



***rc3Dprint***



# **ER-2**

**PRINTING AND  
ASSEMBLY  
INSTRUCTION  
BOOK**

# THANK YOU

Thank you for downloading this ER-2. These models take many hours of work to make available to you so please don't share the STL files with others. Send them to [www.rc3print.com](http://www.rc3print.com) where they can download the models themselves. This enables me to continue to develop new models to make them available for download.

This document aims to help you print and assemble your aircraft. Our designs are made to be simple, this model is designed explicitly with LW-PLA in mind, so it incorporates carbon tube spars. If you print it from regular PLA it will obviously be heavier and you should take this into account.

3D printers often have many differences so you may need to tweak settings to get the best results.

Included in the document you will find Cura profiles and layouts for each part and assembly instructions. Many of the components in the design are *solid bodies*, this has some advantages over hollow bodies in that you can adjust some settings such as wall thickness, infill percentage, etc. As such we recommend using Cura to slice the files. The walls of these solid bodies are single line 0.4mm thickness to reduce weight. As you are printing and assembling the model yourself we take no liability for damage or loss resulting from your use of these files. Please fly responsibly and follow all local laws.

Share your results on Instagram, Facebook, or by email and tag @rc3dprint for discount codes on future orders.

# PARTS LIST

## REQUIRED

EDF ChangeSun 90mm and Motor (TURNIGY SK3 FANDRIVE - 3659-1900KV (90MM EDF - or similar). 6S

6 - Channel radio kit minimum.

8 x 9g Micro Servo

2 x Metal Servoless Gear Retracts - Non steerable version ([Link](#))

Pultruded carbon tubes: 8mm, 6mm, 4mm and 2mm. The carbon tubes need to nest inside each other: **Check before you buy!** See carbon schematics below for lengths required.

Piano Wire for Elevator and Rudder push rods

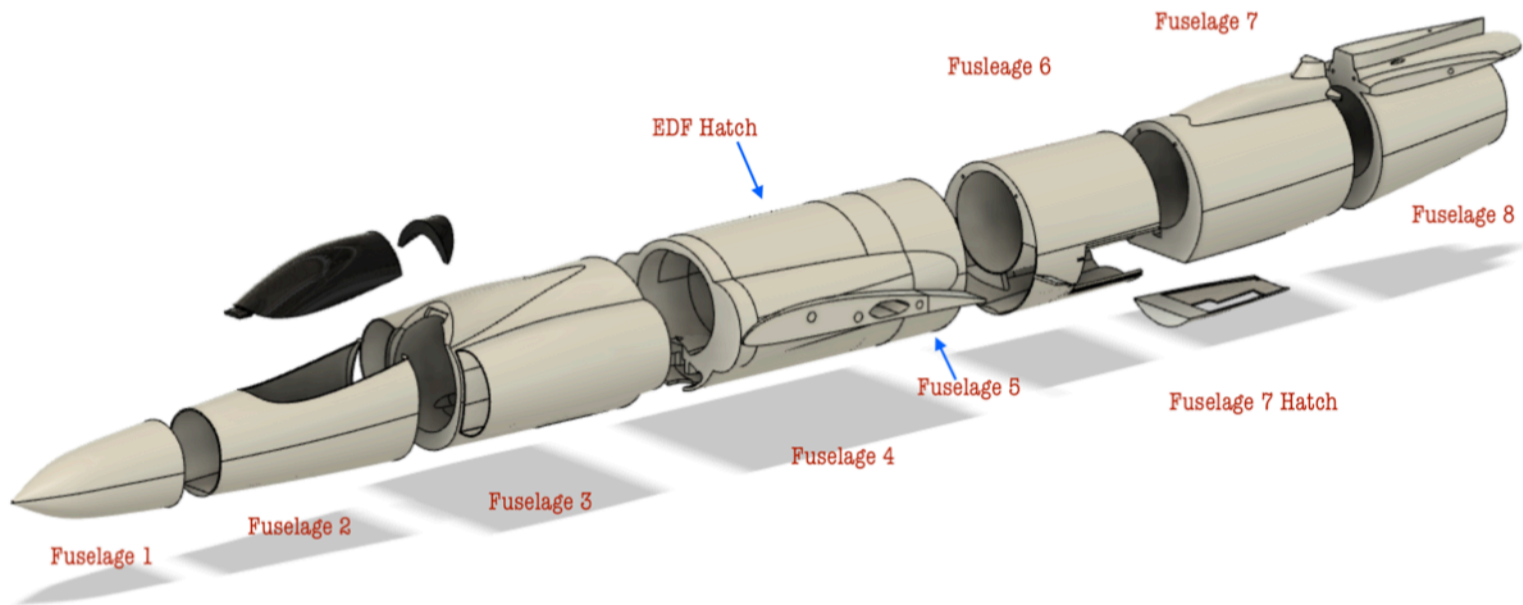
CA glue

Hot glue (for securing Servos)

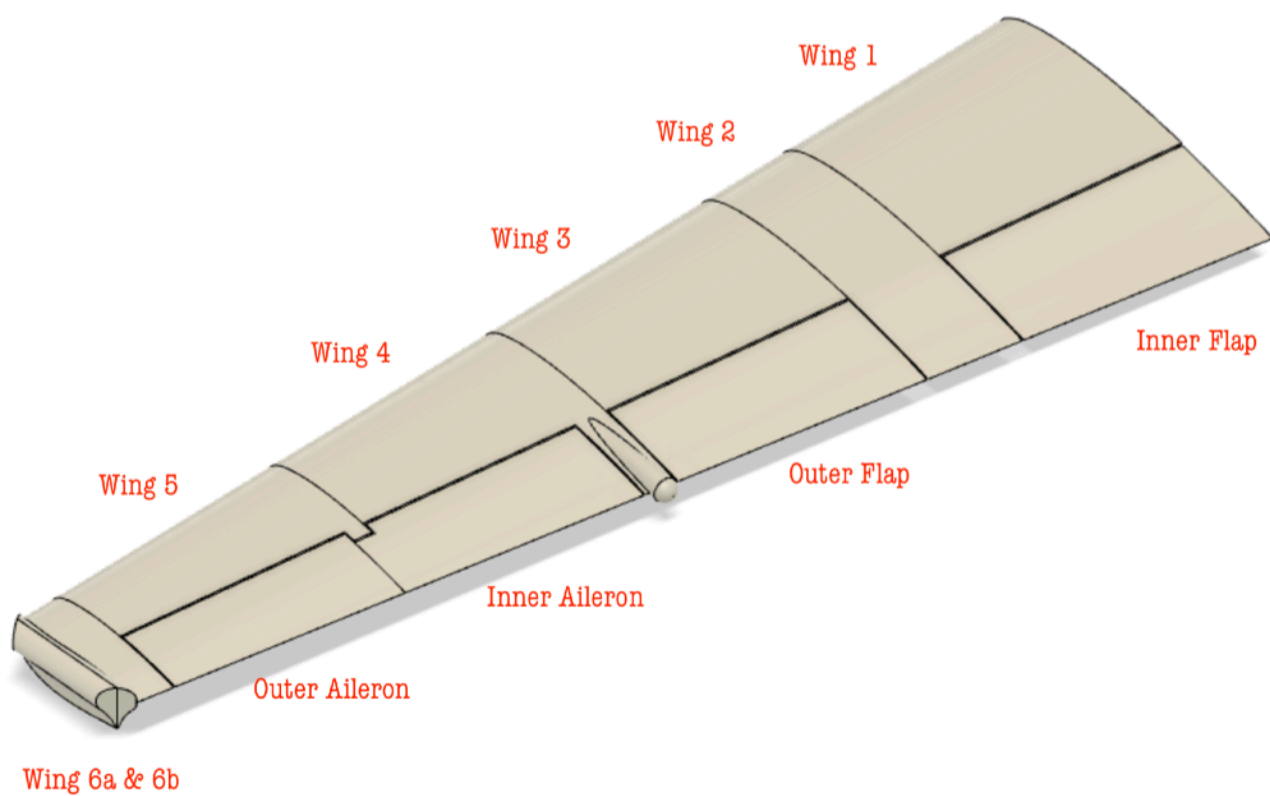
2 x 25mm x 8mm x 2mm N35 Magnets for hatch - <https://amzn.to/35GtsmC>

# INCLUDED STL. FILES

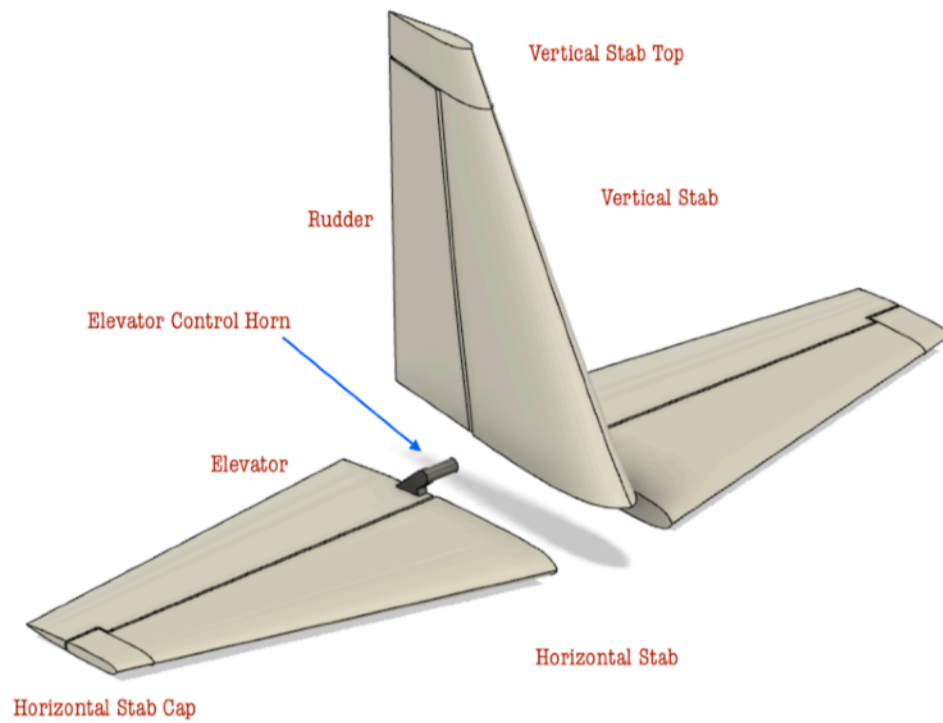
## FUSELAGE



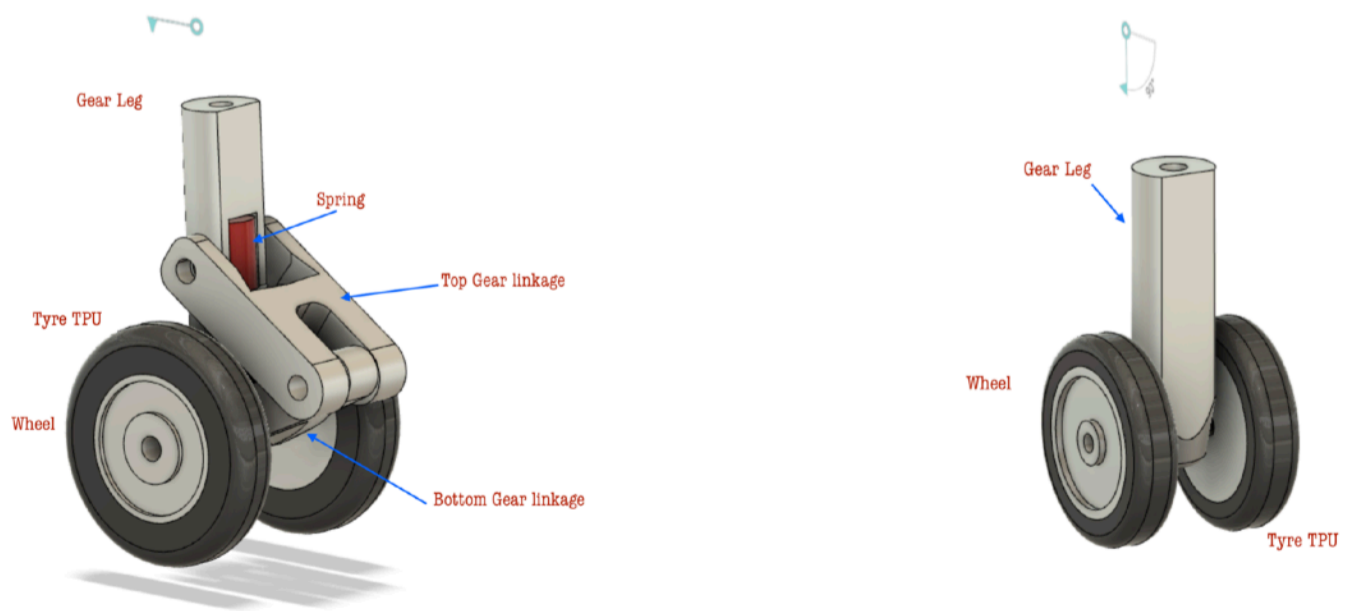
## WING



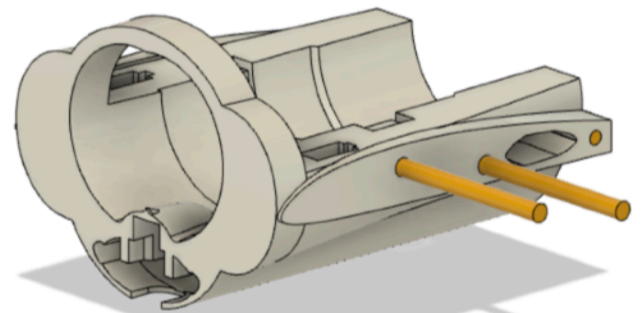
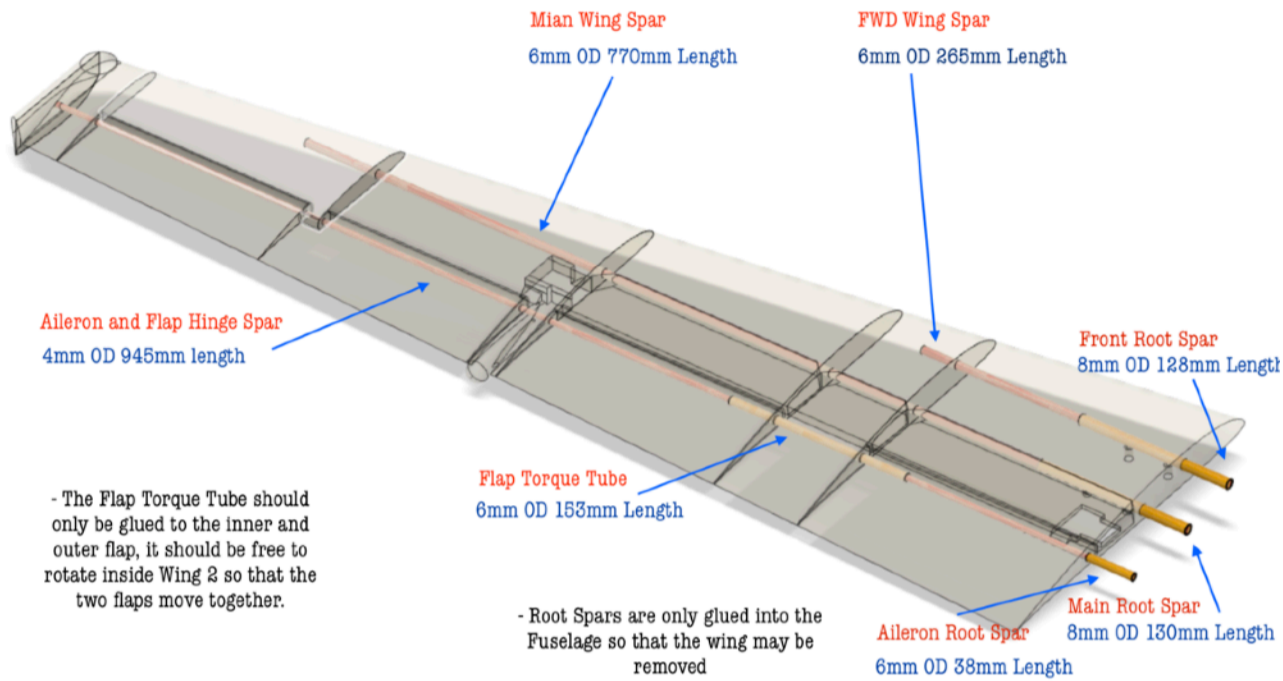
# EM PENNAGE



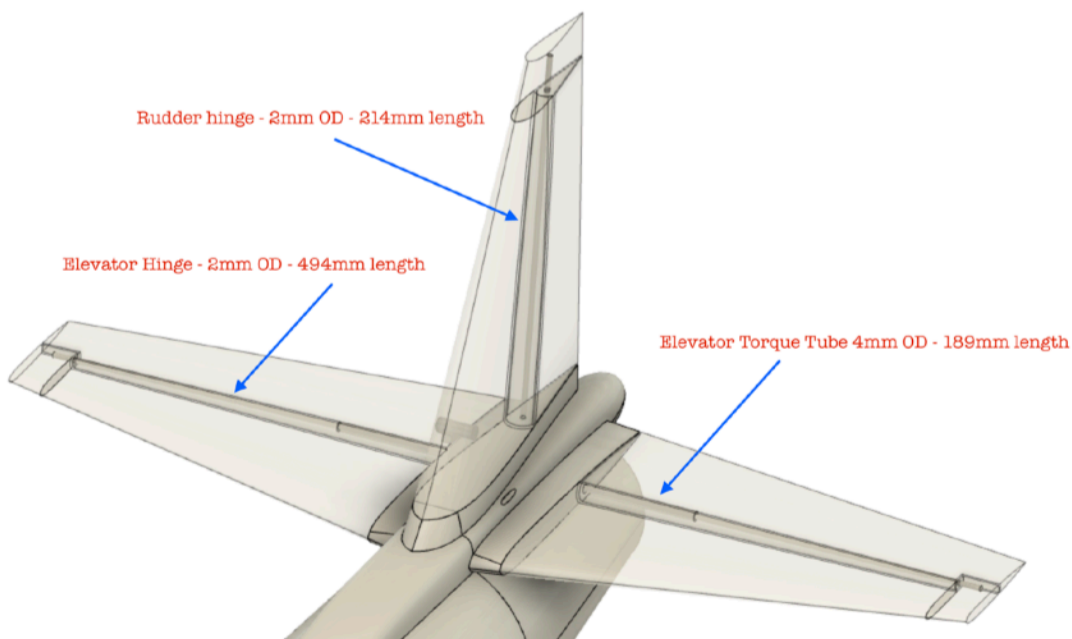
# GEAR PARTS



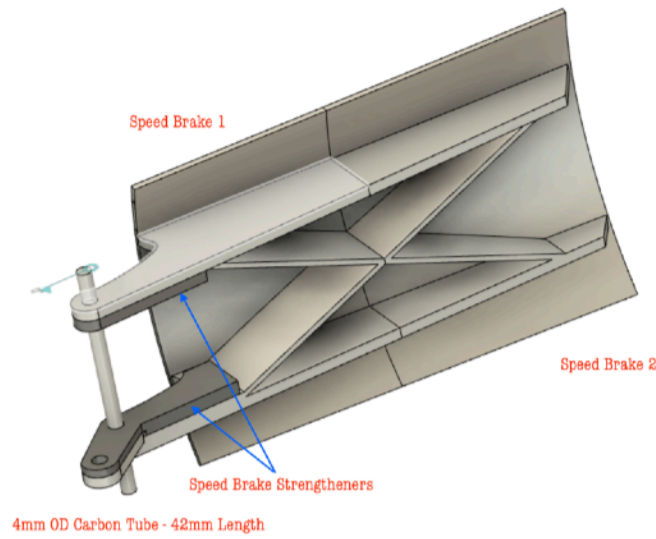
# CARBON TUBES



Wing Root Spars are glued to the fuselage. The wing spars then nest inside



# SPEED BRAKE PARTS



# SPECIFICATIONS

## Wing Span & Area

**2020mm - 39.33dm<sup>2</sup>**

## Flying Weight

**(2200mAh 4S): 2000g**

## Wing Loading

**50.9 g/dm<sup>2</sup> 16.6 oz/sq.ft**

## Wing Cube Loading

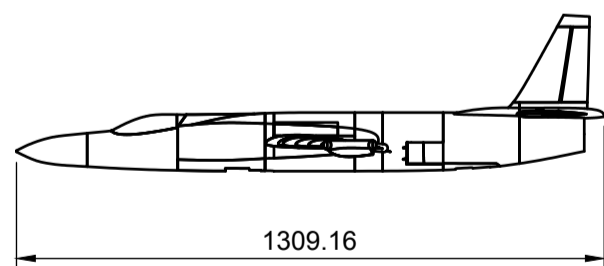
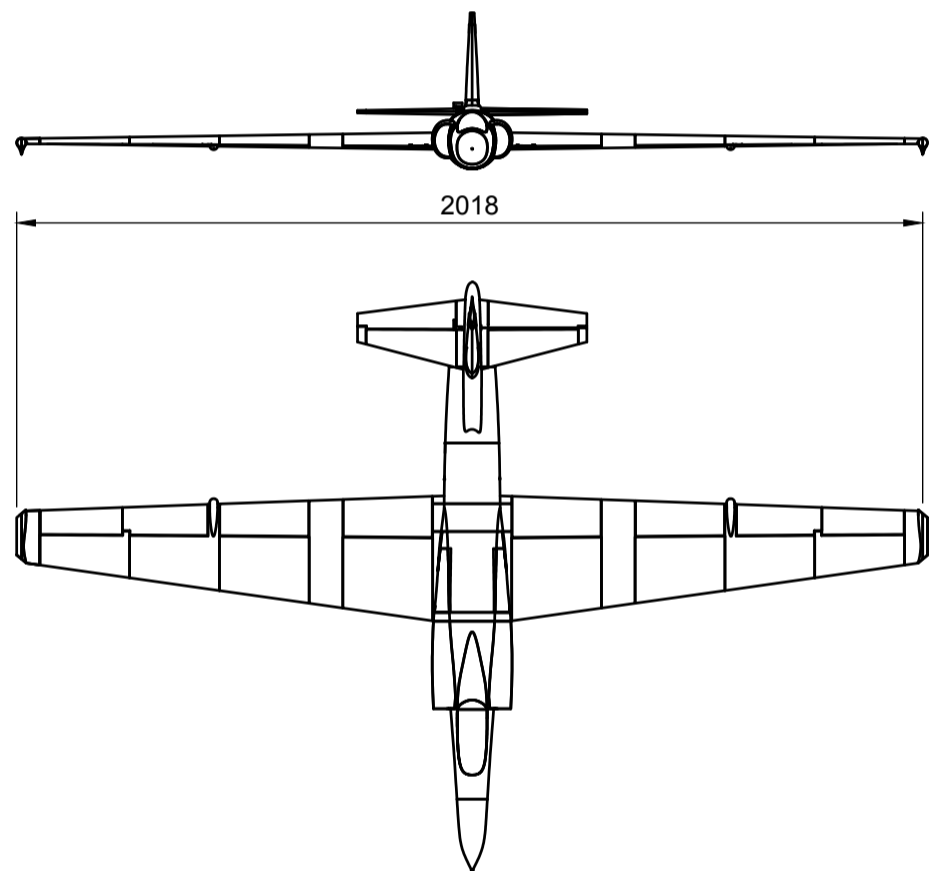
**8.1**

## Channels

**6 Channel Minimum**

## Centre of Gravity

**10 cm Behind of Leading Edge**





# PRINTING PROFILES

A handful of parts are printed in PLA and TPU, these can be printed using standard settings.

## LW-PLA PROFILE

This model is designed to be printed in LW-PLA.

All printers are different, it is advisable to follow the calibration instructions given by Colorfabb to get the best from this material.

Below are the settings I use on a Creality Ender 5. Listed are the changes made to the generic 'Low Quality' PLA profile. I use these settings for all part, unless otherwise stated in the Cura Placement pages.

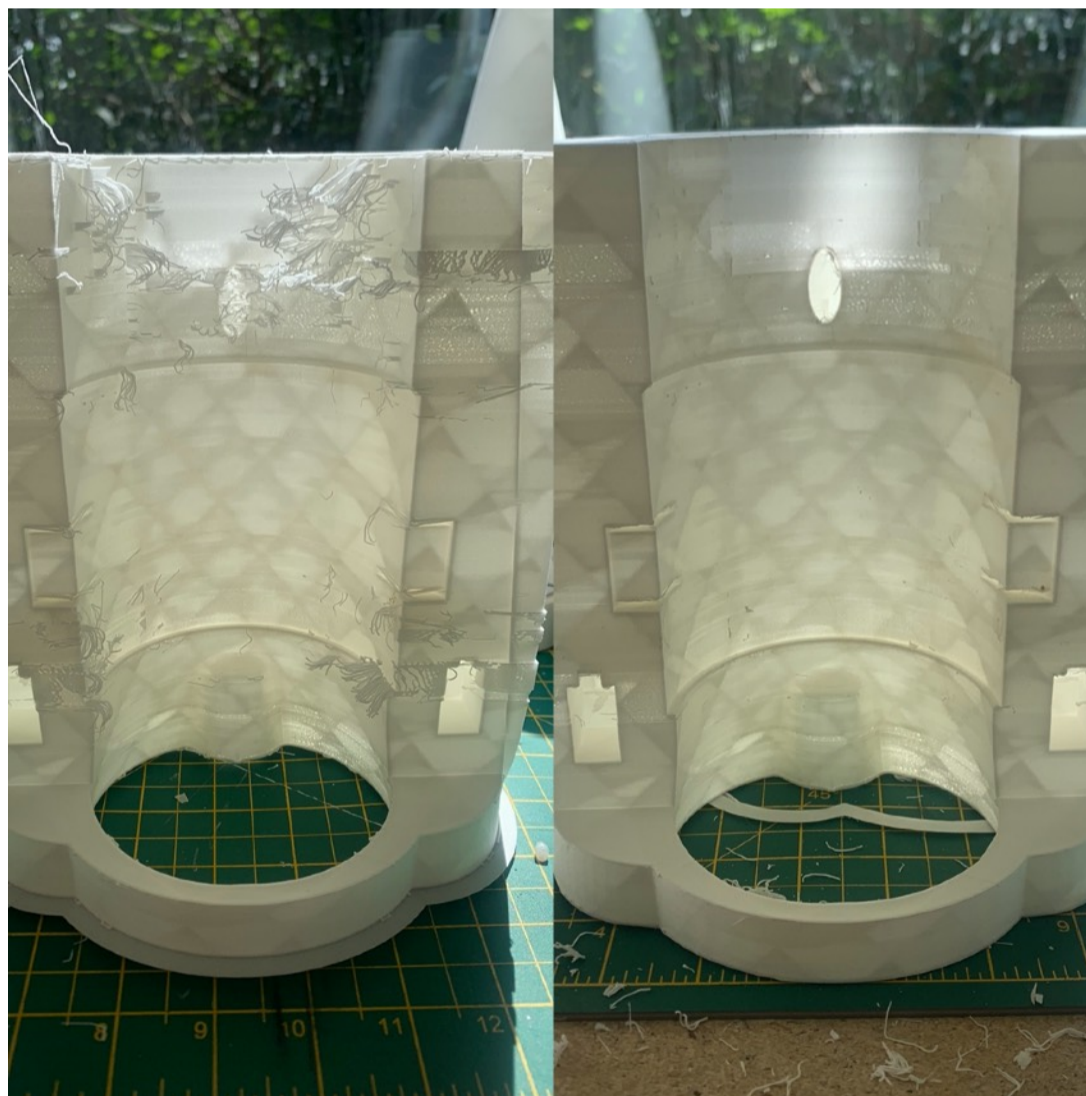
<b>Layer height</b>	<b>0.24mm</b>
<b>Wall Thickness</b>	0.4mm
<b>Wall line count</b>	1
<b>Top/Bottom Pattern</b>	Lines
<b>Infill Density</b>	3%
<b>Infill Pattern</b>	Cubic
<b>Flow</b>	50%
<b>Printing Temperature</b>	245C*
<b>Build Plate Temperature</b>	60C (optional)
<b>Fan Speed</b>	20% Maximum
<b>Generate Support</b>	No
<b>Build Plate Adhesion</b>	Brim

## A WORD ON RETRACTIONS

With regular PLA a common problem is under extrusion at layer change - to fix this change the setting *extra prime amount* in Cura to +1-3mm.

With LW-PLA it is recommended to switch retractions OFF since trying to retract the foaming filament can cause problems. If you need to fix under extrusion you can still use the method above but will need to turn retractions ON and set the retraction distance to 0mm.

A big thing is made of 'retraction free' LW-PLA models. You don't need retractions *on* if you print his model however having retractions *on* but with a value of Zero means you can use the *retraction extra prime amount* setting if you are offering from any under extrusion. You should print the parts one at a time. You may need to clean up *some* parts with a craft knife or sand paper to remove some stringing after printing.



Before and after cleaning up.

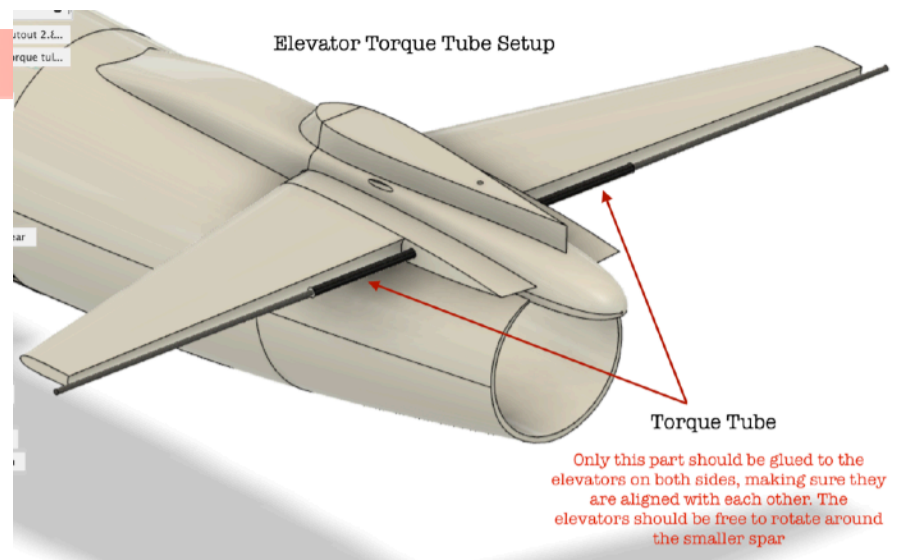
# ASSEMBLY

## FUSELAGE

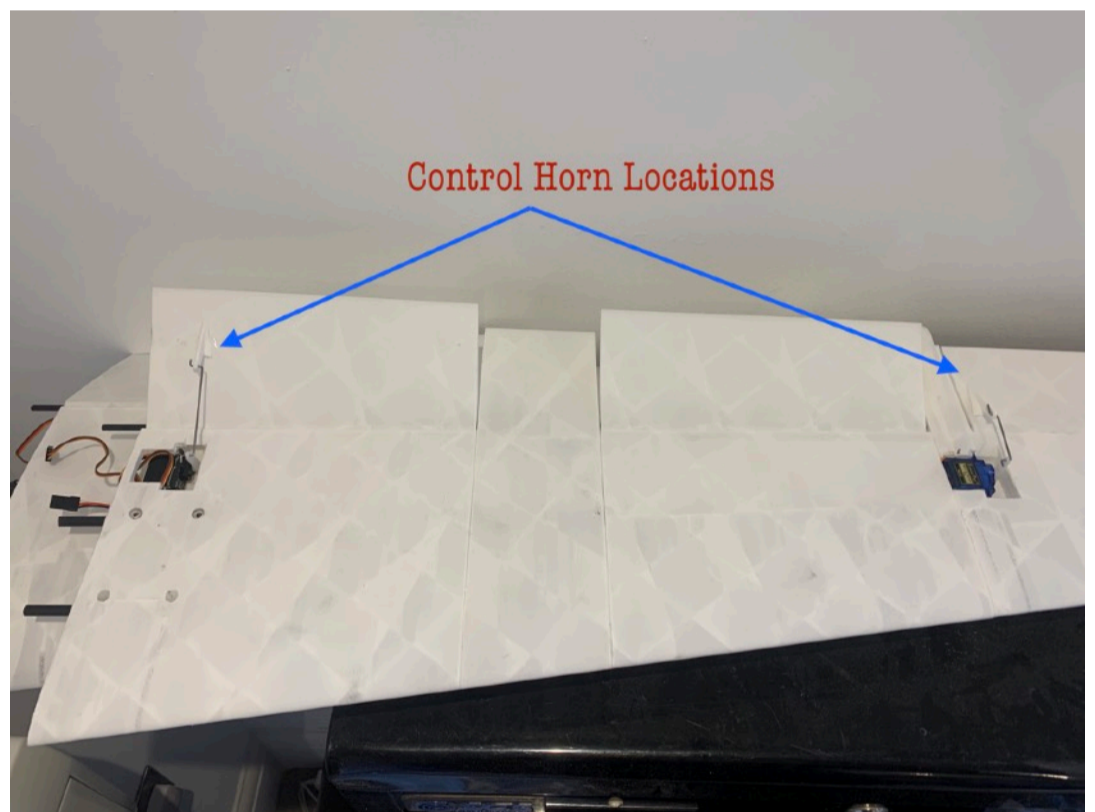
Assemble the fuselage from the back forwards. Here is a recommended sequence:

1. *Fuselage 7 and 8* glued together. With each Fuselage piece added you should run the piano wire elevator and rudder push rods through the Bowden (which may need opening up with a craft knife) to make sure it is lined up correctly.
2. Assemble the speed brake parts together and glue the CF tube hinge into *Fuselage 6*.
3. Glue the *Fuselage 6* and speed brake assembly to *Fuselage 7/8*.
4. Attach your speed brake piano wire pushrods to the speed brakes, then glue on Fuselage 5 to *Fuselage 6/7/8*. Now you can attach 2 servos to the bottom of *Fuselage 5* to actuate the speed brakes. I usually attach the servos with a drop of hot glue.
5. *Fuselage 4* has a lot of parts. You need to sit the EDF in place. You will need to clear out any stringing with a craft knife. Secure the EDF in place with a thin bead of hot glue on the left and right side. This also provides rigidity to the part. Servos need to be put in place with the wires fed into the fuselage centre, the servo horns should face inwards. If using the retractable undercarriage the servo less retract should be set into the bottom of *Fuselage 4*. The CF tubes, inside which the wing spars nest, should also be put in place.
6. You can now glue *Fuselage 4* to *Fuselage 5/6/7/8*. Be sure to run the servo wires up through the fuselage belly.
7. Now glue on the *Horizontal and Vertical stabilisers*. The *rudder* can be assembled with the *Vertical Stab Top* glued on after the rudder and CF hinge have been installed.
8. The *Elevator* is a little more complex and uses a torque tube system. The larger CF tube connect the two elevators together and rotates around the spar. Once the two elevators are aligned together and glued to the torque tube the spar can be passed inside the torque tube and the *Horizontal Stab Ends* glued on to finish the tail assembly

9. The wings are assembled around 3 CF Spars. When gluing the pieces together it is advisable to build around these spars as it ensures correct alignment.



- Often the ends of the 3D printed spar holes will require a little cleaning up with a craft knife. The flaps use a torque tube system similar to the tail. Assemble the *Inner and Outer Flaps*, and *Wing 2* around the torque tube first. The flaps should be aligned to each other and glued to the torque tube. The long *Aileron and Flap Hinge Spar* then passes all the way through the wing. You can build the rest of the wing up in any order after this, ensuring that no glue is applied to the ailerons, and they are free to rotate around the hinge. Position the Aileron control horns so that the hot end is over the hinge. The Flap horns should be placed 2cm further Aft, i.e, these shouldn't line up with the hinge line.



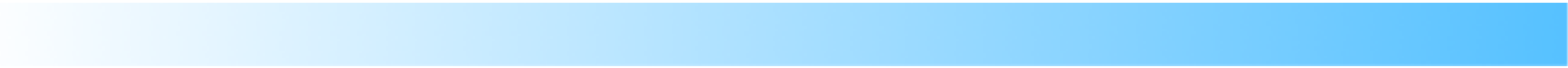
10. At this stage it is a good idea to assemble all the parts together, running the servo wires and extensions forwards to make sure they are long enough.
11. Glue *Fuselage 3* into position. You can now feed all the wire bundles forward making sure they are out of the way either side of the gear retract cutout.
12. If using the retractable gear assemble these pieces together as per the images earlier in this document. It is highly recommended that you use a strong filament for these pieces. ALWAYS check the pieces for fit in the fuselage to make sure you get them in the right



position before gluing them on to the retract leg. The FWD Gear uses some pieces of 4mm Carbon Tubes to assemble.

13. The rest of the fuselage can now be glued in place. The Canopy sections are glued to gather and use a small magnet to connect to the fuselage - make sure when gluing the magnets in place that you check the polarity!
14. The wings are connected to the fuselage by inserting the wing CF tubes inside their fuselage counterparts. To ensure a strong connection the underside of the wings have four holes. Use small drill bit to drill a hole through both the wing and fuselage CF - with the wings connected and firmly in place. Small servo size screws can no be put in place to hold the wings (CAUTION: After drilling out the holes the wings may be difficult to slide away from the fuselage - don't press to hard on the wings to pull them as they will break, instead use a wide prying tool to gently prise the wing away from the fuselage.)
15. Set up the elevator and rudder servos with piano wire push rods. The EDF Hatch will be glued into place so double check everything works before doing so.

## **FURTHER NOTES**

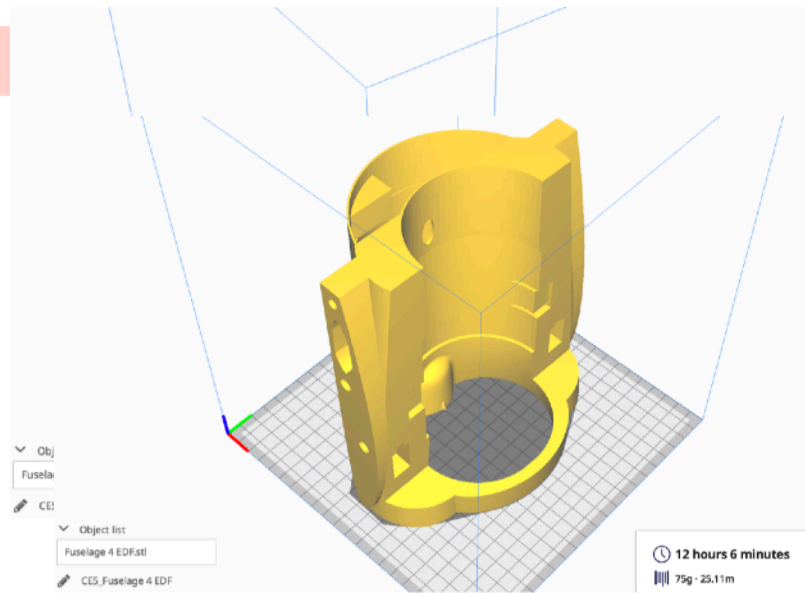
- The model comes with parts for a launch dolly, the assembly of which is pretty self explanatory. Wheels are not included as these will be dependent upon the surface you plan to launch from. It requires 2 x 8mm OD Carbon Tubes and 1 x 6mm OD Carbon Tubes.
  - 
  - The wings have slots available, just inside of the ailerons for “POGO's” to be installed. On the full size aircraft these are installed after landing for taxiing. In our case you can you piano wire inserted in these slots and bent as required.
  - The CAD files for Wing 2 are included in the download. This is so that you have the platform to design your own wing pods. The ER-2 was used as a flying laboratory with all kinds of sensors housed here. I look forward to seeing what people add!
- 



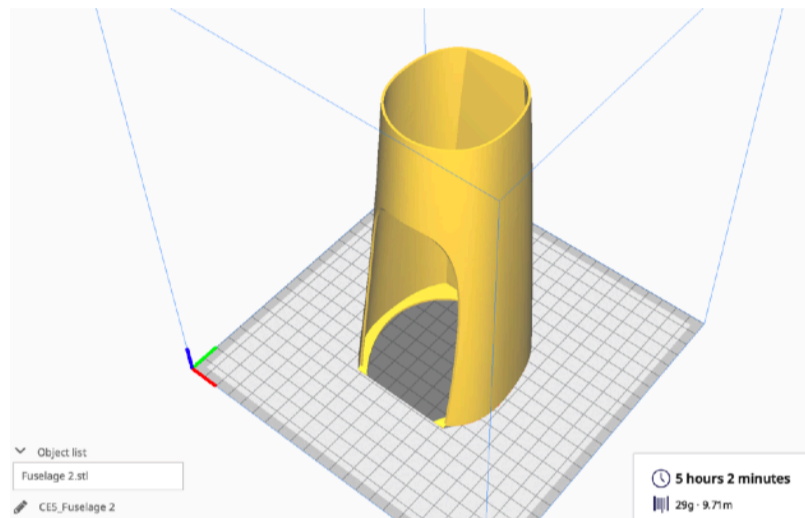
# **CURA COMPONENT PLACEMENT**

**FUSELAGE 1**

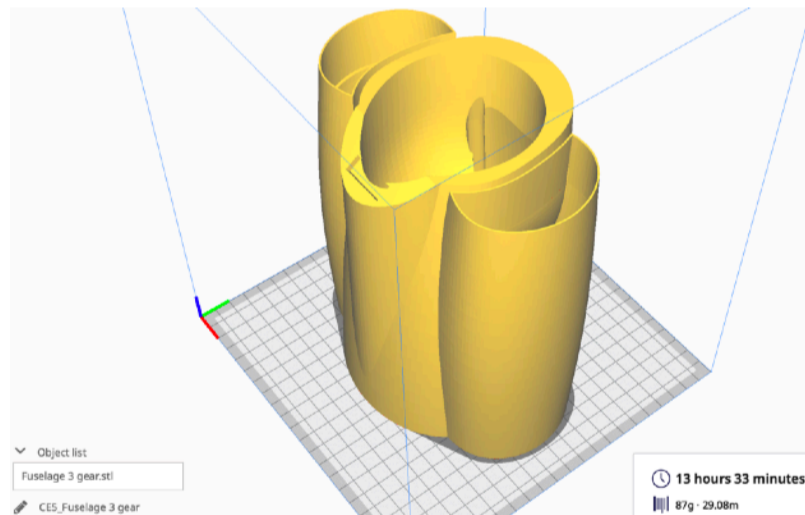




## FUSELAGE 2



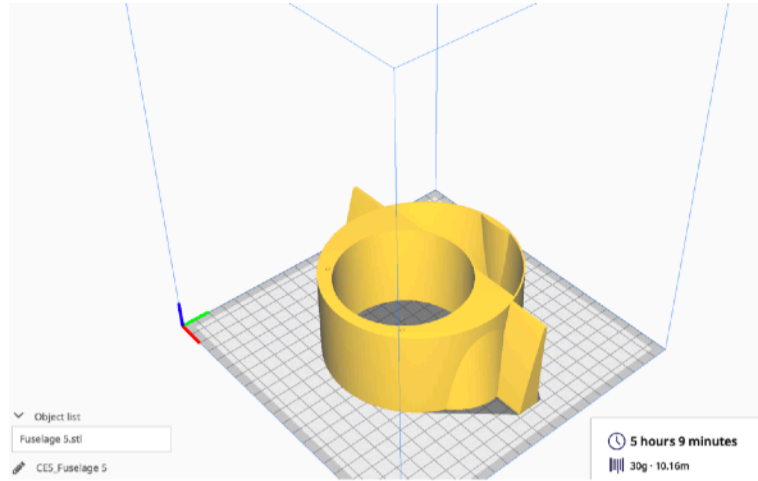
## FUSELAGE 3



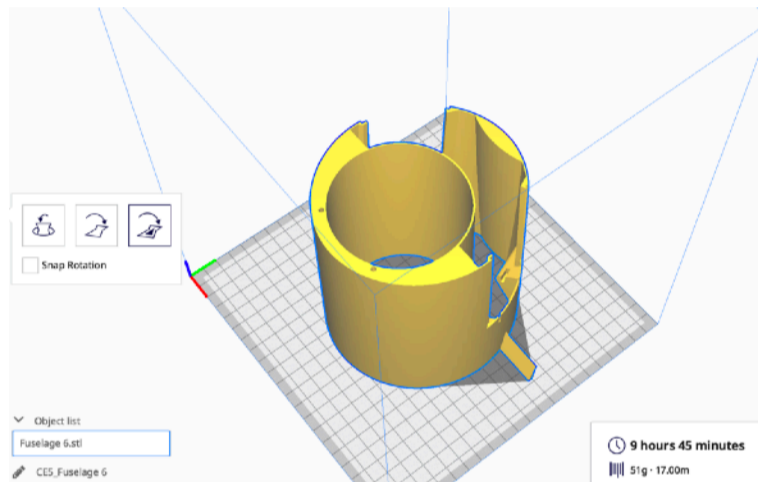
## FUSELAGE 4

Set the infill to 5%

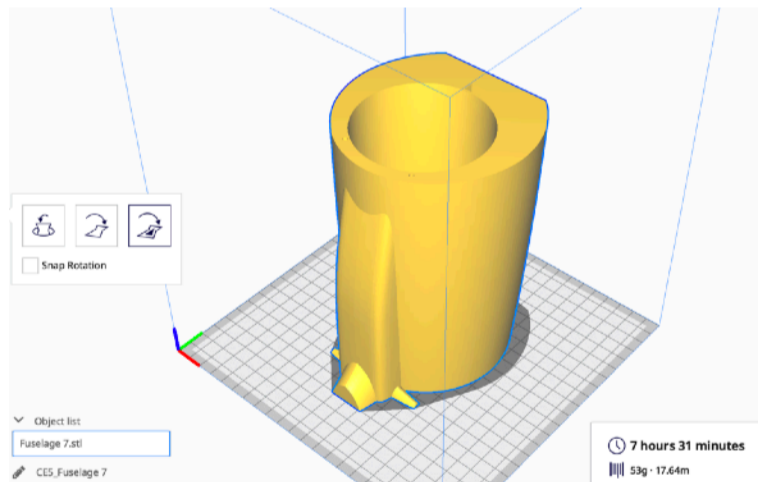
## FUSELAGE 5



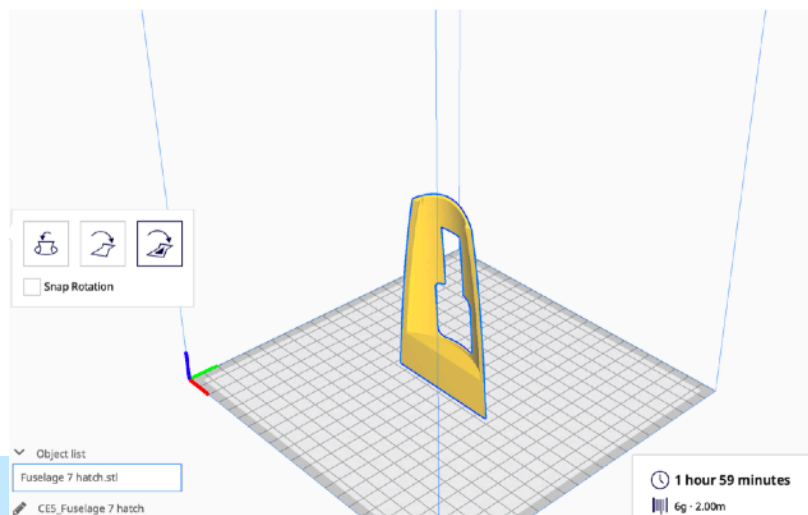
## FUSELAGE 6



## FUSELAGE 7

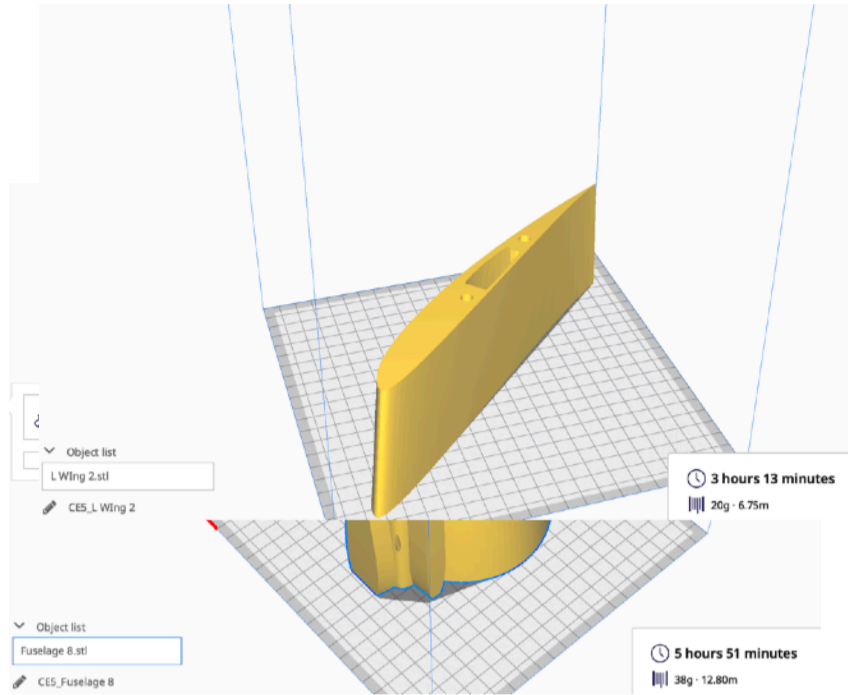


## FUSELAGE 7 HATCH

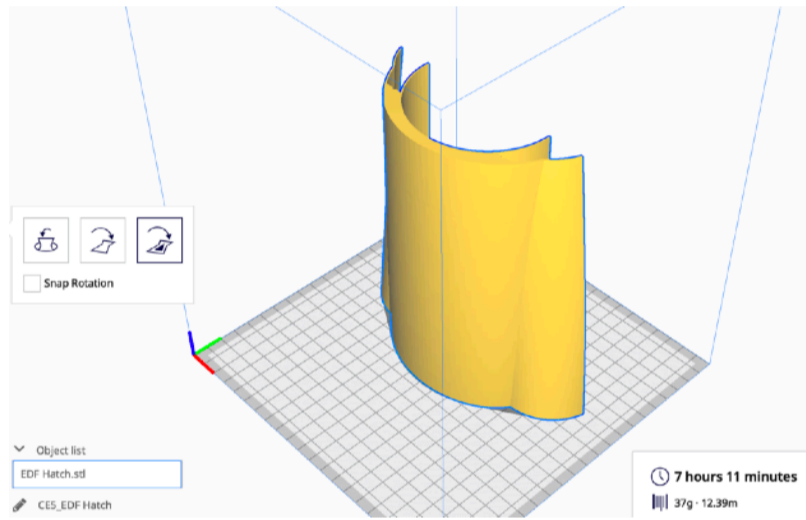




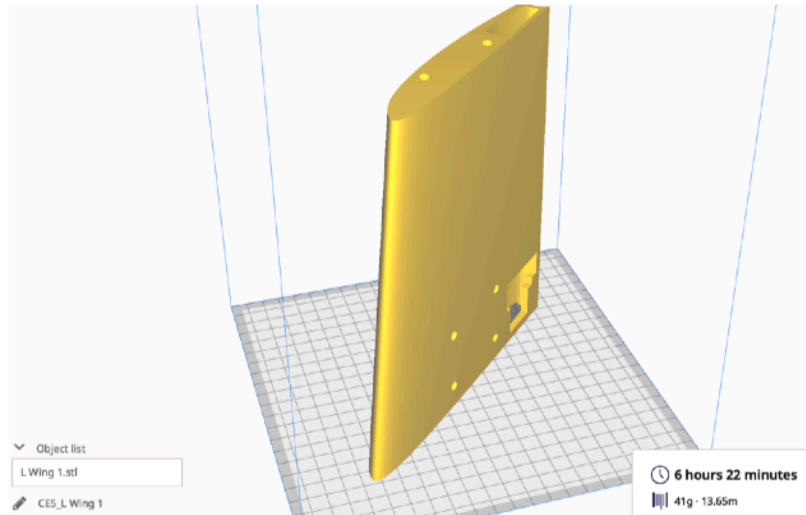
## FUSELAGE 8



## EDF HATCH



## WING 1



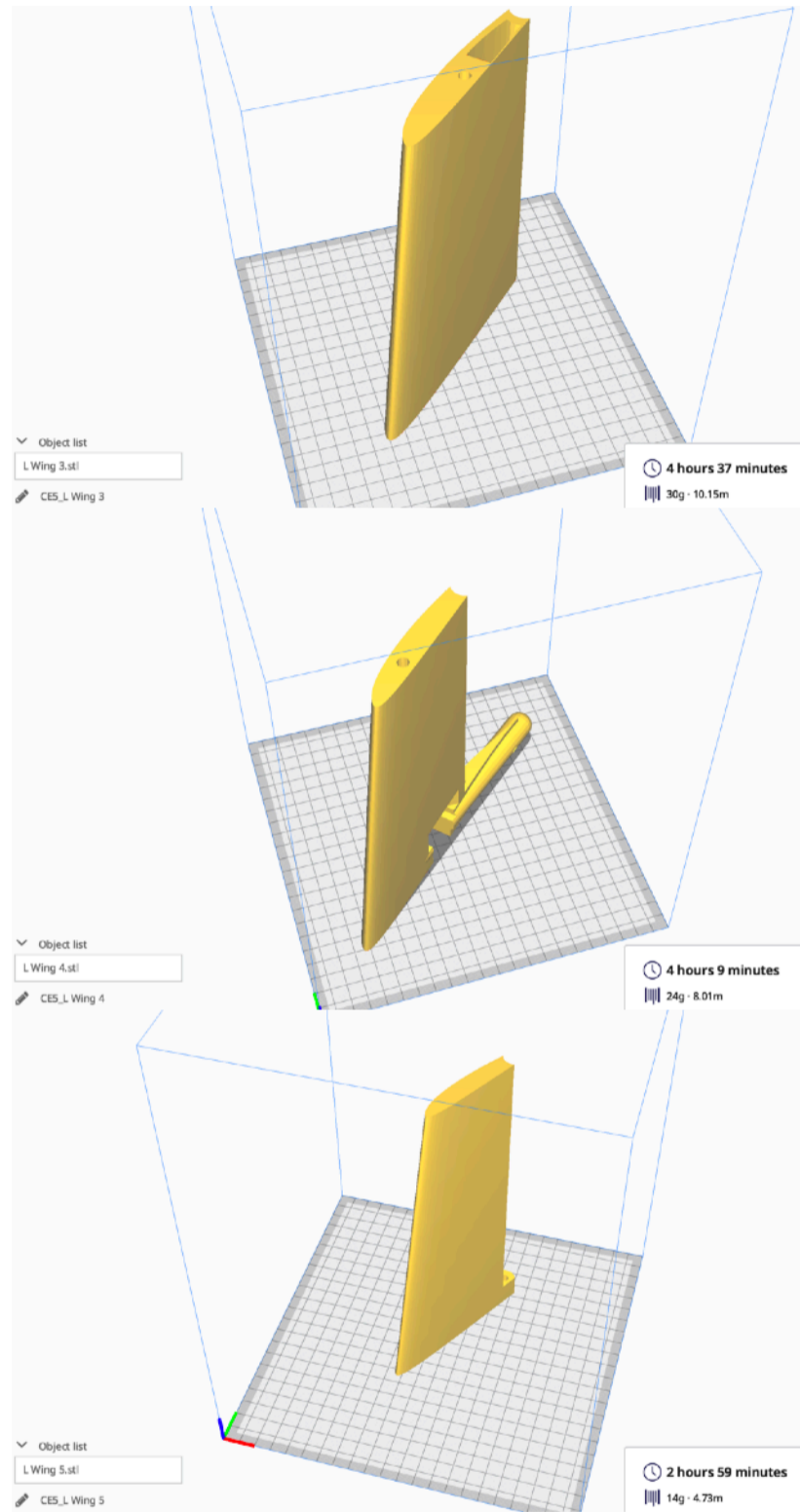
## WING 2

## WING 3

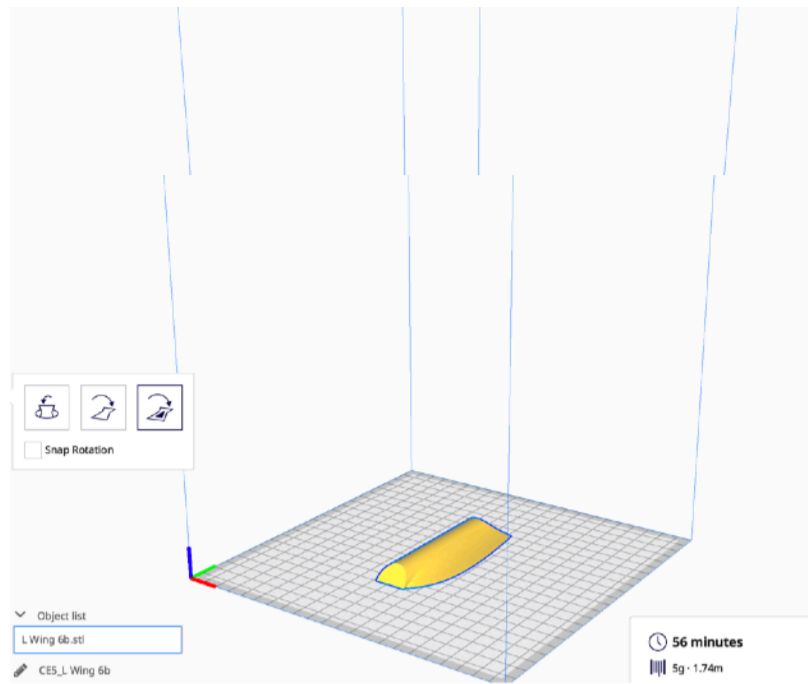
## WING 4

## WING 5

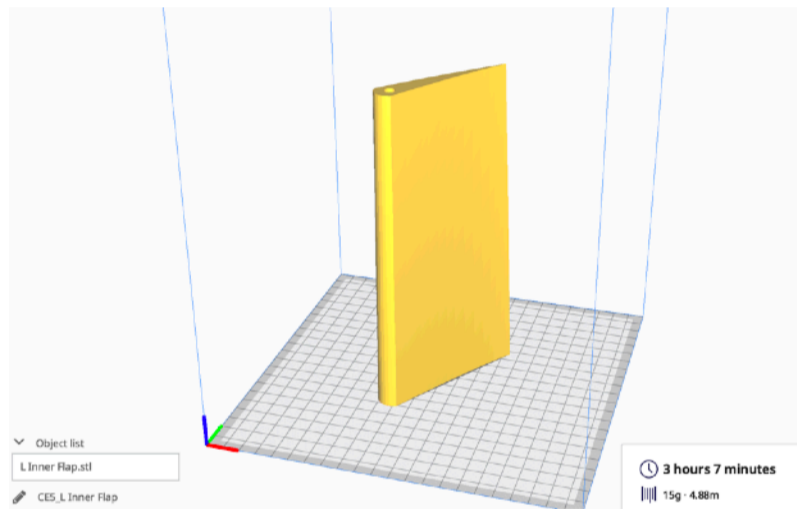
## WING 6A



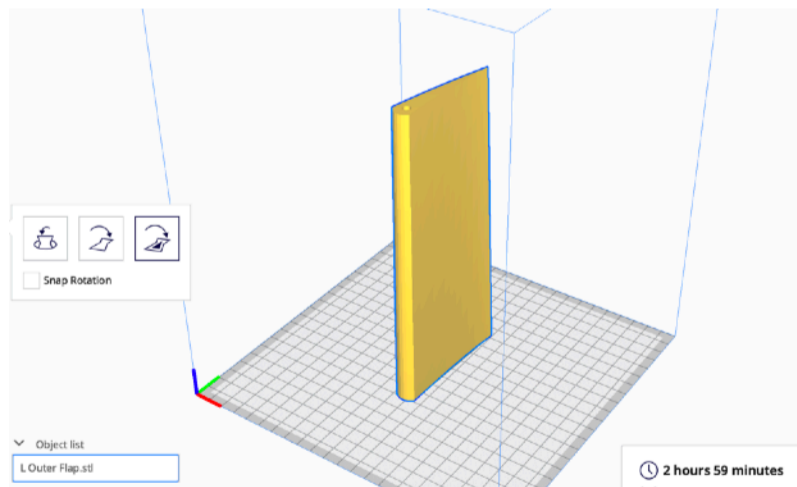
## WING 6B



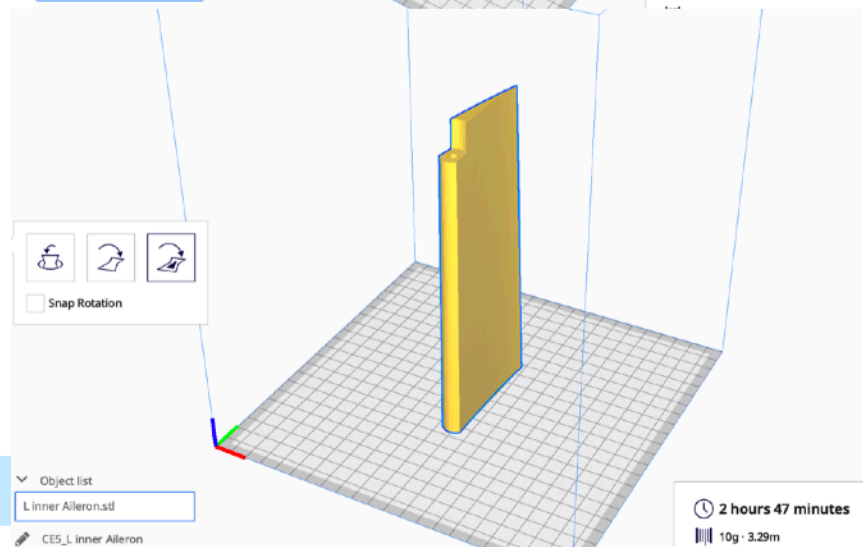
## INNER FLAP



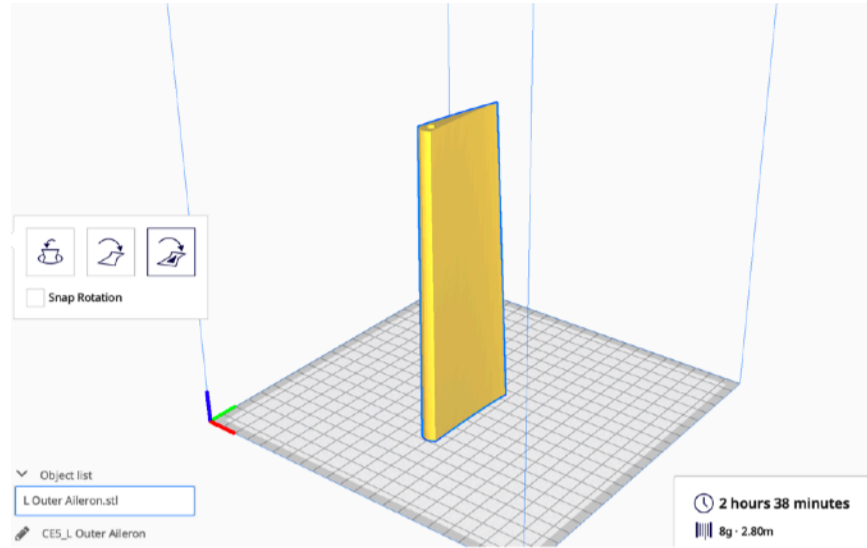
## OUTER FLAP



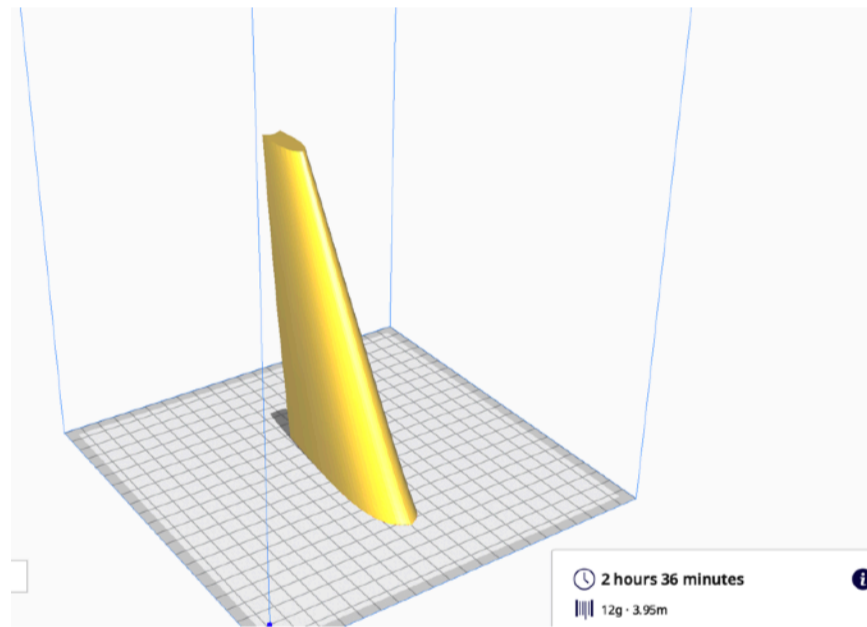
## INNER AILERON



## OUTER AILERON

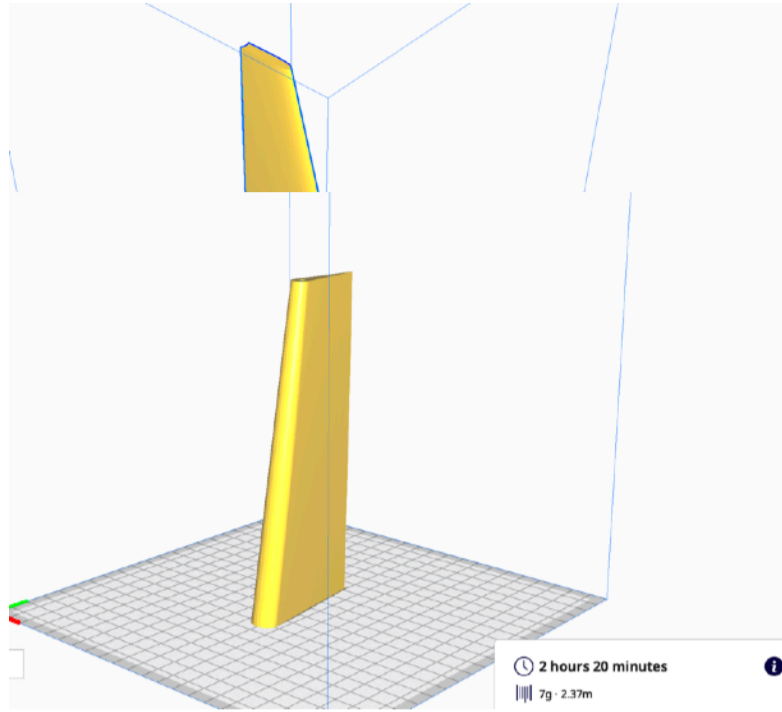


## VERTICAL STAB

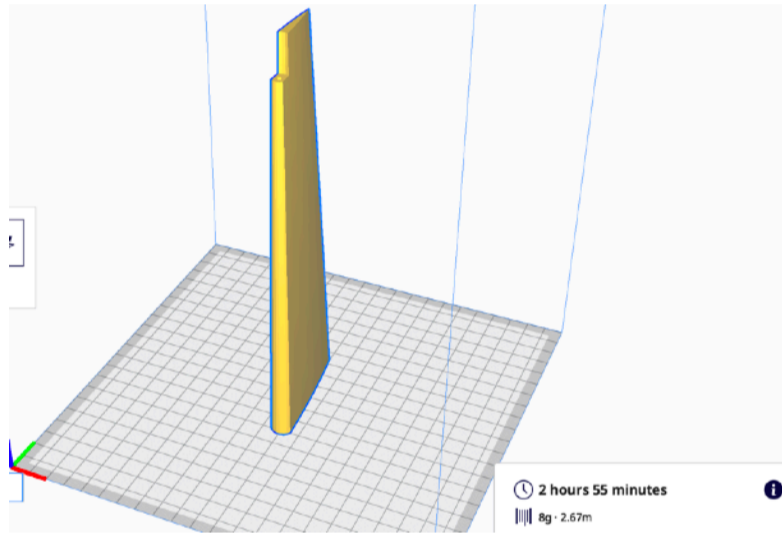


## HORIZONTAL STAB

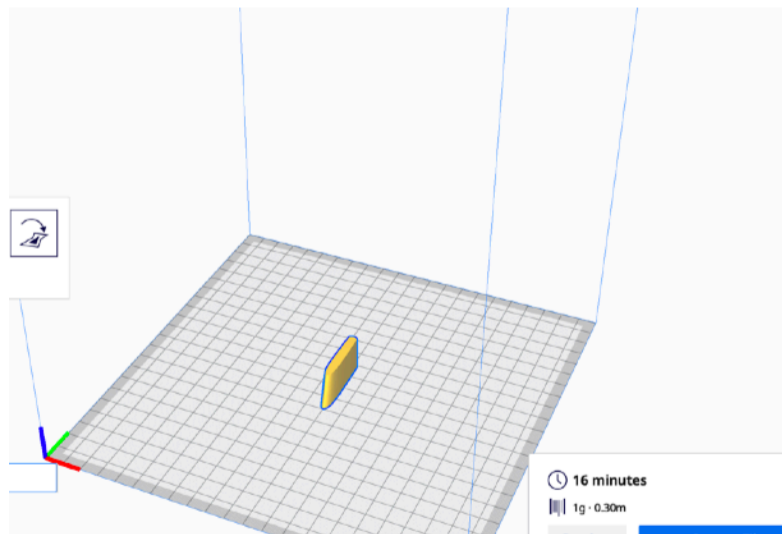
## RUDDER



## ELEVATOR

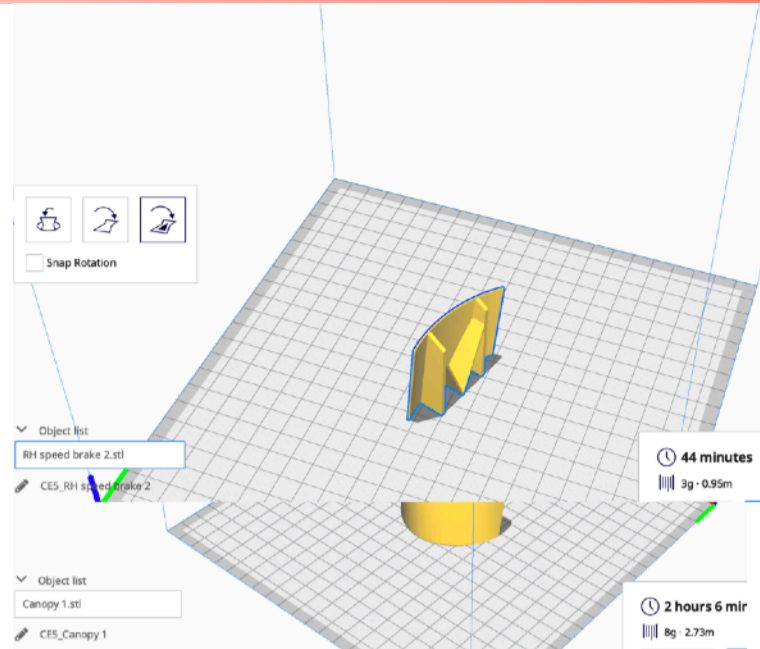


## HORIZONTAL STAB END

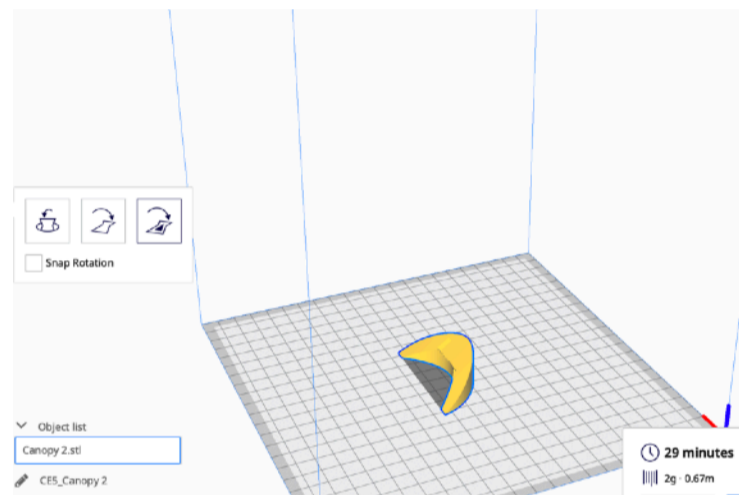


## VERTICAL STAB END

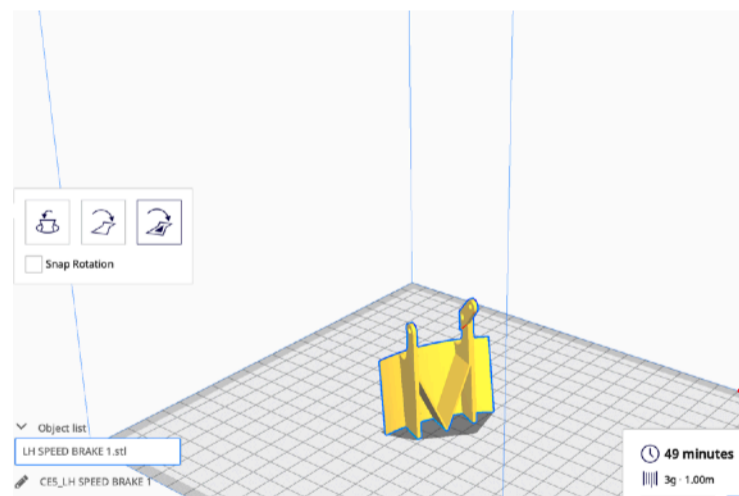
## CANOPY 1



## CANOPY 2



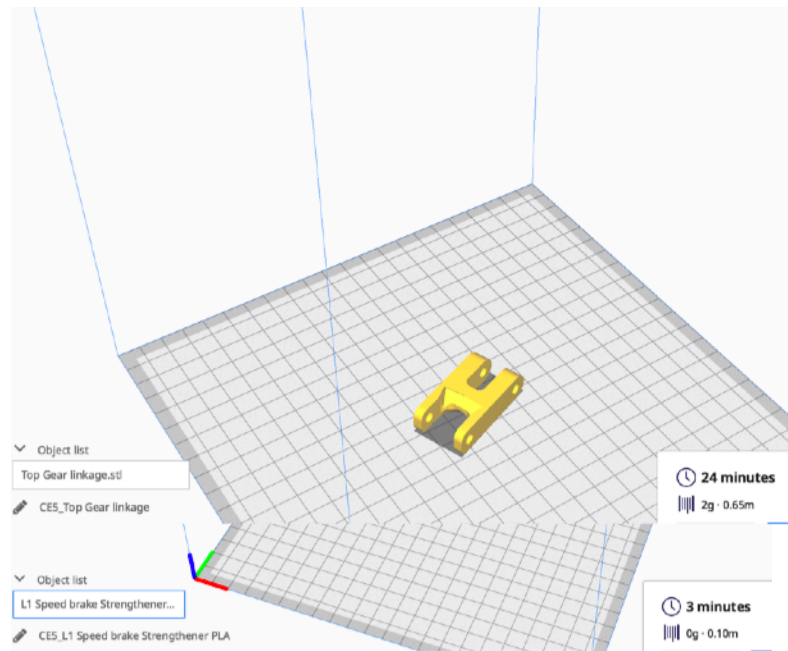
## SPEED BRAKE 1



## SPEED BRAKE 2

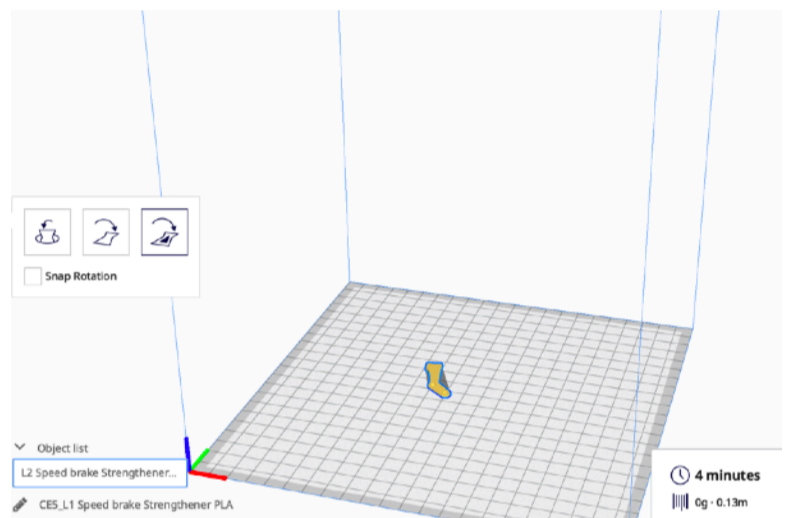
## SPEED BRAKE STRENGTHENER 1

Print in PLA/ABS/PETG



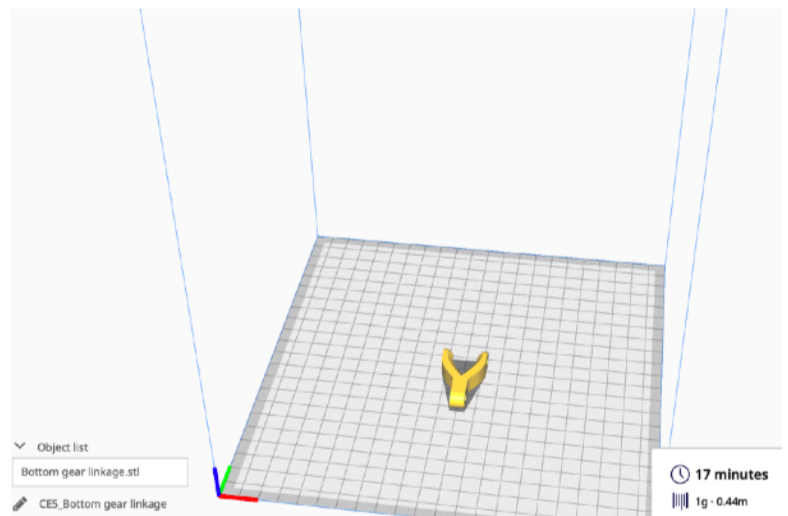
## SPEED BRAKE STRENGTHENER 2

Print in PLA/ABS/PETG



## BOTTOM GEAR LINKAGE

Infill 30% Print in PLA/ABS/PETG

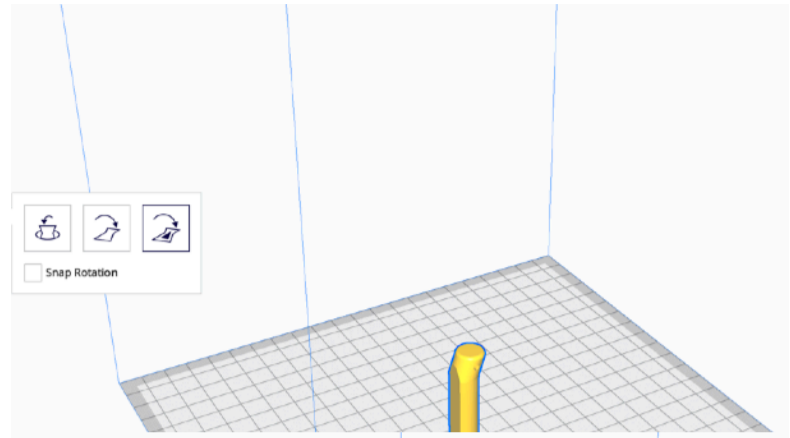


## TOP GEAR LINKAGE

Infill 30% Print in PLA/ABS/PETG

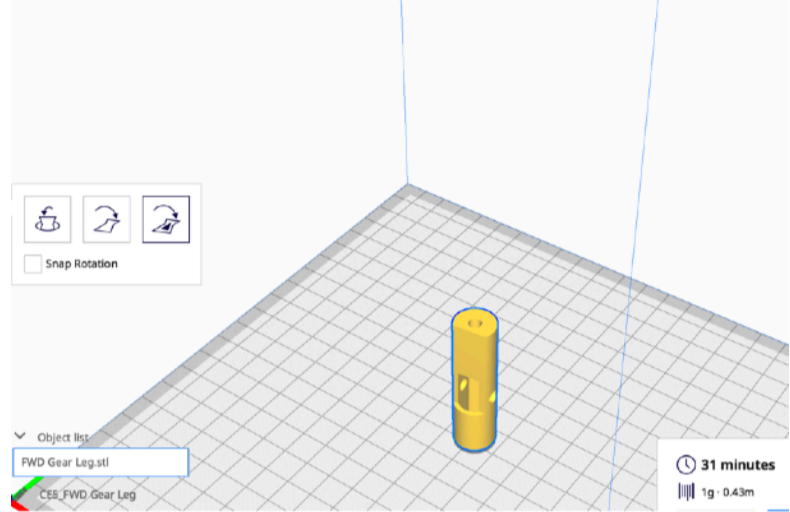
## AFT GEAR LEG

Infill 30% Print in PLA/ABS/PETG

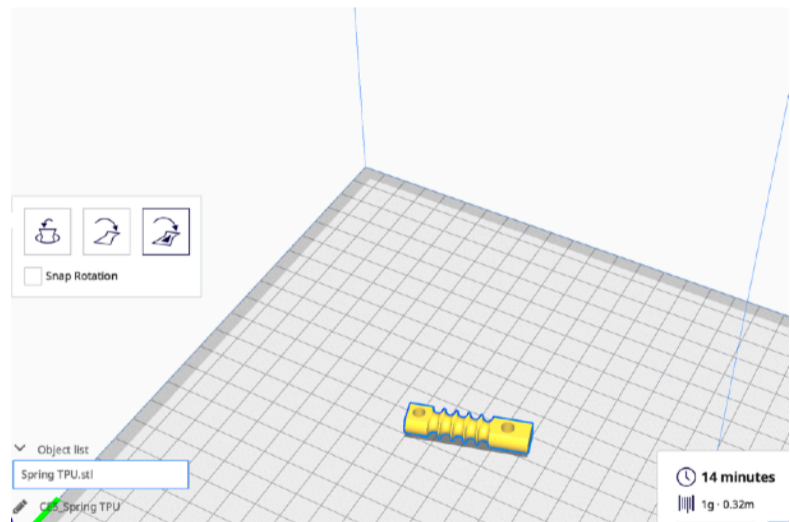


## FWD GEAR LEG

Infill 30% Print in PLA/ABS/PETG

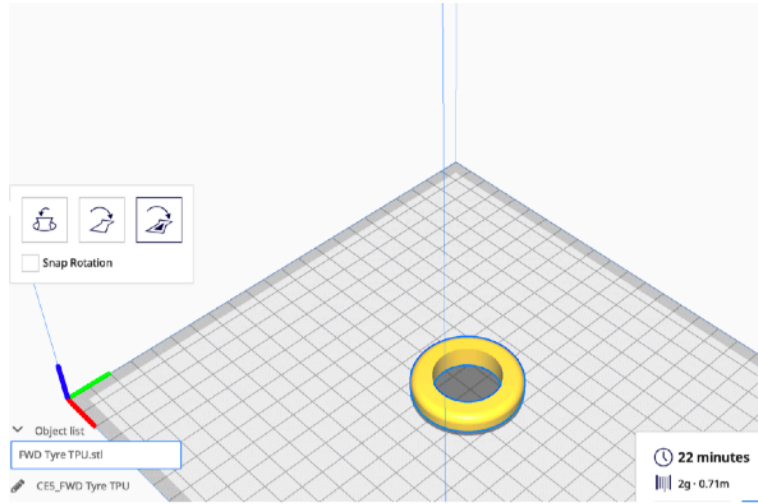


## SPRING (TPU)

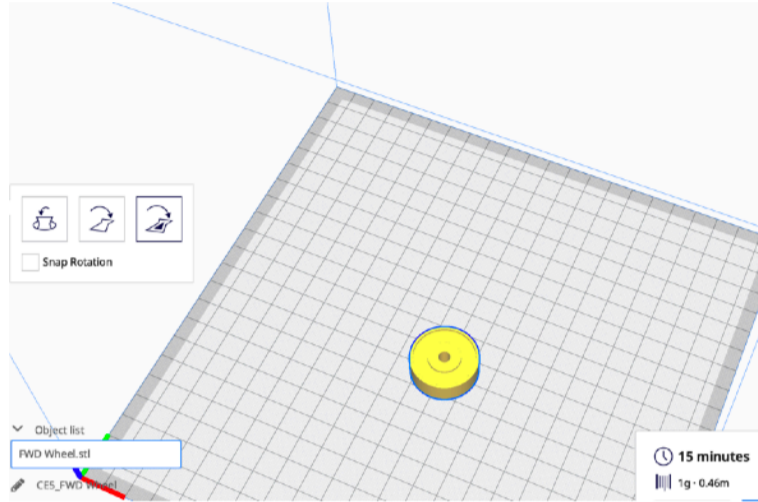




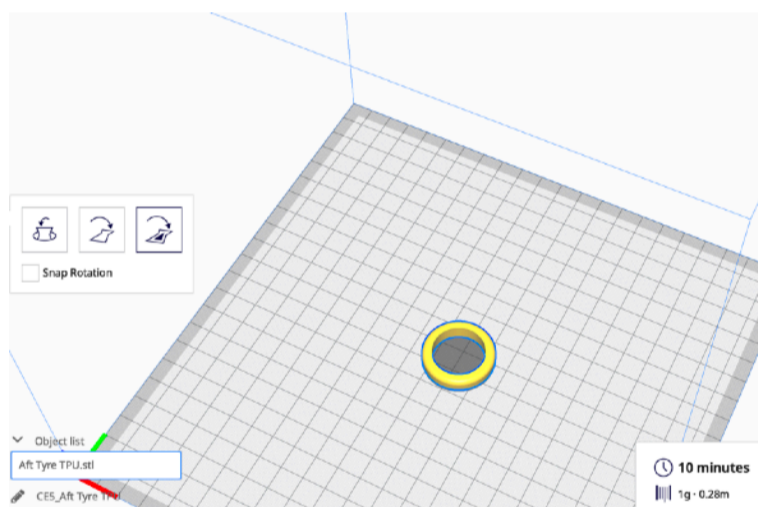
## FWD TYRE (TPU)



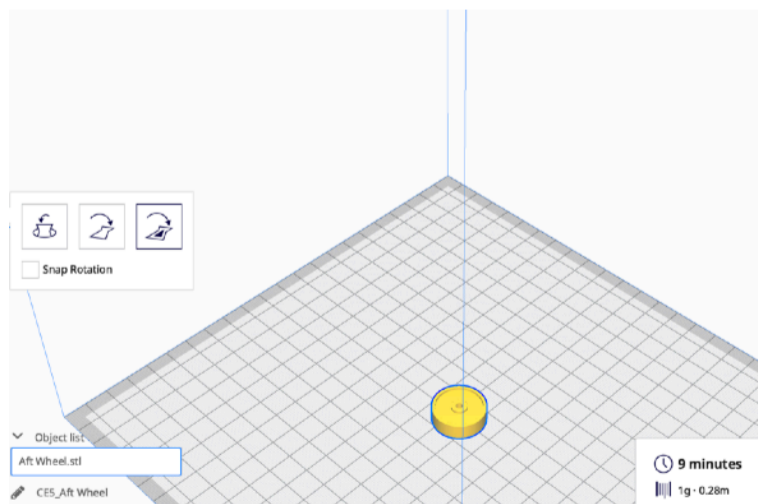
## FWD WHEEL (TPU)



## AFT TYRE (TPU)

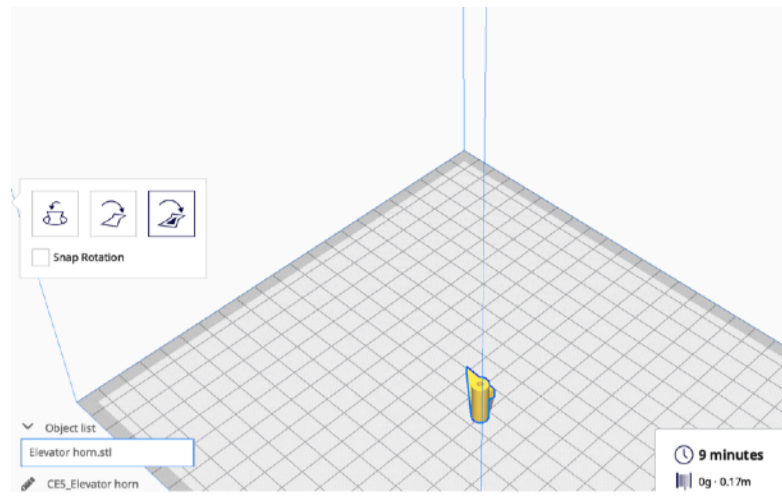


## AFT WHEEL (TPU)



# ELEVATOR CONTROL HORN

Infill 50%



# CONTROL LINKAGE

Infill 50%

