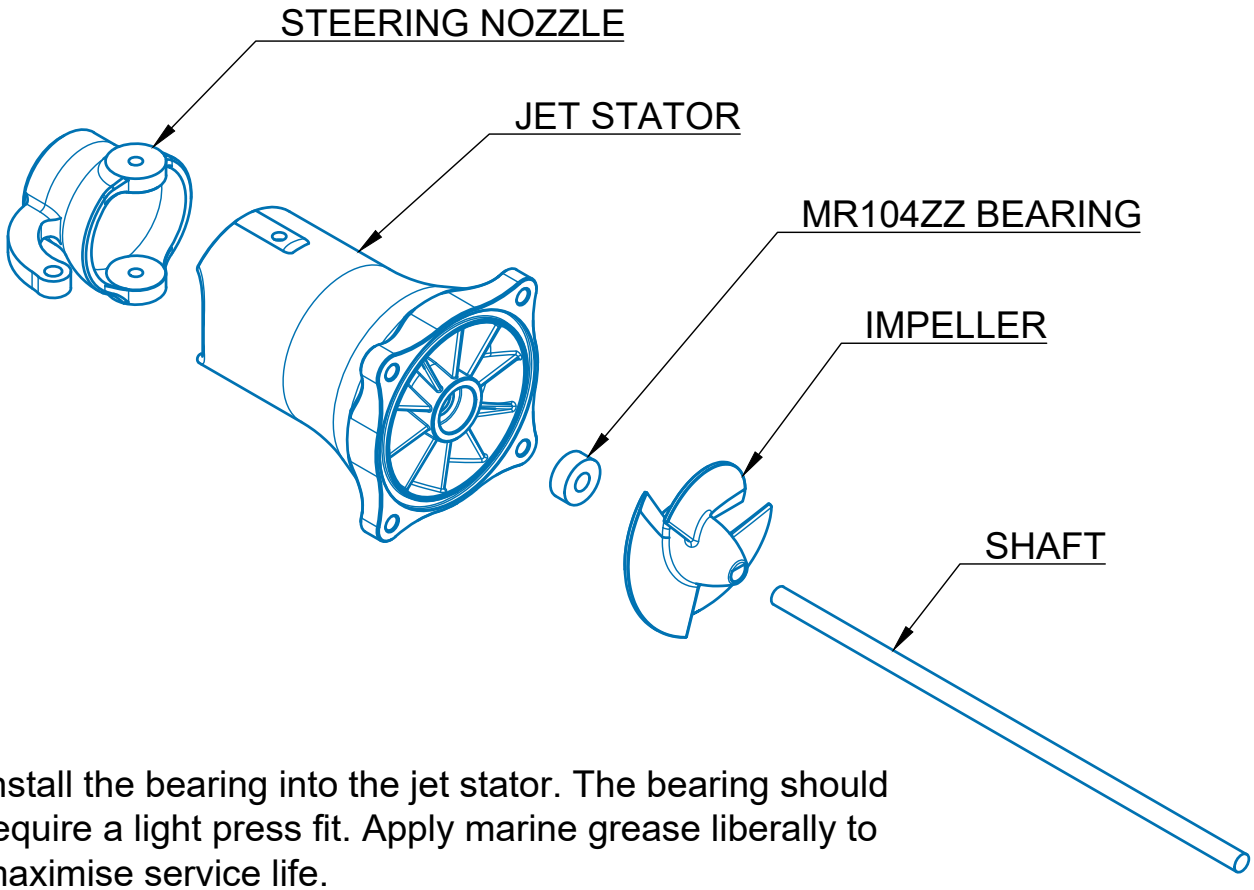


A bead of two-part epoxy shall be applied on the lip of each hull piece. Upon assembly, the parts will locate and bond.

Leave for 24 hours for full bond strength.

OUTBOARD JET ASSEMBLY

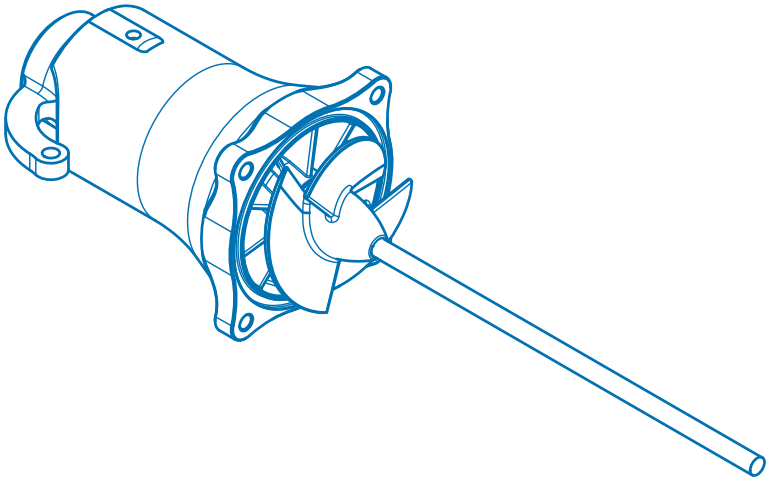
Installation of the jet stator, impeller and steering mechanism.



Install the bearing into the jet stator. The bearing should require a light press fit. Apply marine grease liberally to maximise service life.

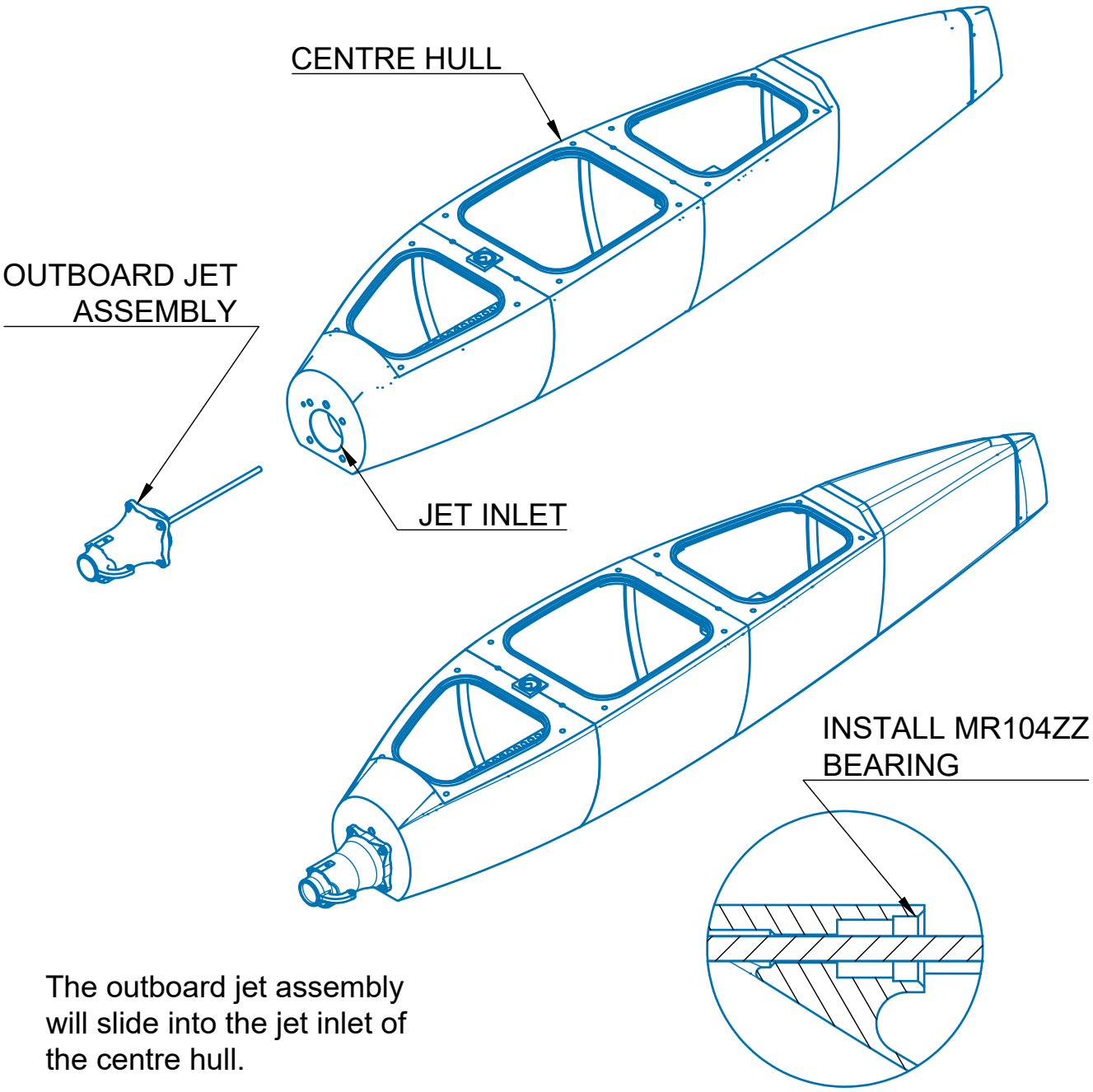
Install the steering nozzle onto the stator with 2x M3x8 SHCS.

Position the impeller on the shaft by bottoming out the shaft against the stator, and moving 5mm back. Secure the impeller with a radially installed grub screw. Insert into stator bearing.



OUTBOARD JET INSTALLATION

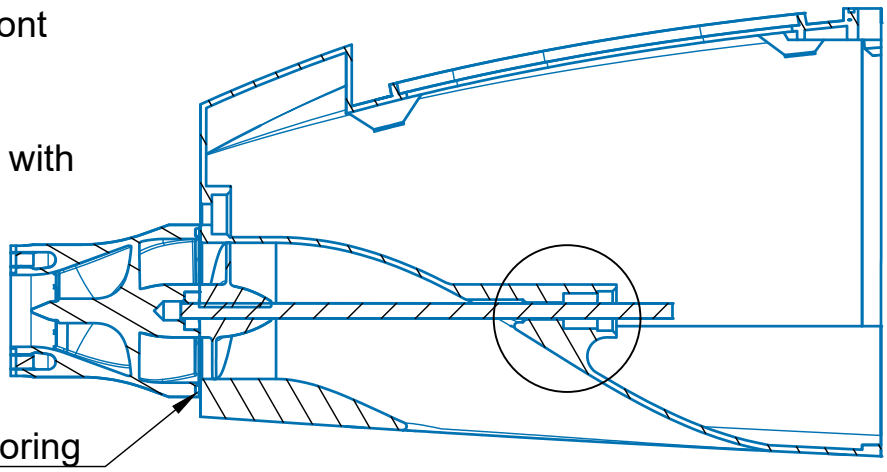
The outboard jet assembly shall be installed prior to motor installation to ensure alignment.



The outboard jet assembly will slide into the jet inlet of the centre hull.

Ensure that the shaft slides through the hull at the front of the inlet.

Secure the jet assembly with 4x M3x8mm SHCS.

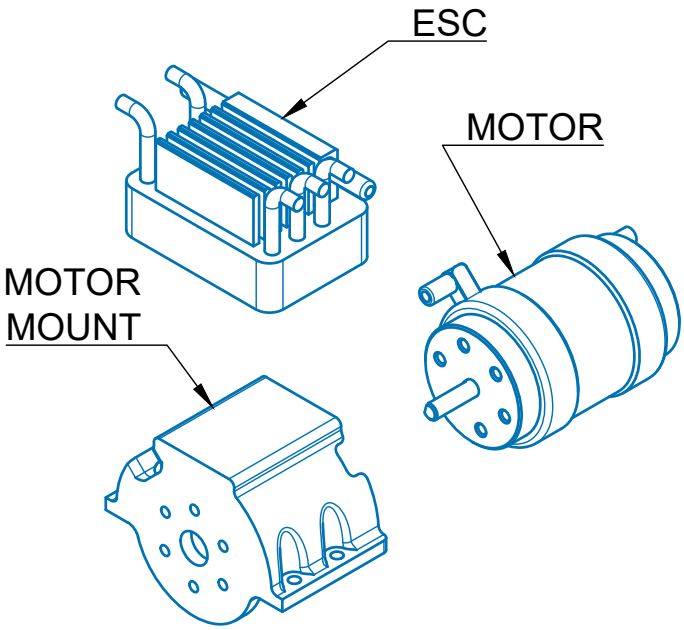


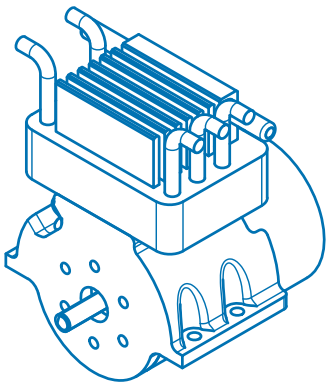
MOTOR ASSEMBLY

Installation of motor and esc to mounting structure.

Attach the motor to the mounter mount with 6x M3x8 SHCS.

Attach the ESC to the top of the motor mount using VHB tape.





MOTOR & SERVO INSTALLATION

Installation of the motor and servo unit.

Servo installation
Install the servo subassembly.

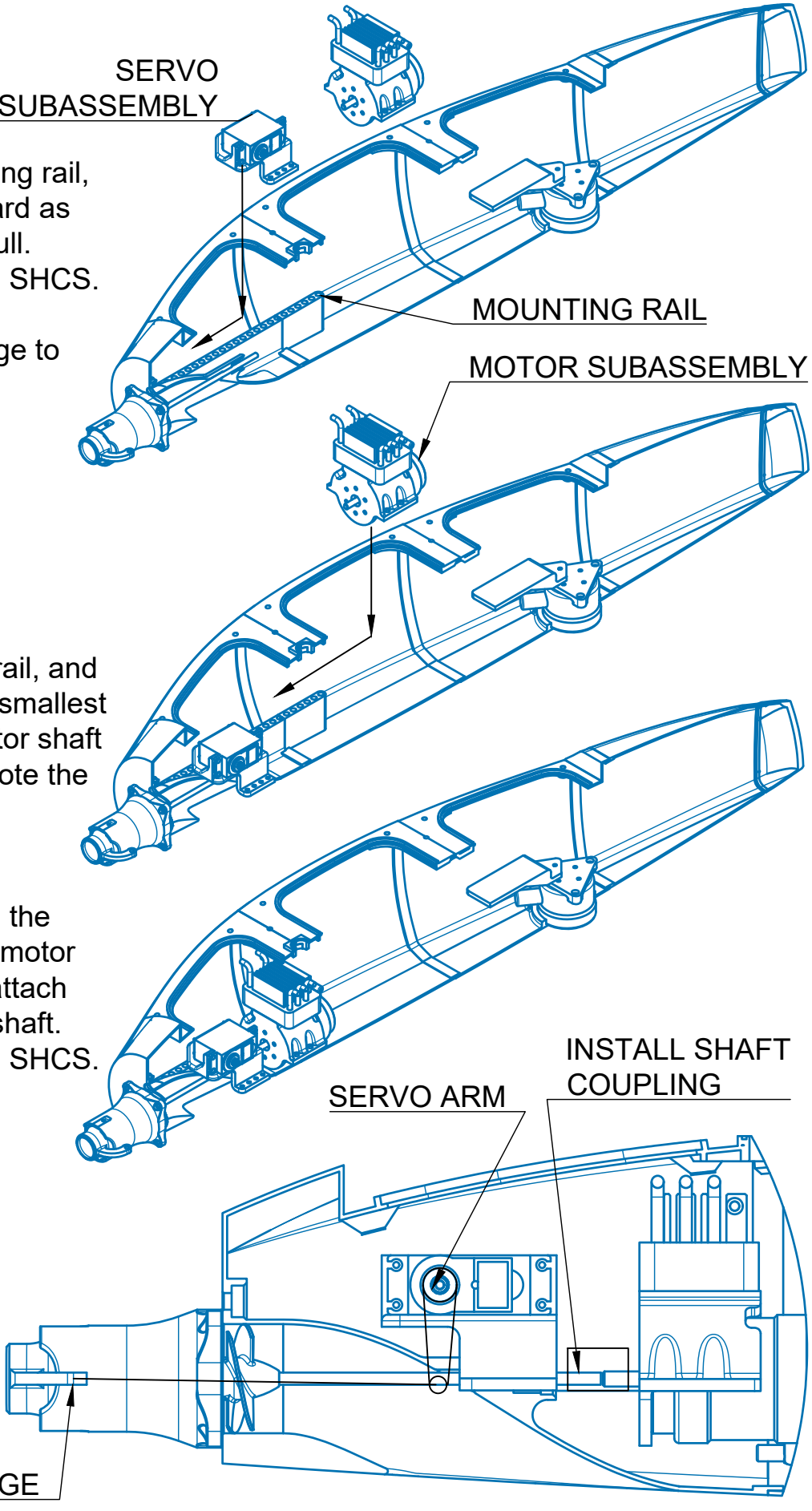
Align with the mounting rail, and mount as rearward as possible inside the hull. Secure with 4x M3x8 SHCS.

Attach steering linkage to servo arm.

Motor installation
Install the motor subassembly.

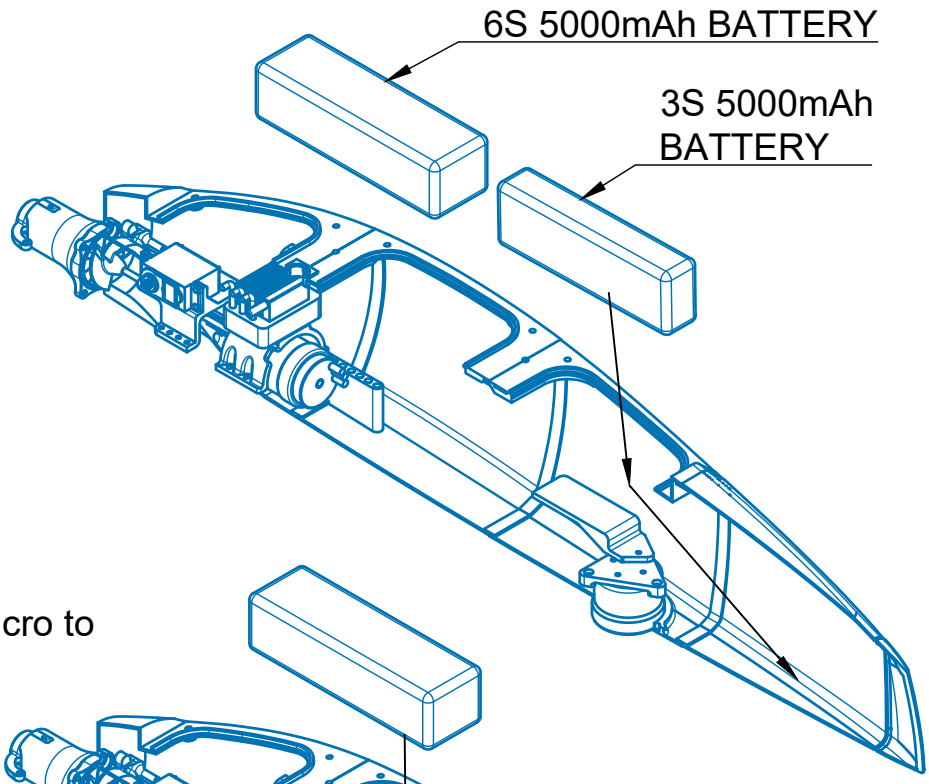
Align with mounting rail, and align axially with the smallest gap between the motor shaft and impeller shaft. Note the mounting holes.

Remove the motor assembly, and install the shaft coupling to the motor shaft. Reinstall and attach coupling to impeller shaft. Secure with 4x M3x8 SHCS.

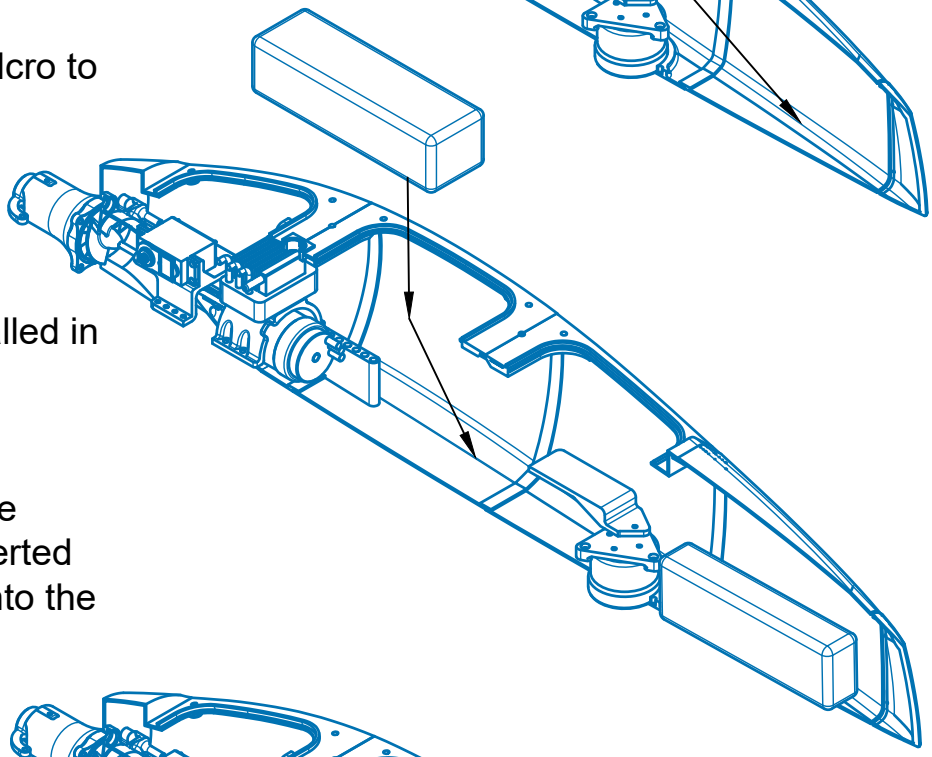


BATTERY INSTALLATION

Installation of batteries. Should be done prior to electronics installation.

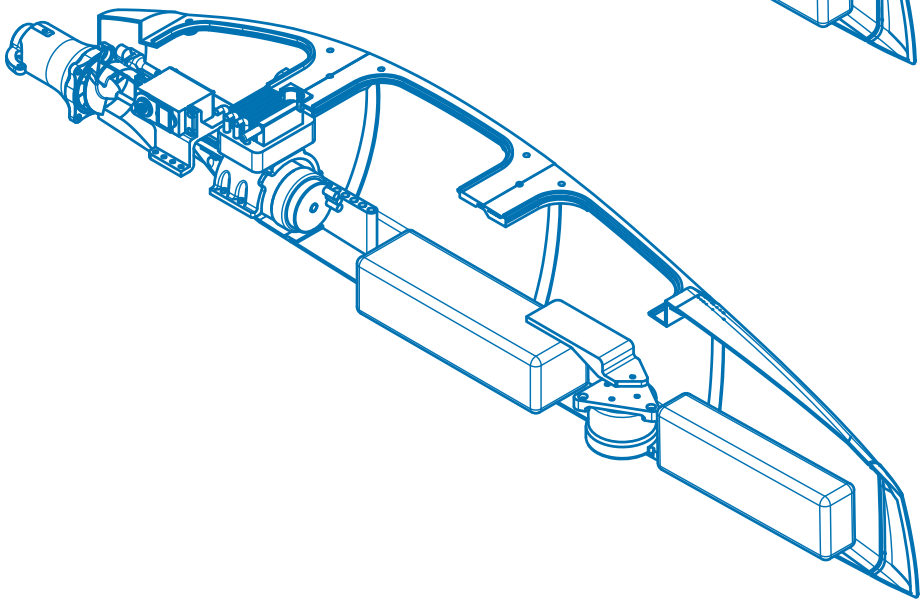


Apply VHB backed velcro to each battery and their associated mounting surfaces.



Batteries may be installed in any order.

The installation of the batteries is tight, so the batteries must be insterted on an angle and fed into the hull.



FLIGHT CONTROLLER BOX

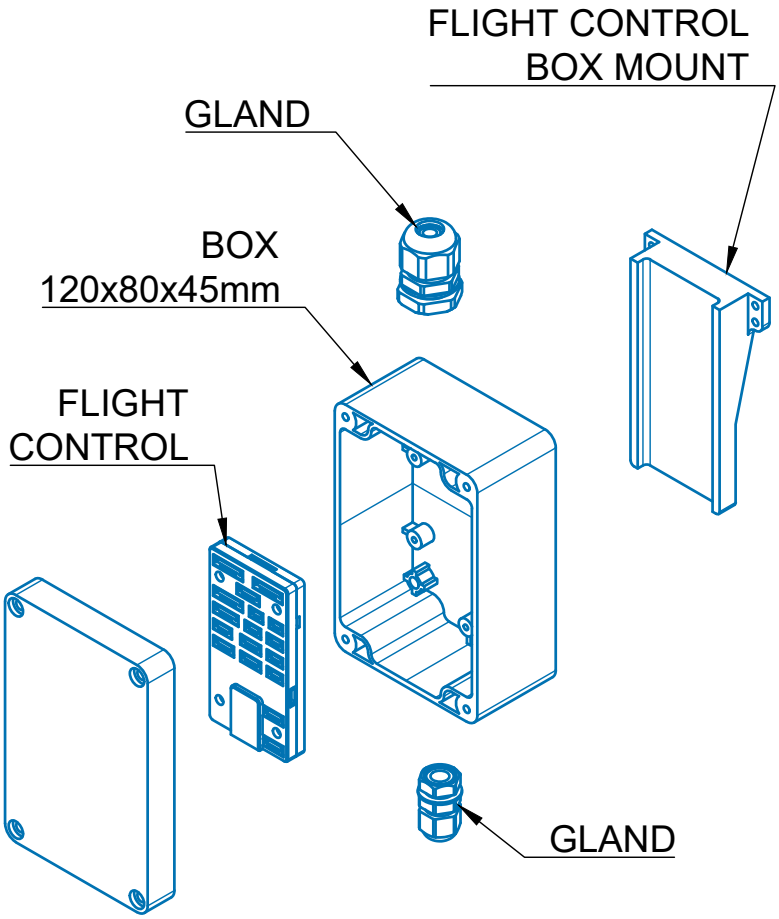
Assembly of flight controller box.

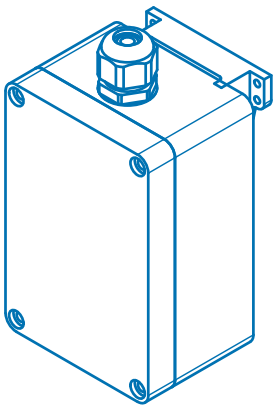
Drill and attach gland seal fittings.

Secure flight control box mount to bottom of box using VHB tape.

Assemble flight controller onto existing screw mounts inside box.

Attach lid.





RPi BOX

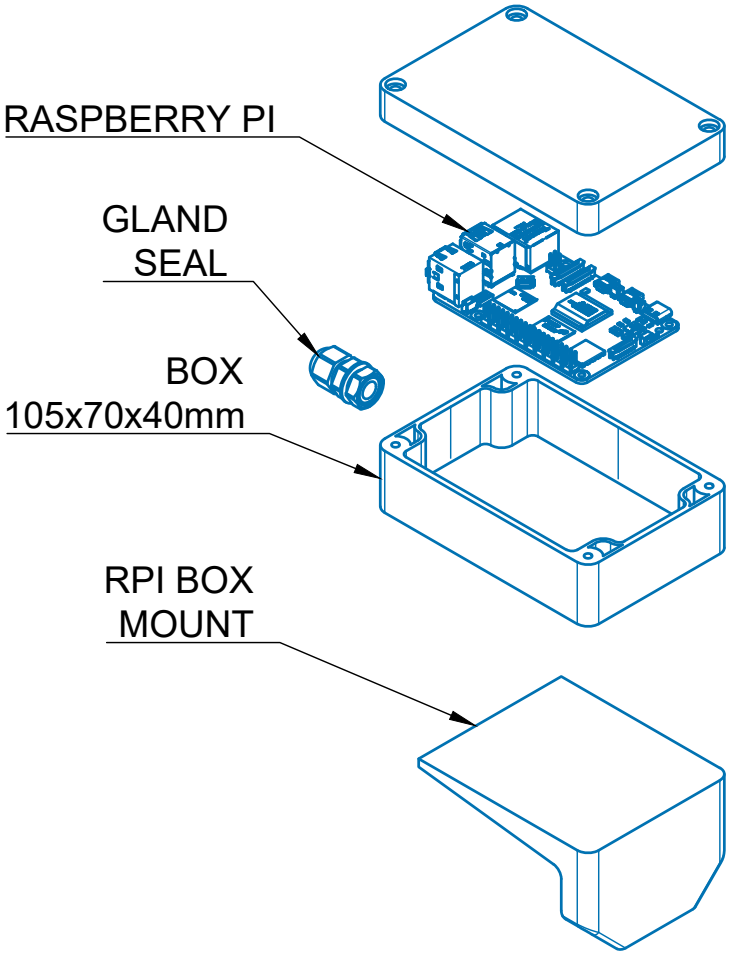
Assembly of Raspberry Pi box.

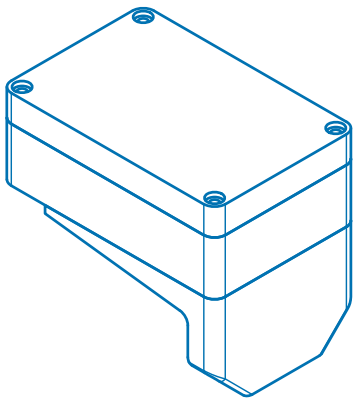
Drill and attach gland seal fittings.

Secure RPi box mount to bottom of box using VHB tape.

Assemble Raspberry Pi onto existing screw mounts inside box.

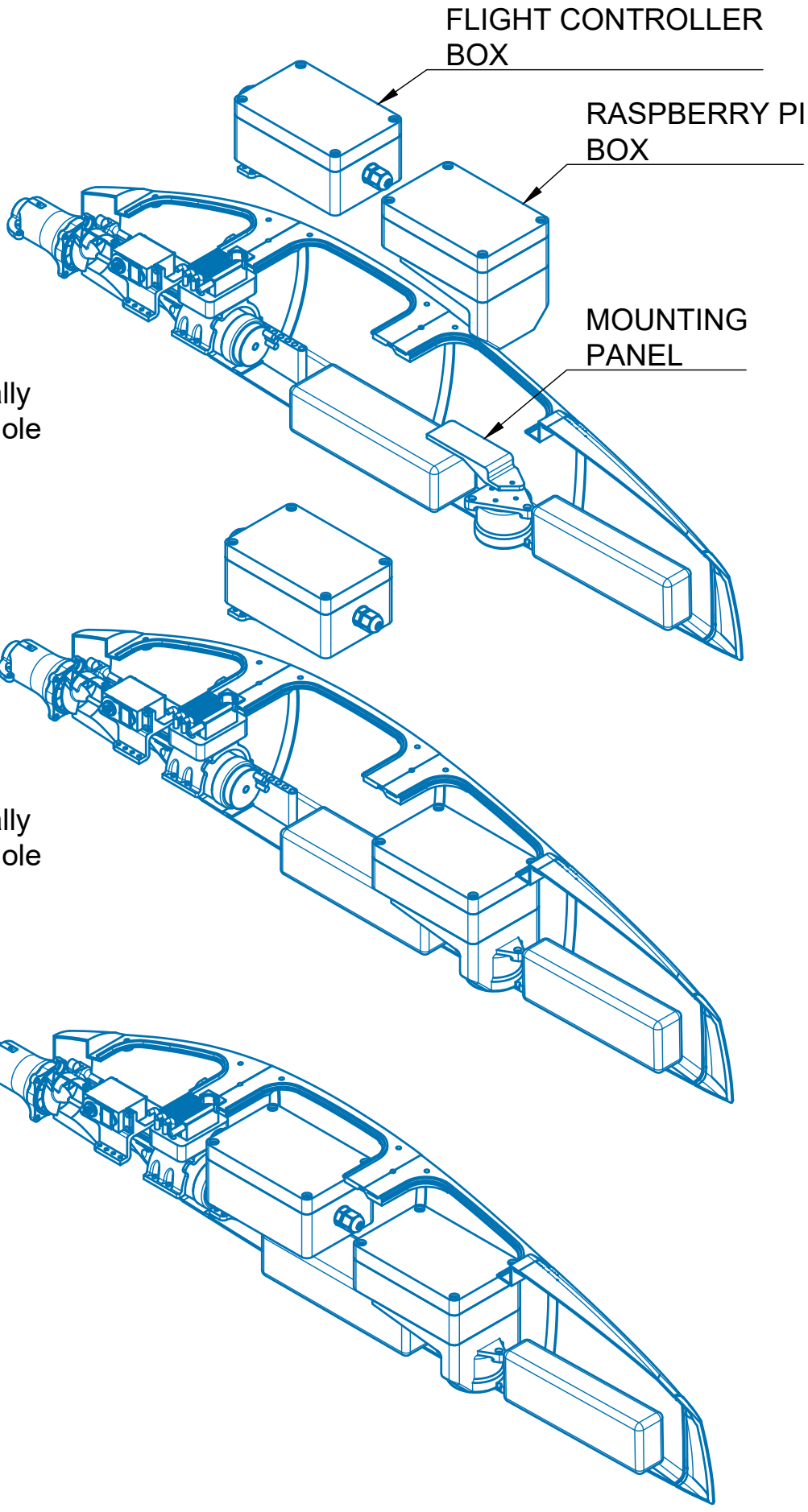
Attach lid.





ELECTRONICS INSTALLATION

Installation of flight controller and raspberry pi



Flight Controller Installation

Apply VHB tape to mounting panel.

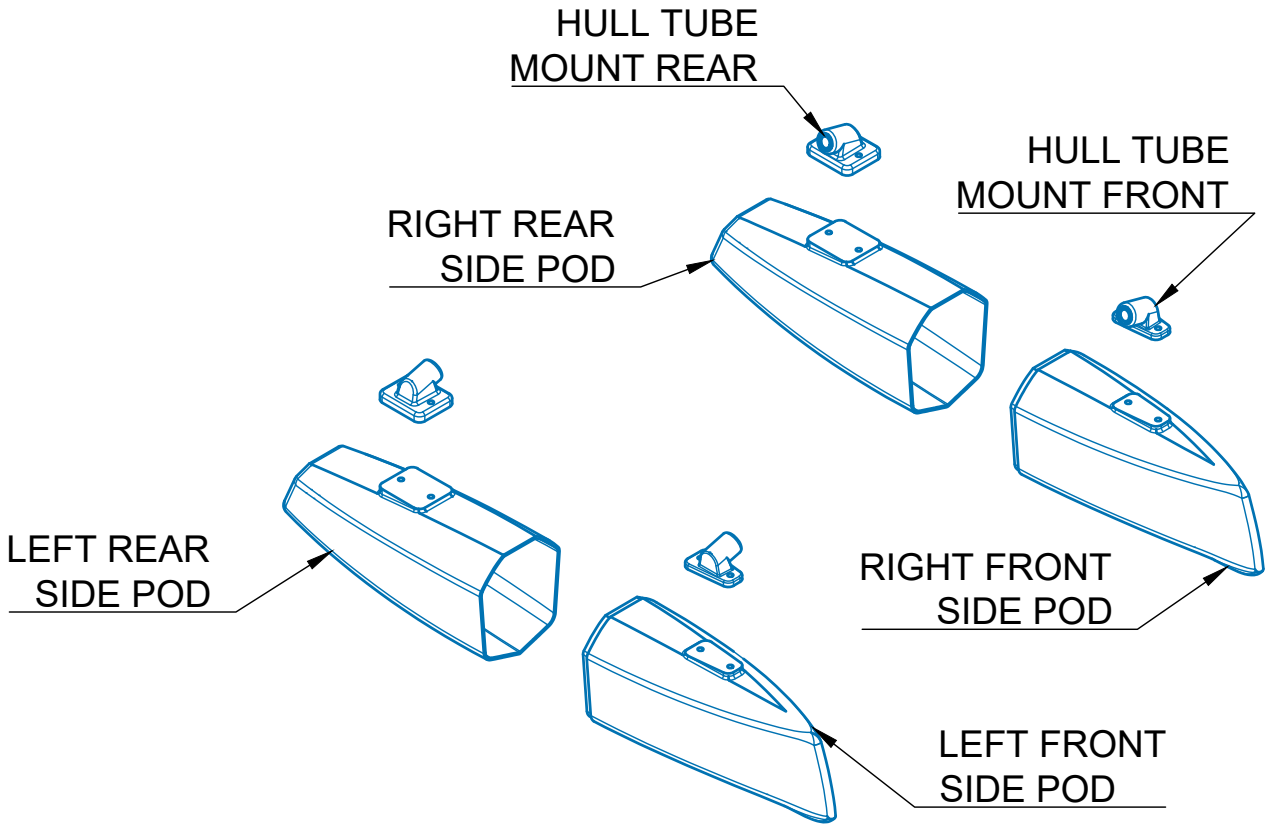
Install the box vertically through the access hole onto the mounting panel.

Raspberry Pi Installation

Install the box vertically through the access hole and secure using 4x M3x8 SHCS to the mounting rail.

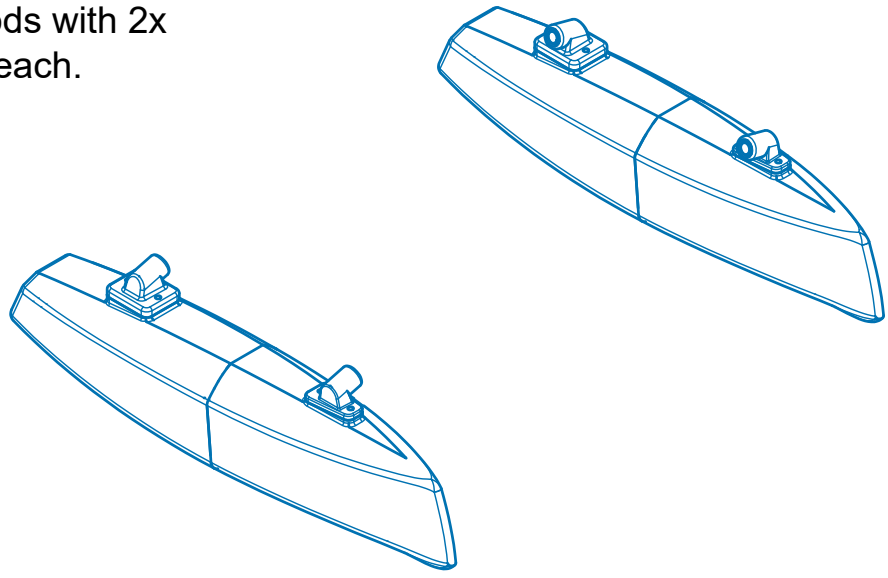
SIDE POD

Assembly of hull side pods.



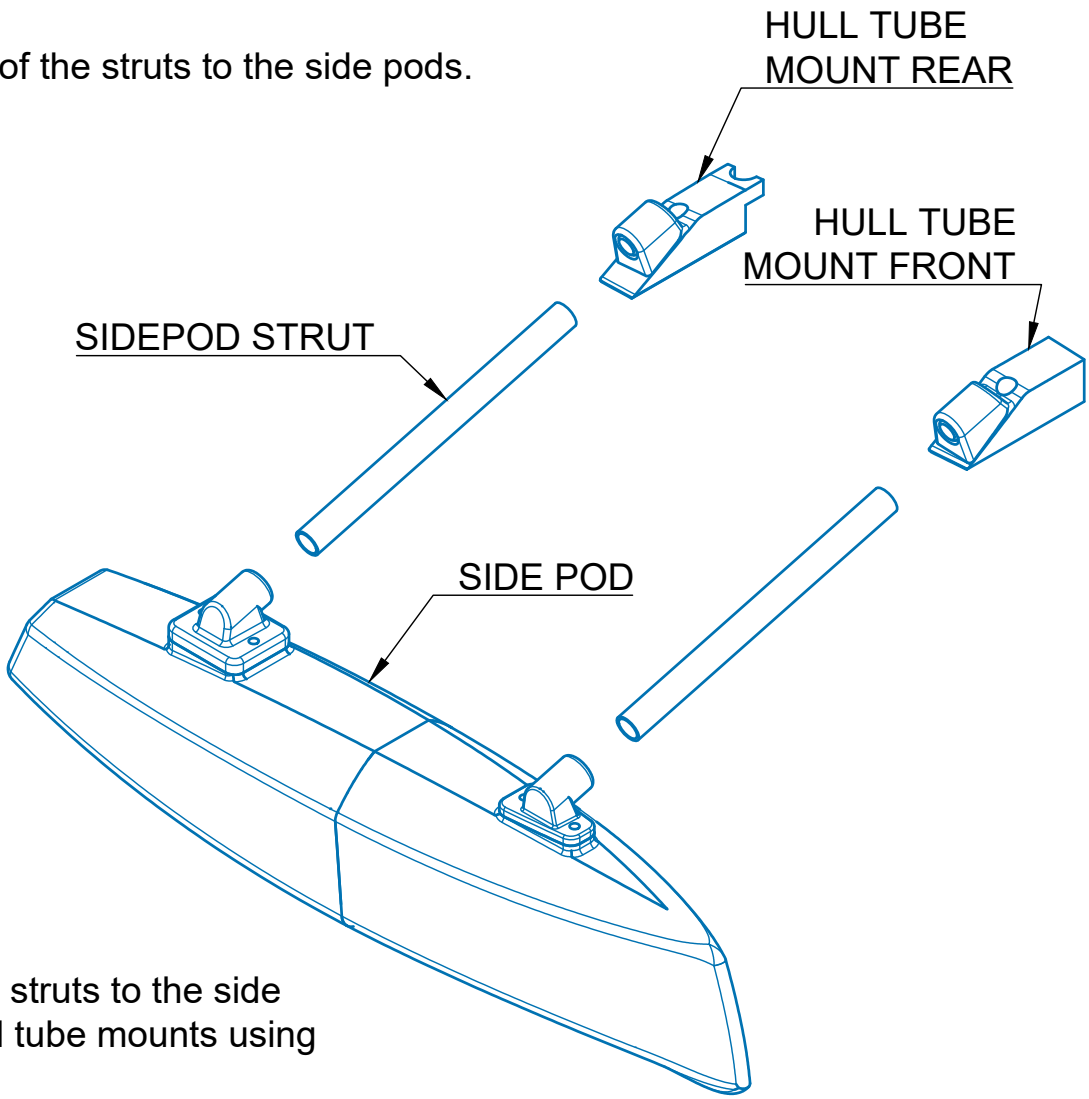
Assemble the side pod components with epoxy using the same method as shown in the main hull section.

Attach the hull tube mounts to the side pods with 2x M3x8 SHCS each.



SIDE POD STRUT ASSEMBLY

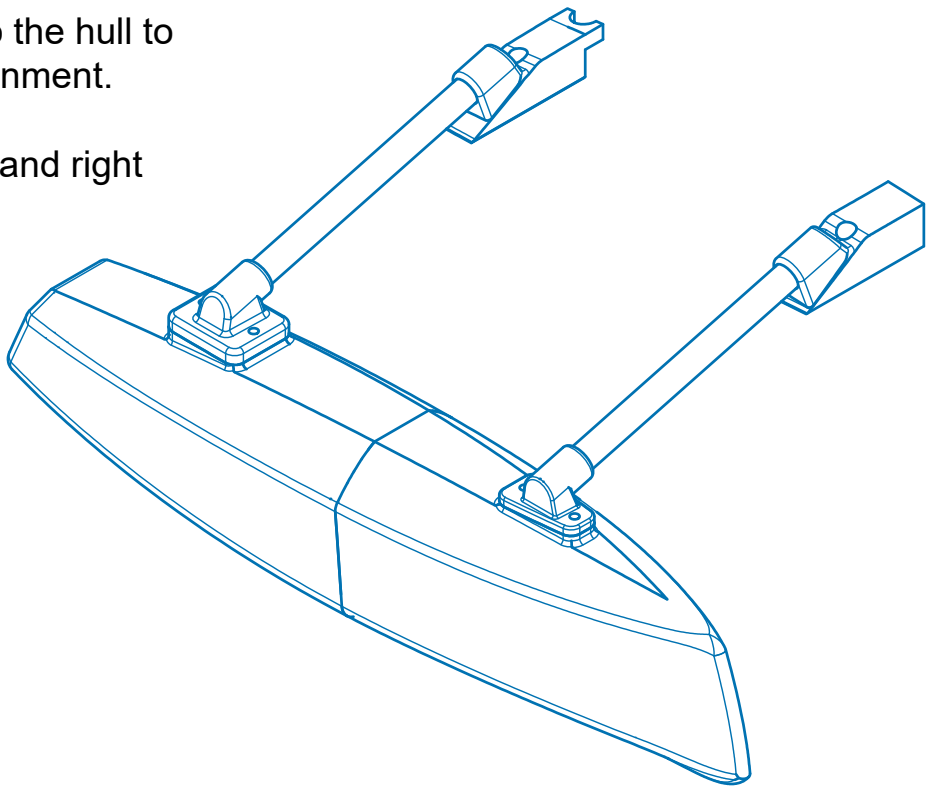
Installation of the struts to the side pods.



Bond the struts to the side pods and tube mounts using epoxy.

It may be helpful to attach the tube mounts to the hull to ensure correct alignment.

Repeat for the left and right side.



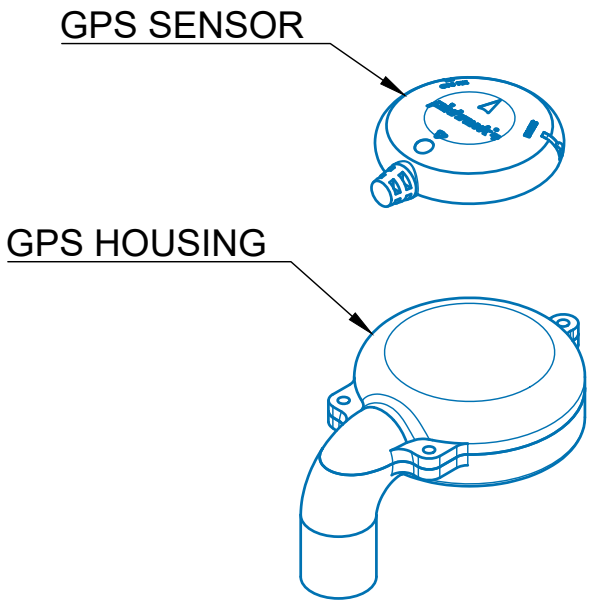
GPS SENSOR POST

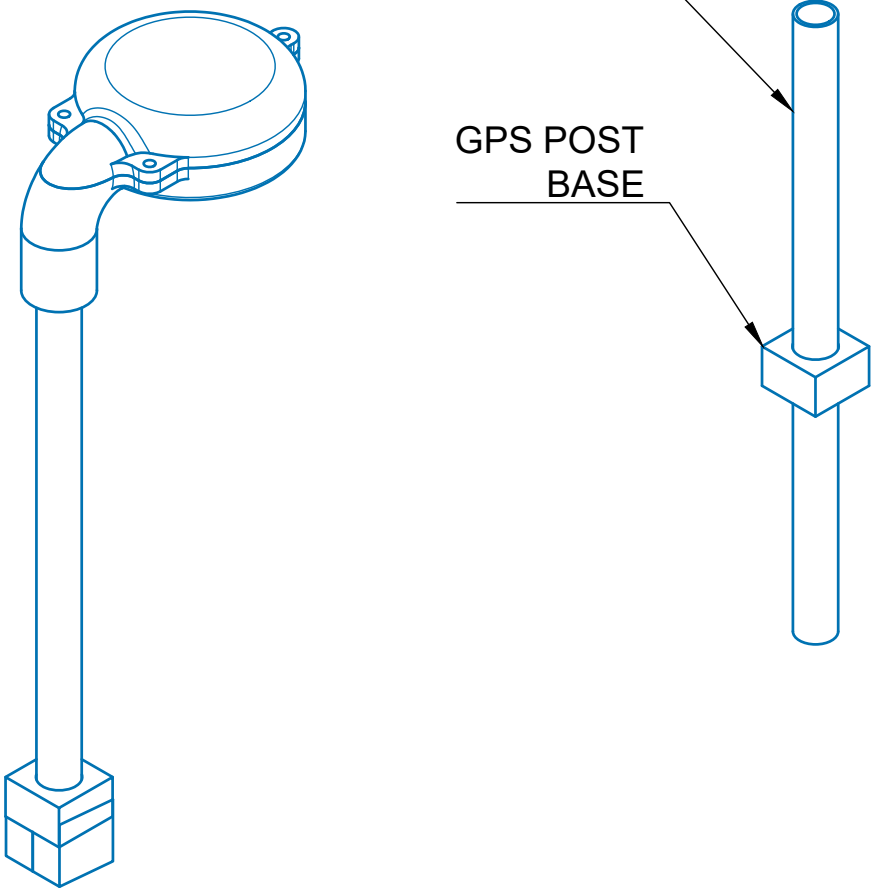
Assembly of GPS sensor.

Seat the GPS sensor inside the GPS housing. Close the housing with 3x M3x8 SHCS.

Ensure the GPS cables run through the housing. Run the cables down the GPS post.

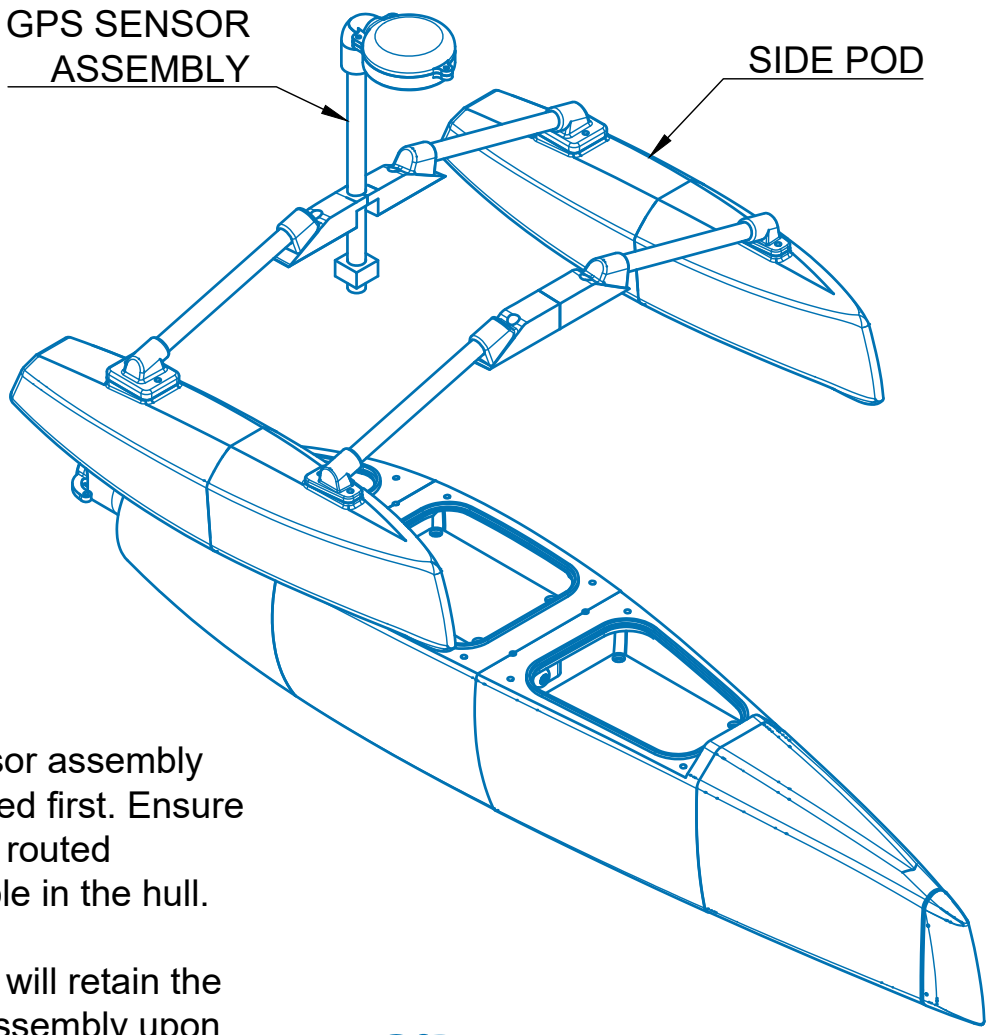
Use adhesive to bond the GPS post based and GPS housing to the GPS post.





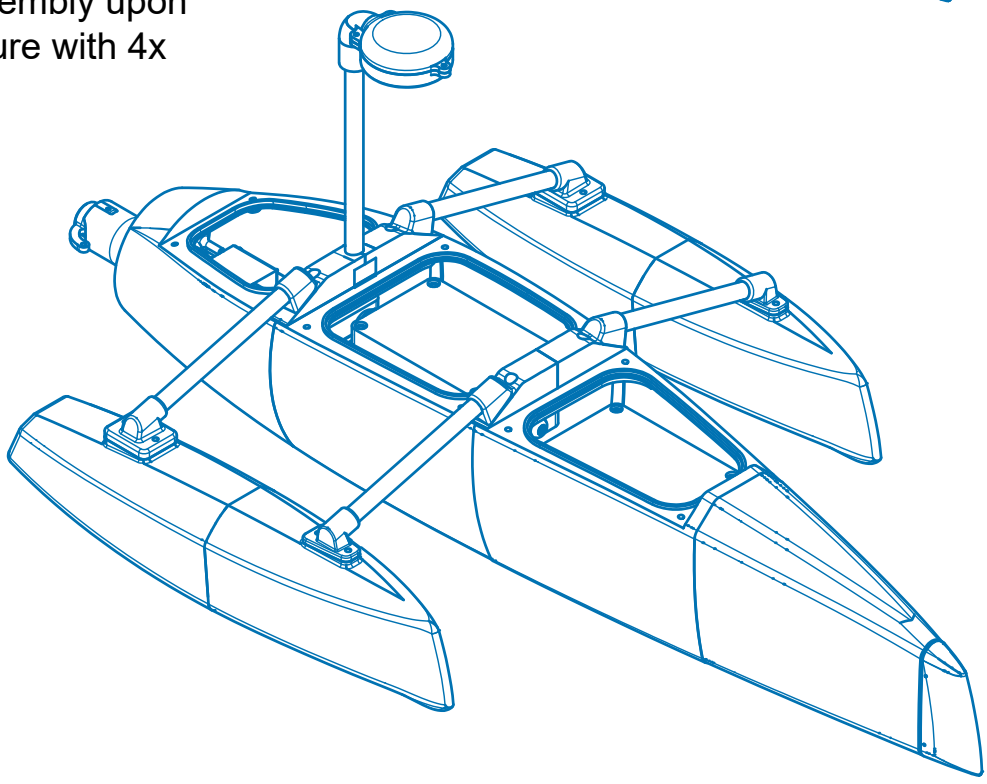
SIDE POD INSTALLATION

Installation of the GPS sensor and side pods.



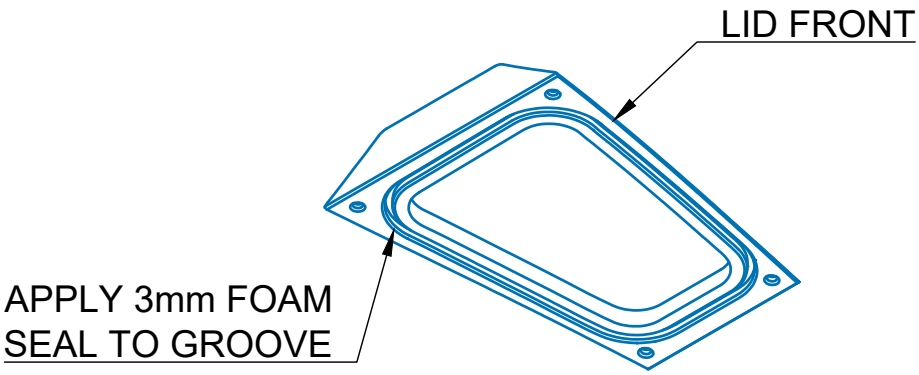
The GPS sensor assembly shall be installed first. Ensure the cables are routed through the hole in the hull.

The side pods will retain the GPS sensor assembly upon installation. Secure with 4x M3x8 SHCS.



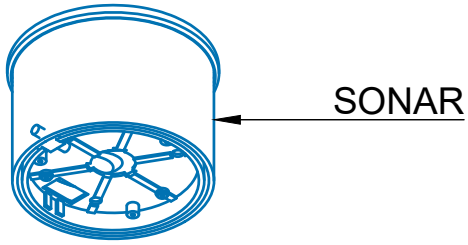
LID ASSEMBLY

Pre-assembly of hull lids.

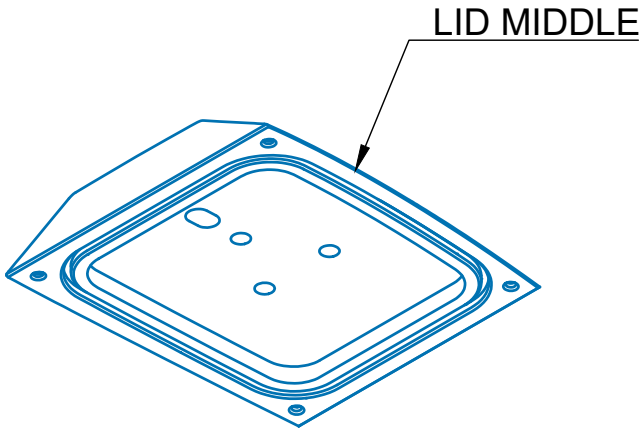


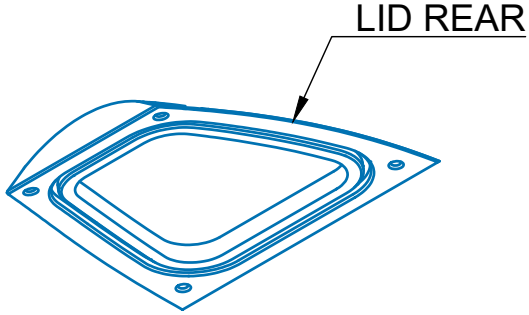
Each lid shall have a 3mm closed cell foam seal pressed into the groove.

Each seal shall be cut to size.



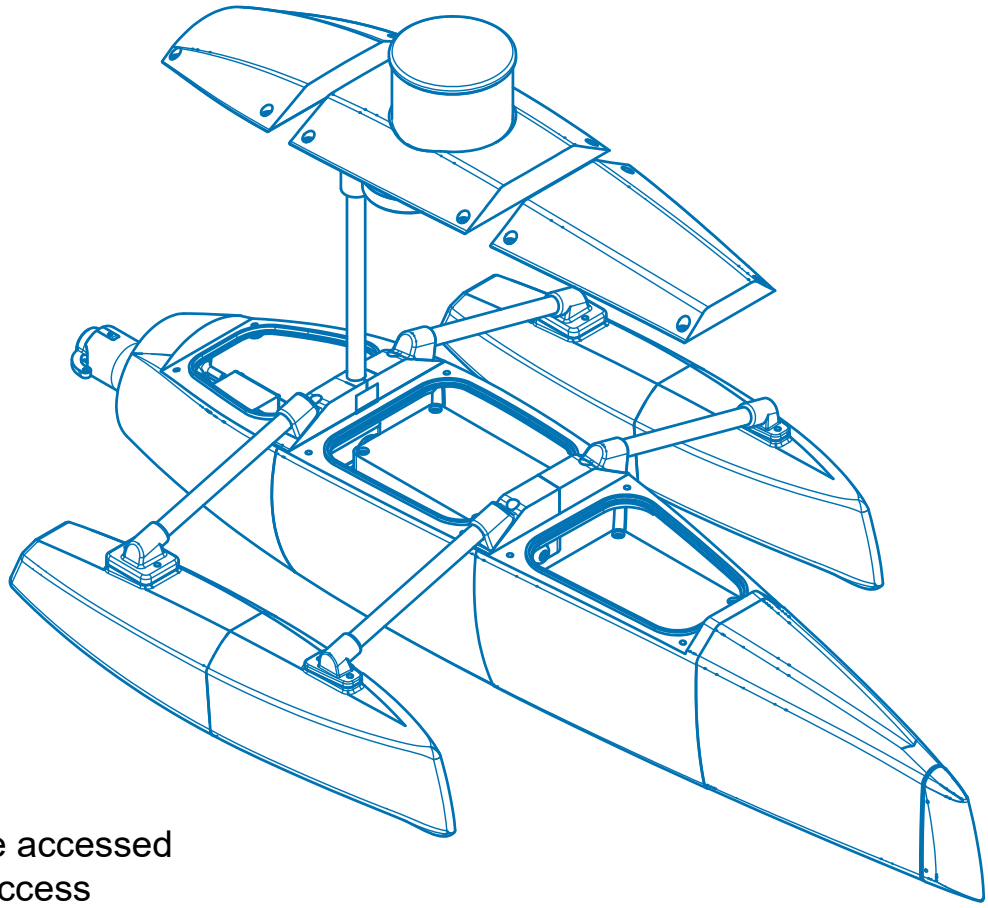
The sonar shall mount to the middle lid using 3x M3x8 SHCS.





CENTRE HULL LID INSTALLATION

Installation of watertight lids for the centre hull.



Each lid may be accessed individually to access different areas inside the hull.

Secure each lid with 4x M3x8 SHCS.