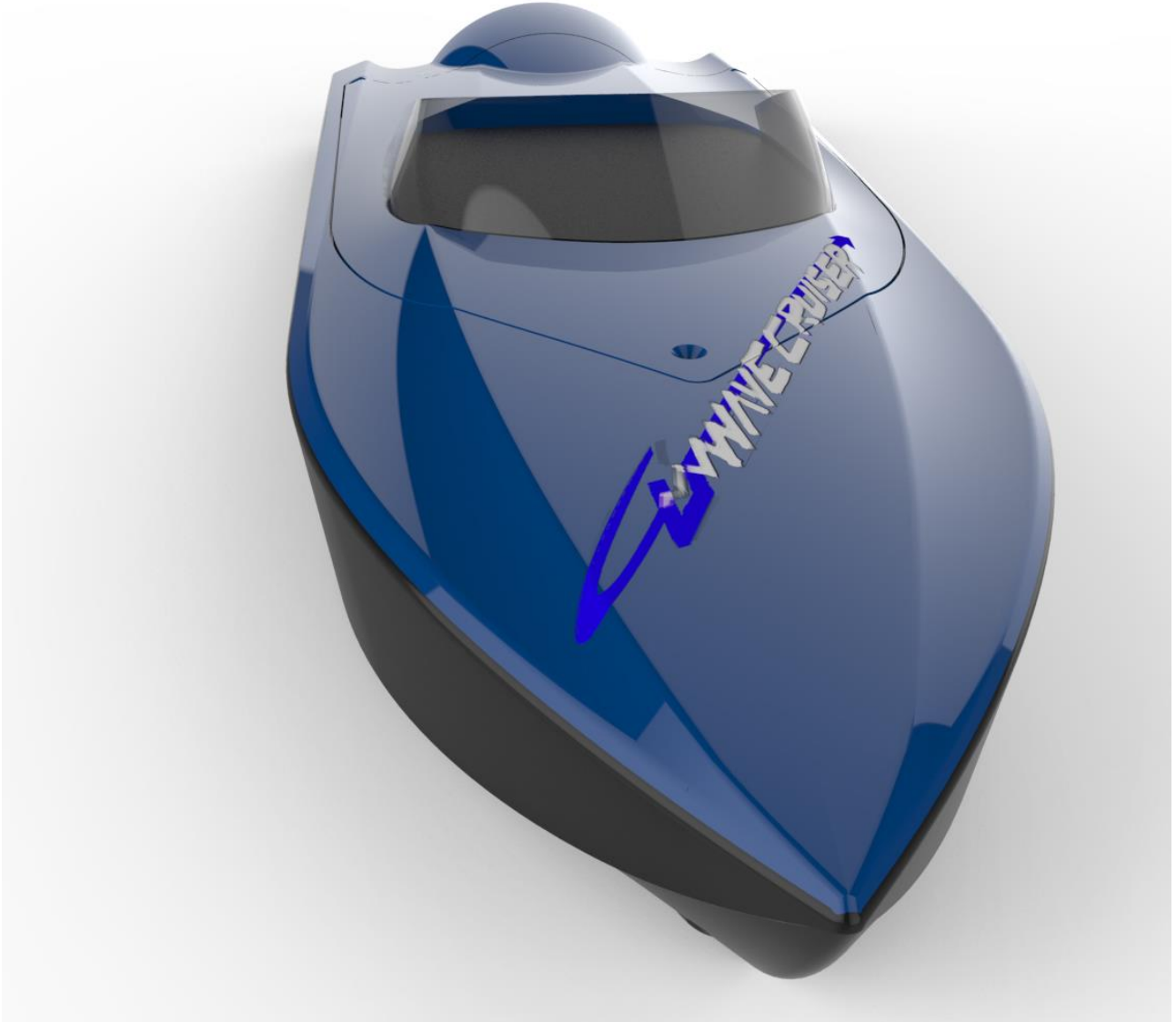


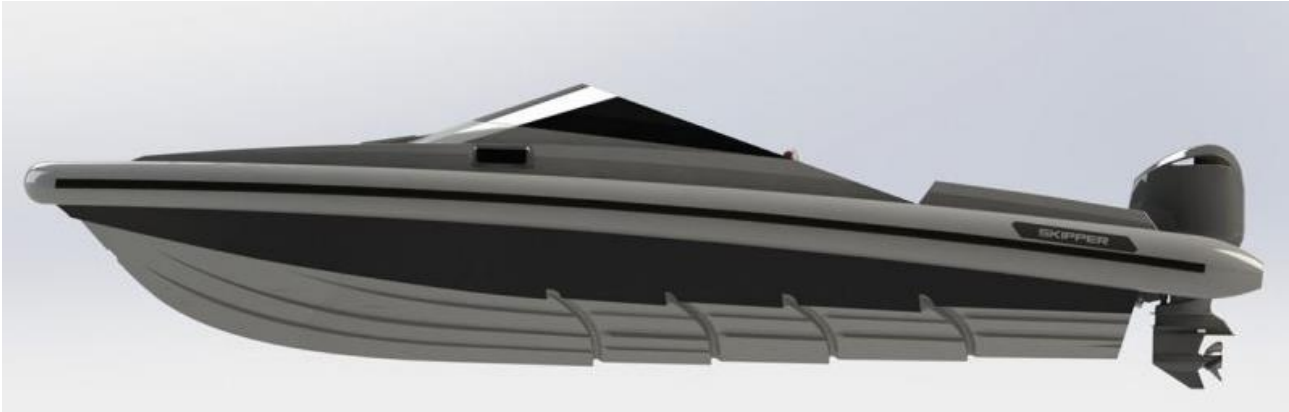
C.U Wave Cruiser

Ulf Raudberget



Introduction

The basic idea for this project was using a low rpm motor i already had. With this restriction I needed a large diameter propeller and the propeller shaft would come out in the dry area as benifit. With a reversing gear implemented, two propellers in opposite direction makes the boat run straight at any speed. The stepped hull is inspired by a greek RIB, Skipper NC 100C. The grooves behind each step lead air in to reduce the wetted surface and reduce drag. The deck design was made by my friend Christian Krug, who is an Automotive designer.



Parameters

Lenght:	790 mm
Width:	236 mm
Height:	182 mm

Requirements

Print size recommended: 250x200x200 Minimum 200x200x200

Slicing software: Simplify 3D recommended.

Bill of material:

PLA 1300g, hull and deck can be printed from one 1kg spool.

Ninjaflex (or similar) 20g

CA glue

Activator for CA glue (all PLA parts)

Contact glue like UHU Por (for top cover seal)

Acrylic paint (for example edding permanent spray)

Steel pushrod dia 1.0 mm

Ball bearings, recommended stailless if budget allows (could be found at ekugellager.de):

6 x MR106 6x10x3

2 x 61800 10x19x5

2 x 61804 20x32x7

Screws, stainless recommended:

- 4 x M4x16 countersunk head (propeller and motor)
- 8x M4x25 countersunk head (Rudder, top cover rear, propeller mount)
- 1x M4x40 countersunk head (Top cover front)
- 3x M3x16 countersunk head (reversing gears)

Outrunner 430KV, recommended Turnigy AeroDrive 5055 430

ECS 80A

Battery 3s or 4s 3000 – 5000 mAh

9g servos, recommended Truningy TG9e

Print settings

The hull and top cover parts (except hull 1 and 3) are generally printed with no infill and 1 one perimeter, no top and bottom layer. For the first layers and last layers use 2 perimeters to get a good glue surface inbetween the parts. In the range of the hull steps, 3 top and bottom layers are recommended.

For hull 1, from 0 to 43mm Z-height, use 20%infill, 5 top layers, 2 bottom layers and 3 perimeters. From 43mm onwards, use 8%infill, 0 top and bottom layers and 3 perimeters.

Hull 3 is a combination of two models to enable different settings in one print: „hull_3_Sides“ and „hull_3_motor_mount“. For „hull_3_Sides“ use no infill and 1 one perimeter, no top and bottom layer. For the first layers and last layers use 2 perimeters. For „hull_3_motor_mount“ use 20% infill, 3 top layers, 2 bottom layers and 3 perimeters.

The battery tray and stands are printer with 2 perimeters, no top and bottom layer and 5% triangular infill.

For all other parts 3 perimeters, 4 top and bottom layers and 30% infill is recommended. For Shaft 3 use 85% infill from 75mm upwards or complete with 85%.

Center hub, Front propeller hub and Propeller mount need support.

Factory files for Simplify3D are provided.

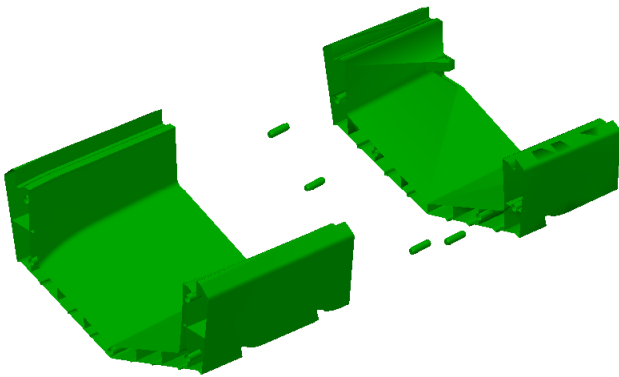
Depending on what PLA used and how your 3d-printer preform, the fit of the bearings on the shafts could variate. The shafts are generally 0,1mm smaller than the bearings. If the bearings have too loose fit on the „shaft_2“ or „propeller mount“ there are two additional files provided for each part. _00 is nominal dimension, same as inner diameter of the bearing, and _01 is 0,1mm larger.

For 200x200x200 printer the stl files to be used for hull, windscreen, seal and stand are named _2x2x2.

Assembly instructions

Hull and top cover:

1. Insert the connection pins in the holes on one of the parts.
2. Glue the parts with CA glue and use activator.



For 200x200x200 hull parts, glue the hull halves before above steps.

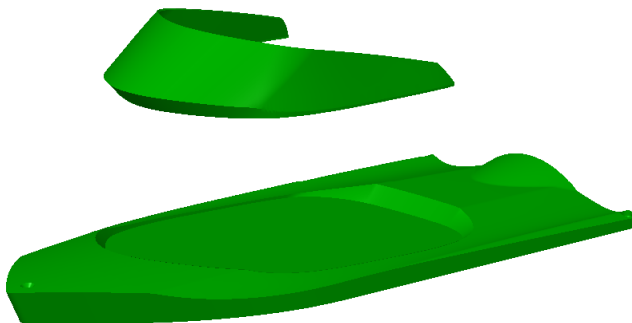
Paint the hull:

The 3d printed hull will probably not be 100% watertight. It's important to paint the hull to prevent water intrusion. Mask the bottom area and paint with acrylic paint or use a clear paint without masking.



Windscreen:

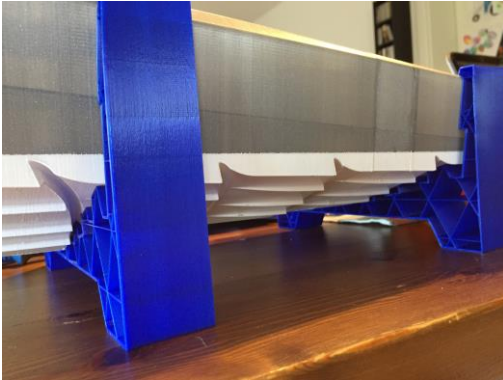
1. Glue the windscreen with CA glue to the assembled top cover and use activator.



For 200x200x200 windscreen, glue the 3 windscreen parts to the assembled top cover.

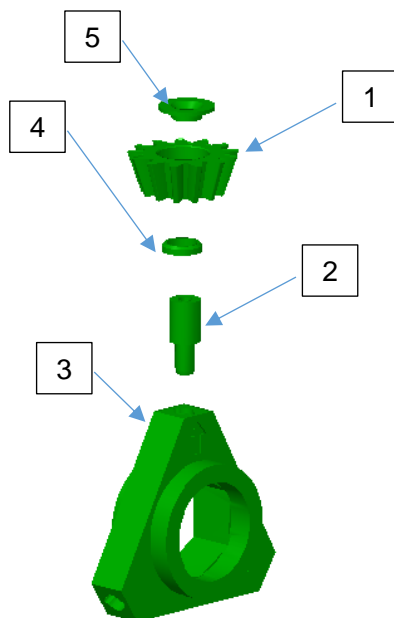
Stand:

Print the front and rear stand. The front stand fits in the front groove and the rear stand in the rear groove. The stands comes in good use for the assembly of the propulsion and for transport of the boat.



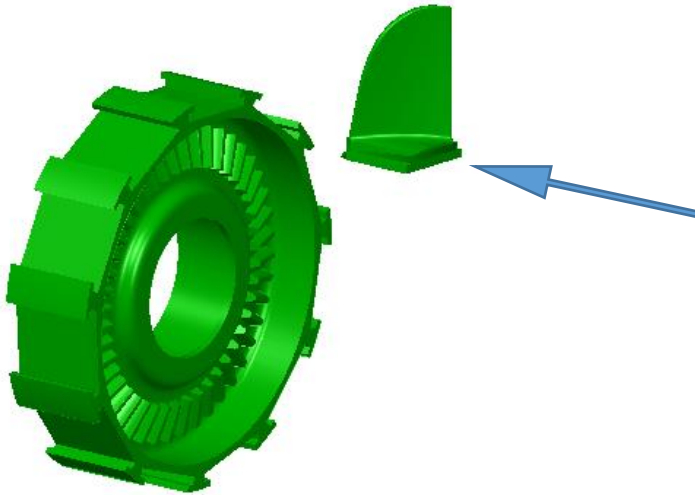
Propeller gear:

1. Press two ball bearings (MR106 6x10x3) in each reversing gear wheel. 1
2. Pres one ball bearing (61800 10x19x5) into the center hub 3 from the side where the arrow is visible.
3. Glue the three gearwheel shafts 2 into the center hub 3 with CA glue.
4. Slide the the gearwheel spacer 4 to the bottom of the gearwheel shafts.
5. Mount the gearwheels 1 on the gearwheel shafts 2 .
6. Use M3x16 screws with the gearwheel washers 5 to fix the gearwheels.

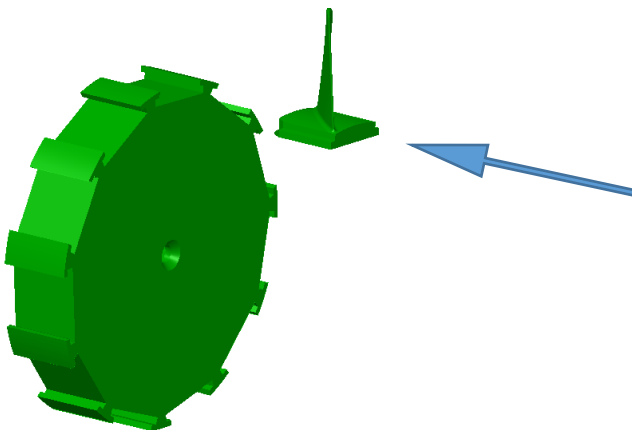


Front propeller hub:

1. Press two ball bearings (61804 20x32x7) into the front propeller hub.
2. Slide 11 propeller blades „CCV“ into the grooves. Normally the fit is so tight that no glue is needed. A vice is recommended for this operation.

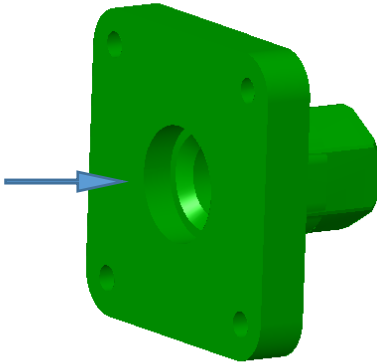
**Rear propeller hub:**

1. Slide 11 propeller blades „CV“ into the grooves. Normally the fit is so tight that no glue is needed. A vice is recommended for this operation.

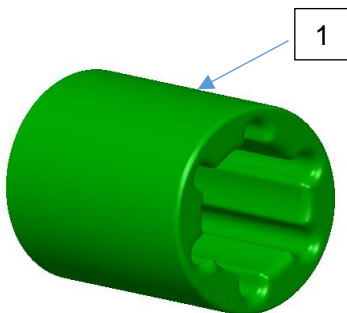


Propeller mount:

1. Press one ball bearing (61800 10x19x5) into the propeller mount.

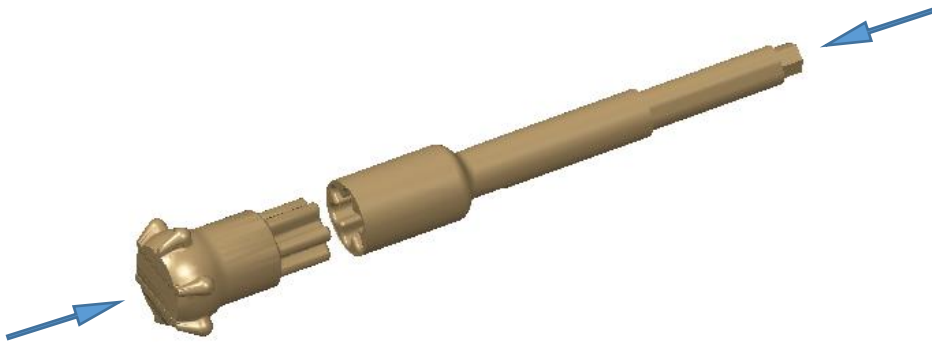
**Motor:**

1. Mount the motor in the hull with four M4x16 screws
2. Mount the shaft drive 1 on the motor with the propeller fixation delivered with the motor.

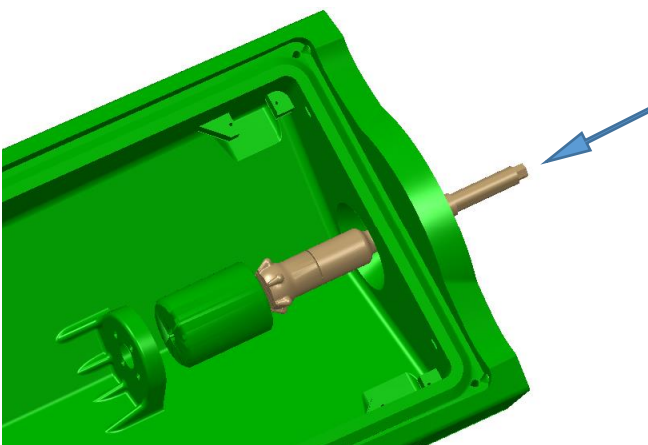
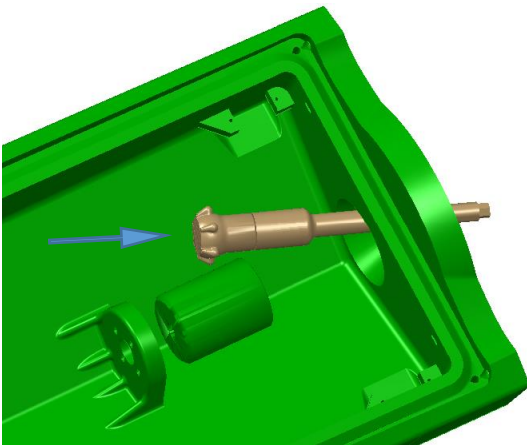


Shaft:

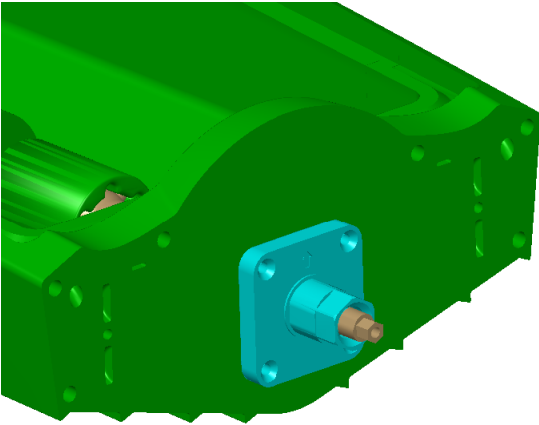
1. Press shaft 1 and 2 together. If too loose fit glue with CA glue and use activator.



2. Slide the shaft through the hull and insert in the shaft drive.



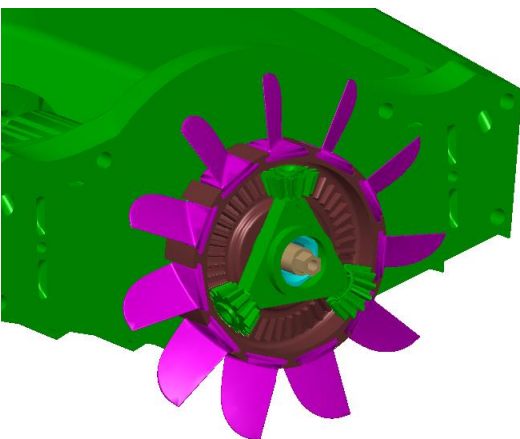
3. Slide the propeller mount onto the shaft and fix with 4 M4x25 screws

**Propeller:**

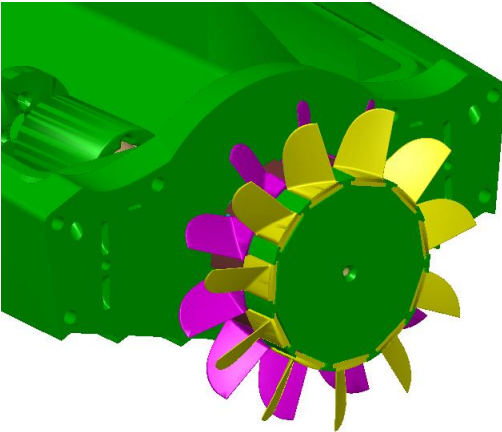
1. Press the front propeller onto the propeller mount.



2. Slide the assembled propeller gear onto the propeller mount.

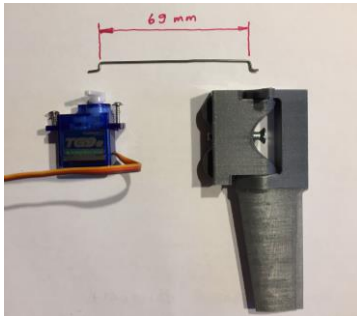


3. Fix the rear propeller onto the shaft with a M4x16 screw.

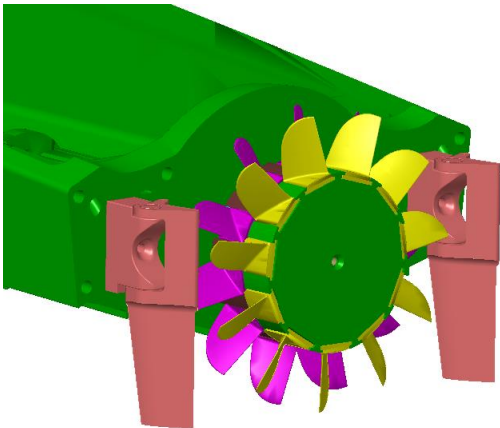


Rudder:

1. Mount the servos in the hull and bend steel rods to connect servos and rudders.

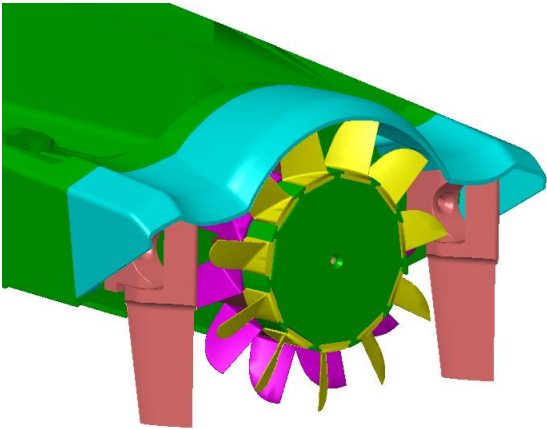


2. Mount the two rudders onto the hull with two M4x25 screws.



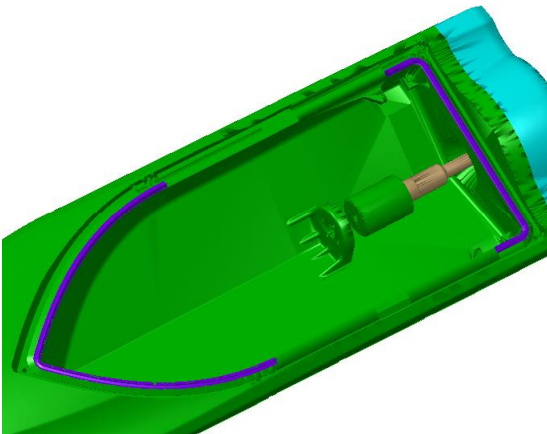
Rear cover:

1. Glue the rear cover to the hull. Use CA glue and activator.

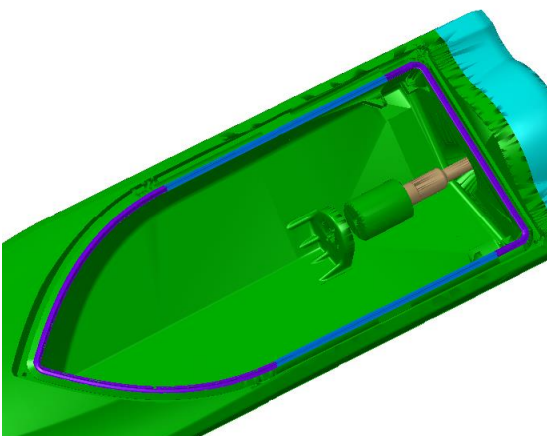


Top cover seal:

1. Glue the front and rear seal to the hull. Use contact glue.

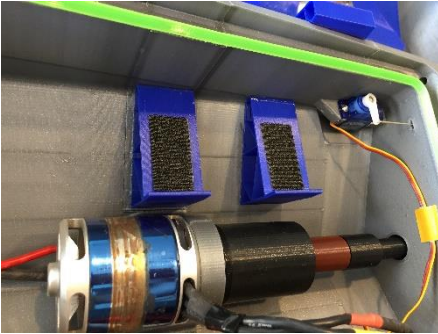


2. Glue the middle seal on each side. You may have to stretch the seal to match with the front and rear seal. Use contact glue.

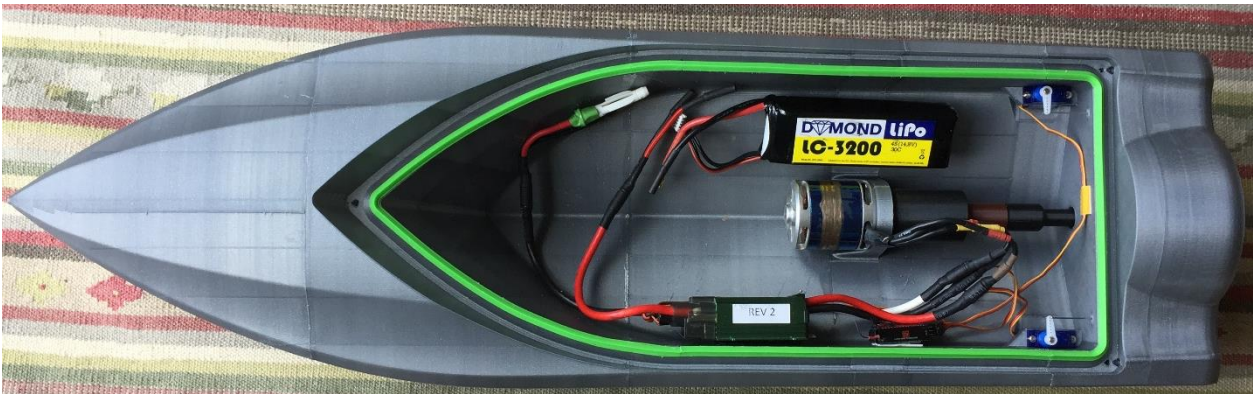


Battery tray:

Glue the two battery trays at a distance appropriate to your battery. If you use two batteries glue one set on each side for a perfect balance.



Now just add the electronics and you're ready to go!



Note that there is no cooling of the motor and ecs. Don't run too long time att full speed.

I hope you enjoy this project and have fun printing, building and cruising the waves!

Ulf Raudbegret 2018 , Austria

