

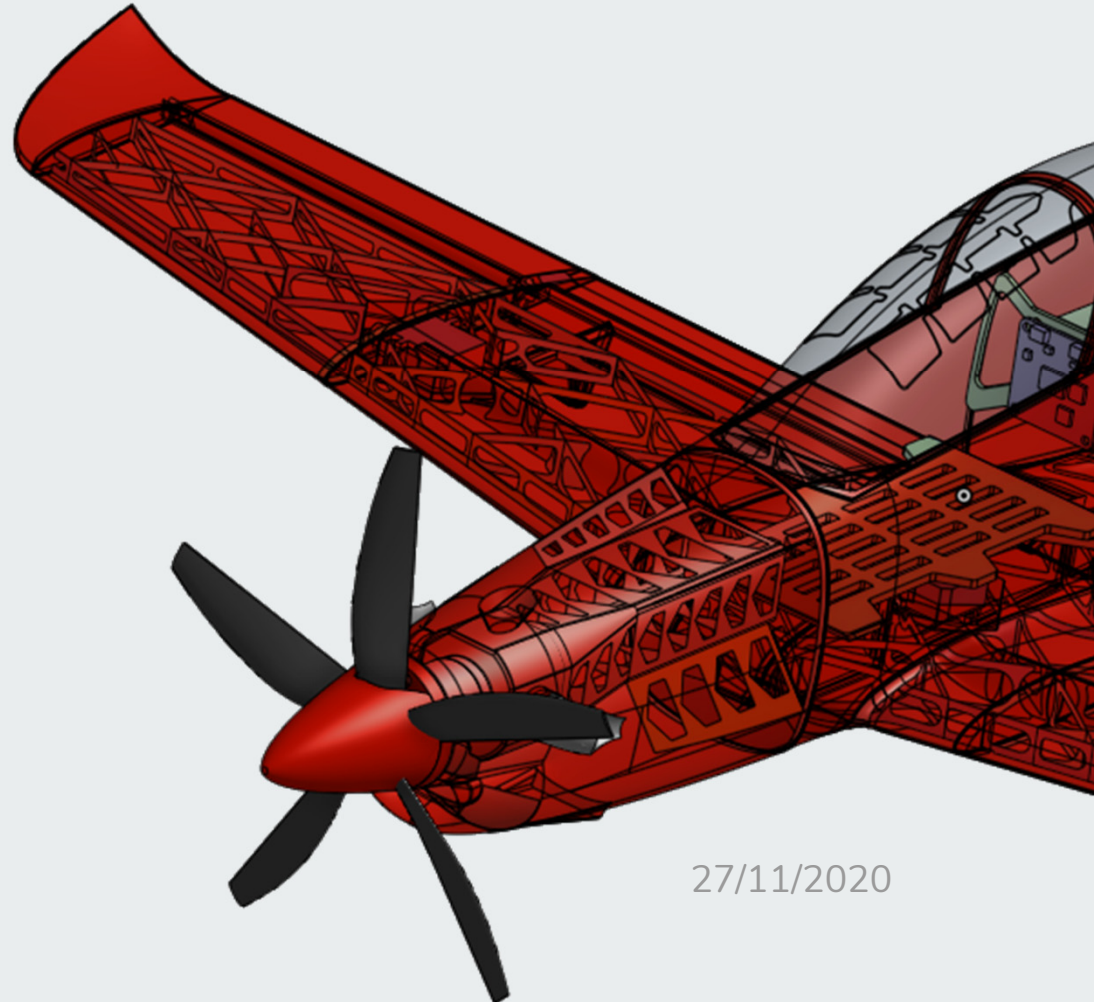
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# Pilatus PC-21

3D Printed RC model

By Ismaël “Khan” JUHOOR

27/11/2020





# Disclaimer and Warnings

This RC plane design is intended **for responsible people** knowing what they do !

RC planes can be dangerous to people and air traffic. It is assumed that you will **comply to your local flying regulations** and general common sense.

I (Ismaël JUHOOR, the author of this design) shall not, under any circumstances, be held liable for damage or injuries that could occur during building and flying this model.



# A few words from the designer

I've been longing to design, build and fly this plane ever since I fell in love with its sleek lines, performances and thrilling 5-bladed turboprop sound.

But I didn't want to keep it all to myself, so I designed the model always thinking about others RC modelers, keeping printing and assembly as easy as possible.

**I hope you'll enjoy flying yours !** If, despite all thinking, trying and correcting efforts done, something goes wrong, please do not hesitate to drop me a line, so that I can further polish the design.

And if everything goes well, [please drop me a line and maybe a photo](#) of your PC-21, I'd be most pleased.

Lastly, if you wish to support my work or want to say "thank you" please consider donating :



**Paypal Donation**

<https://paypal.me/pools/c/8uFpjS14XX>



# Copyright

RC Model Dimensioning : **Predim RC**

<http://rcaerolab.eklablog.com/predimrc-p1144024>

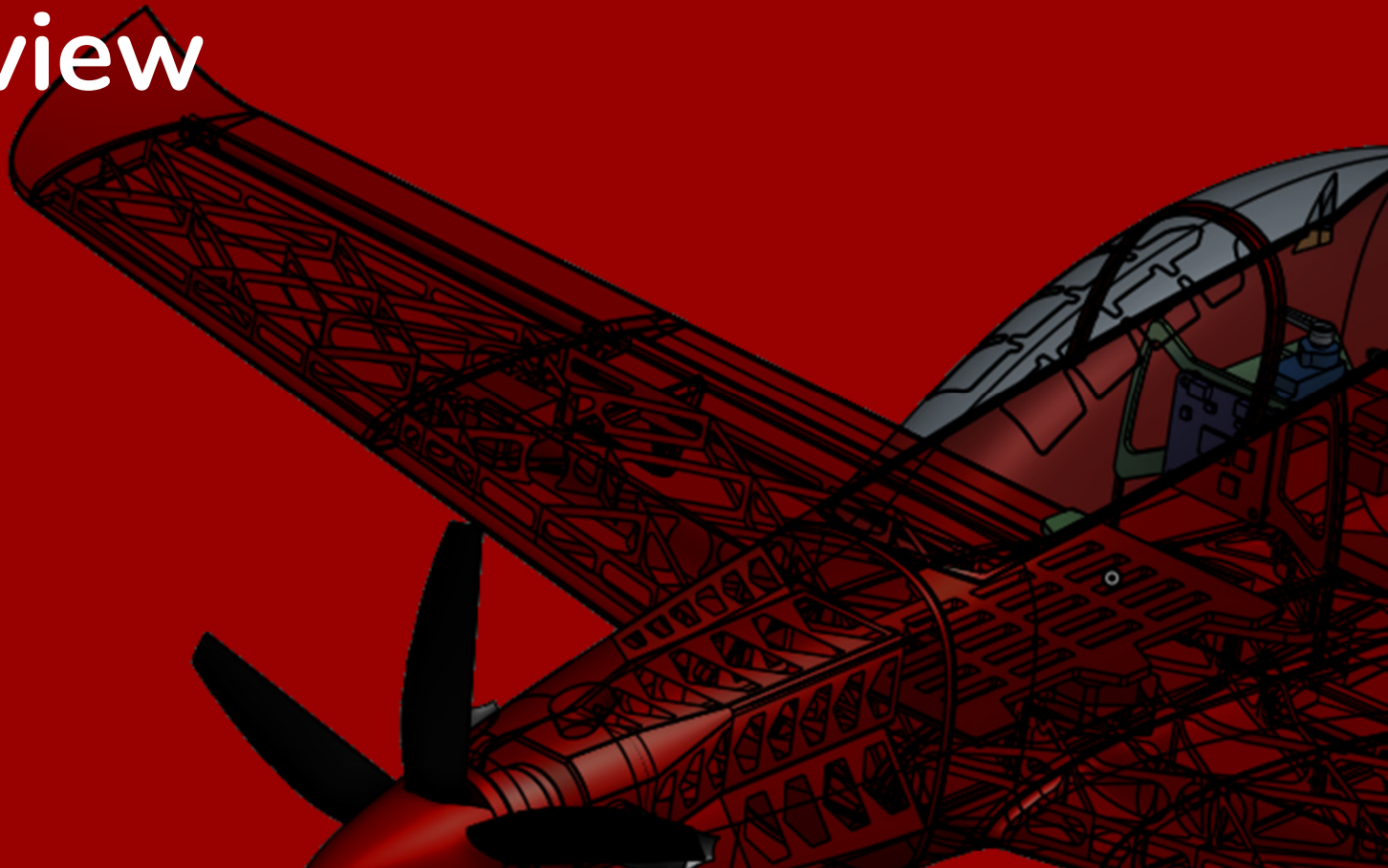
3D CAD Model : **Onshape**

<https://cad.onshape.com/documents/518f00669f7f83c9645e9f68/w/46a3c4874daffb0b36c9e2d4/e/4b63fad1c7efb76718940242>

This model was designed with a [free Onshape account](#), thus you are free to copy the Onshape document and work on it as you like, to customize the design for your equipment, for example.

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# Parts Overview



# Shopping list

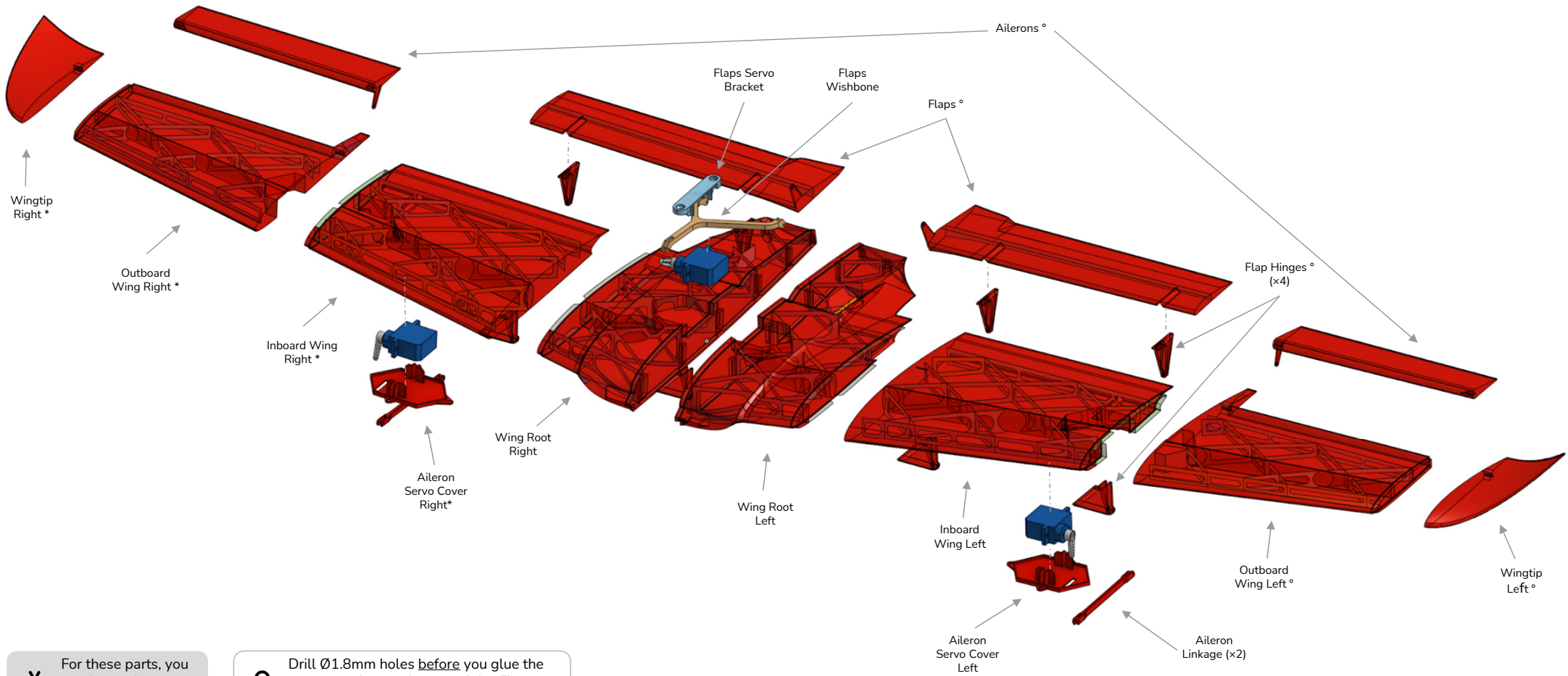
## Plane Parts

- 1× Battery : 1800-2200mAh 3S LiPo
- 1× Motor :
  - Emax GT2215-09 1180 kV
  - Propdrive v2 2830 1200KV
  - Sunnysky X2216 1250kV
  - Sunnysky X2216 1400kV
- 1× 40A ESC
- 1× Propeller :
  - 9x6
  - 8x6 (for high kV Motor)
- 5× 9g Servo
- 2× Ø1.8mm Carbon Rod (Min Length : 500mm)
- 4× Ø1.8mm Clevis
- 4× Canopy Magnets
  - Ø3×4mm Cylindrical
  - 3mm Cube
- 2× M3×10mm Cylindrical Head Nylon screw
- 2× M3 Nylon Nut
- 6× 1.5×6mm Countersunk Self-tapping Screw
- 5× 2×6mm Self-tapping Screw

## Tooling

- Rotary Power tool (A Dremel !)  
with Ø1,8mm drilling bit
- CyanoAcrylate Glue
- Hobby Knife
- Flush wire cutting pliers

# Wing Assembly

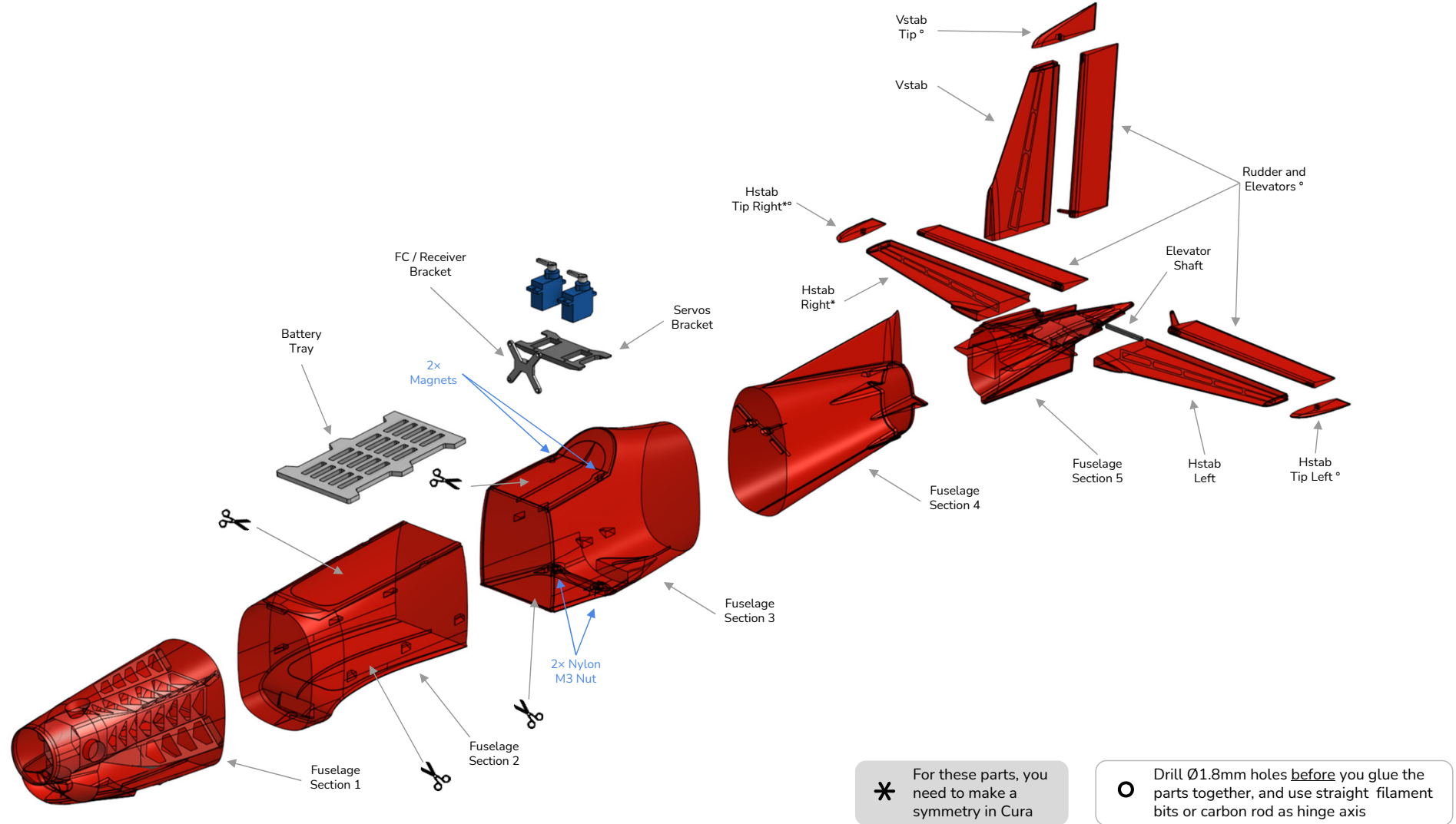


For these parts, you need to make a symmetry in Cura



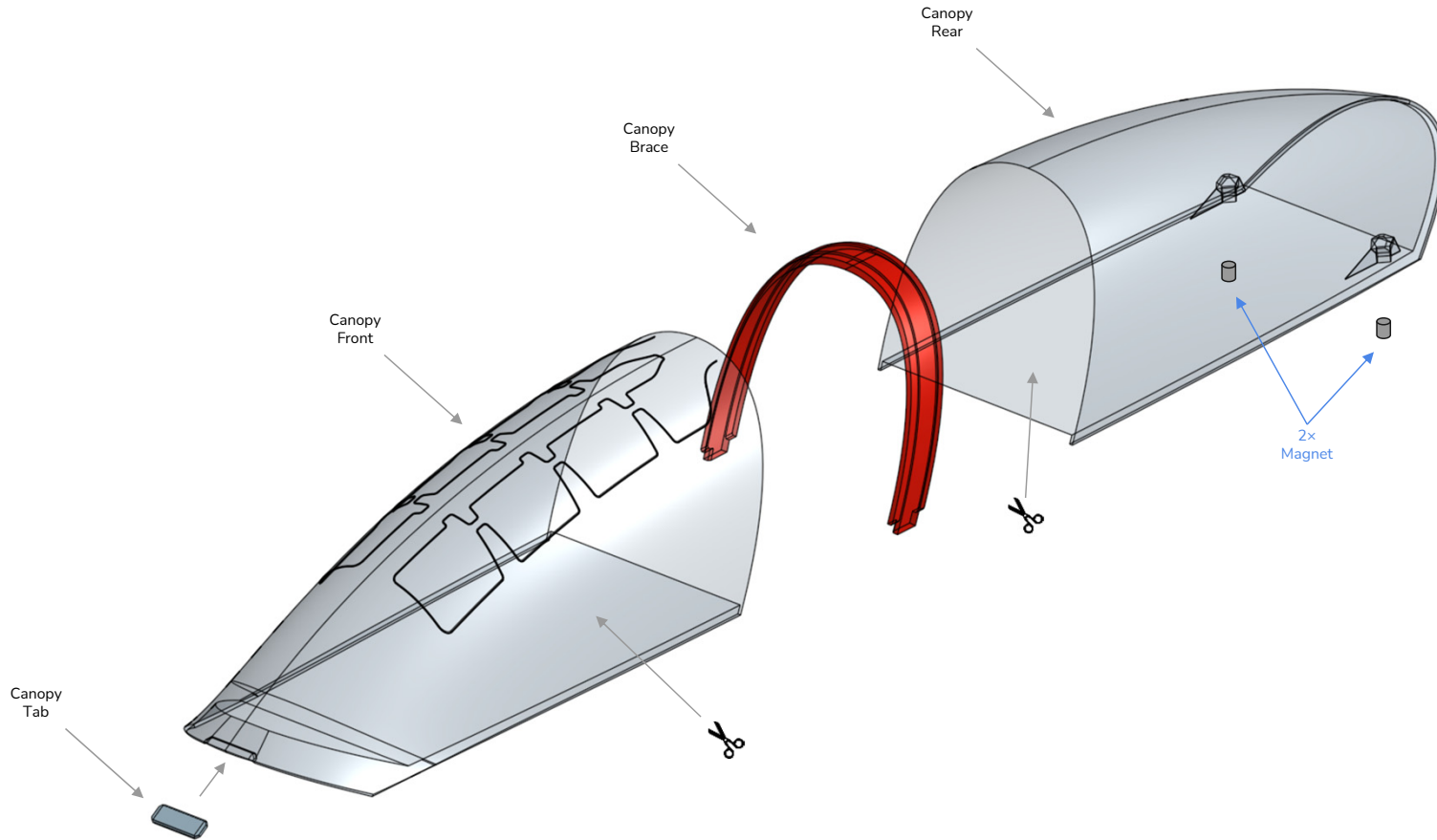
Drill Ø1.8mm holes before you glue the parts together, and use straight filament bits or carbon rod as hinge axis

# Fuselage Assembly

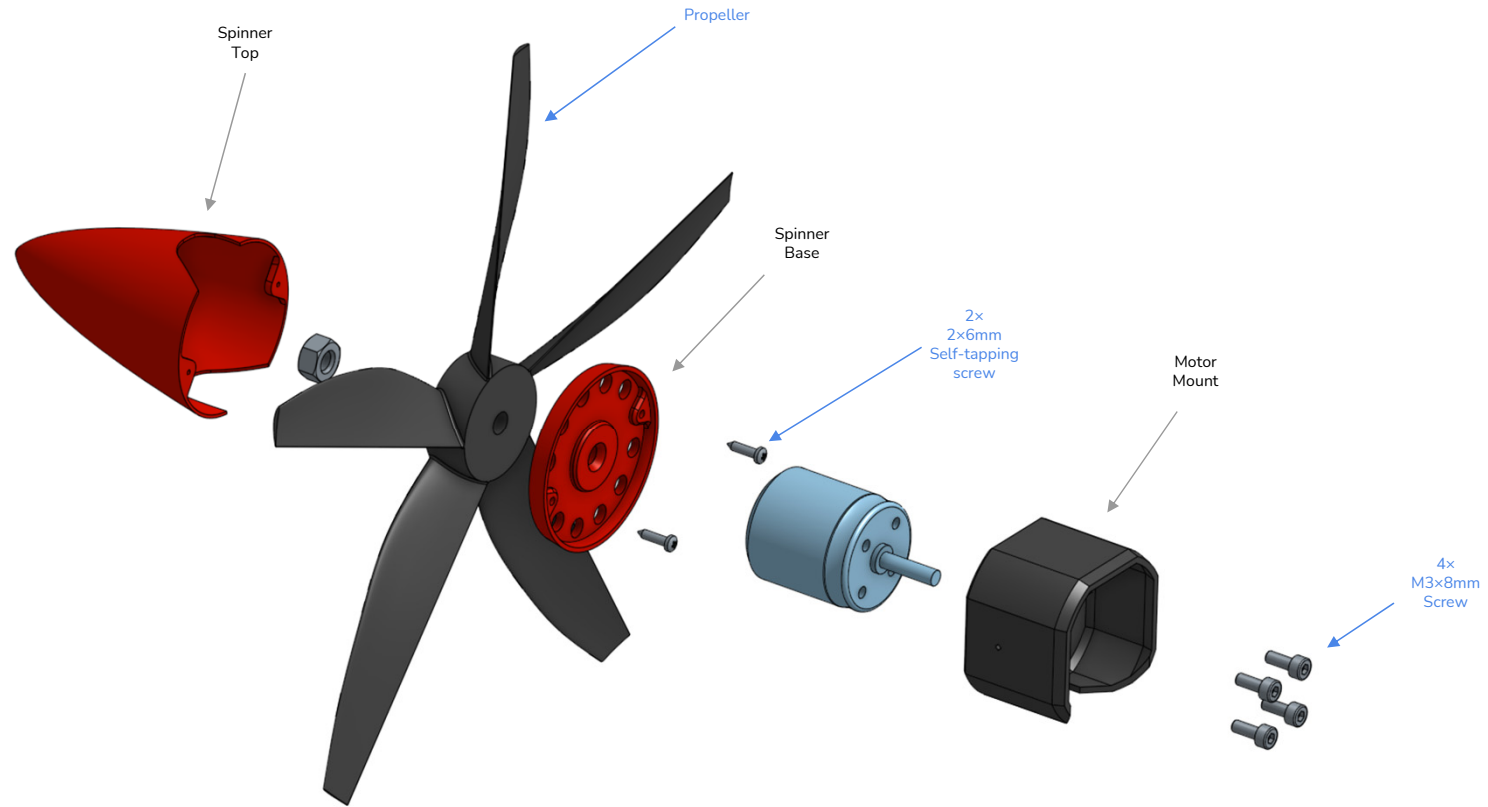




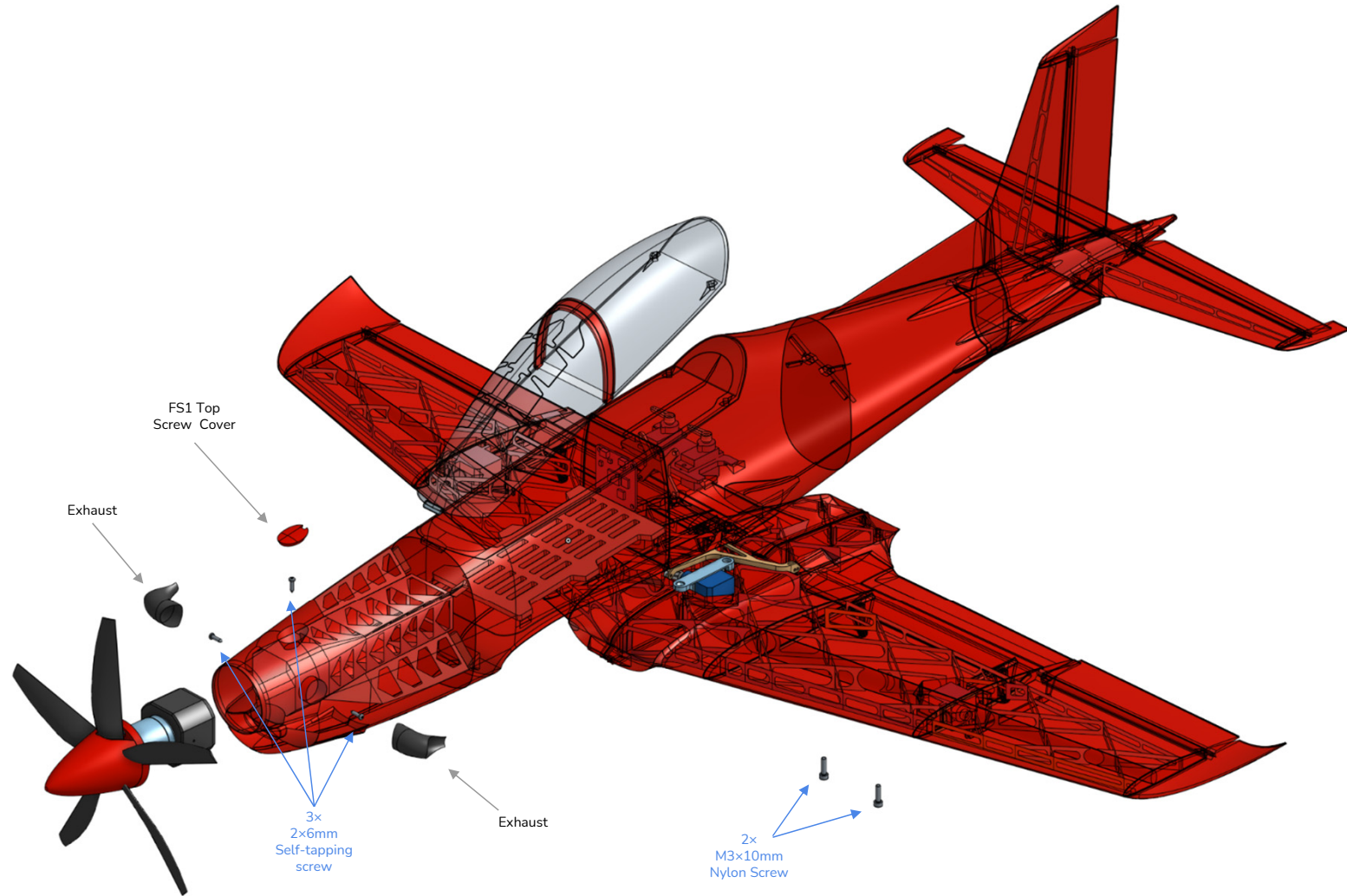
# Canopy Assembly



# Motor Assembly

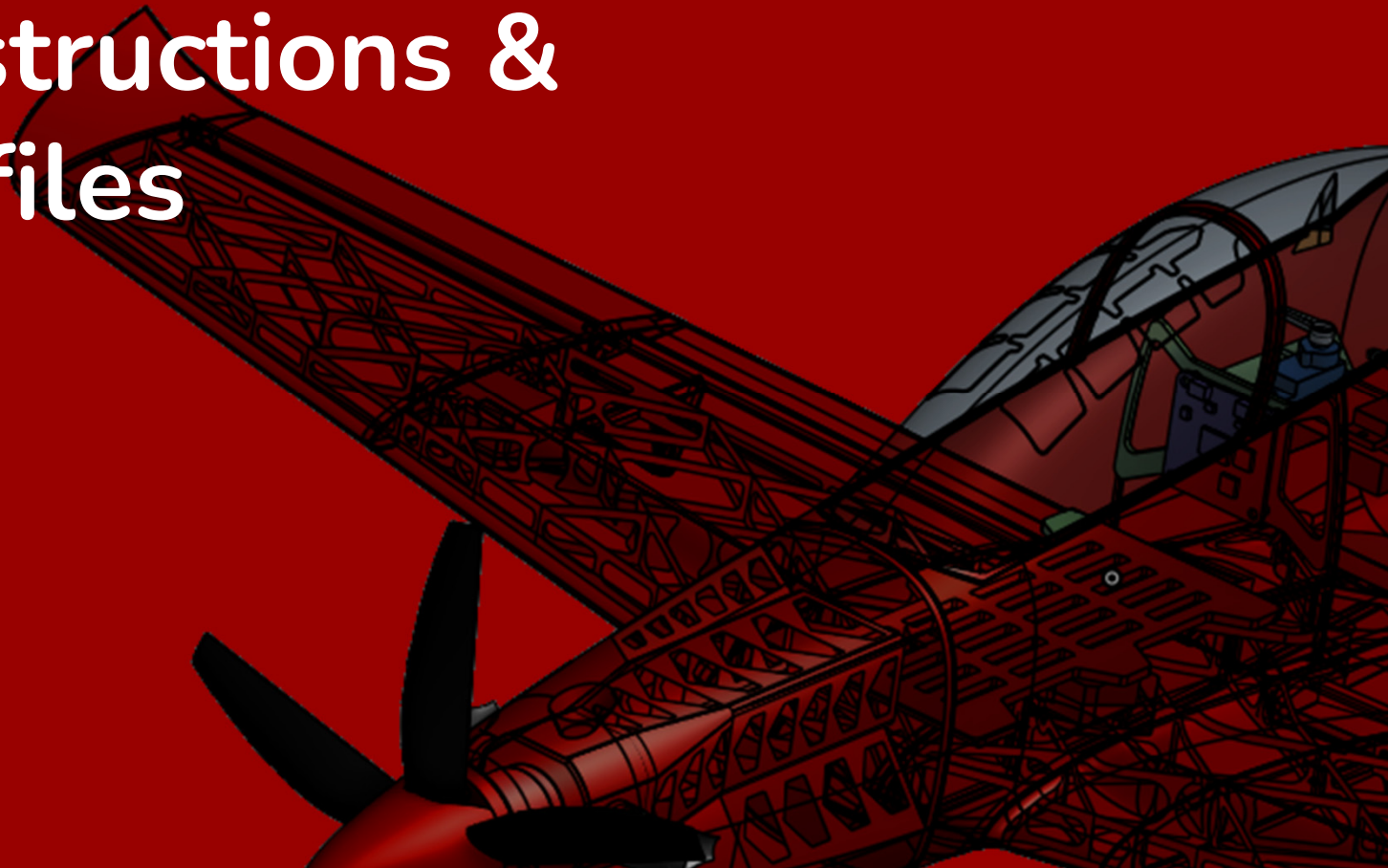


# Complete Assembly



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# Printing Instructions & Slicing Profiles





# Printing general advice

## Slicer :

Because the design uses CAD loose open surfaces for wing reinforcement and other features, you will need to use **CURA** (version 4.5 and upper) to slice this model. To this day AFAIK, no other slicer can work with loose surfaces.

## Filament :

Use quality, and most importantly, **dry** PLA. This is capital in achieving strong layer adhesion and blob-less single walled parts.

## Printer :

You'll achieve great printing quality with little hassle with a **direct drive** setup. That being said, I printed the prototype on a bowden printer (Anycubic i3 Mega) with good results, but that took some calibration efforts.

# Slicing Profiles

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# Hybrid 1

Start from a **standard profile** (0,2mm layer and 0,4mm line width),  
and modify the parameters  
with the following overrides :

## Shell

- Wall Line Count 1
- Top Layers 0
- Bottom Layers 0
- Compensate Wall Overlap Off
- Z Seam Alignment Sharpest Corner - Hide Seam

## Infill

- Infill density 0
- Infill Pattern N/A

## Travel

- Combing Mode Off

## Cooling

- Regular Fan Speed 0%
- Maximum Fan Speed 30%
- Regular/Maximum Fan Speed Threshold 3s
- Minimum Layer Time 5s
- Lift Head Off

These cooling parameters  
are a baseline, and will  
probably need to be  
adjusted depending on your  
specific machine setup.

## Mesh Fixes

- Union Overlapping Volumes Off
- Maximum deviation 0.04mm

## Special Modes

- Surface Mode Both



# Hybrid 2

Take your **Hybrid 1 profile**,  
and modify the parameters  
with the following overrides :

## Shell

- Top Layers
- Bottom Layers

2  
4





# Solid 1

Take your **Hybrid 1 profile**,  
and modify the parameters  
with the following overrides :

## Shell

- Top Layers 2
- Bottom Layers 2
- Compensate Wall Overlap On

## Infill

- Infill density 15%
- Infill Pattern Lines

## Special Modes

- Surface Mode Normal

Parts using this profile are not as critical as parts using Hybrid 1 profile, so feel free to tweak the parameters according to your experience and printing results.



# Solid 2

Take your **Hybrid 1 profile**,  
and modify the parameters  
with the following overrides :

## Shell

- Wall Line Count 2
- Top Layers 4
- Bottom Layers 4
- Compensate Wall Overlap On

## Infill

- Infill density 20%
- Infill Pattern Triangles

## Special Modes

- Surface Mode Normal

Feel free to tweak infill pattern and density values

# Wing Parts



Qty	Part	Print Time	Weight (g)	Printing Profile	Notes
1	Wing Root Left	2:27	25	Hybrid 1	Brim recommended
1	Wing Root Right	2:27	25	Hybrid 1	Brim recommended
2	Inboard Wing	1:36	34	Hybrid 1	
2	Outboard Wing	2:17	21	Hybrid 1	
2	Wingtip	0:16	4	Hybrid 1	Place seam on trailing edge, enhance part cooling
1	Flaps	1:45	23	Hybrid 2	Place seam on leading edge, enhance part cooling
1	Ailerons	0:59	12	Hybrid 2	Place seam on leading edge, enhance part cooling
2	Aileron Servo Cover			Hybrid 2	
4	Flap Hinges			Hybrid 2	Brim recommended, enhance part cooling
1	Flaps Wishbone			Solid 2	Can use PETG or ABS

# Fuselage Parts



Qty	Part	Print Time	Weight (g)	Printing Profile	Notes
1	Fuselage Section 5	1:02	14	Hybrid 1	
1	Fuselage Section 4	1:34	22	Hybrid 1	
1	Fuselage Section 3	2:39	31	Hybrid 1	
1	Fuselage Section 2	2:08	24	Hybrid 1	
1	Fuselage Section 1	3:17	37	Hybrid 1	
2	Hstab	0:47	8	Hybrid 1	
2	Hstab Tip	0:10	2	Hybrid 1	Place seam on trailing edge, enhance part cooling
1	Vstab	0:48	9	Hybrid 1	
1	Vstab Tip	0:10	2	Hybrid 1	Place seam on trailing edge, enhance part cooling
1	Rudder & Elevators	1:28	17	Hybrid 2	Place seam on leading edge, enhance part cooling
1	Elevator Shaft			Solid 2	
1	Battery tray			Solid 1	Can omit top layers, use PETG or ABS if you feel your battery can get hot
1	Receiver/FC Bracket			Solid 1	Can omit top layers
1	Servo Bracket			Solid 1	Can omit top layers
2	Exhaust			Hybrid 1	<b>Switch surface mode to “surface”</b> , use brim
1	FS1 Top Screw Cover			Solid 1	Can omit bottom layers

# Canopy & Motor Assembly parts



## Canopy parts

Qty	Part	Print Time	Weight (g)	Printing Profile	Notes
1	Canopy Rear	0:43	8	Hybrid 1	
1	Canopy Front			Hybrid 1	
1	Canopy Brace			Hybrid 2	Add 15% infill, Lines pattern
1	Canopy Tab			Solid 2	

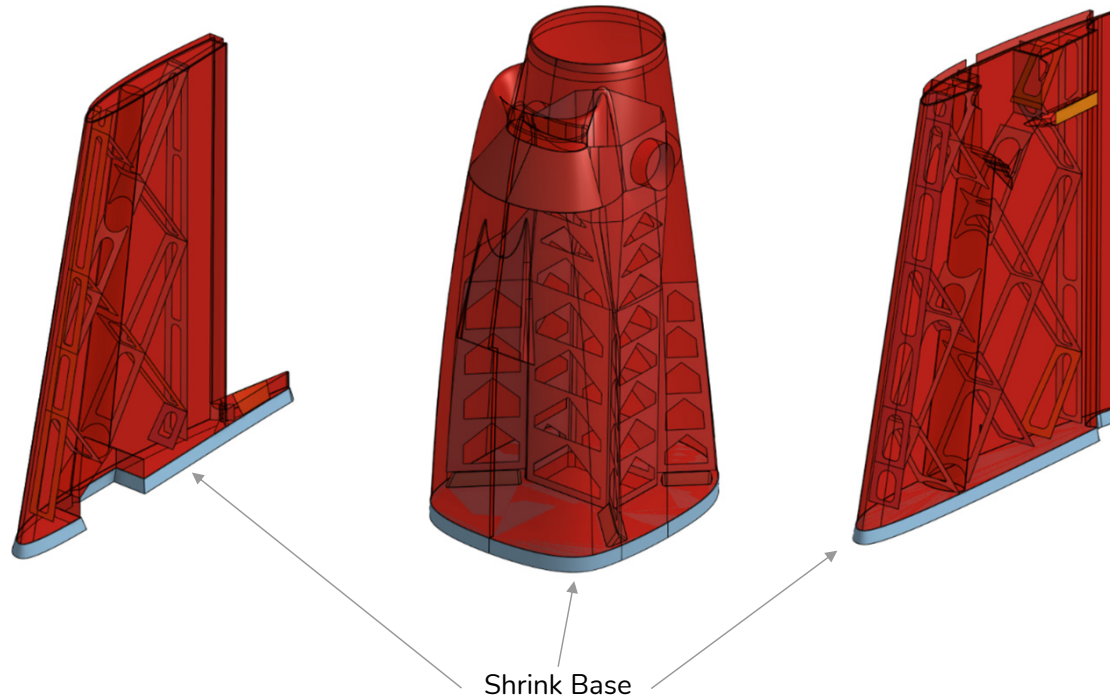
## Motor Assembly parts

Qty	Part	Print Time	Weight (g)	Printing Profile	Notes
1	Spinner Base		5	Solid 1	
1	Spinner		6	Solid 1	Use Support with a min. supported area of 2mm <sup>2</sup>
1	Motor Mount			Solid 2	Use PETG or ABS, adjust infill to your liking

# Separating supports

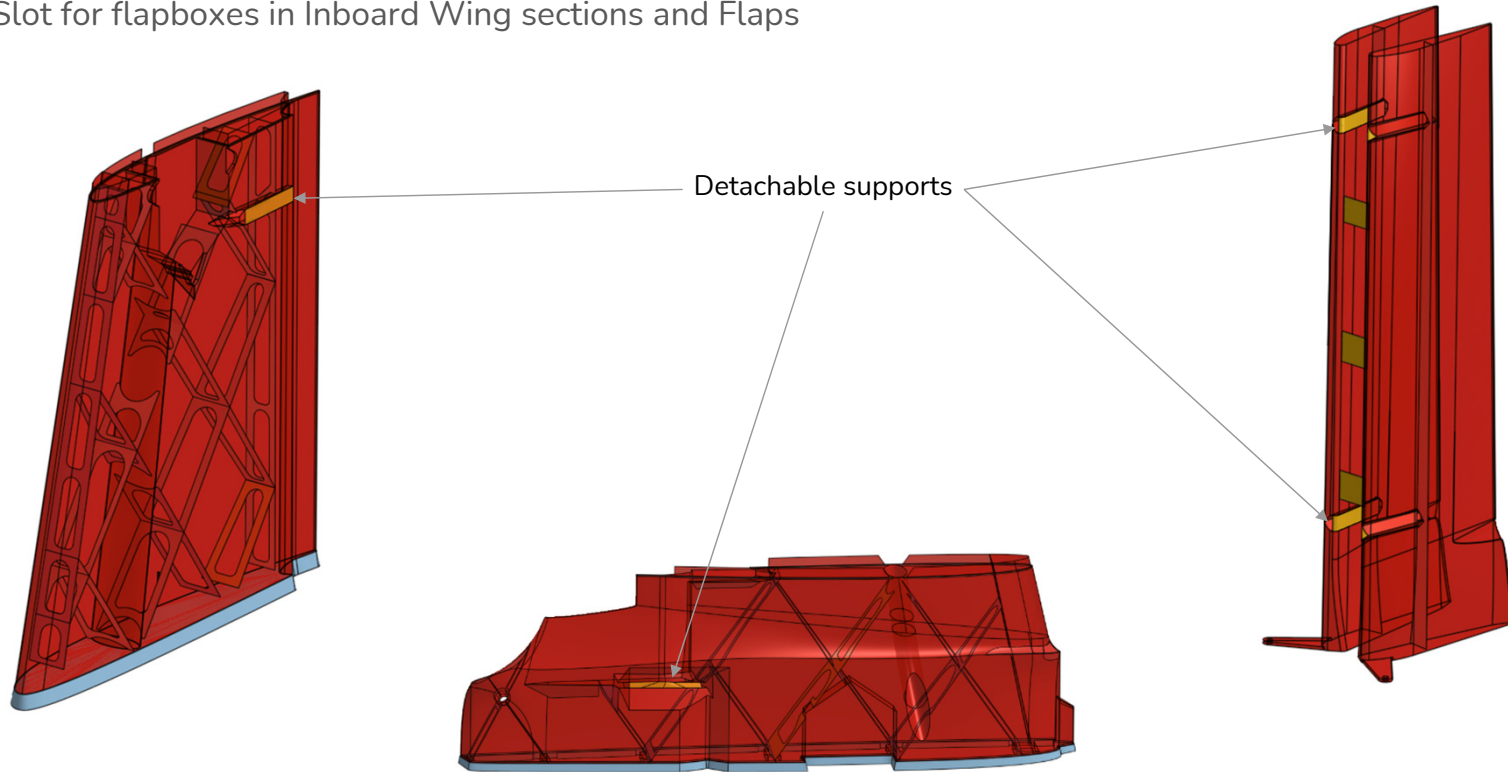
- Shrink Base

- Most tall parts have a 4-6 mm high “shrink base”, that you are meant to separate before assembly. It is designed to be slightly offset from the actual part.
- You can separate it easily if you first cut it open with a pair of clippers
- Examples :



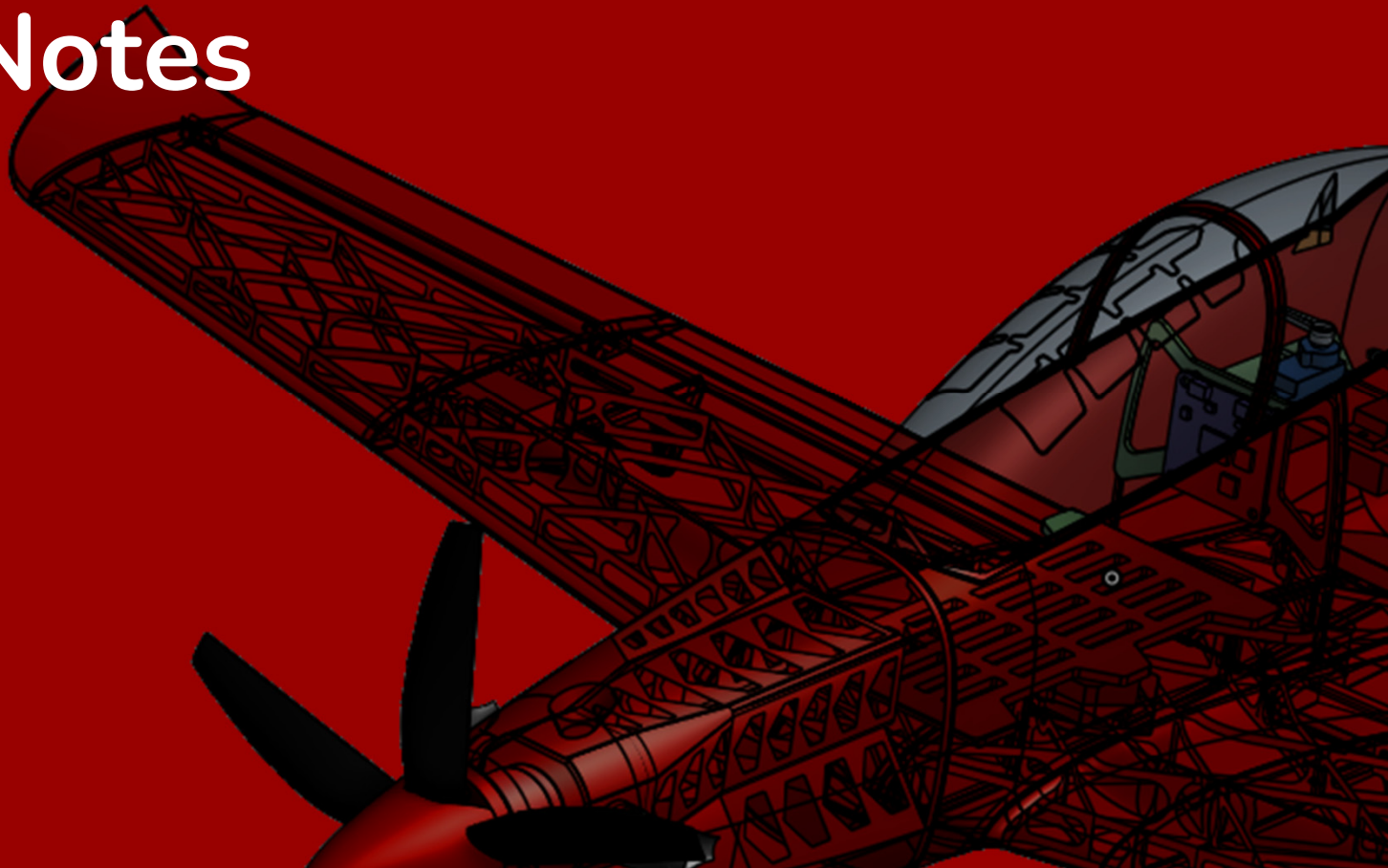
# Separating supports

- Detachable supports
  - Slot for flaps horn in Root sections
  - Slot for flapboxes in Inboard Wing sections and Flaps



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# Assembly Notes







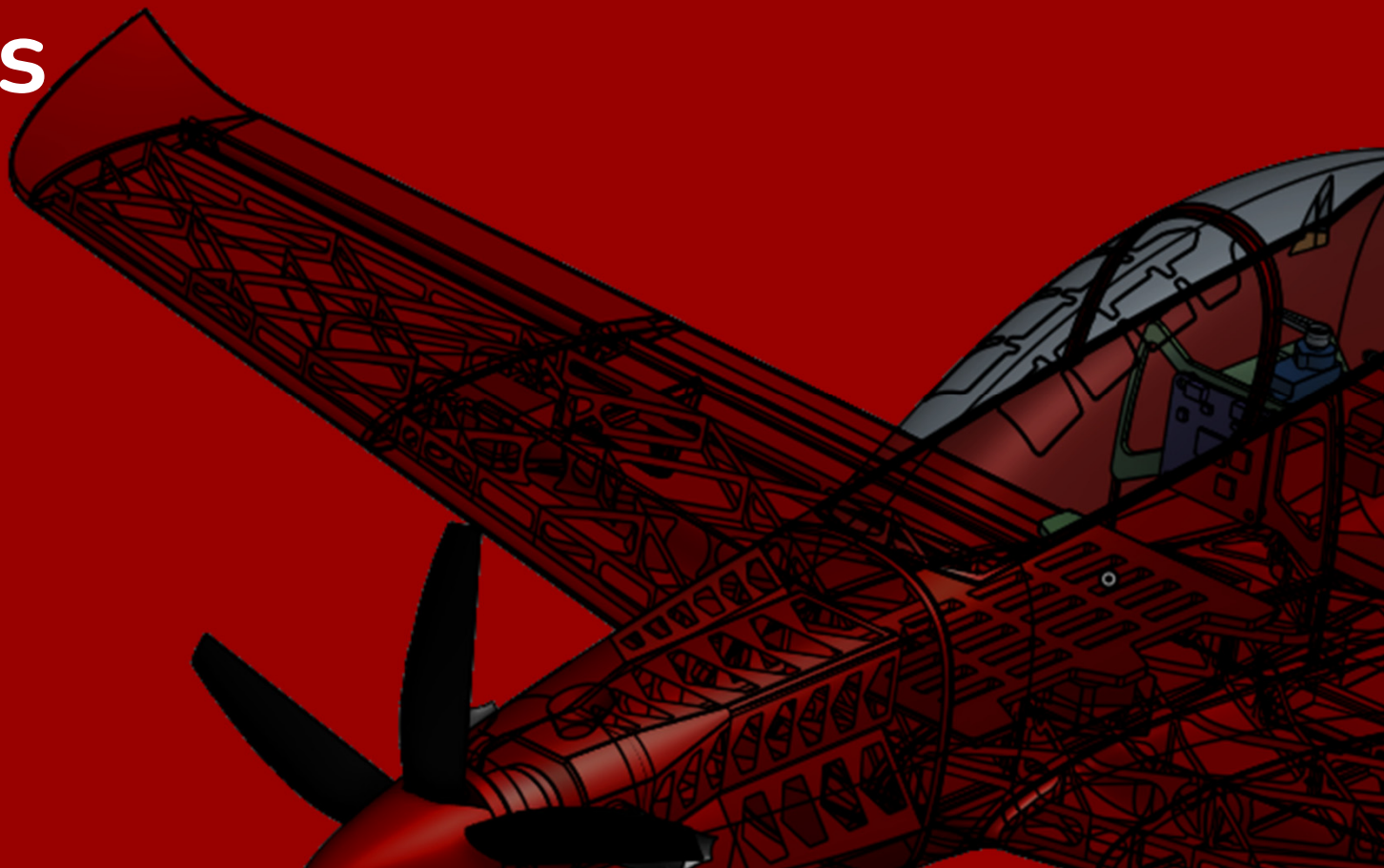
# Assembly general advice

## Dry-fitting:

Dry-fit all of your parts (hold them together with masking tape) before you glue them.

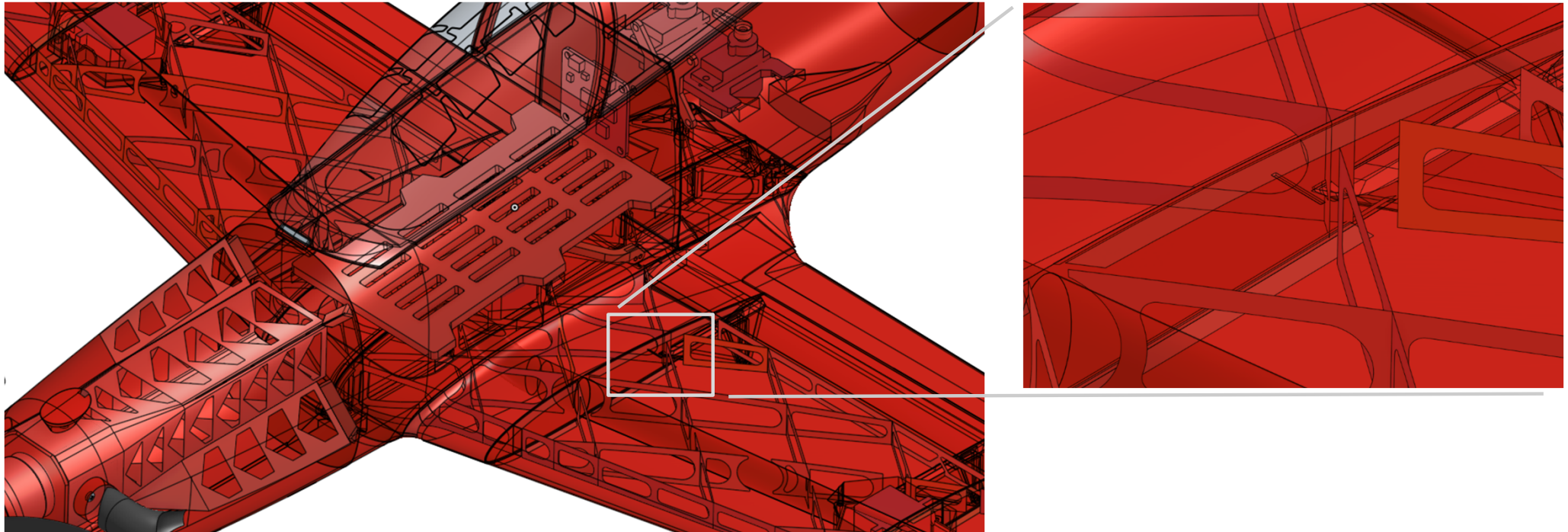
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# Flying notes



# Center of Gravity Location

The recommended Center of Gravity is marked by a crease on the upper surface of the wing root.



This mark is 94,2mm from Leading Edge at wing root, and gives you a 3% static margin.

⚠ CoG aft limit is 4.5mm behind that mark.

That's it !  
Enjoy your flights !

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