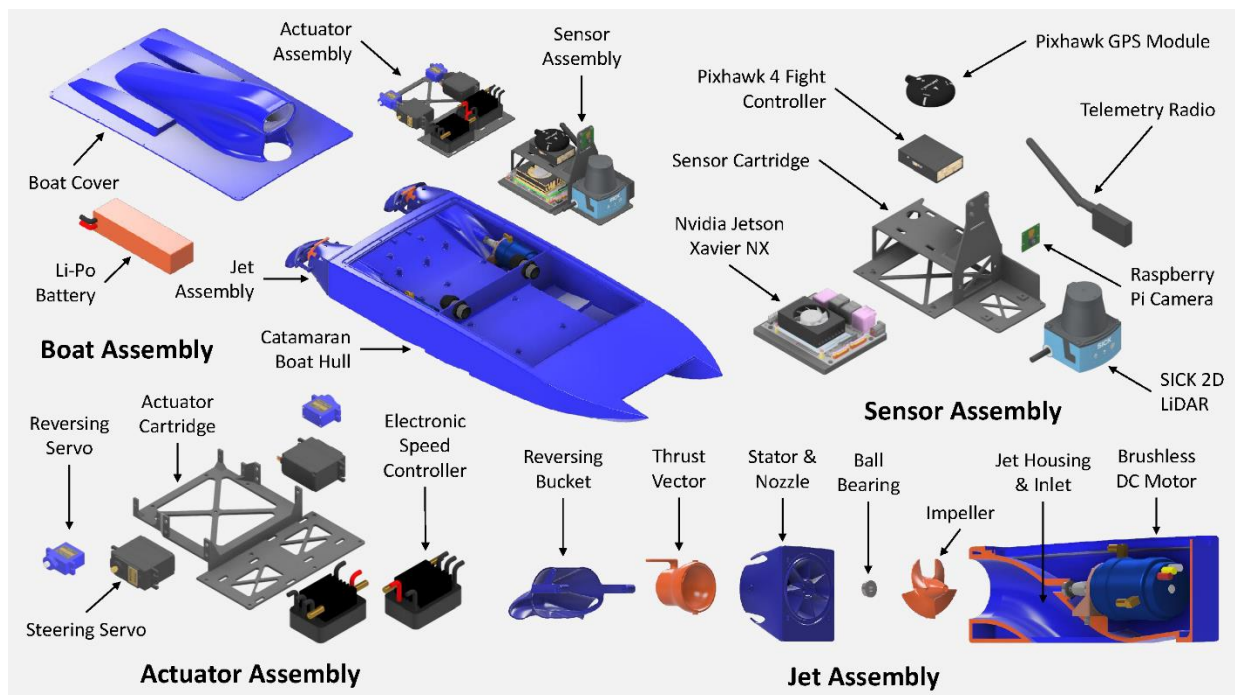


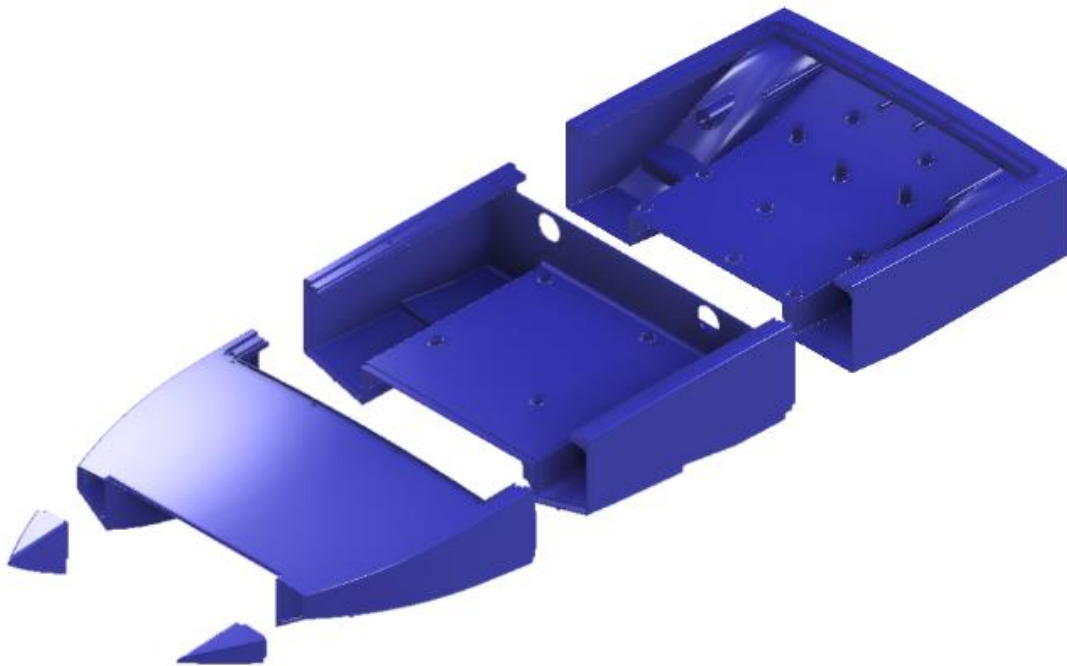
3D Printed Catamaran



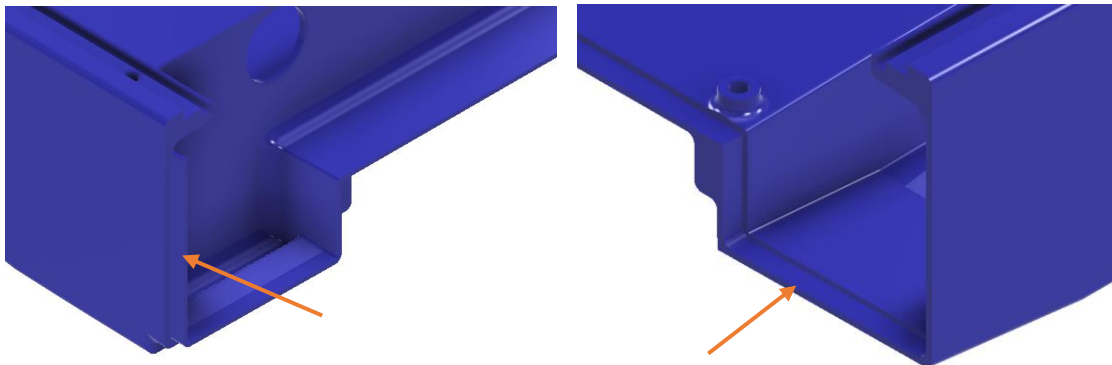
Parts List

<i>Part</i>	<i>Description</i>	<i>Quantity</i>
Driveshafts	4mm steel rod – 120 mm long	2
Actuation Rods	1.5mm steel rod – 150 mm long	4
Propeller Lock Rings	Dragon Hobby 4mm Propeller Lock	2
Shaft Couplings	Drive Shaft Coupler 5mm to 4mm	2
Bearings	Flanged Bearing 4x10x4 mm	4
Rubber O-ring kit	2.5mm diameter rubber, cut to fit	2
3D Printing Filament	2kg 1.75mm PLA (all prints = 1.8kg)	2
Threaded Inserts	M3 (Bag of 100)	1
Cable Gland	5.5mm to 12mm Cable Gland IP68	2
Wire Grommet	20mm	2
Bolts	M3 6mm (Container of 100), 8* M2.5	1
Hull	3D Printing PLA – 20% Infill, 0.2 mm layer height, supports Project files attached for an 'Original Prusa i3 MK2S'	1
Cover	3D Printing PLA – 20% Infill, 0.2 mm layer height, supports	1
Electronics Subframe	3D Printing PLA – 20% Infill, 0.2 mm layer height, supports	1
Powertrain Subframe	3D Printing PLA – 20% Infill, 0.2 mm layer height, supports	1
Impellers	3D Printing PLA – 80% Infill, 0.1 mm layer height, supports	2
Nozzle	3D Printing PLA – 20% Infill, 0.15 mm layer height, supports	2
Reverse Bucket	3D Printing PLA – 20% Infill, 0.15 mm layer height, supports	2
Thrust vector	3D Printing PLA – 40% Infill, 0.15 mm layer height, supports	2
Gasket Seal	Laser Cut from 1.6mm natural rubber	1
Cooling lines	Silicon tubing 3mm internal diameter, 1m long	1

1. Hull – made up of 4 separate sections to fit everything on a print bed of 210*250*210 mm



Each section is attached using HPR epoxy with each section having a male/female mating surface to ensure alignment.

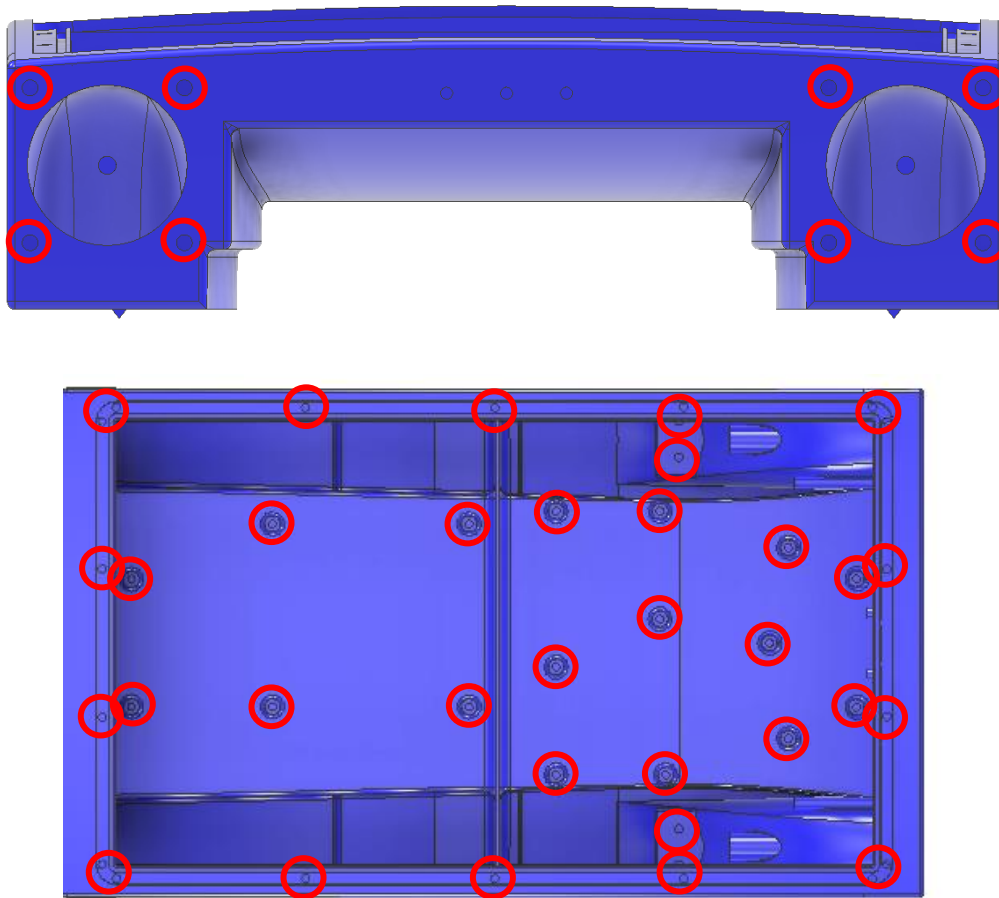


2. Hull Cover – made up of 2 sections

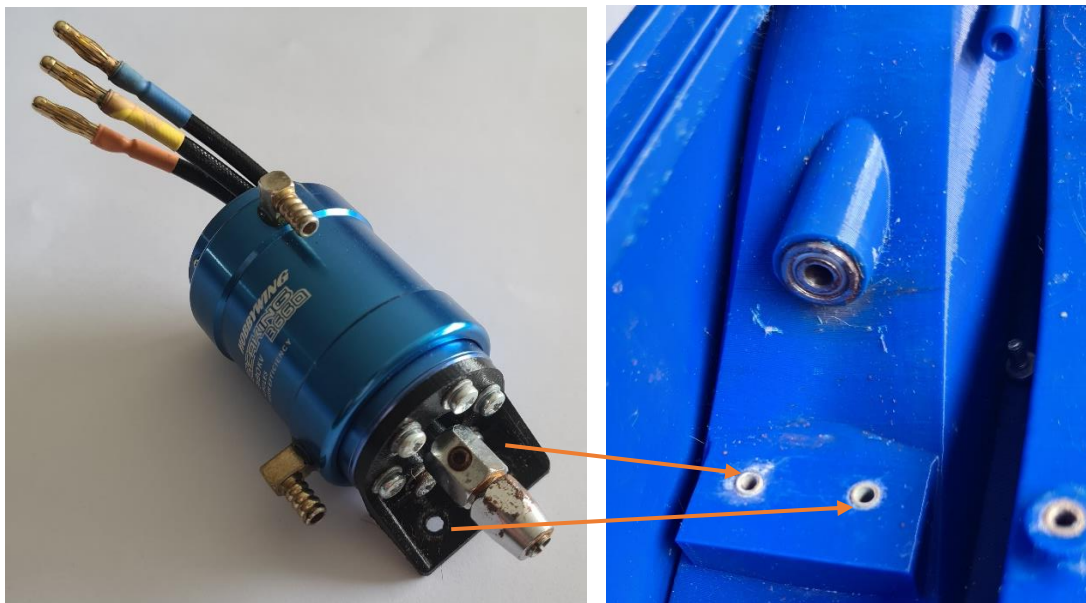


It has the same male/female mating surfaces as the hull.

3. Once the sections are bonded threaded inserts need to be installed, this can be done using a soldering iron. The insert is placed on the tip of the soldering iron at a low head and slowly pushed into the holes. M3 Inserts are highlighted below in red:



4. Motor mount attaches to the motor through 6 holes that are M3 6 mm, it is then attached to the hull through a further 2 M3 6mm bolts. A coupling and a bearing can be attached to the motor shaft by tightening the grub screw and a bearing pressed into the jet housing.



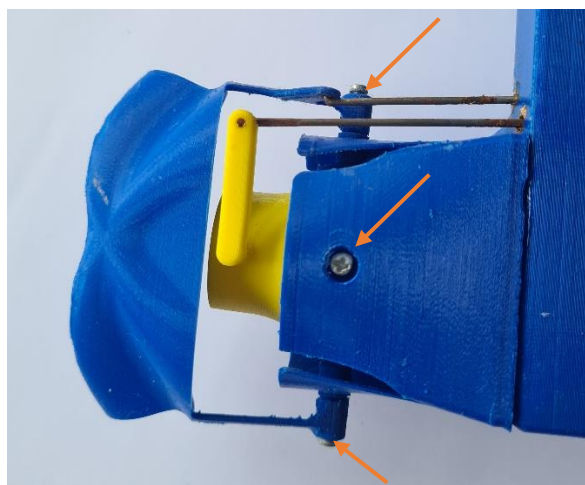
5. The shaft can be cut from 4 mm rod to a length of 120 mm and then 30 mm at one end can be filed to a depth of 1 mm or till the impeller can be pressed on. Once attached it can be slide in the jet housing and be attached to the couple on the motor shaft and tightened with spanners.



6. Installing the nozzle requires a custom O-ring to be cut to the size of the slot, with super glue used to join the ends, a bearing is also press fit into the nozzle center. This can then be slotted over the shaft and attached with 4 M3 6 mm bolts.

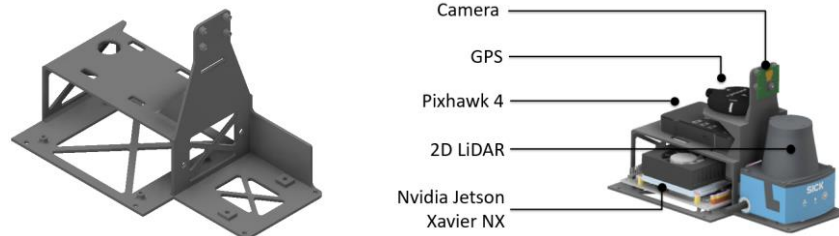


7. Thrust vector and the bucket can now be installed with 4 M2.5 bolts. Along with the connecting rods attached to the thrust vector and bucket.

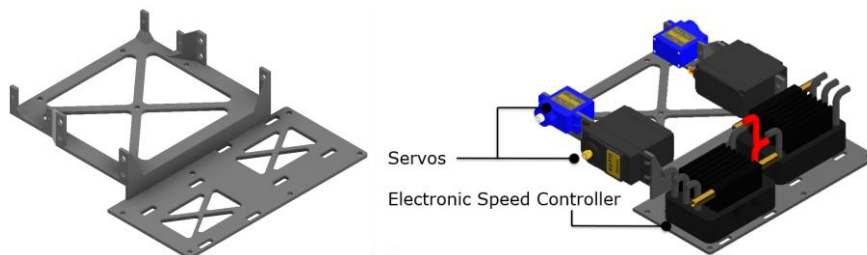


8. Sensor and powertrain sub frames – these are custom to the user based on the provided geometry. They are simply bolted onto the hull once any required inserts are installed. Such as the camera mount and the microcontroller mount. All components should be attached to the brackets before installation into the boat.

Sensor sub frame:



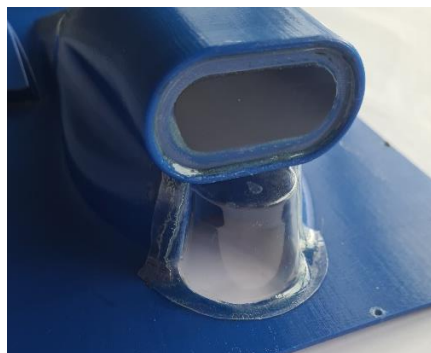
Powertrain sub frame:



9. Using the servo placement, the actuator rods can be finished off and installed to attach the servo arms to the thrust vector and reversing bucket. Along with cooling lines for the motors and the ESC.



10. Laser cut gasket is cut using the attached DXF from rubber of 1.5mm and a LiDAR cover can be created using a vacuum former on a mold. Once formed it can be trimmed to fit, then with the laser cut lens for the camera they can be bonded with the print with HPR epoxy.



11. Testing time:



Tape was added as an extra precaution.