

ASSEMBLY MANUAL AND USER GUIDE



Pond Racer **PR1**

By 3D AEROWORKS

OVERVIEW:

This scale replica of Burt Rutan's Pond Racer is designed for quick and easy construction and printed using light weight PLA (LW-PLA). For best results the canopy should be printed with clear PLA. Semi scale propellers are included in the plans designed to suit the 2804 2300kv outrunner (6.75x5 blade) in 2 blade configuration. Utilising full 4 channel controls; aileron, elevator, rudder and throttle, this model performs extremely well given its small size and lightweight. Links to components used can be found on the last page of the user guide.

This model has taken many hours of hard work and testing in order to provide a nice flying aircraft. Please do not share it. Please show your appreciation by directing interested parties to the link below.

<https://cults3d.com/en/3d-model/various/pond-racer-700mm>

GENERAL SPECIFICATIONS

WINGSPAN:	700mm
PRINT TIME:	78 hrs
PRINT WEIGHT:	200g
FLYING WEIGHT:	498g
CENTER OF GRAVITY	10mm aft of L.E at wing root. (Marked with indentation)

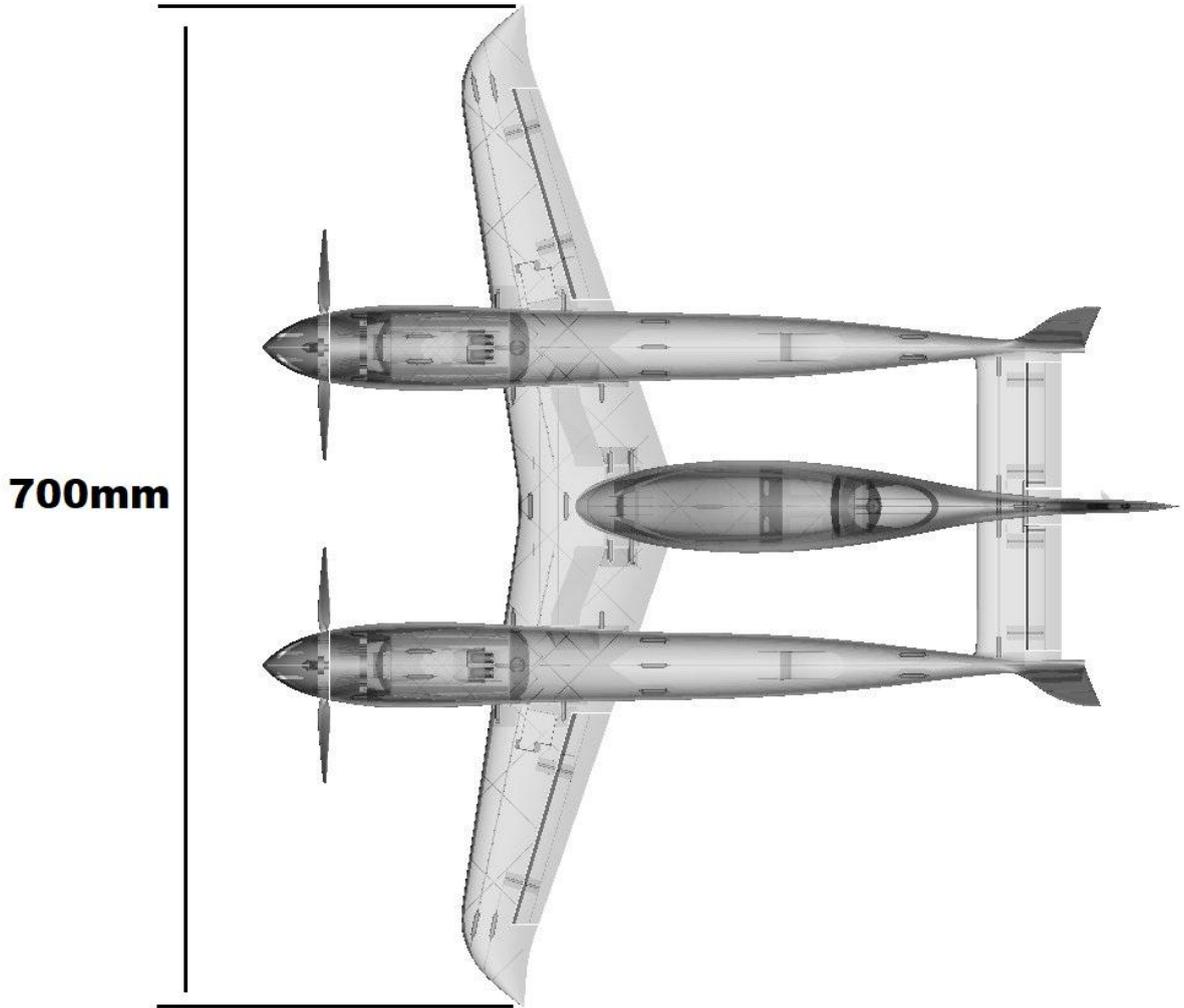
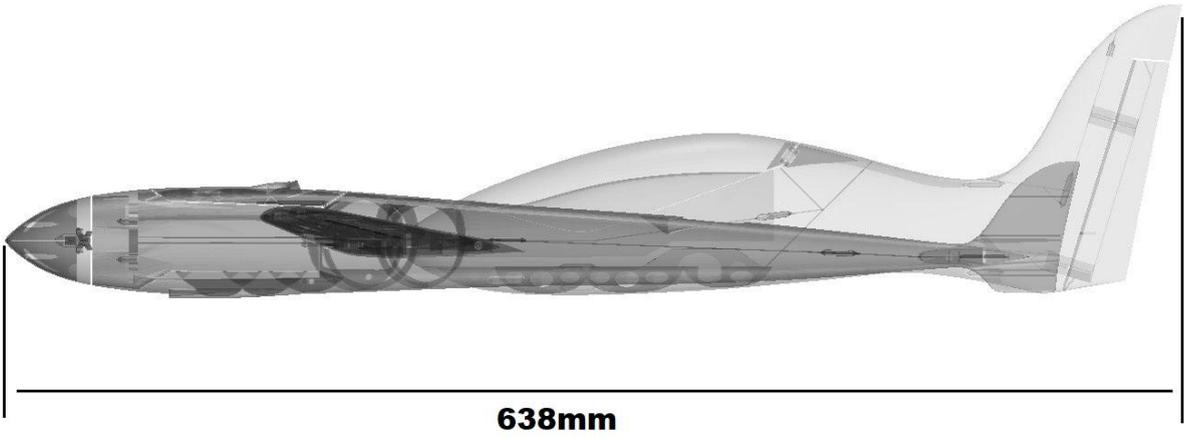
ELECTRICS

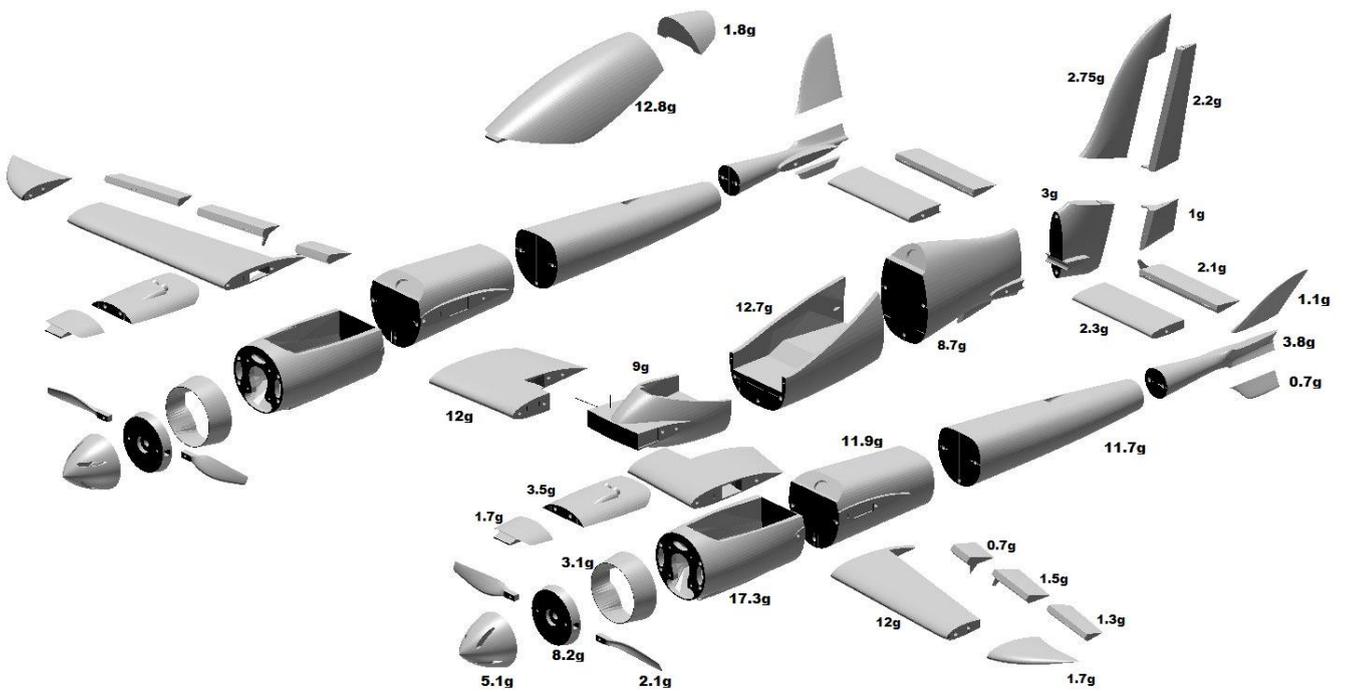
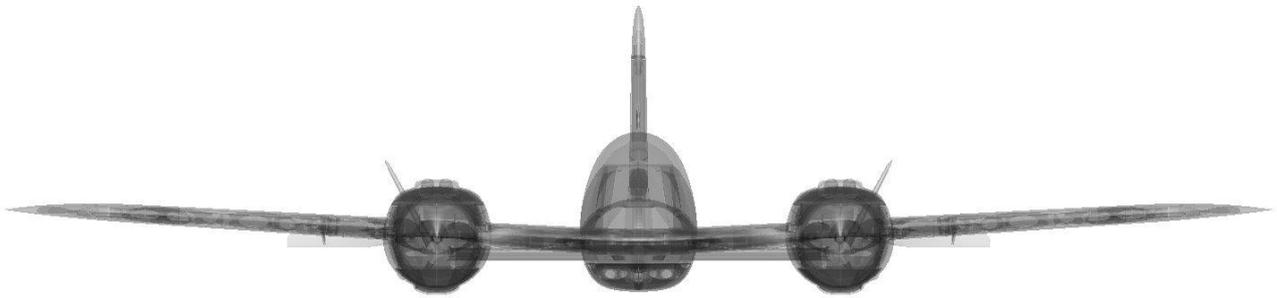
MOTOR:	2205 2300KV (1 CW and 1 CCW) (or similar motor)
ESC:	12amp (min) 20amp (recommended)
SERVOS:	3.7g MICRO
BATTERY:	950MAH 2S (45gram or similar)

INCLUDED:

STL FILES OF ALL COMPONENTS (scale to 1000% if not using S3D)

FACTORY FILES FOR (S3D) SIMPLIFY 3D FOR PRINTERS: 200X200X200





REQUIRED TOOLS:

KNIFE

LIGHTER

SANDPAPER (MEDIUM GRIT)

PLIERS

CA GLUE

SCREW DRIVERS

FILE OR RASP

REQUIRED COMPONENTS:

X2 2205 2300KV MOTOR (or similar)

X2 12AMP or 20AMP ESC

X2 950MAH 2S LIPO OR SIMILAR

X4 3.7G MICRO SERVO

BAMBOO SKEWERS 3MM

HEAT SHRINK TUBE 3mm

X6 10mm X 10mm X 2mm MAGNET (ROUND)

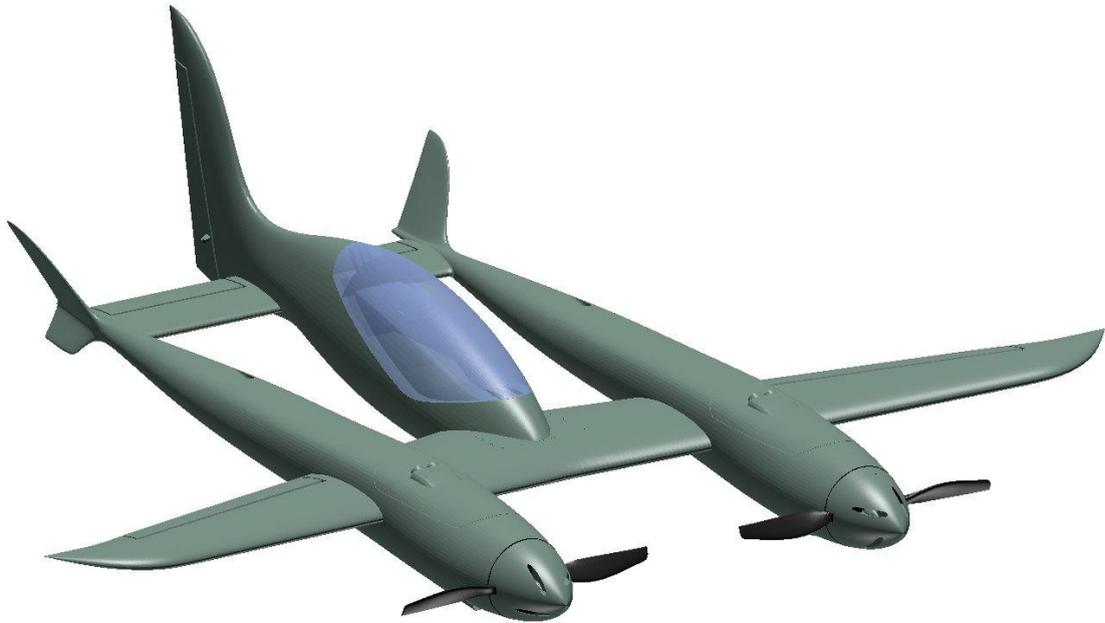
X10 MICRO HINGES (OPTIONAL)

VELCRO

X2 x 500mm CARBON STRIP 3mm x 0.6mm (OPTIONAL)

M2 x10mm SCREWS

1mm PIANO WIRE



ASSEMBLY INSTRUCTIONS

1

After all parts have been printed, some may require to be cleaned/trimmed as LW-PLA is prone to stringing. Do this by gently sanding back the rough sections with a file, sandpaper or blade until the surface is smooth.

2

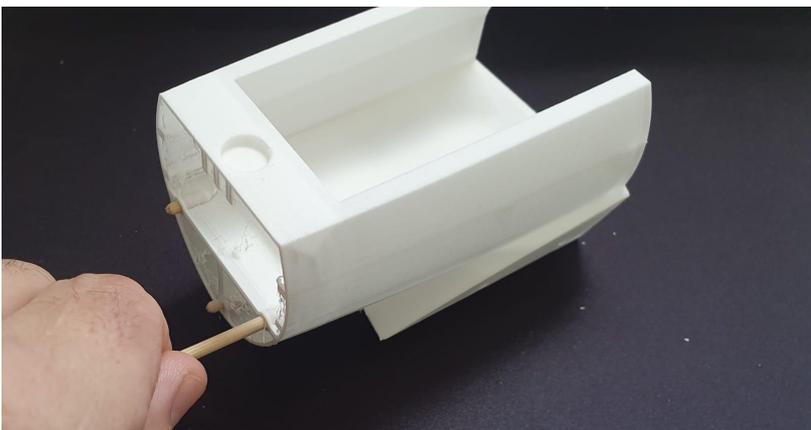
All faces which are to be glued to other parts need to be given a light sanding (scuff the surface) to assist with glue adhesion.

3

Cut 15mm sections of skewer and place into alignment holes in the fuselage sections.

NOTE - It may be required to open up the holes a small amount if the fit is too tight. Do this by using a 3mm drill bit. Gently spin it in reverse as you insert it into the hole. This will ensure the bit does not tear the print.

Test fit the sections of the fuse before gluing to ensure a clean fit.

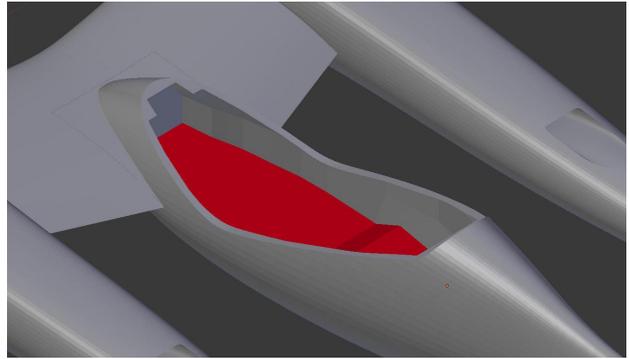
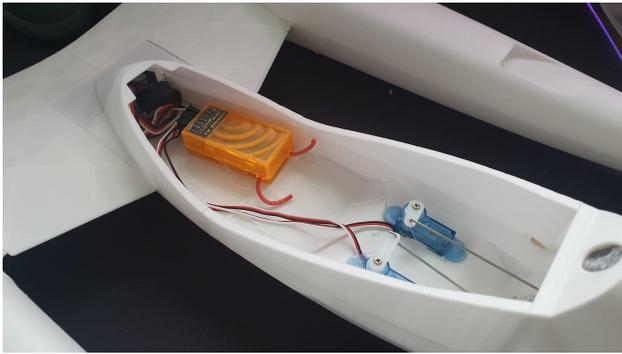


4

Glue all sections of the center fuse and together except fuse 4. This will be glued on after the elevators have been installed.

5

Once glued, with a sharp knife, remove the false floor of the battery hatch. (see pic/ red faces) NOTE: The removed sections of LW-PLA that is the false floor will be used as hinge pieces later. **Do not throw away.**



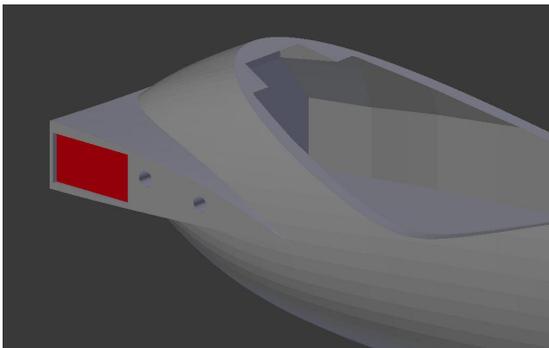
6

Glue all sections of the fuse pods together except fuse pod 1. This will be glued on after the CG has been achieved. 6

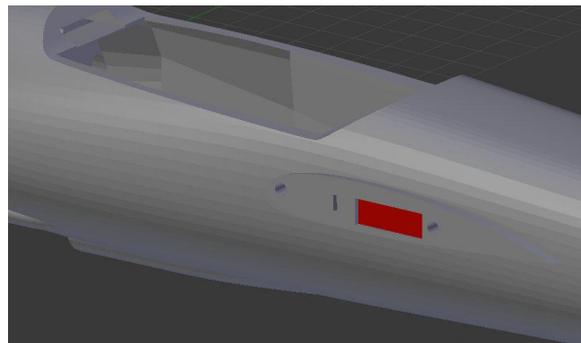
7

From parts "center fuse 1, fuse pod 3" remove the inner section of the lead tunnel with a knife or heated metal rod to allow the servo lead for the aileron to pass through. (marked red)

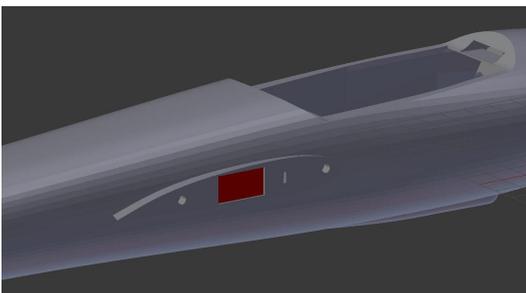
Center fuse 1



fuse pod 3 left side



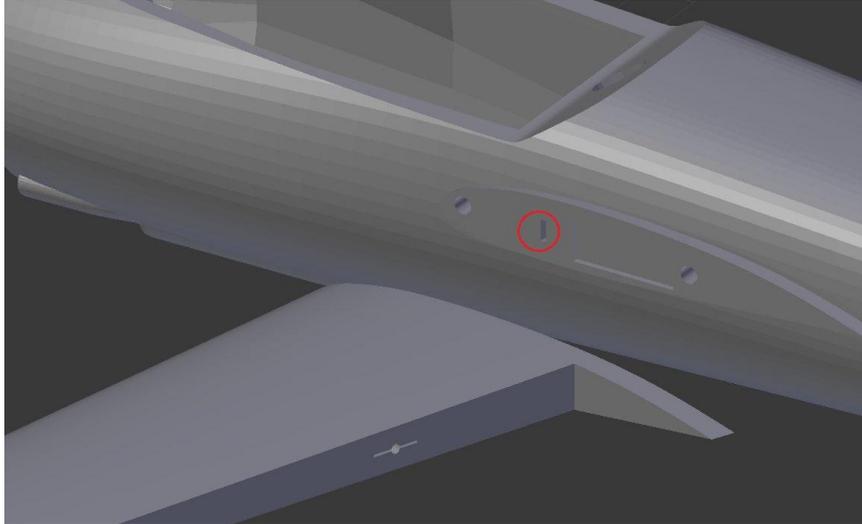
Fuse pod 3 right side



8

Cut a 250mm length of carbon strip and gently test fit the “wing outer” section to “fuse pod 3”. (slot for carbon strip highlighted below)

NOTE - There are internal slots in fuse pod 3 for the carbon strip. Take care not to break them as the strip is fed through the fuse section.



Now feed the protruding end of the carbon strip into the “center wing section”

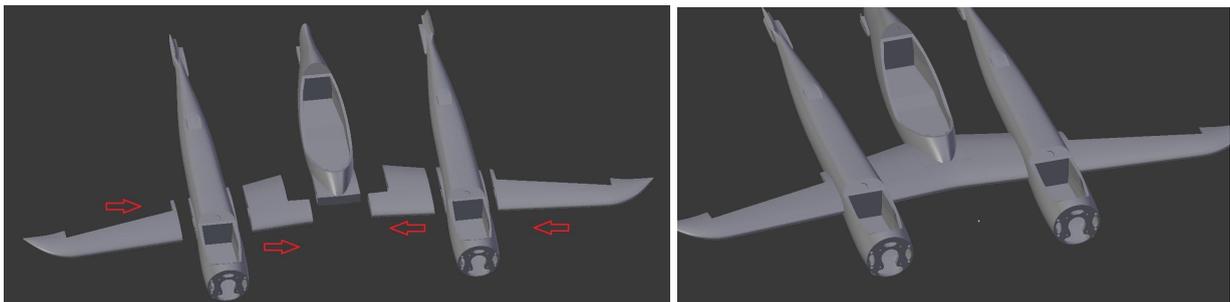
Once happy with the fitment, the wing and fuse pod section can be glued in place.

9

- Glue the fuse pod/outer wing assembly to the center wing.
- Cut two 120mm sections of carbon strip and test fit the center wing sections together.
- Glue the center wing, fuse pod and outer wing assembly together with the center fuse sandwiched in the middle using the alignment holes provided.

Before

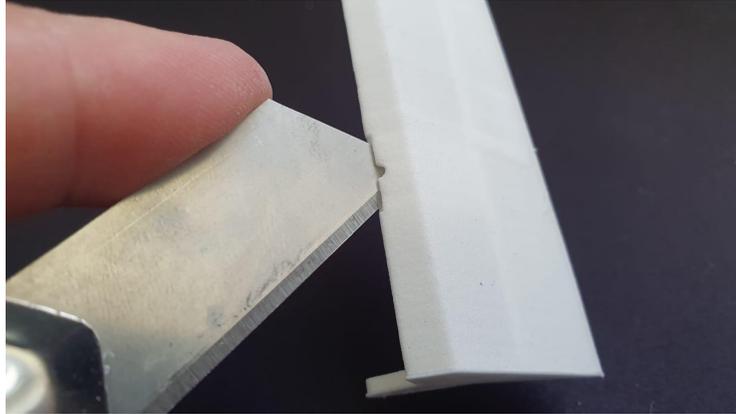
after



10

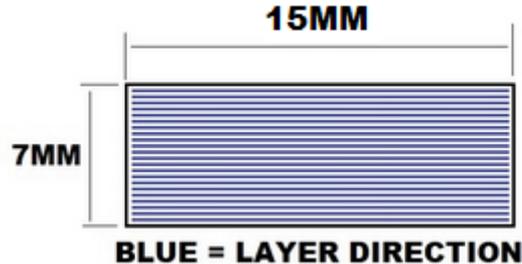
Glue the horizontal stabilisers in place, the indent in the trailing edge is face inwards.

Assemble each control surface and test fit the hinges in the hinge slots for each control surface and its parent part, this will make gluing the control surface easier when the time comes. **NOTE**- Do not force the hinge if it is too tight. Loosen the slot by gently inserting a stanley knife.

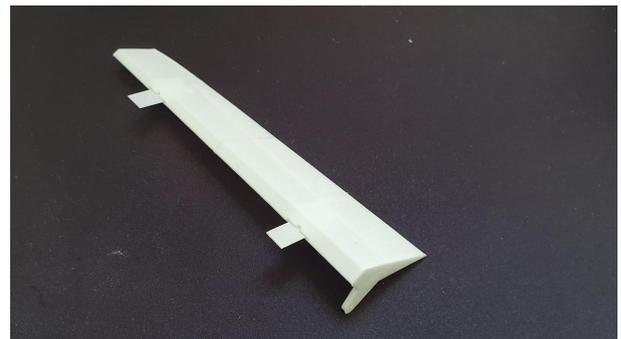
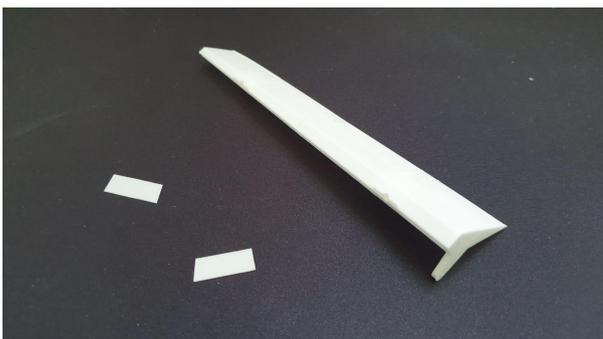


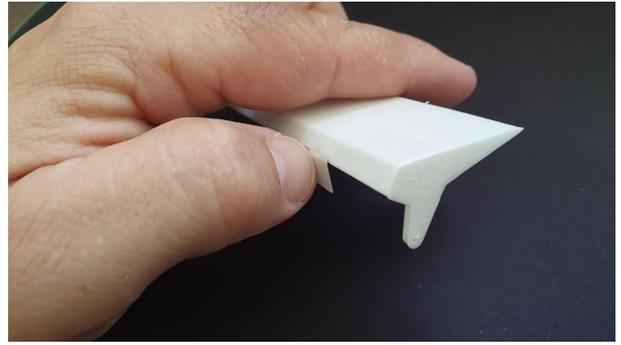
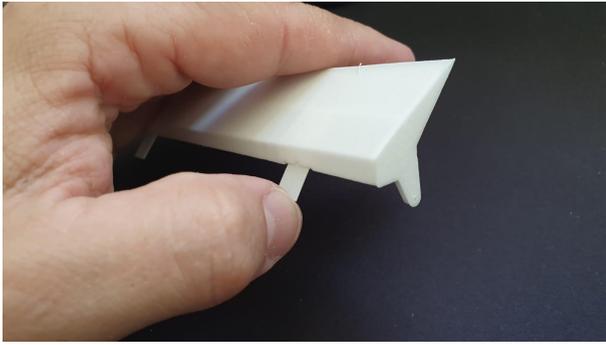
Using the LW-PLA as a hinge:

From the off-cuts from the fuselage false floor, cut small sections of 15mm x 7mm with the 7mm side being against the grain of the layers. Test fit the pieces into the hinge slots of the control surface and stabiliser or wing.



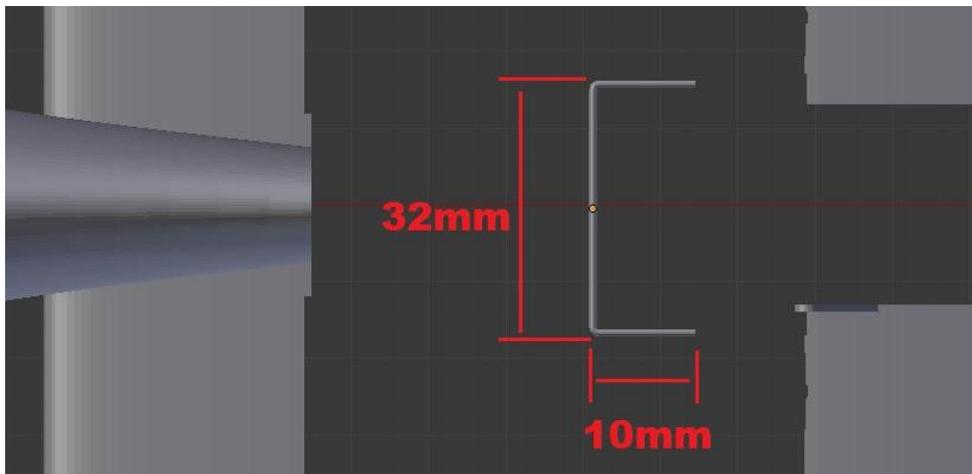
Place a drop of CA in the hinge slot of the control surface and insert the hinge. Be sure that the hinge is perpendicular to the control surface. Then bend the hinges to 90deg back and forward a few times to make sure they are appropriately loose. (the outer aileron and elevator hinge may need to be trimmed). **See below**



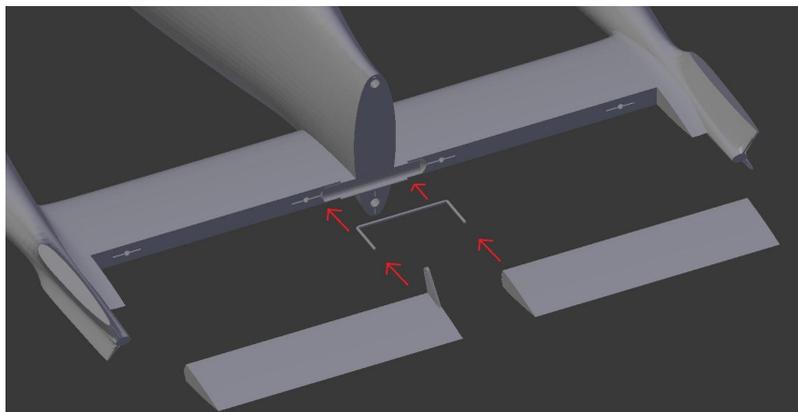


13

Bend a section of 1mm steel wire to connect the elevators together.

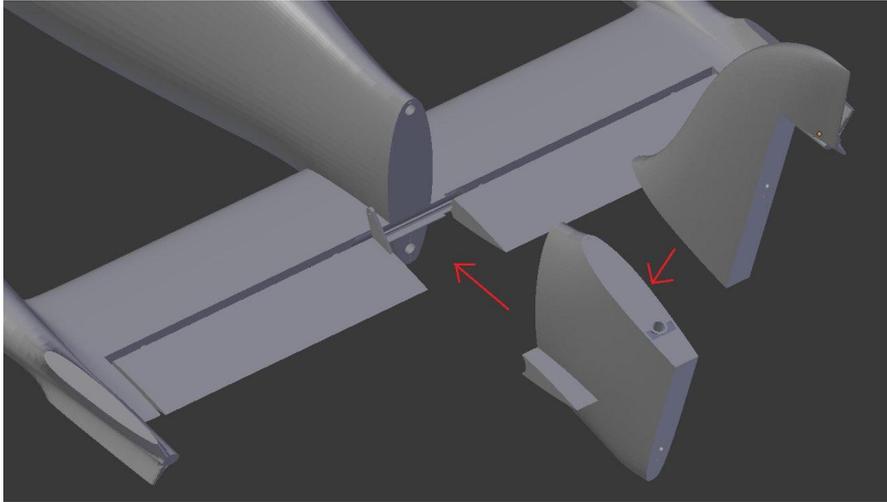


Test fit the wire and the elevators connection to the horizontal stabilisers before gluing the wire to the elevators, or the elevators to the tail plane. There should be un-obstructed travel. Once satisfied, glue the elevators in place.



14

Glue the “vertical stabiliser” to “center fuse 4” and this assembly to “center fuse 3”.



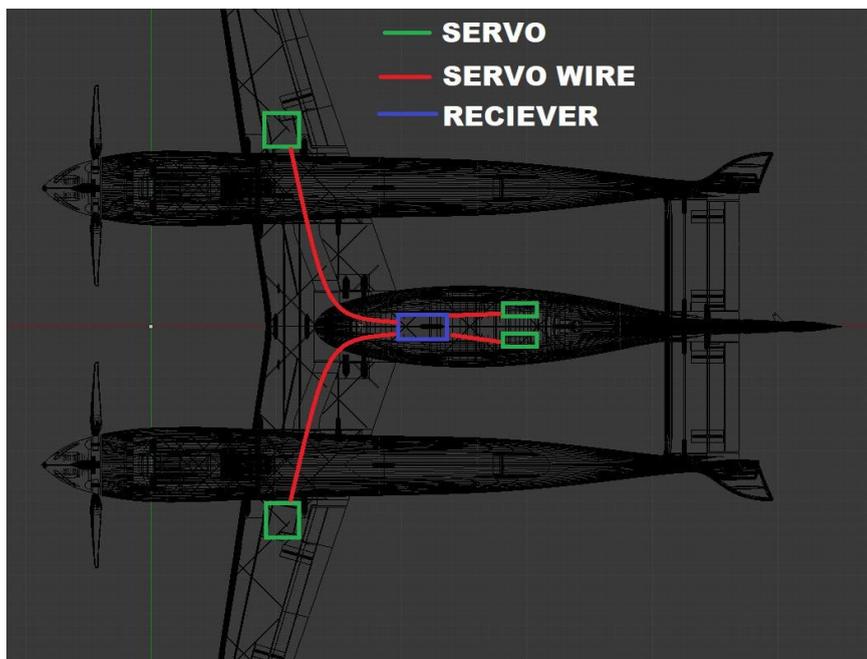
Glue the rudder and ailerons in place. Make sure each control surface has full and free movement.

15

Glue the wingtips and pod tips in place (if not already completed).

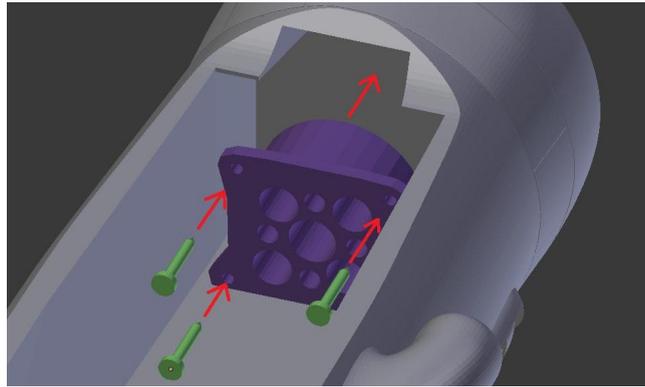
16

Install the servos and run the wiring through the tunnels to the cockpit.



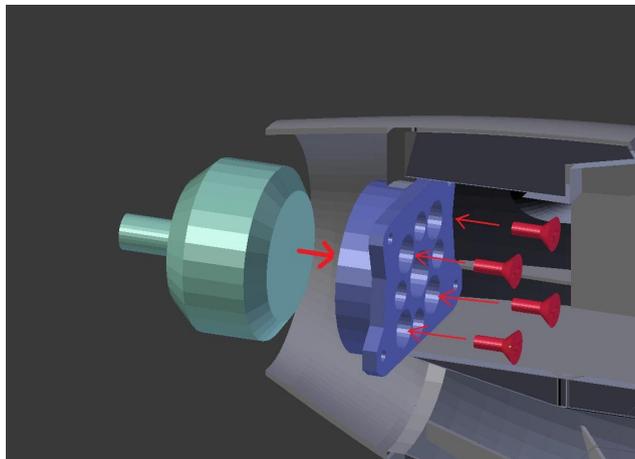
17

Install the motor mounts to the firewall.



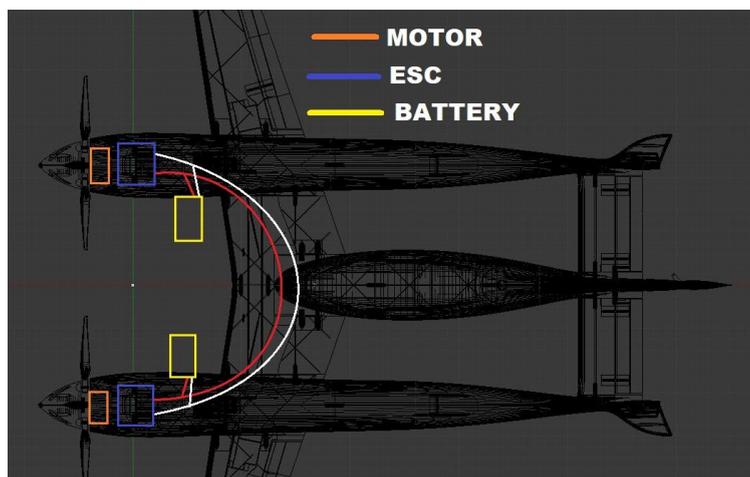
18

Install the motors to the mounts. (CCW motor = right pod / CW motor = left pod)



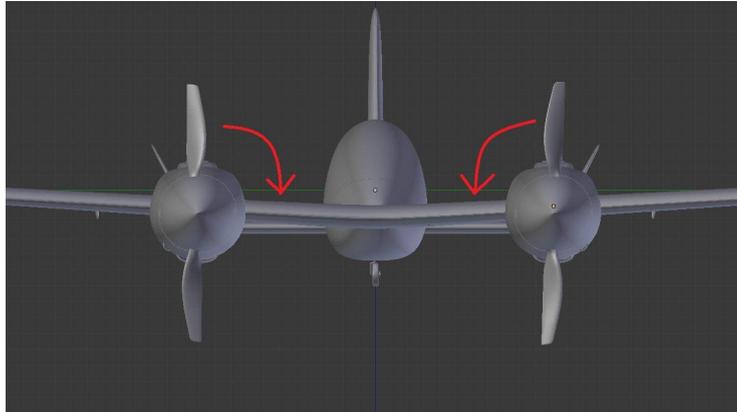
19

Connect the two esc's battery wires by feeding wires through "fuse pod 3" and into the center wing tunnel and into the other fuse pod. This will balance the voltage across both batteries, maintaining a constant rpm on both motors and limit a yawing moment in flight. The CCW motor should be mounted on the right side, This will ensure the propeller does not come loose in flight or on landing. It will also minimise any adverse yaw if an engine fails.



The CCW motor and propeller should be mounted on the right side, This will ensure the propeller does not come loose in flight or on landing. It will also minimise any adverse yaw if an engine fails.

AIRCRAFT VIEWED FROM THE FRONT



- Lastly, feed the receiver wires to the cockpit.

20

Assemble the canopy and battery hatches and install the magnets. It is a good idea to mark one of the battery hatches on the underside so they don't get mixed up.

21

Using an appropriate length of 1mm steel wire, connect the Ailerons, Elevator and Rudder to their relative servo.

NOTE - The indent of the side of the center fuse near the rear indicates where the wire should pass through the fuse section.

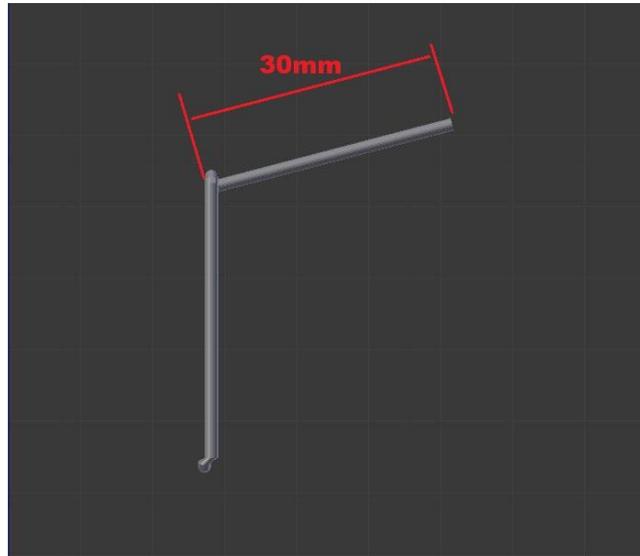
Elevator = left side

Rudder = right side

22. INSTALLING THE LANDING GEAR (optional)

Bend up the 2mm section of piano wire according to the diagram below.

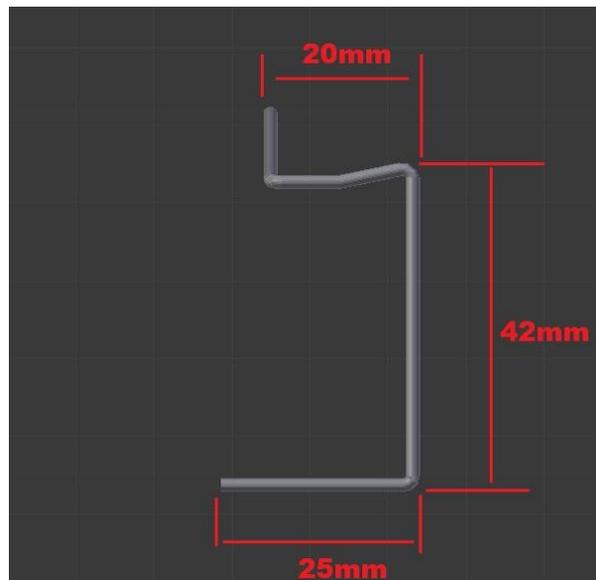
SIDE VIEW



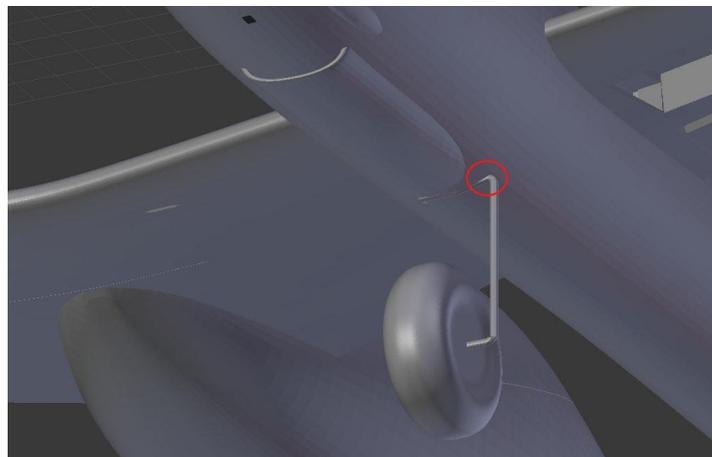
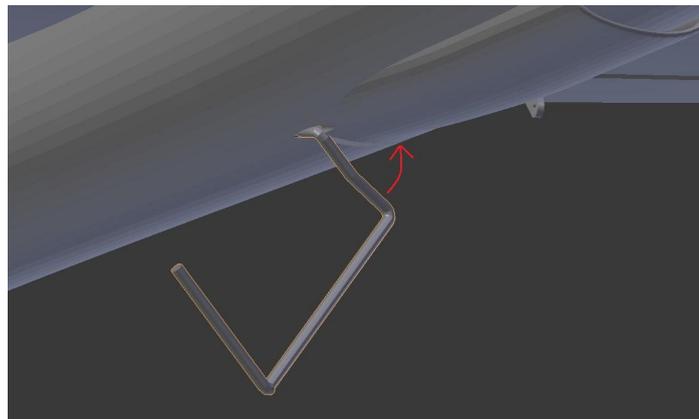
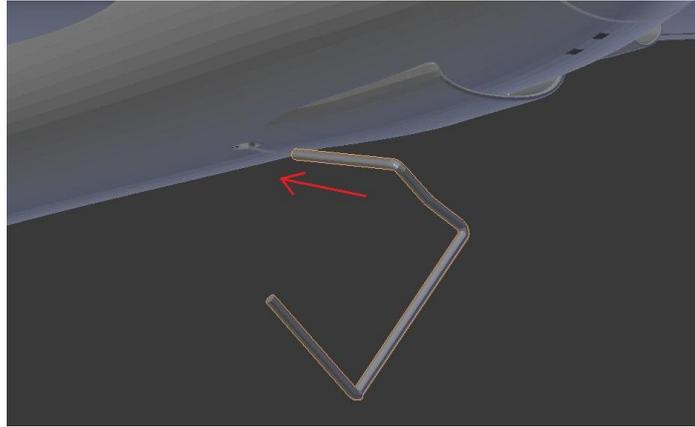
The test wheel was a 45mm diameter x 17mm wide foam wheel.

Add a 25mm rake forward to the main gear leg. This will assist in preventing the model from nosing over on grass fields. See below.

FRONT VIEW



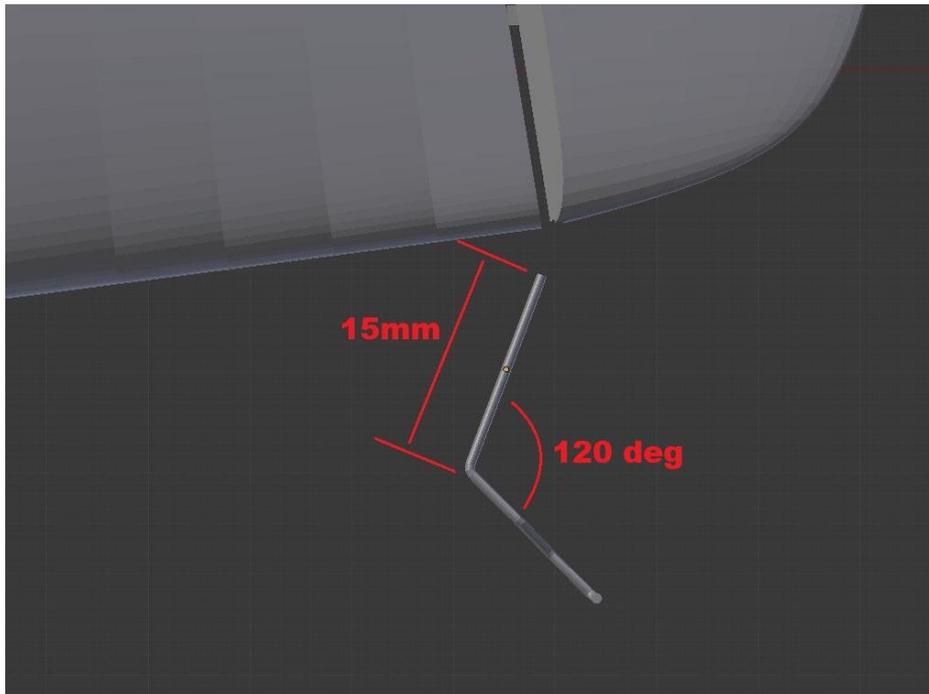
Insert the gear leg into the wing as pictured below.



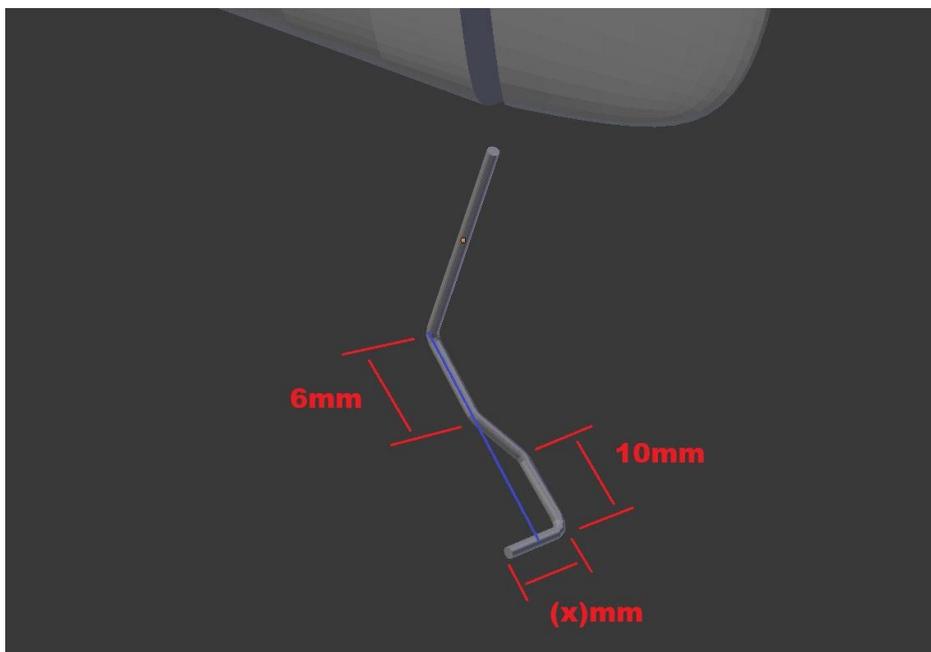
Apply a small amount of hot glue to the outer bend of the leg (red circle on image above). This will hold it in place but also allow it to be removed if desired. Fit the wheel and secure it with a shaft collar.

Bend up the tailwheel link from 1mm piano wire as pictured below.

SIDE VIEW



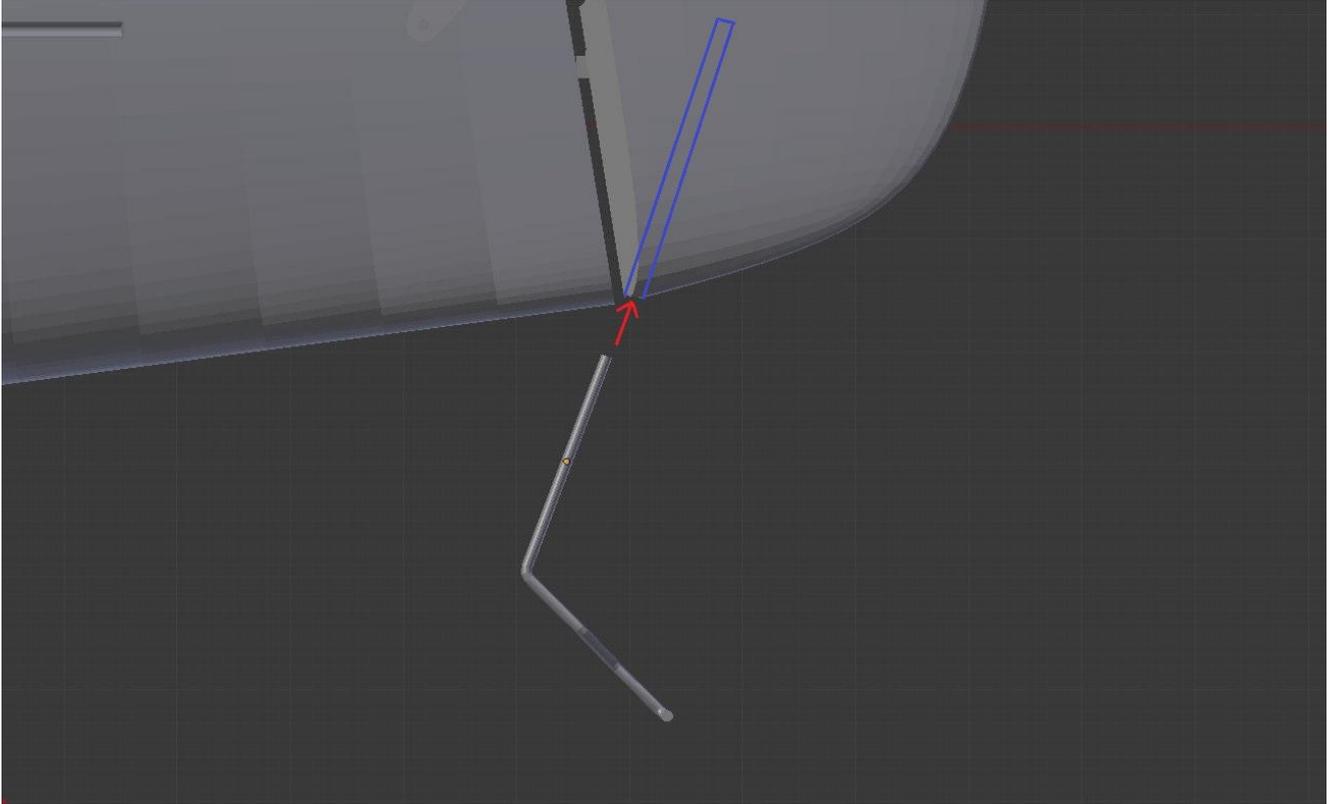
ISO VIEW



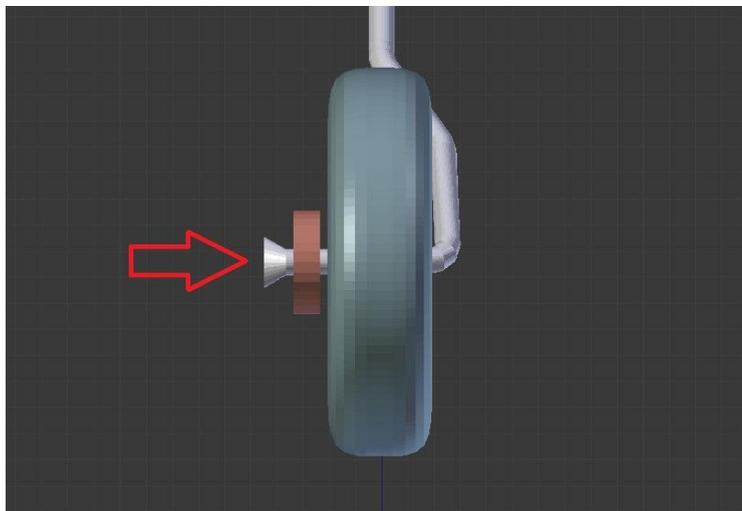
(X)mm refers to the distance required to fit the wheel and wheel lock of your choice to the axle. Test wheel was printed 20mm diameter x 5mm wide. 2mm should protrude from the wheel collar once fitted to allow crimping of the wire.

Insert the tail wheel assembly into the rudder as pictured.

The slot should not be drilled out so as to maintain friction and stop the wheel from rotating in the slot. A drop of CA can be applied to the link once in place if desired however this will make removal later on much more difficult. Ensure the link is aligned with the rudder so that the wheel will track straight when taxiing.



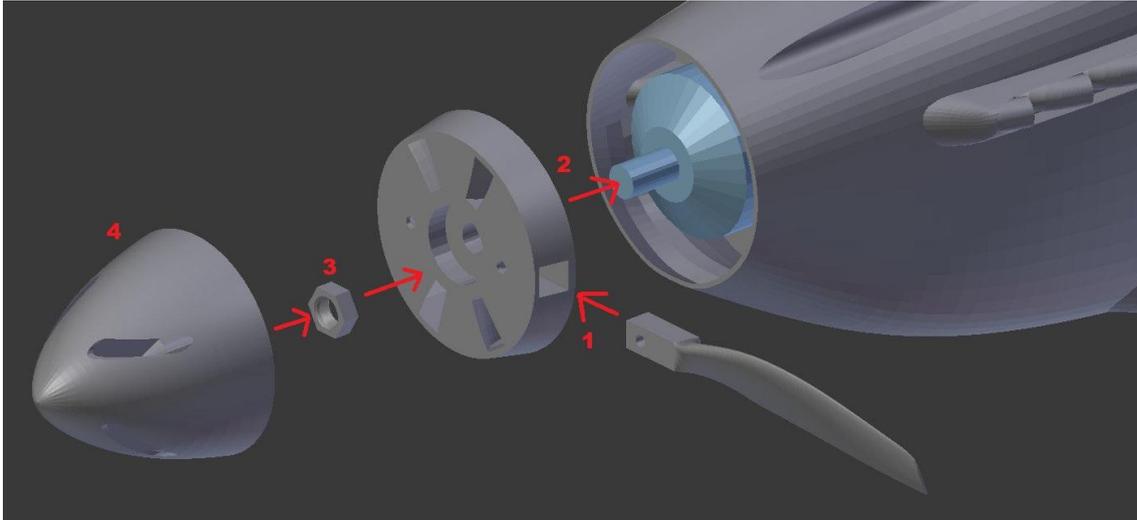
Install the wheel and secure it with the printed collar. Crimp the end of the wire with a pair of vice grips so that the collar will not slip off. A drop of CA can also be added to ensure the collar does not spin with the wheel.



Fit the propeller hub to the motor and screw in the blades using m2 x 10mm screws. Then secure the spinner to the hub. The propeller blades will need to be pre-drilled with a 2mm drill bit for ease of fitment.

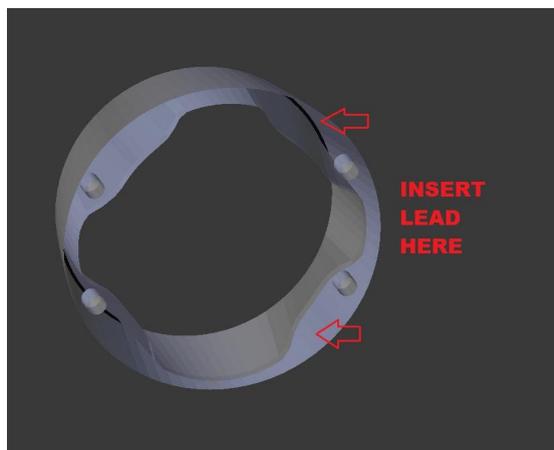
Installing the propeller:

- Install the blade to the hub and secure it with an m2 x 10mm screw. (screw direction towards the back of the hub)
- Install the hub to the motor.
- Secure with either metal nut provided or printed nut.
- Install the spinner. The spinner is designed with an m5 thread to suit most small motors with a regular cw thread.



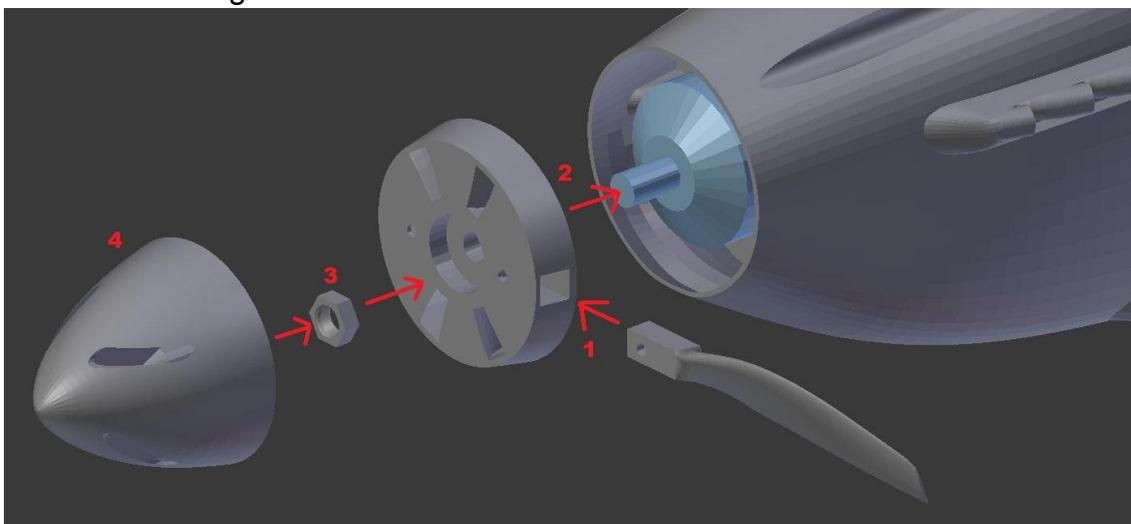
BALANCING AND CG

The ballast lead required should be placed in the hollow section of fuse 1. **NOTE!** Balancing needs to be done with the propeller attached. See below



Installing the propeller:

- Install the blade to the hub and secure it with an m2 x 10mm screw. (screw direction towards the back of the hub)
- Install the hub to the motor.
- Secure with either metal nut provided or printed nut.
- Install the spinner. The spinner is designed with an m5 thread to suit most small motors with a regular cw thread.



Once balanced appropriately, glue Fuse 1 in place with ca.

Fit the battery using Velcro as required and balance the aircraft inverted on the CG marking points located **10mm aft of the leading edge at the wing root.**

RANGE OF TRAVEL:

MAIDEN / NORMAL FLIGHT:

Elevator +/- 6mm

Rudder +/- 7mm

Aileron +/- 8mm

AEROBATIC:

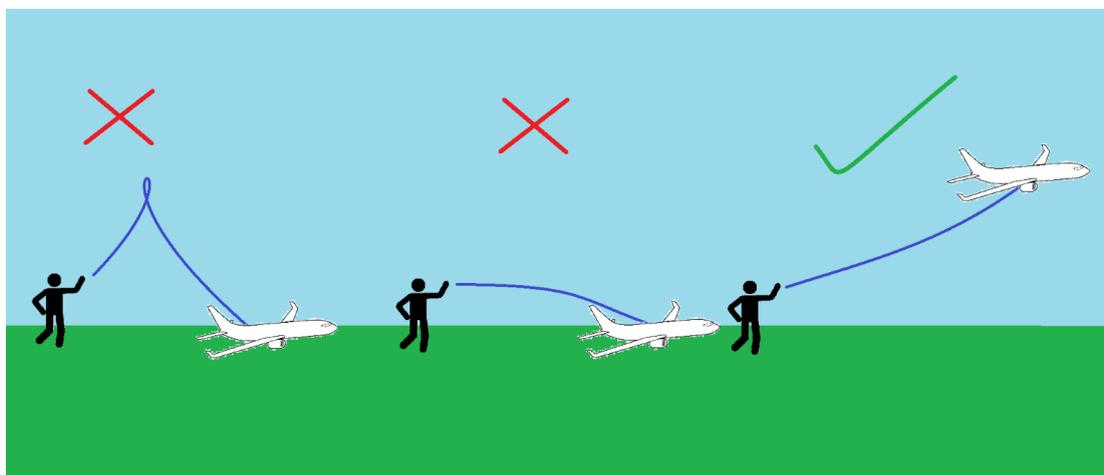
Elevator +/- 6mm

Rudder +/- 15mm

Aileron +/- 12mm

LAUNCHING:

It was found that the safest and most successful launch technique for this model was the over-arm style gripping the model by the base of the cockpit. The aircraft should be launched at approximately 20deg nose up at 50% power. Too steep and the aircraft will stall, too shallow and it will contact the ground.



PARTS LINKS:

X2 2205 2300KV MOTOR

https://de.aliexpress.com/item/1005001587067520.html?spm=a2g0o.productlist.0.0.ae647cc5HaD4B9&algo_pvid=21209e45-b934-47a9-82bc-7dbe8868653d&algo_exp_id=21209e45-b934-47a9-82bc-7dbe8868653d-1&pdp_ext_f=%7B%22sku_id%22%3A%2212000016695568471%22%7D

X2 20AMP ESC

https://www.aliexpress.com/item/32905632543.html?spm=a2g0o.productlist.0.0.293536aecw u7yT&algo_pvid=09b70550-d77e-46d3-b25e-621167aaeef6&algo_exp_id=09b70550-d77e-46d3-b25e-621167aaeef6-0&btsid=0b0a556616077433274567589e7b03&ws_ab_test=searchweb0_0,searchweb201602_,searchweb201603_

X2 950MAH 2S LIPO OR SIMILAR

<https://www.aliexpress.com/item/32907577121.html?spm=a2g0s.9042311.0.0.30714c4dJd4dZG>

X4 3.7G MICRO SERVO

https://www.aliexpress.com/item/32965734270.html?spm=a2g0o.productlist.0.0.57d95e97a WNNAJ&algo_pvid=4824ea1c-06ed-43e8-b6c7-9737d1226dbe&algo_exp_id=4824ea1c-06ed-43e8-b6c7-9737d1226dbe-0&btsid=0bb0623415991458444523660eb7bd&ws_ab_test=searchweb0_0,searchweb201602_,searchweb201603_

BAMBOO FOOD SKEWERS (3mm diameter)

HEAT SHRINK TUBE 3mm

https://hobbyking.com/en_us/turnigy-3mm-heat-shrink-tube-black-1mtr-1.html?queryID=c16c094bb26b18e39fabcb12a93a96cb&objectID=46911&indexName=hbk_live_magento_en_us_products

X6 10mm X 10mm X 2mm MAGNET (ROUND)

https://www.aliexpress.com/item/1005001362617359.html?spm=a2g0o.productlist.0.0.5da3607dAATH5j&algo_pvid=b9e32b8a-0d4f-469a-b838-b478442dda50&algo_expid=b9e32b8a-0d4f-469a-b838-b478442dda50-0&btsid=0bb0623a15991797178681785e1811&ws_ab_test=searchweb0_0.searchweb201602_.searchweb201603_

X10 MICRO HINGES

https://hobbyking.com/en_us/super-light-pivot-round-hinges-d2xw8xl24mm-12pcs.html

VELCRO – (local hardware store)

X2 x 500mm carbon strip 3mm x 0.6mm (optional)

https://www.aliexpress.com/item/32576381076.html?spm=a2g0o.productlist.0.0.4e922cc3nR6757&algo_pvid=500714e5-ce74-4e52-a1b0-e349cac3f595&algo_expid=500714e5-ce74-4e52-a1b0-e349cac3f595-7&btsid=0bb0623e15991463277515177efc08&ws_ab_test=searchweb0_0.searchweb201602_.searchweb201603_

m2 x10mm screws

<https://www.ebay.com.au/itm/400PCS-M2-M2-6-Pan-Head-Self-Tapping-Screws-Assorted-Kit-Stainless-Steel-Black/254399626404?hash=item3b3b663ca4:g:CLEAAOSwQLZdsqkd&frcectupt=true>

Thank you for supporting us! We hope you enjoy many hours of flying your Pond Racer. If you have any questions regarding the build process or set-up of your model, please contact us at:

Aeroworks3d@outlook.com