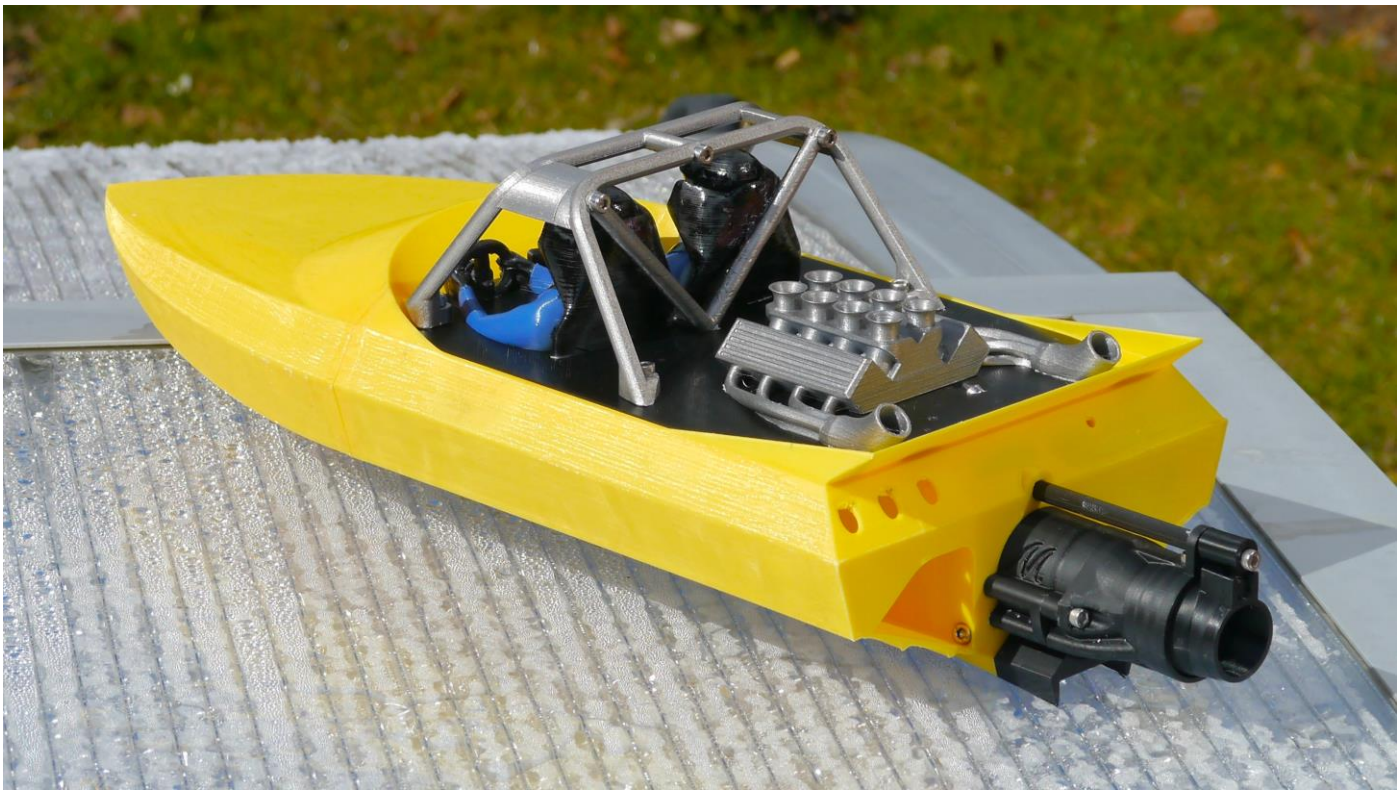
M-Jet Sprint Manual



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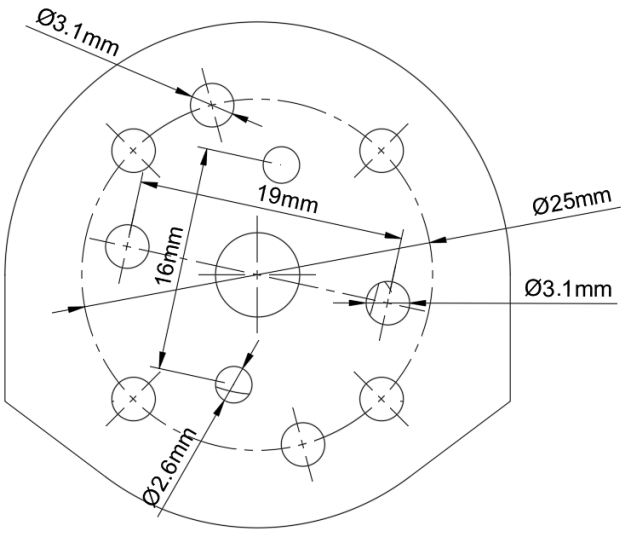
Part list

Hardware

- All 18 3D printed parts
- Screws:
  - 15x M3x6
  - 4x M3x10
  - 8x M3x20
  - 4x M3x35
  - 2x M3 nut
  - 2 small screws for fixing the servo, 2mm diameter
  - For the M3 screws, I recommend using stainless steel screws with hex socket cap head.
- 4mm diameter stainless steel rod
- 2x stainless steel or ceramic bearing; OD=10mm, ID=4mm, width=4mm
- 4x rubber O-ring; OD=8mm, ID=4mm, thickness=2mm
- Silicone tube for watercooling and sealing the cover; OD=5mm (other diameters will not work), ID=3mm
- Motor shaft coupler with 4mm hole on one side, other side to fit your motor, maximum OD=16mm, maximum length=25mm
- Velcro strap, maximum width=21mm
- Zip ties
- About 500g of PLA filament and about 15g of ABS or PETG filament *(see "Print settings")*
- Epoxy glue
- Optional: Clear lacquer for better sealing of the hull, foam, plastic bag or balloon for the receiver

Motor choice



- You need a watercooled brushless inrunner
- The boat is designed to accept both 28mm and 36mm diameter motors. **The biggest possible size is 3660.**
- The motor mount includes the standard mounting hole patterns for both of these motor sizes, as shown in the drawing
- **If you choose a 28mm motor with length under 50mm**, aim for 20000 unloaded RPM *(Unloaded RPM = Battery voltage * motor KV)*
- **If you choose a longer 28mm motor**, aim for 27000 unloaded RPM. I tested a 2860 2700KV Leopard motor on 4S with good results but lower kv is better.
- **If you choose a 36mm motor,** aim for up to 35000 unloaded RPM. I am using a 3660 1700kv motor on 4s (in the videos I used a 3180kv one but it was too high).

Electronics

- Brushless watercooled ESC with at least 50A rating – depends on your motor choice. Maximum width is 50mm. I am using Flycolor 70A ESC.
- Standard 9g micro servo (23mm x 12mm) with a standard single servo horn
- LiPo battery with maximum dimensions of 45x36x130mm. I am using Turnigy graphene 4S 2200 mAh.
- Transmitter and receiver. I am using Radiolink RC4GS transmitter with Radiolink R6F receiver.

Tools

- Drill with 3mm bit
- Allen keys
- Sandpaper
- Pliers
- Knife
- Tools to cut the driveshaft: Vice, hacksaw, file
- FDM 3D Printer of a minimum build volume 185mm x 150mm build plate x 200mm height

Print settings

Using following settings is very important for getting good tolerances and strength of the parts.

General settings – all parts

- 0.4mm nozzle
- 0.45mm extrusion width
- 4 perimeters
- 5 top and bottom layers
- For better results and reliability, print all parts one by one

Individual parts

Part name	Layer height	Infill	Supports	Brim	Material
Cover, Hull_front, Hull_rear	0.2mm	15%	NO	YES	PLA
Ball, Bearing_cap, Cover_lock, First_stage, Intake_grate, Nozzle, Rollcage_front, Rollcage_rear, Second_stage, Steering_rod	0.15mm	15%	NO	NO	PLA
First_impeller, Second_impeller	0.1mm	80%	YES	NO	PLA
Motor_mount	0.15mm	80%	NO	NO	PLA unless your motor heats up a lot, then use ABS or PETG to prevent melting
Engine, Pilots (optional parts)	0.15mm	5%	NO	NO	PLA

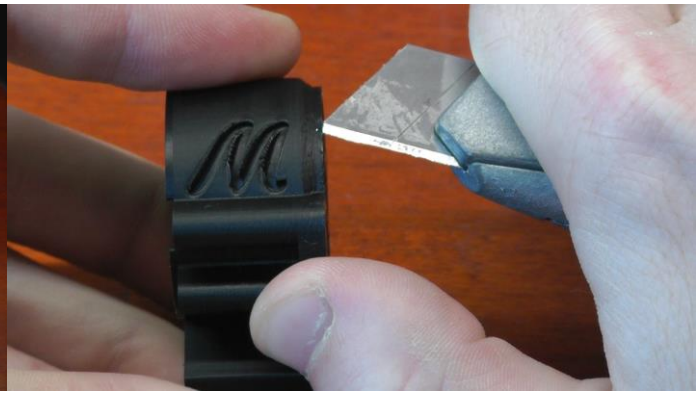
Printing orientation

All STL files are by default oriented the way they should be printed.

Assembly

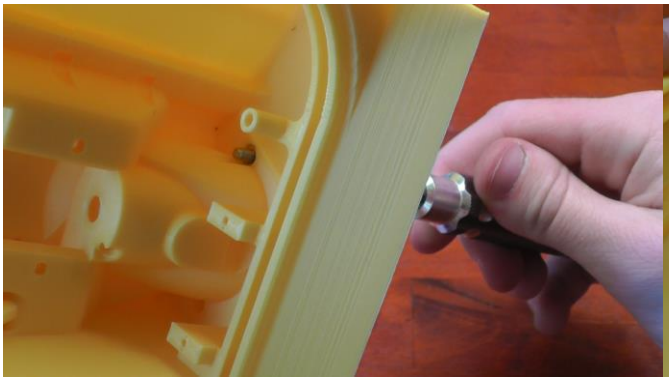
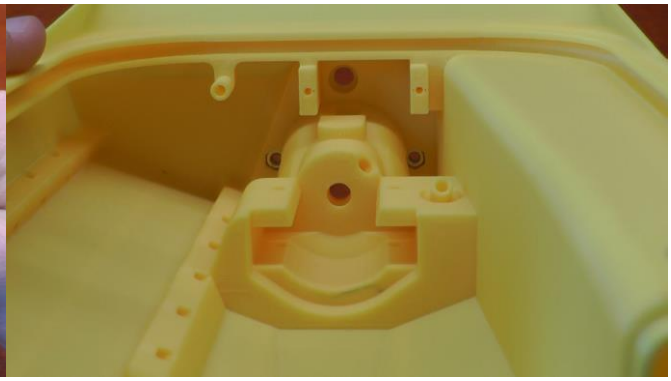
Post-processing

Cut off the brims and the fat first layer from your prints. Pay extra attention to the places, where the parts need to fit together. If your parts do not fit, it is most likely caused by this layer. Sanding is not necessary, but sanding the impellers can slightly improve the performance. Do NOT drill through the screw holes – some holes are smaller for the screws to be tightened properly.

A) Hull assembly

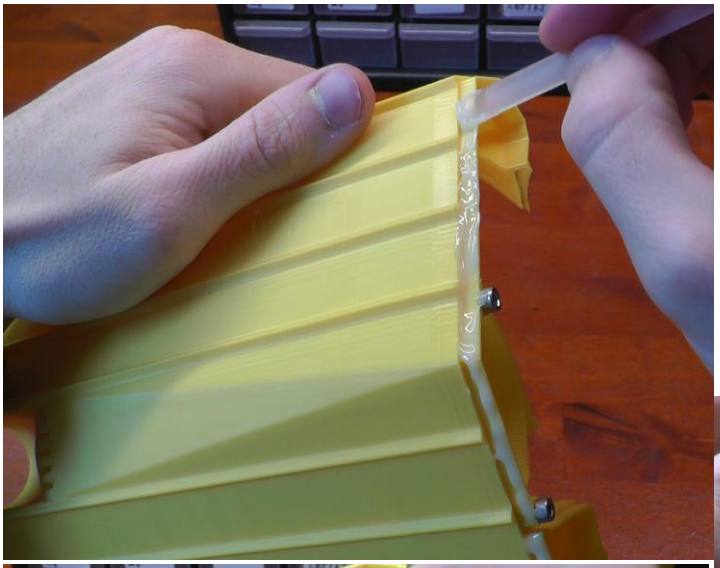
1. Insert 2 M3 nuts into the slots in Hull_rear. You can use a screw to pull them from the outside.

2. Use pliers to remove the interated print support on Hull_rear.

3. Use 2 M3x35 and the Velcro strap to create a battery mount as shown.

4. Use epoxy glue to fix Hull_rear and Hull_front together. Be careful to not let any glue in the channel for the cover seal.

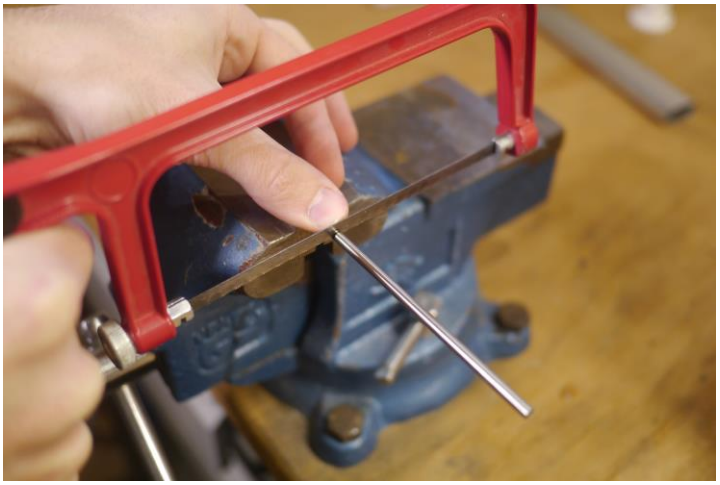


5. Optional: Paint the outer hull surface with a lacquer to prevent water from leaking through the PLA. You can waterproof the flood chamber as well by pouring a bit of lacquer inside and letting it flow over the walls. Be careful to not let any lacquer flow into the holes and slots around the pump! You can also sand the hull for lower water resistance.

6. Insert a 5mm OD 3mm ID silicone tube into the channel in the Hull.

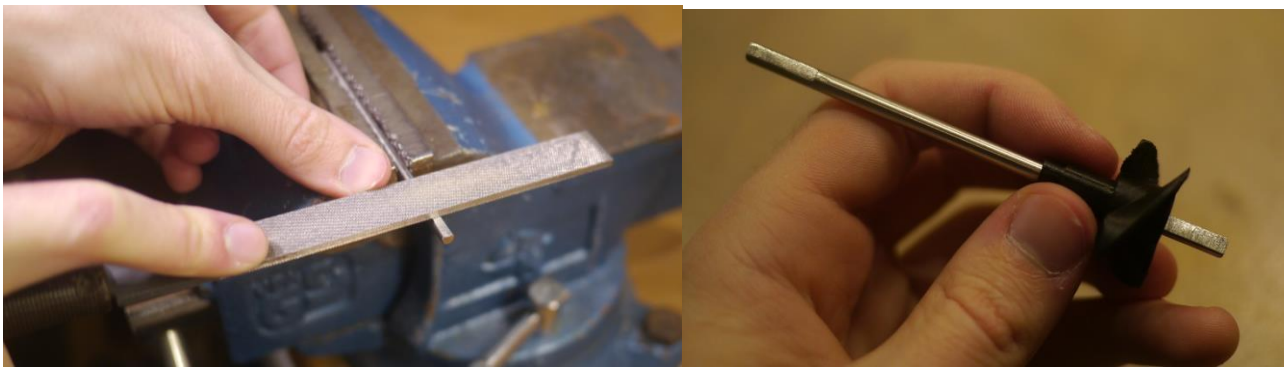
B) Pump assembly

1. Cut 95mm long 4mm stainless steel rod for the driveshaft.

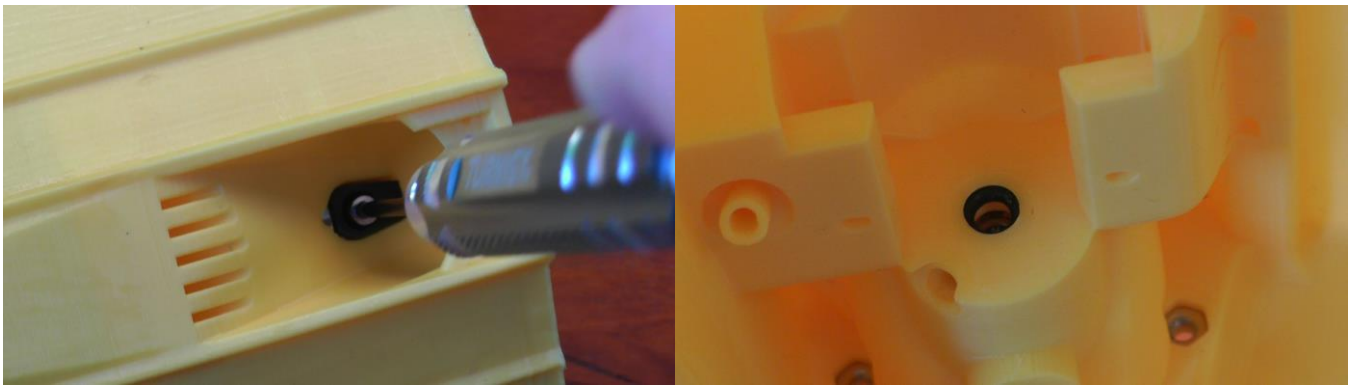


2. Try to slide the 4x10x4mm bearings onto the shaft. If they do not fit, sand both ends of the shaft using a drill and some sandpaper. Continue sanding until they fit with slight resistance.

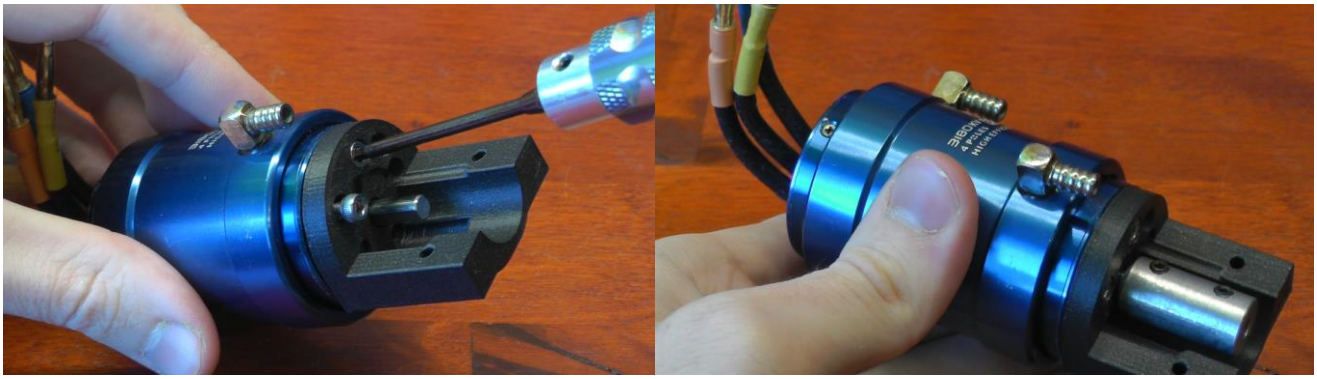
3. Use a file to create a 23mm long flat spot on one end of the shaft to fit the Second_impeller. Continue filing until the Second_impeller fits. Make a small flat on the other end for the grub screw in your motor coupler as well.



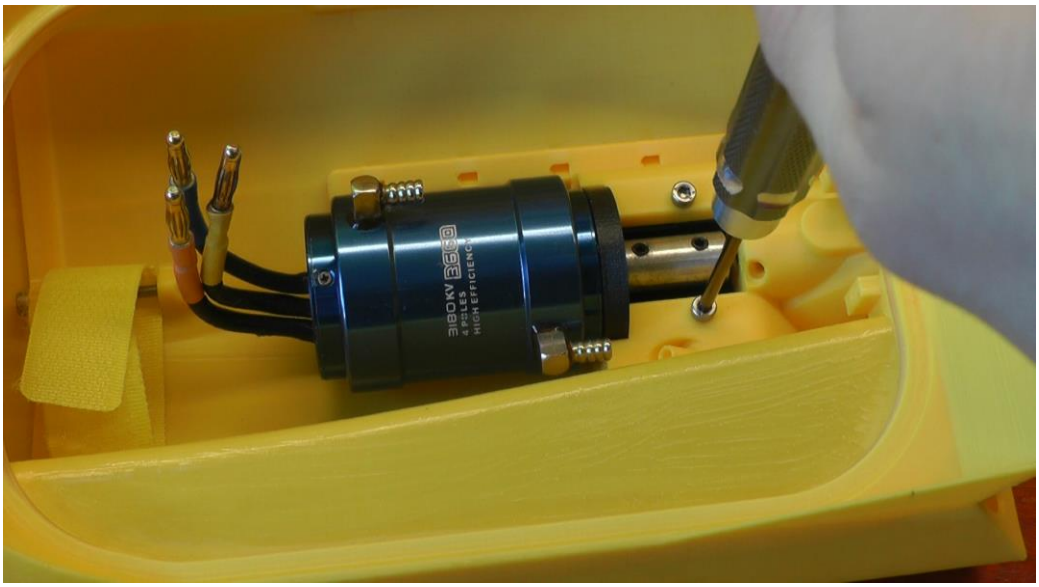
4. Insert the first 4x10x4mm bearing into the Hull_rear. Secure it with Bearing cap and M3x6 screw. Insert an 8x4x2 rubber O-ring into the Hull_rear as shown. Push it into the channel with an allen key.



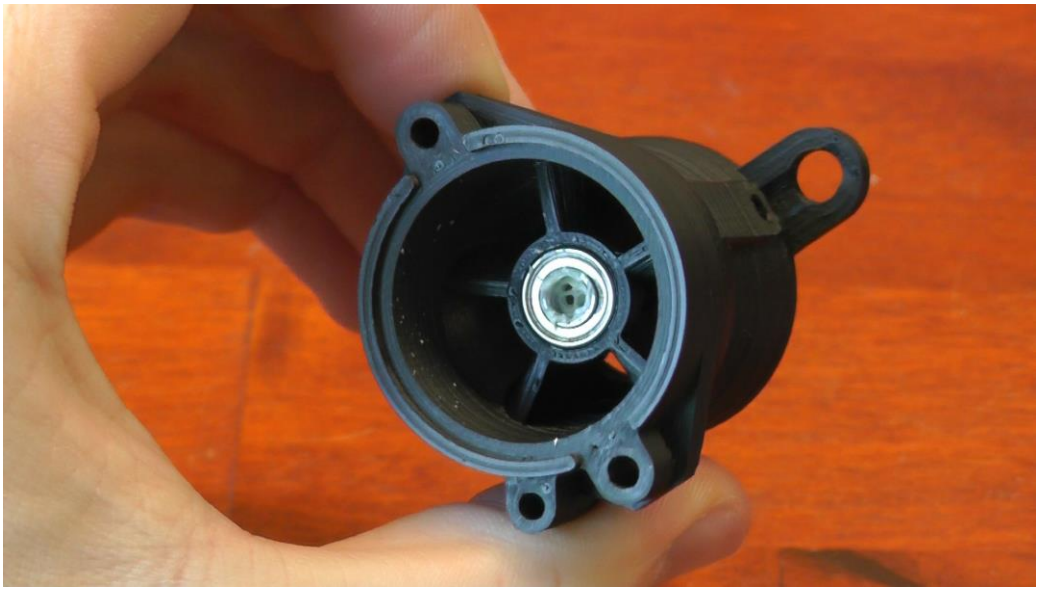
5. Mount your motor to the Motor_mount. If you have a 28mm motor, use 2 M3x6 (and optionally 2 M2.5x6 if you have them). If you have a 36mm motor, use 4 M3x6 (no matter if your motor has 4 or 6 mounting holes). Mount the motor coupler to the motor.



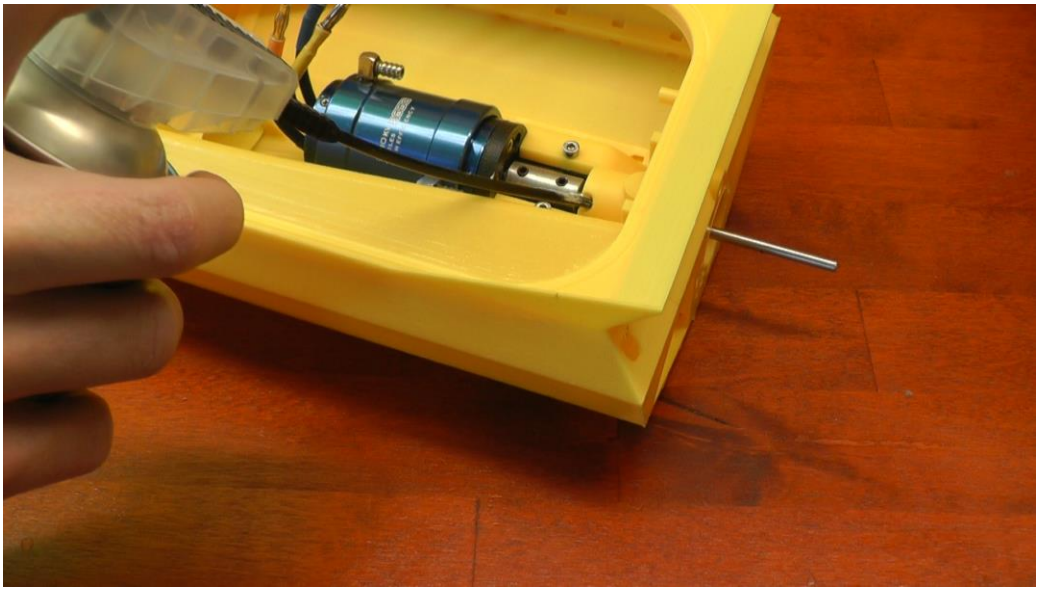
6. Slide the Motor_mount into the slot in Hull_rear and secure it with 2 M3x20.



7. Insert the second 4x10x4mm bearing into Second_stage. You can use the Second_impeller on the driveshaft to push it. Push some grease through the bearing.



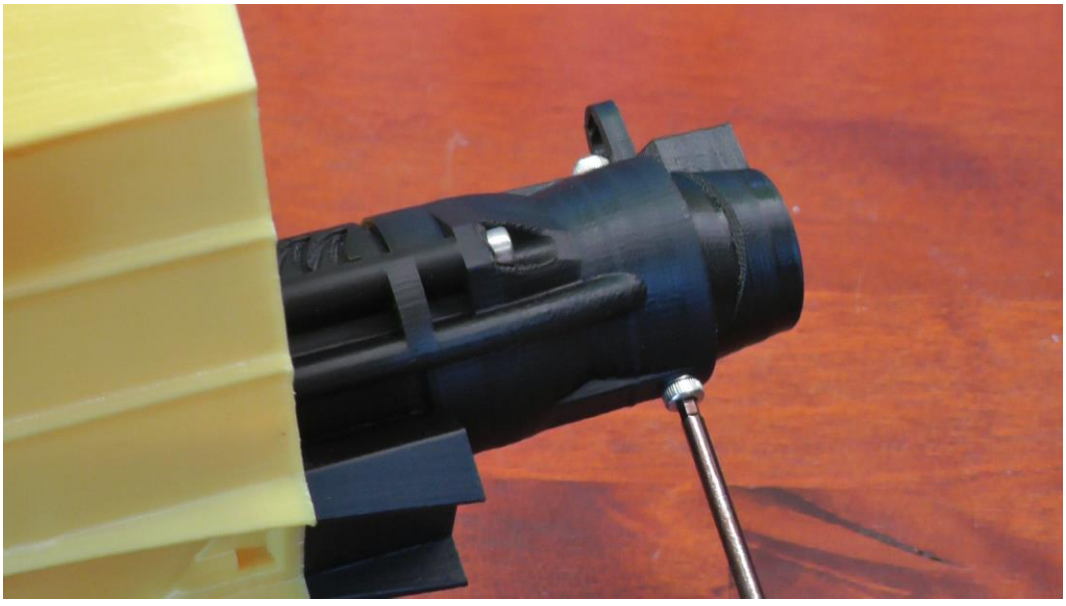
8. Insert the driveshaft into the hull, tighten the grub screw. Push grease into the grease port, close it with M3x6.



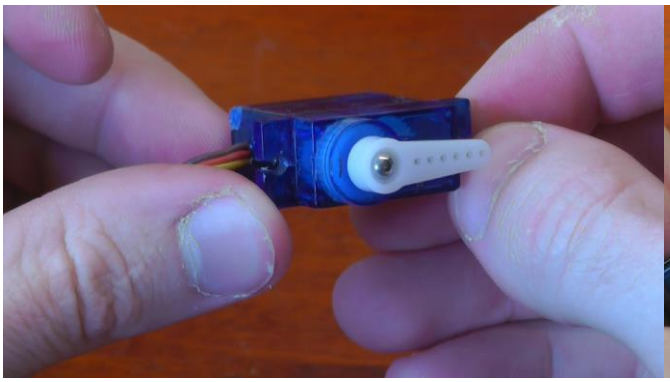
9. Slide First_impeller onto the shaft, close it with First_stage. Insert Second_impeller. The impellers have to line up, rotate the First_impeller if needed. Insert an 8x4x2mm O-ring into the slot on the Second_impeller as a spacer to prevent it from rubbing against the Second_stage bearing.


10. Close everything with Second_stage and secure it with 2 M3x35.

11. Mount the Nozzle to the Second_stage using 2 M3x6. Make sure that it can move freely in full range.



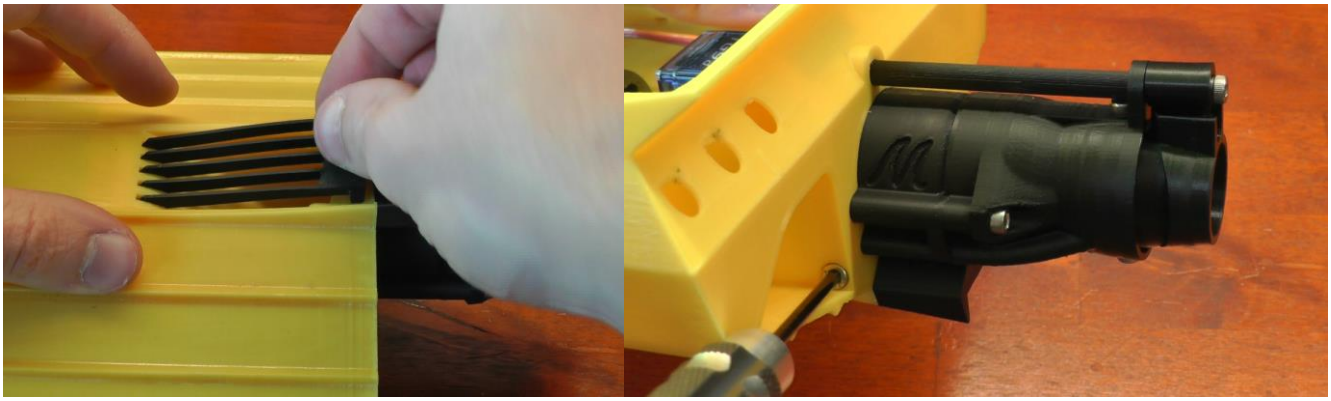
12. Center your servo. Mount the horn to a parallel position with the servo. Click the Steering_rod onto the horn. Cut the excess piece of the horn using pliers (otherwise it would rub against the hull and stall the servo! Make it completely flat with the surface of the Steering_rod). Slide an 8x4x2mm O-ring into the channel on the Steering_rod.



13. Slide the servo with the Steering_rod through the hole in Hull_rear and Second_stage. Secure the servo with 2 small screws.

14. Slide the Ball onto the Steering_rod. Secure it with M3x6. The Steering_rod might appear a little bit too short – that is ok, it is there to allow mounting servos with slightly different dimensions. Do not tighten the M3x6 – it should just touch the Ball, and not push it against Second_stage.

15. Insert the Intake_grate and secure it using M3x20.

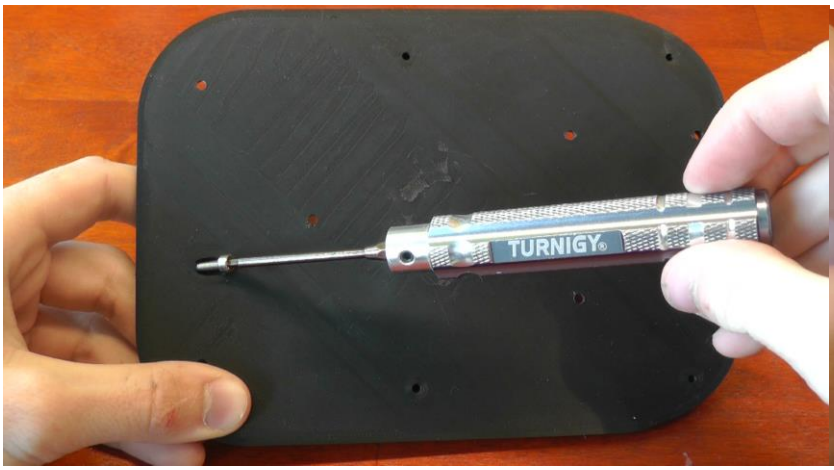


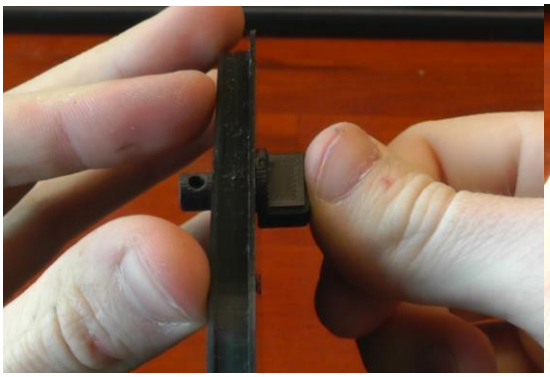
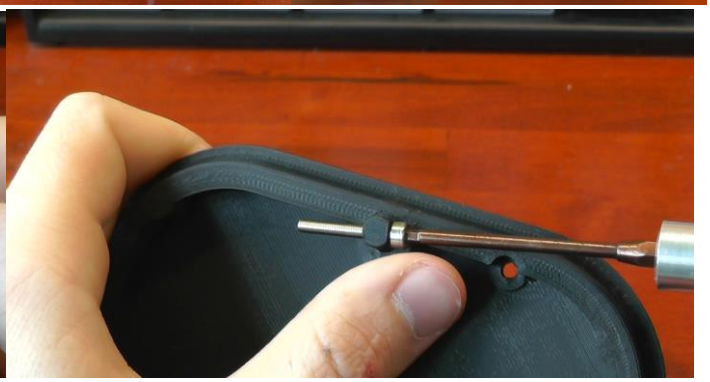
C) Cover assembly

1. Optional: Drill through the 6 holes on the bottom of the Cover with a 3mm bit. Only do this if you wish to install the Pilots and the Engine.

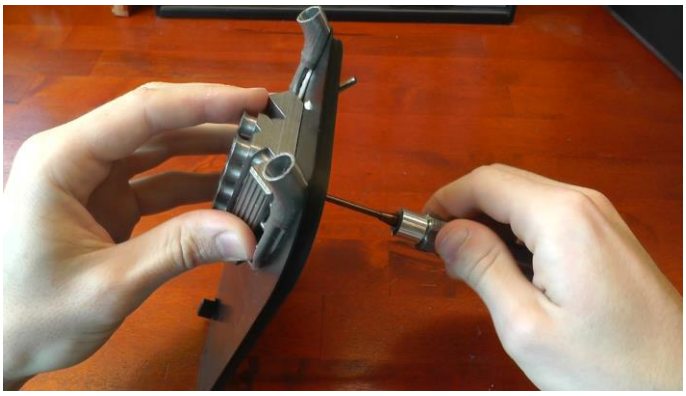
2. Optional: You can paint the Rollcage, Pilots and the Engine.

3. Screw a M3x20 into the Cover – as a pin to prevent opening from the rear. Slide an 8x4x2mm O-ring into the channel on Cover_lock, insert the Cover_lock into cover (the O-ring will create some resistance) and secure it using M3x20.

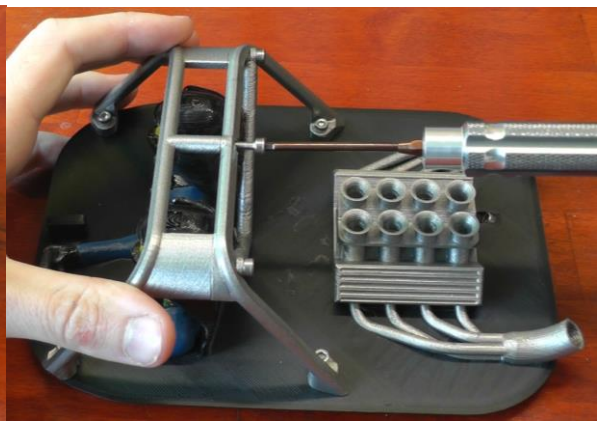


4. Optional: Mount the Pilots and the Engine to the Cover using 6 M3x6.

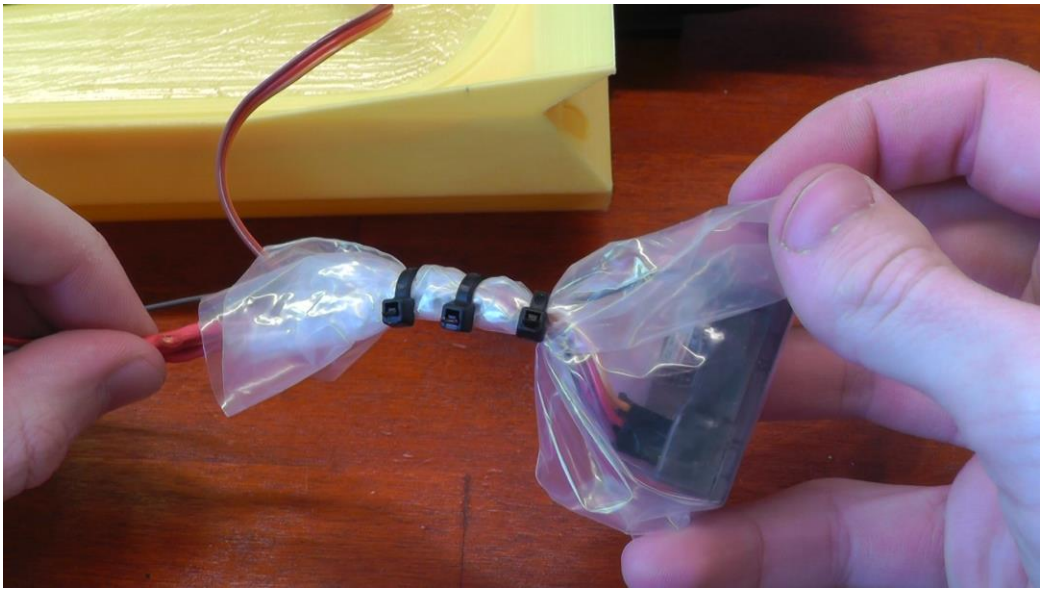


5. Use 4 M3x10 to mount the Rollcage_front and Rollcage_rear onto the Cover. Fix the parts together using 3 M3x20.

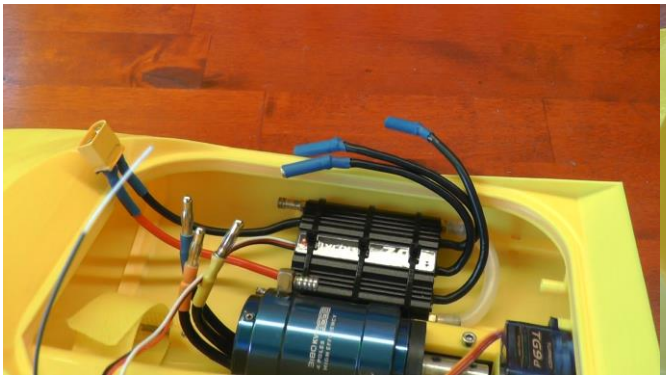



D) Electronics

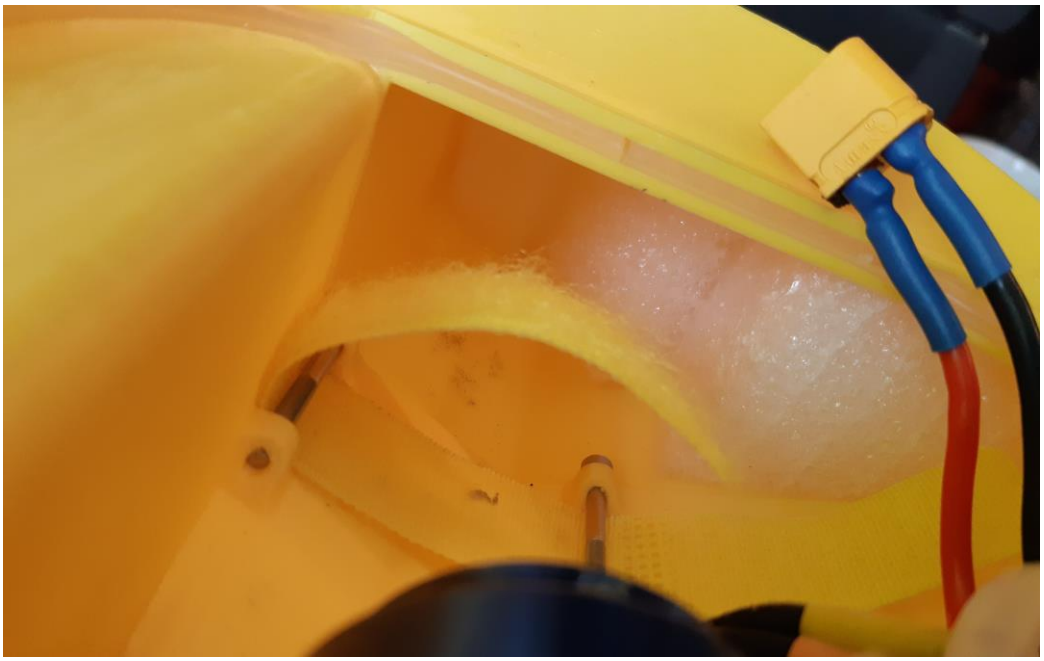
1. Waterproof your receiver for example by putting it into a plastic bag.

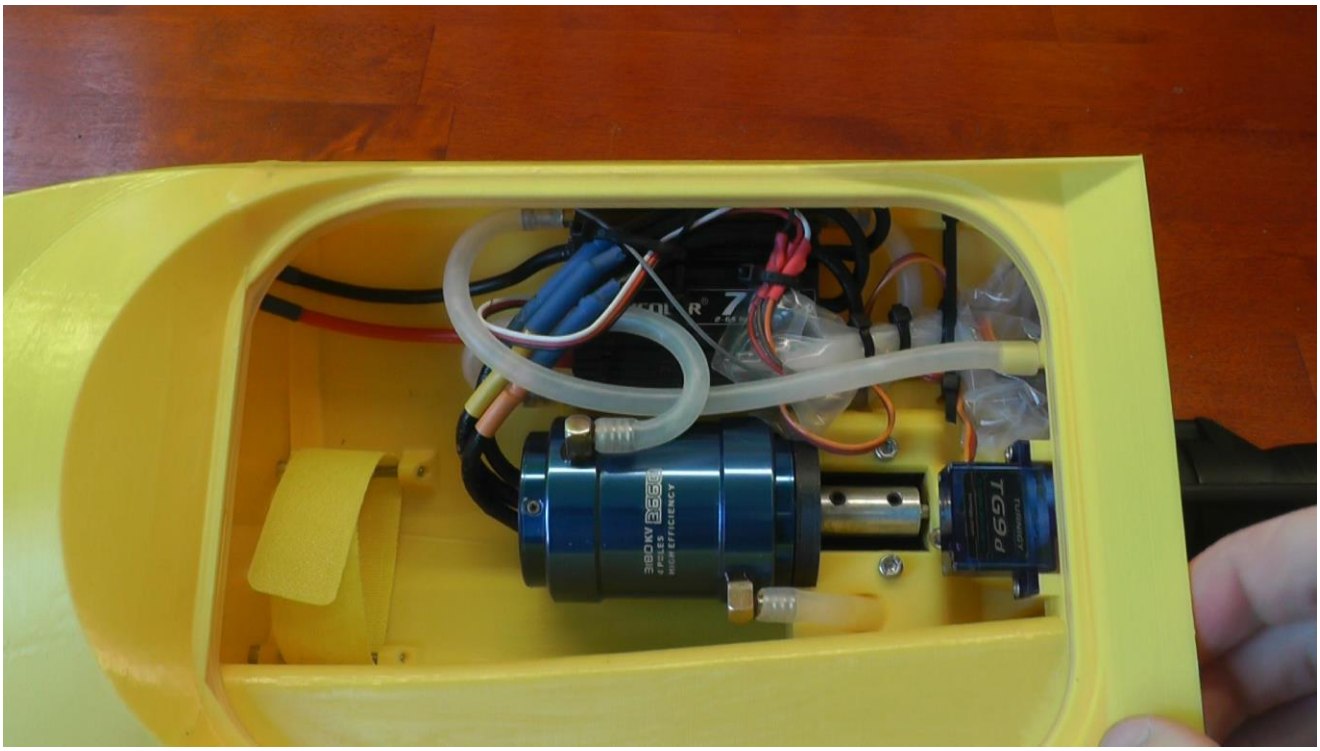


2. Connect the wires and mount your ESC and receiver using zip ties as shown.



3. Connect the watercooling.
4. Optional: Put some foam into the free space to prevent the boat from sinking when something unexpected happens.





5. Finished!