

# Rivus IV Instructions



## Specifications

Wingspan: 1008 mm

Length: 600 mm

Wing Area: 22.8 dm<sup>2</sup>

Wing Profile: MH60 (-2° washout)

Center of Gravity: 44 mm from leading edge (marked on bottom of wingB)

## Requirements

500g LW-PLA

100g PETG or PLA+

carbon fibre tube outer dia 8 mm, inner dia 6 mm, 800 mm long (spar)

carbon fibre rod 3 mm, 4x 50 mm (fin pins)

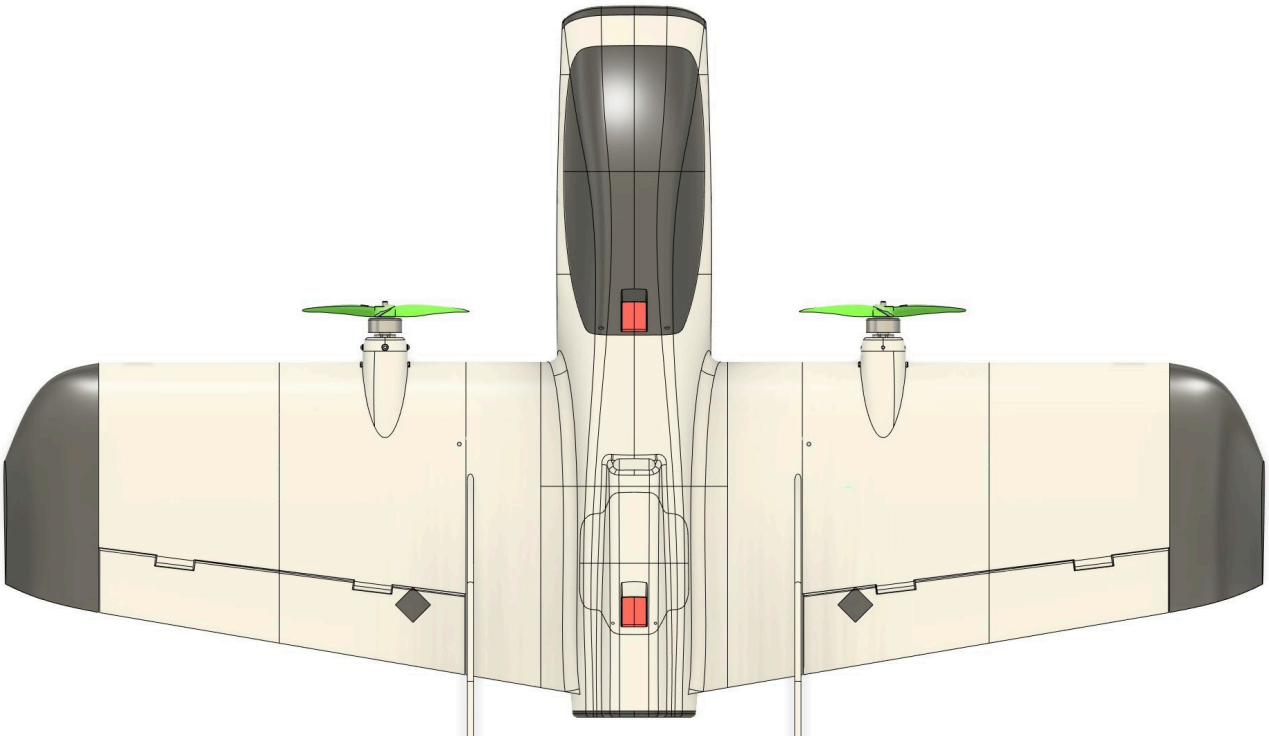
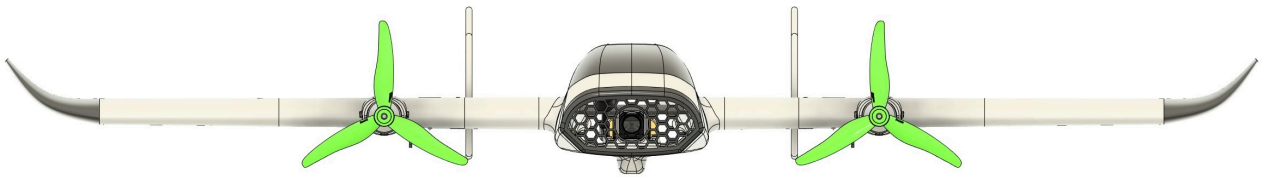
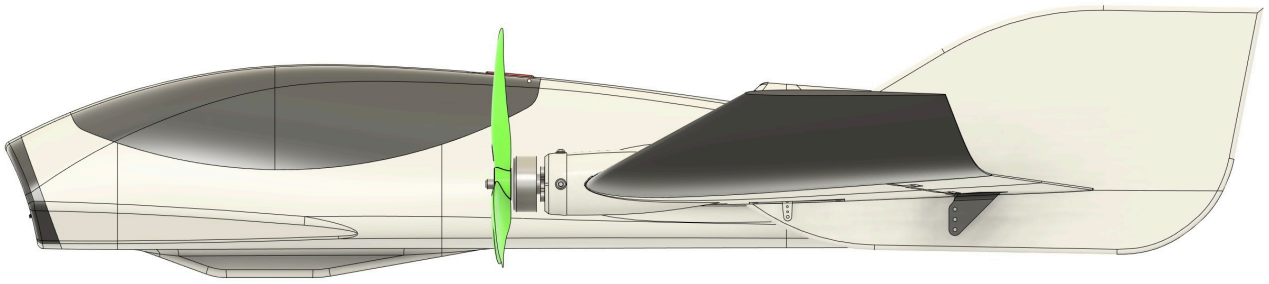
steel wire 1 mm, 1000 mm long (elevator hinges and canopy latch)

3x Ruthex M3 Inserts

3 mm self tapping screws

watch the Video on [Youtube](#)

and download the files on [cults3d.com](#)

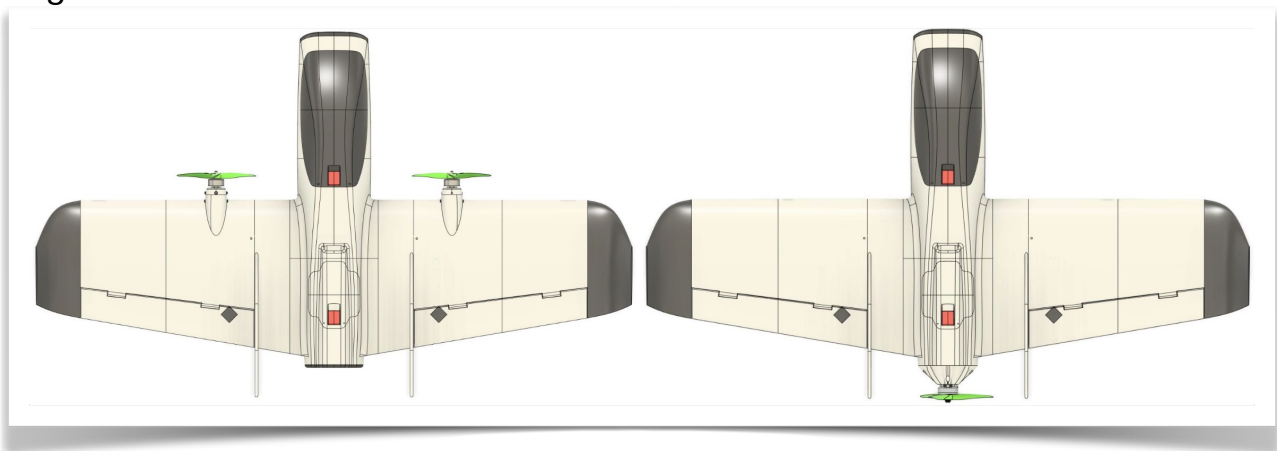


## Versions

You can build two different Versions of the Rivus IV.

The **Tractor Version** uses two typical 5" drone motors, like 2306 / 2000 kV or similar, mounted on fixed wing nacelles and is capable of vertical take-off and landing (VTOL) using a flight controller which supports tailsitters. The prototype is controlled by a **dRehmFlight VTOL** Flight Controller, based on a Teensy 4.0 and the MPU6050. Ardupilot or iNav can also be used.

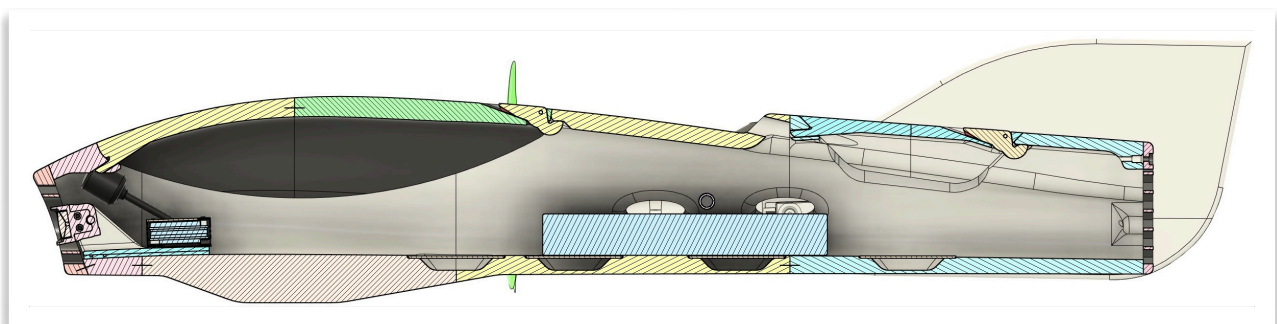
The **Pusher Version** uses a slightly bigger 2806 motor or similar and up to a 8" propeller. The motor is mounted at the rear end of the fuselage. This Version is not capable of vertical take-off and landing as two motors are needed for roll control in hover mode. But it is lighter, the CG is easier to get right and flight times will be longer.



Of course the two options can be combined in the "Ludicrous" Setup with all three motors installed for even more power and speed. The large wing will carry the extra weight without a problem, but you might want to consider using PETG or PLA+ for the whole plane instead of LW-PLA.

## FPV Setup

All version offer plenty of room in the nose for your FPV setup of choice. A holder for DJI FPV equipment is included. Big openings in the front and rear of the fuselage allow for good cooling of the video transmitter and ESCs.



## Printing LW-PLA

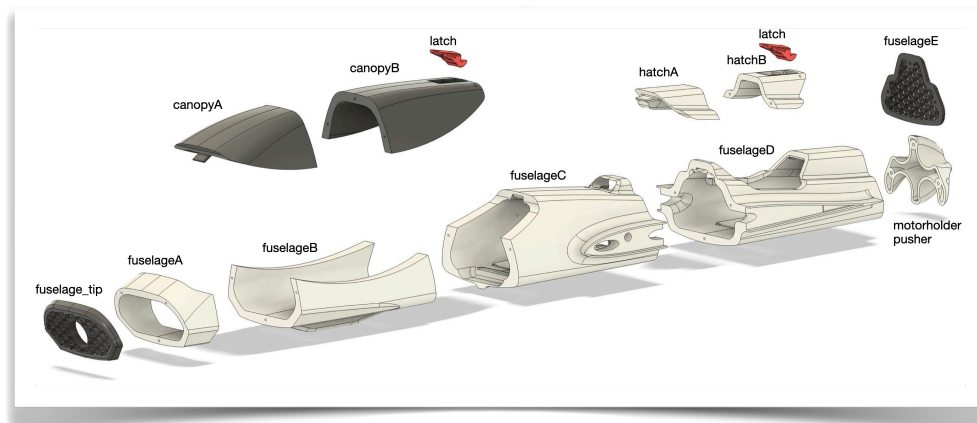
Light weight PLA uses active foaming technology for lighter parts. The two main parameters for the amount of foaming and strength of the parts are the material flow and printing temperature. On the prototypes of the Rivus IV LW-PLA from Colorfabb was used. By printing the parts with 48% flow at 250°C, usually combined with 2% Gyroid infill and a single perimeter, the lightest possible part can be printed, although the plane must be handled with care and will not be able to handle rough landings without damage.

Therefore it is recommended to print at a higher flow rate around 62% and lower temperatures around 230°C, but still keeping the settings of a single perimeter and 2% Gyroid infill. The parts will be 14% heavier (the flow rate directly influences the weight of the final part) but they will also be more durable.

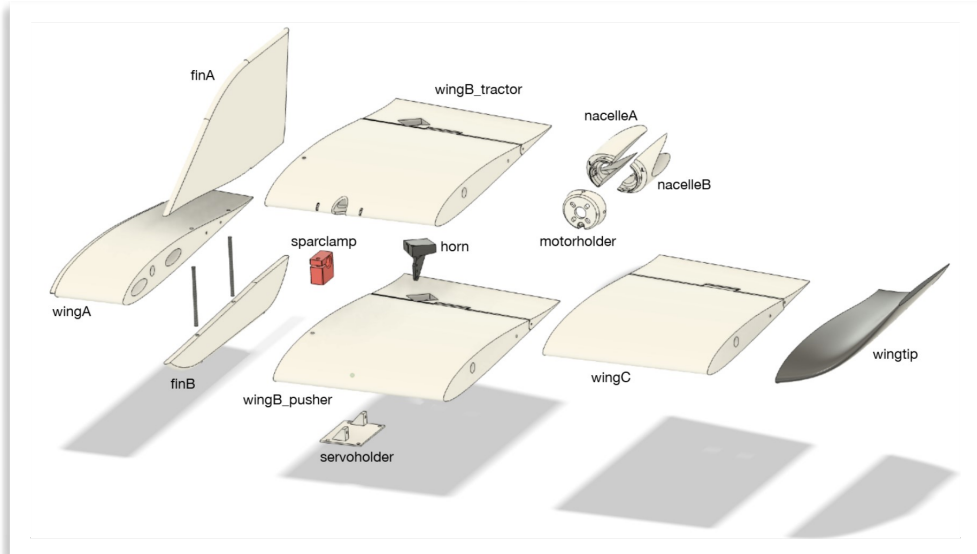
For even more strength there is the option to print the parts with two perimeters (and 3-4% Gyroid infill) at 48% flow at 250°C. This will drastically improve the surface quality of the prints and also strength, but will result in even heavier parts. Also the printing time will go up even more, especially as LW-PLA parts should always be printed one by one to reduce travel moves between the parts. No matter how fast your printer can produce "normal" parts the foaming process needs time and therefore LW-PLA can only be printed very slow.

As you can see in the printing table below, different print settings are used depending on the parts expected loads during flight. For example the part fuselageD is the same for the Tractor and the Pusher version, but should be printed with strong settings if you are planning the mount a pusher motor at some point as it carries the PETG printed motor holder with M3 screws and brass inserts. If you are only planning to build the VTOL Tractor version go for a light part and ignore the holes for the inserts. The hexagonal meshed fuselageE part can be glued with superglue.

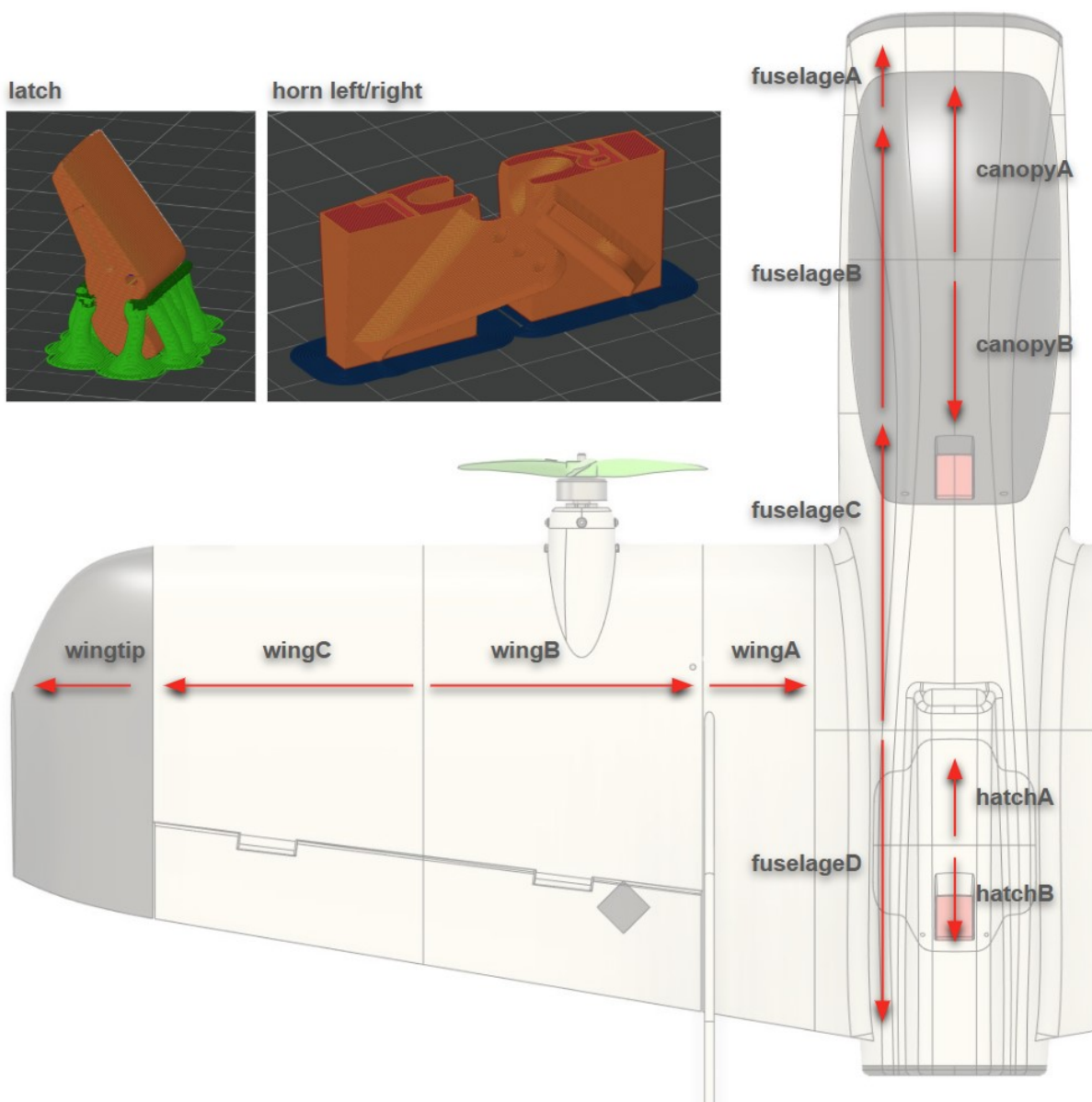
Fuselage	Material	flow	temp	layer height	Layers			Infill	Support	weight
					Bottom	Top	Perim			
fuselage_tip_FPV	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	9,6 g
fuselageA	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	11,2 g
fuselageB	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	26,1 g
fuselageC	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	48,0 g
fuselageD (for tractor version)	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	43,0 g
fuselageD (for pusher version)	LW	48%	250°C	0,24 mm	1	3	2	4% Gyroid	no	60,0 g
fuselageE_hexagon	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	6,6 g
canopyA	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	13,4 g
canopyB	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	15,1 g
hatchA	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	5,0 g
hatchB	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	5,0 g
latch	PETG	95%	255°C	0,20 mm	1	5	2	15% rect.	tree	4,0 g
velcroplate	PETG	95%	255°C	0,20 mm	2	2	2	30% rect.	no	4,4 g
motorholder_pusher	PETG	95%	255°C	0,20 mm	3	3	3	50% rect.	no	29,0 g



Wing	Material	flow	temp	layer height	Layers			Infill	Support	weight
					Bottom	Top	Perim			
wingA	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	22,3 g
wingB_tractor	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	39,5 g
wingB_pusher	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	38,0 g
wingC	LW	62%	230°C	0,24 mm	1	3	1	2% Gyroid	no	30,5 g
wing_tip	LW	48%	250°C	0,20 mm	1	3	1	2% Gyroid	no	14,4 g
finA	LW	48%	250°C	0,24 mm	2	3	2	5% Rect.	no	14,7 g
finB	LW	48%	250°C	0,24 mm	2	3	2	5% Rect.	no	6,4 g
servoholder	PETG	95%	255°C	0,20 mm	3	5	2	15% rect.	no	4,0 g
spar_clamp	PETG	95%	255°C	0,20 mm	3	5	2	80% rect.	no	4,0 g
nacelle	PETG	95%	255°C	0,20 mm	3	5	2	15% rect.	optional	15,0 g
motormount	PETG	95%	255°C	0,20 mm	3	5	2	15% rect.	no	3,9 g
horn	PETG	95%	255°C	0,20 mm	3	5	2	15% rect.	no	2,0 g



## print directions



### Fuselage

Print and glue parts fuselageA, B, C and D using 8 mm short filament pieces and superglue.

fuselage\_tip is available as FPV version with a circular camera cutout in the middle for FPV setup or closed.

fuselageE is only used for Tractor setup.

Up to four velcro plates can be glued in the fuselage depending on battery placement determined later when the airplane is finished and the center of gravity can be determined by balancing the plane on the CG knobs under the wing - see section „battery placement“. The velcro plate can also be used as a mounting base for the flight controller. It's a simple rectangular part measuring 60x48 mm with a thickness of 1.2 mm. You can design your own plate for your specific flight controller and use in any one of the four locations in the fuselage.

## Canopy / hatch

Print and glue parts canopyA and B using 8 mm filament pieces and superglue.

Print and glue parts hatchA and B using 8 mm filament pieces and superglue.

Print 2x latch in the recommended orientation with tree supports and use 1 mm steel wire as hinge to mount on canopy and hatch.

The length of the hinge wire is 50 mm for the canopy and 32 mm for the hatch.

## Wing

Print wingA, finA and finB. Cut 4 pieces of 3 mm carbon rod 50 mm long and insert two into the holes of each finB part. Slide pins through wingA from the bottom and glue into place. Slide and glue finA onto carbon rods.

Print wingBpusher or wingBtractor according to the version you are building.

Insert and glue control horns into elevons before removing elevons from wing. The horn must stick out at the bottom of the wing.

Cut elevon from wingB and wingC by using a sharp knife next to the hinge sections. Do not use the knife to cut the whole length of the elevon. Carefully move the elevon up and down to brake the small tabs holding the elevons to the wing. Clean the cut surfaces with a sharp knife.

Use 8/6 mm carbon fibre tube and a 8 mm short piece of filament to position the wing sections in place.

**Do not glue the carbon fibre tube to any of the wing sections!**

Glue the two elevon parts together up side down on the workbench and test fit a 1 mm steel wire. Hinge the elevon to the wing using a 380 mm long piece of the steel wire. Bend a 10 mm long section by 90° at one end, which is glued in place on the most inner surface of part wingA. The steel wire should extend a few millimeters into the wingtip which acts as the last hinge point for the elevon.

Insert M3 locknut into each sparclamp and insert the sparclamp into wingB from the bottom and hold in place with M3x20 screw from top of wing.

## Nacelles Tractor Version

Each Nacelle part is marked in the front with L or R. Glue the two L parts and R parts with superglue and make sure the parts are not shifted. You can use part motorholder tractor to help with alignment, but do not glue this part to the nacelles. Glue Nacelles to correct wing between the small ribs on part wingB.

Mount motor to motorholder from the inside using Loctite and M3 screws supplied with the motor. Be careful not to damage the windings of the motor. Lengthen motor wires for ESC to be placed just inside the fuselage. Use 3 mm self tapping screws to mount motorholders to nacelles.

## Battery placement

Batteries up to a max. height of 23 mm can be mounted anywhere needed for correct center of gravity. A 4s Li-Ion pack in flat configuration with 21700 cells is just one of many options. Bigger batteries can be mounted in front or behind the spar.

The pusher version needs more weight in front of the spar, which usually means that ESC and FC are in the rear part of the fuselage and the battery in front of the spar with FPV stuff in the nose. The tractor version usually balances with all printed parts, motors and ESCs just around the CG. This means that the FPV equipment and FC are in the nose and the battery is placed directly behind the spar.

## dRehmFlight VTOL Flight Controller by Nicholas Rehm

dRehmFlight is a simple, bare-bones flight controller intended for all types of vertical takeoff and landing (VTOL) vehicles from simple multirotors to more complex transitioning vehicles with a small amount of user modification. This flight controller software and hardware package was developed with people in mind who may not be particularly fluent in object-oriented programming, or software development in general. Other flight controller packages work well for very specific applications, but their extensively developed code bases are not friendly to newcomers looking to hack something together for their new and unique VTOL platform.

[dRehmFlight VTOL](#)



Wolfgang „WOV“ Vogel, 2025  
<http://www.youtube.com/@3dcadfreak611>  
[3dcadfreak@gmail.com](mailto:3dcadfreak@gmail.com)