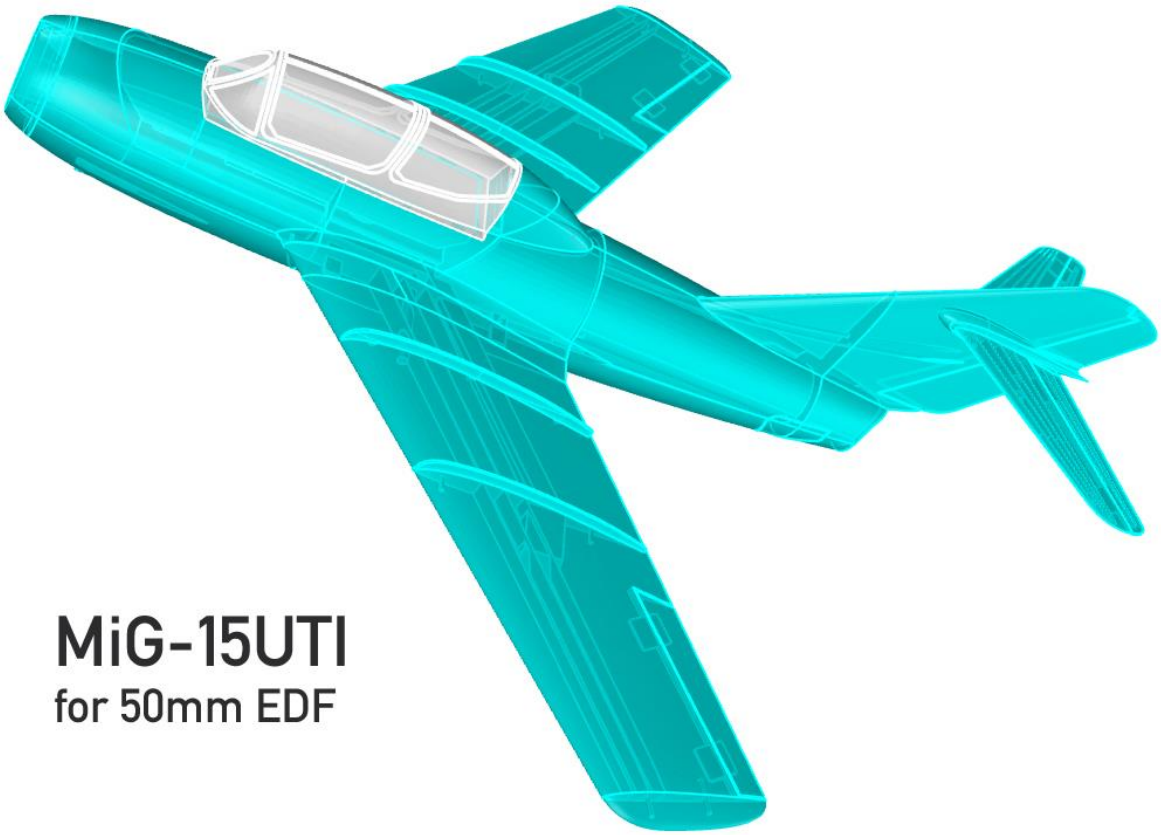


MiG-15UTI
for 50mm EDF

SCALE	1/13.5 approx
WINGSPAN	750mm (29.5 inches)
FLYING WEIGHT	640g (22.5 ounces)
WING AREA	160 SQ IN
WING LOADING	20 OZS/SQ FT
EDF	X-FLY Galaxy or FMS 50mm EDF or similar 4S unit
LIPO	4S x 1300mAh

Mig-15UTI - history

First flying in 1949, the MiG-15 UTI (dubbed “Midget” by NATO) was a two-seat trainer development of the MiG-15 (“Fagot”), which took to the air a year and a half after the single-seater Installation of the second seat required a small plug in the front fuselage along with space behind the standard cockpit being rearranged, at the expense of fuel tankage..Many MiG-15UTIs carried a variety of under-wing auxiliary fuel tanks to make up for this shortfall.

The rear cockpit was slightly raised to give the instructor a better view. Largely due to the drag from the poor shape of the extra cockpit, the high-speed performance was significantly worse than the single-seat Mig-15, but combat handling characteristics were identical.

Ultimately, the MiG-15 UTI had a longer production run and in greater numbers than the single-seater, thus becoming one of the world’s most-produced jet aircraft. At the time of writing the MiG-15UTI is still in use as a military jet trainer in North Korea, nearly 75 years after its first flight.

NOTES ABOUT THE DESIGN PROCESS AND PRINTING OPTIONS:

The MiG-15UTI files include G-code files and .3MF files for all parts, sliced on the free Prusa slicer (version 2.5.2).

In the first instance, the G-code files should be generic enough to give acceptable results when loaded directly on a cartesian printer with at least a 200 x 200 x 200mm build volume, with direct drive or Bowden extruder, but individual results may vary.

Alternatively, the Prusa slicer is easy to use, to load the corresponding part .3MF file as a project, and to change any applicable settings that are not working for your specific print job. These parts have not been tested in other slicers, so for predictable results the Prusa slicer should be used if the G-codes do not give a satisfactory result.

Except for the nose inlet, integrated motor mount, canopy, and wing &fuselage joiners which are in normal PLA, all parts are printed from LW-PLA. Clear Gorilla Glue is a good alternative to CA and accelerator for joining LW-PLA parts.

The LW-PLA components were printed with E-Sun LW-PLA which gave excellent results. E-Sun PLA+ was used for PLA parts and can be recommended. Other filaments may require a small adjustment to print temperatures and/or extrusion multiplier to give similar results.

Design methodology:

This model has been designed so that all components are solids and are printed with an outer skin and internal infill. Depending on variables such as nozzle condition, extruder condition, bed temperature sensor accuracy, filament condition etc. it may be necessary to tweak some of the print settings to give the best results. The .3MF files when loaded as a project into Prusa slicer will populate the Print Settings, Filament Settings and Printer Settings with the generic values generated by the designer, as well as loading the component STL file.

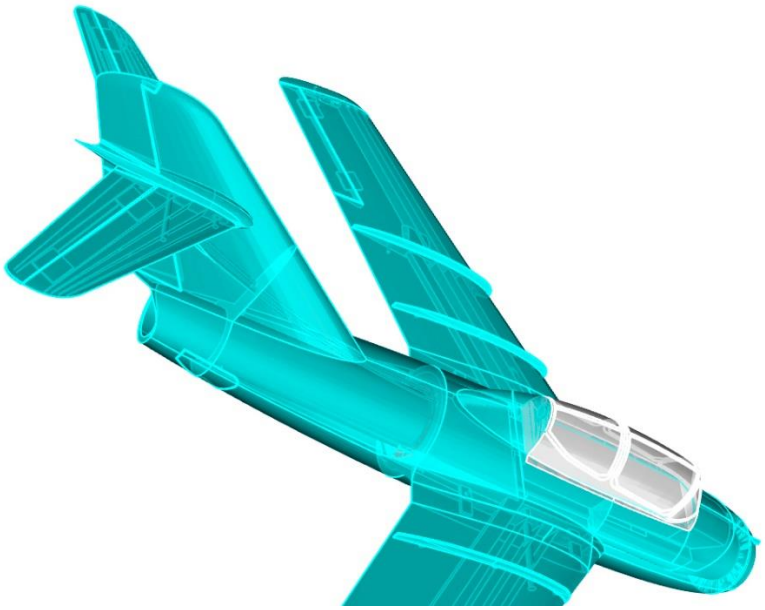
The drop down “Printer Settings” menu can be used to load the default settings specific to your printer (such as prime line G-code etc.) This may be helpful especially for Bowden printers. Additionally, any changes that you make in the Print Settings menus or Filament Settings menus can be saved (if desired) under another name from the “Save Current….” option adjacent to the drop-down menu boxes at the top left of the Prusa window.

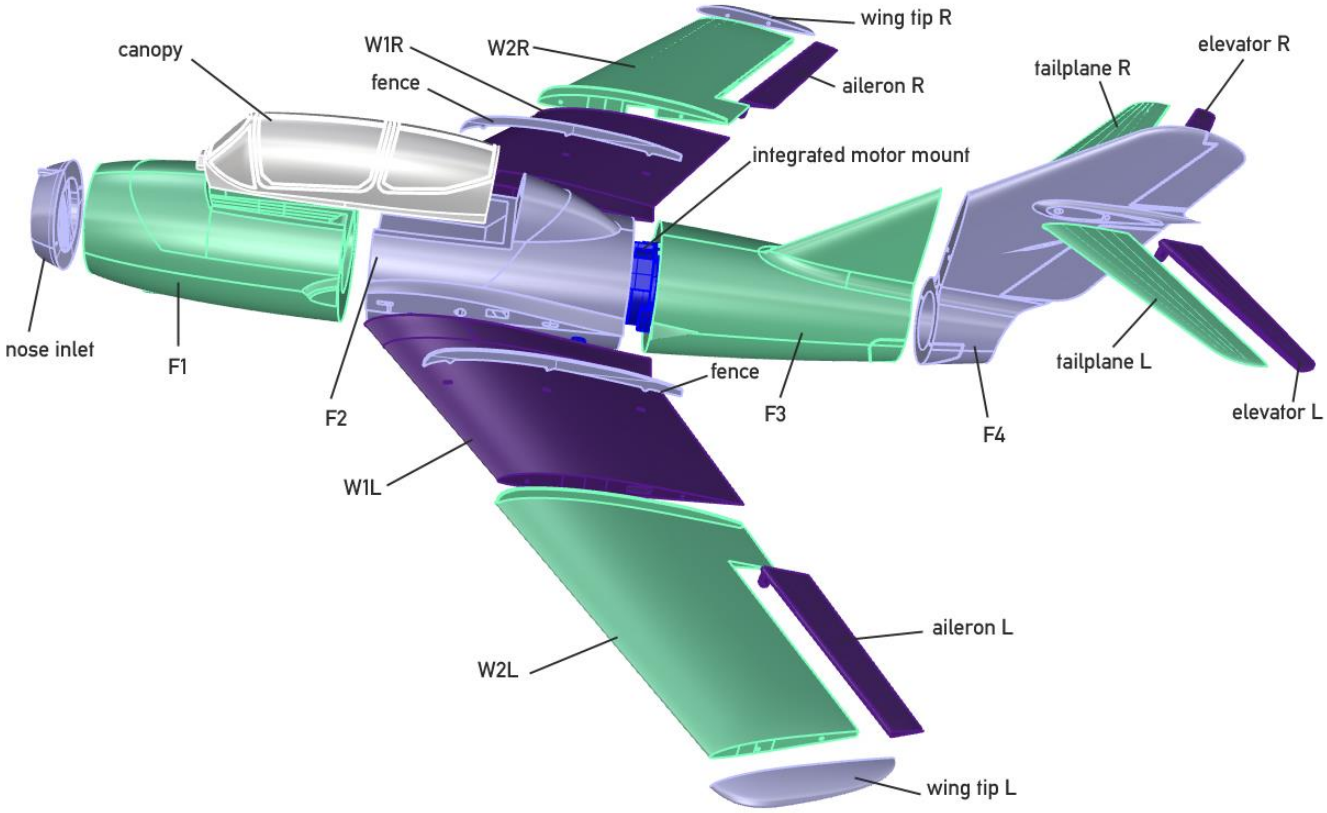
LW-PLA parts should be printed one at a time. Weights and times are just a guide, but should be close to default file values, and are conservative giving strong parts. For this model, gyroid infill works best on fuselage components, and cubic infill for the wings

The default print speed set in most of the G-code files is 40mm/sec, which is quite high for LW-PLA but gives an acceptable print result, saving hours of print time over the often-used speeds of around 30mm/sec.. This may be reduced of course if desired.

If covering with glass cloth/WBPU or epoxy the extrusion multiplier for PLA parts may be reduced from 0.7 to around 0.65 or lower..

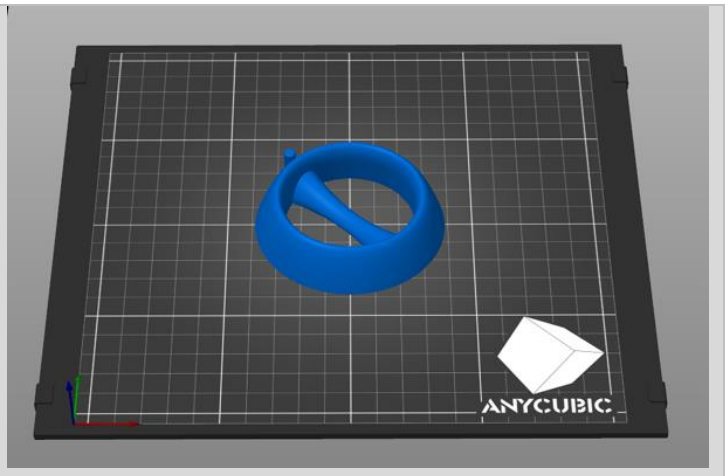
By default, a small amount of part cooling fan is used on all parts. If necessary, better layer adhesion may be achieved with the fan off, if the print result is acceptable in other respects.





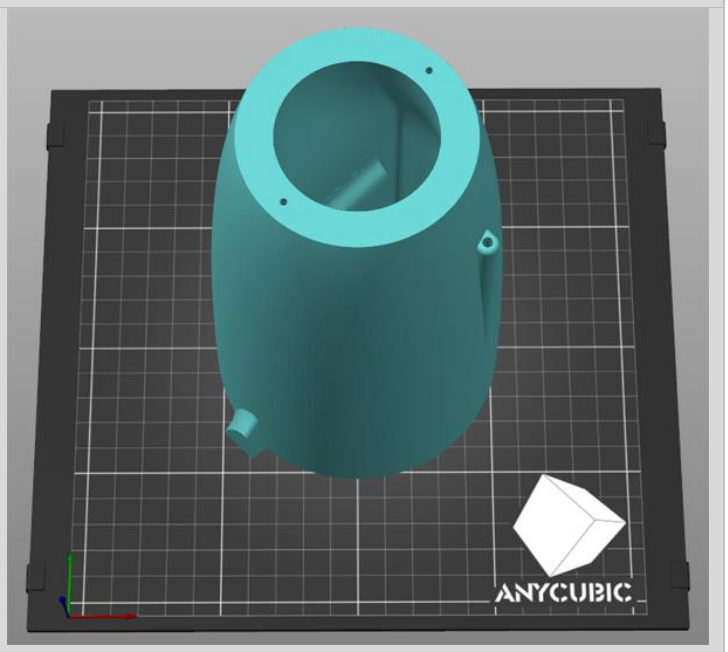
PART **nose inlet**

- PLA
- Print weight: 10.68g
- Print time: 47 mins



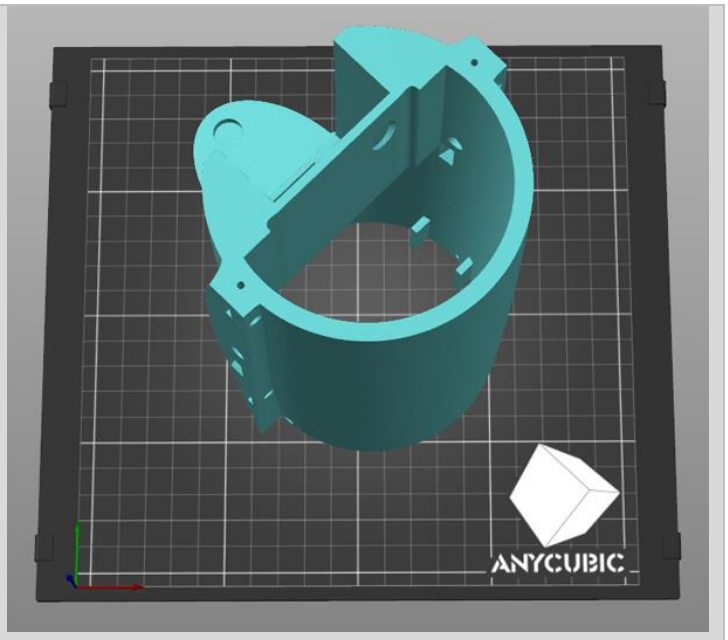
PART **F1**

- LW-PLA
- Print weight: 50.95g
- Print time: 5hr 22min



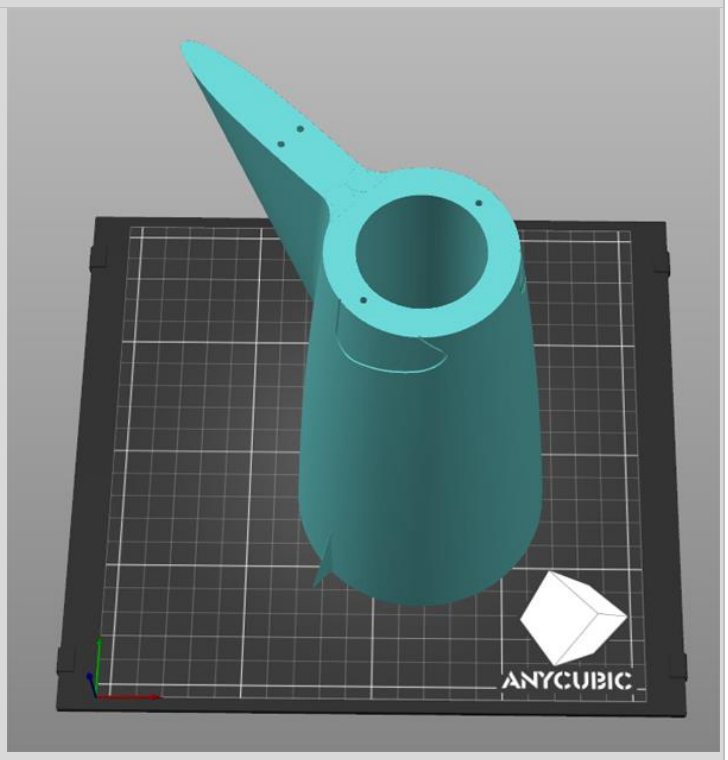
PART F2

- LW-PLA
- Print weight: 54.26g
- Print time: 5hr 52min



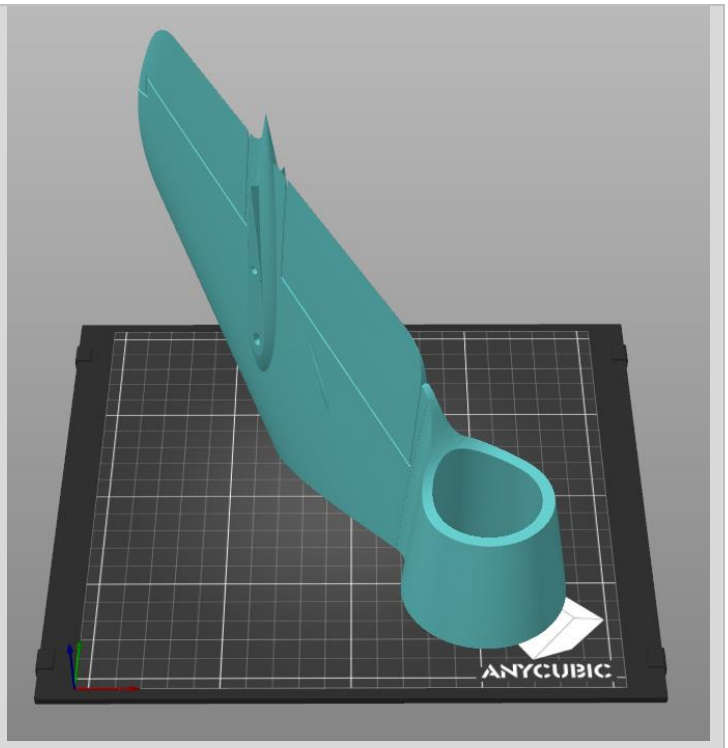
PART F3

- LW-PLA
- Print weight: 47.88g
- Print time: 6hr 33min



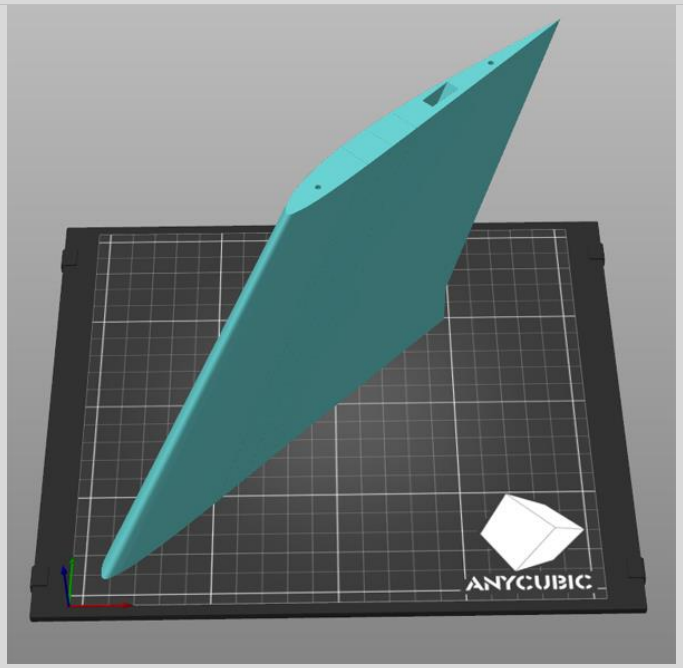
PART **F4**

- LW-PLA
- Print weight: 24.83g
- Print time: 3hr 4mins



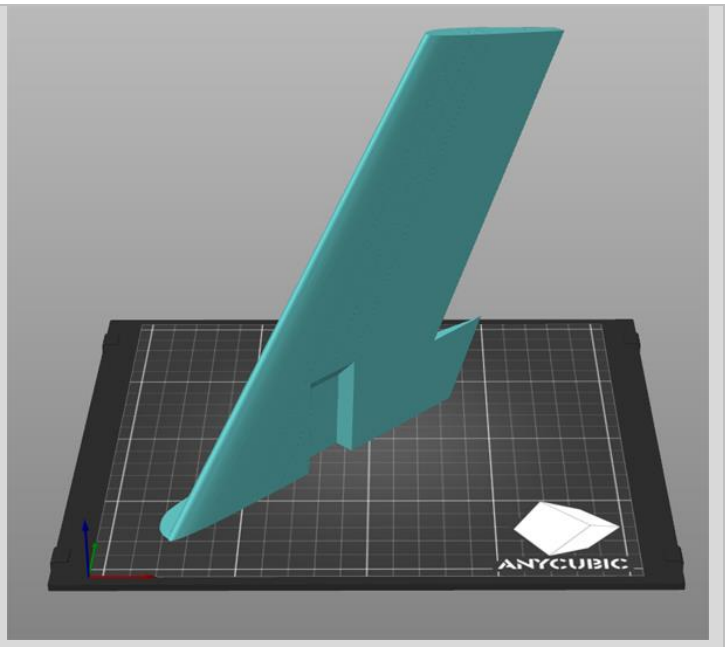
PART **W1L**

- LW-PLA
- Print weight: 29.31g
- Print time: 3hr 28min
- W1R is mirror image of this part



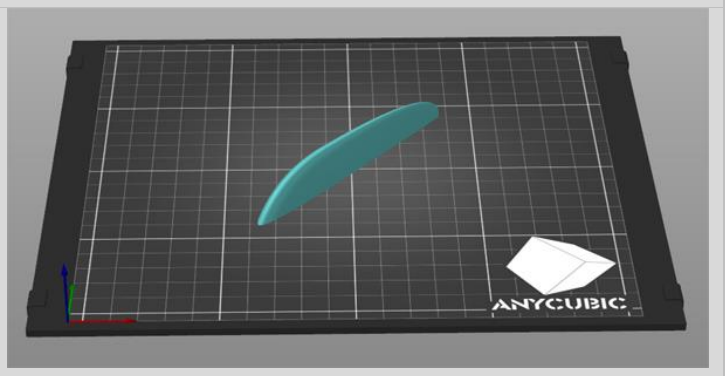
PART **W2L**

- LW-PLA
- Print weight: 24.45g
- Print time: 3hr 31min
- W2R is a mirror image of this part



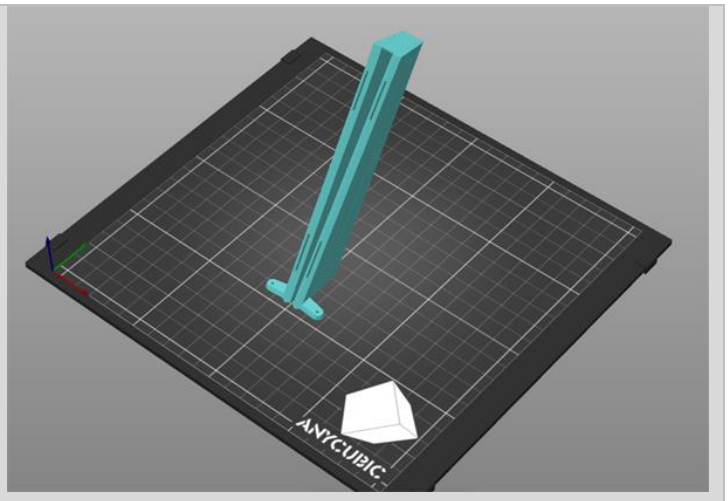
PART **wing tip L**

- LW-PLA
- Print weight: 2.38g
- Print time: 22 mins
- Wing tip R is a mirror image of this part



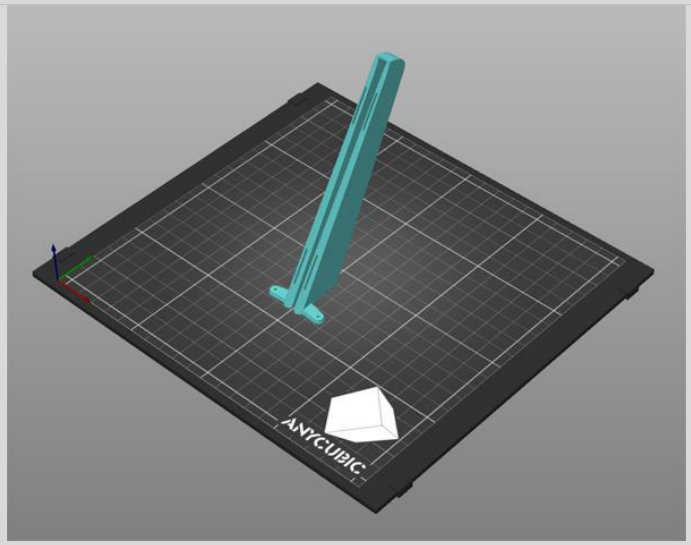
PART ailerons L&R

- LW-PLA
- Print weight: 8.42g
- Print time: 1hr 45mins
- A brim may be necessary if print bed adhesion is not good



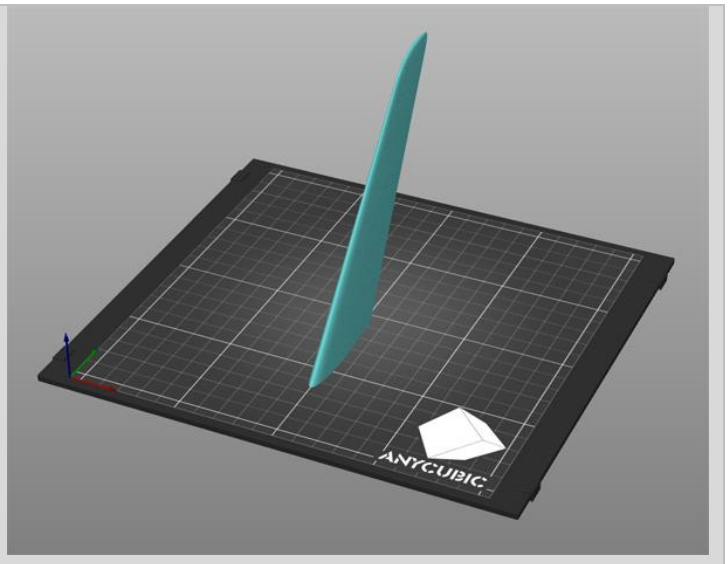
PART elevator L&R

- LW-PLA
- Print weight: 8.11g
- Print time: 1hr 31min
- A brim may be necessary if print bed adhesion is not good



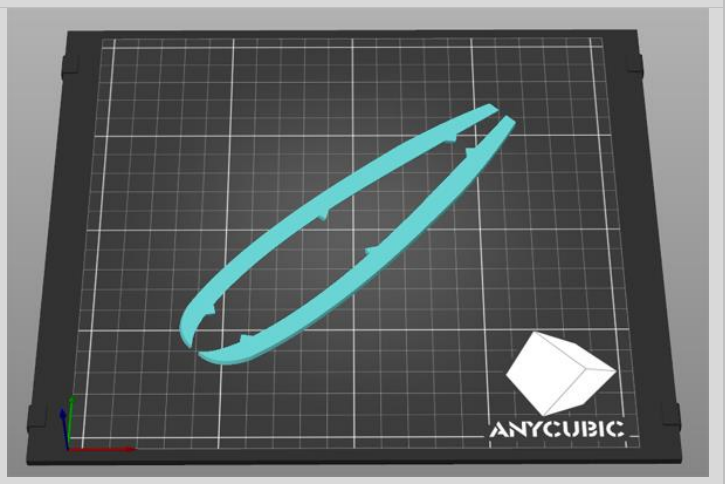
PART tailplane L

- LW-PLA
- Print weight: 4.74g
- Print time: 1hr 12mins
- A brim may be necessary if print bed adhesion is not good
- tailplane R is a mirror image of this part



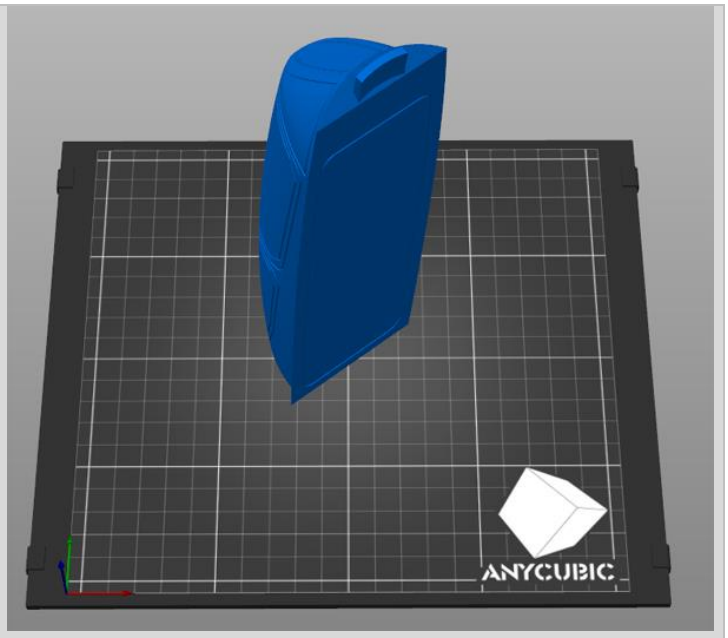
PART wing fences

- LW-PLA
- Print weight: 2.94g
- Print time: 26mins



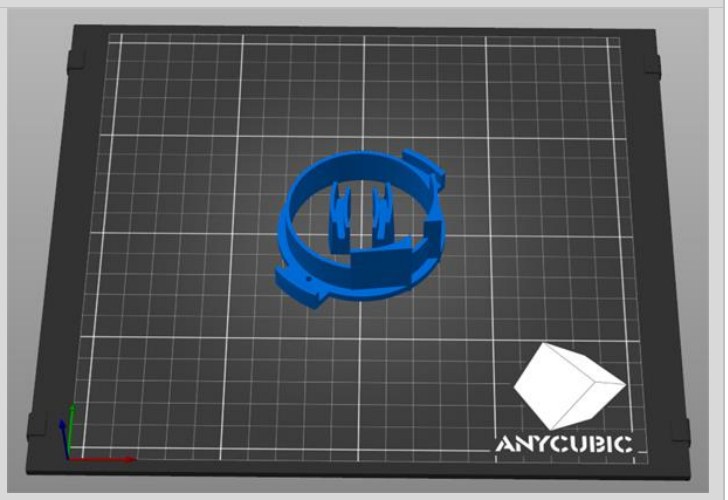
PART **canopy**

- Clear (natural)PLA or solid colour PLA if desired
- Print weight: 32.29g
- Print time: 3hr 17mins
- A brim may be necessary if print bed adhesion is not good



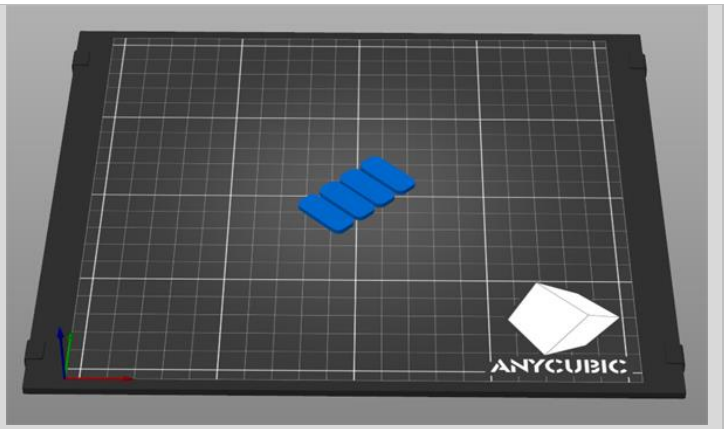
PART **integrated motor mount & F2 mounting brackets**

- PLA
- Print weight: 17.02g
- Print time: 1hr 21 min
- A brim may be necessary if print bed adhesion is not good



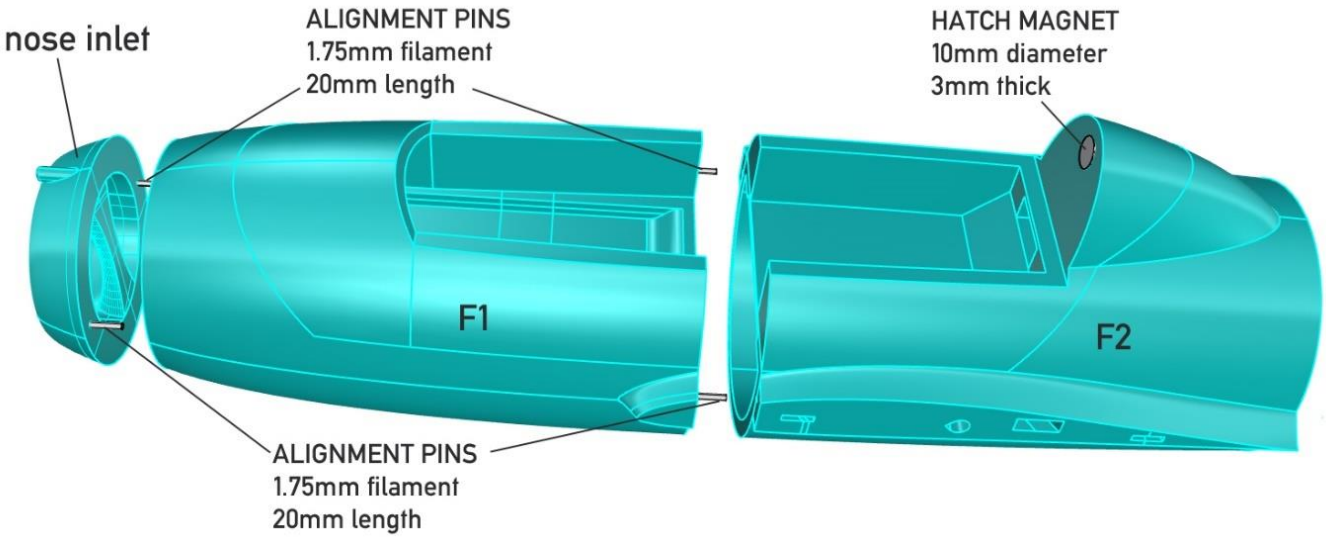
PART wing joiner tabs

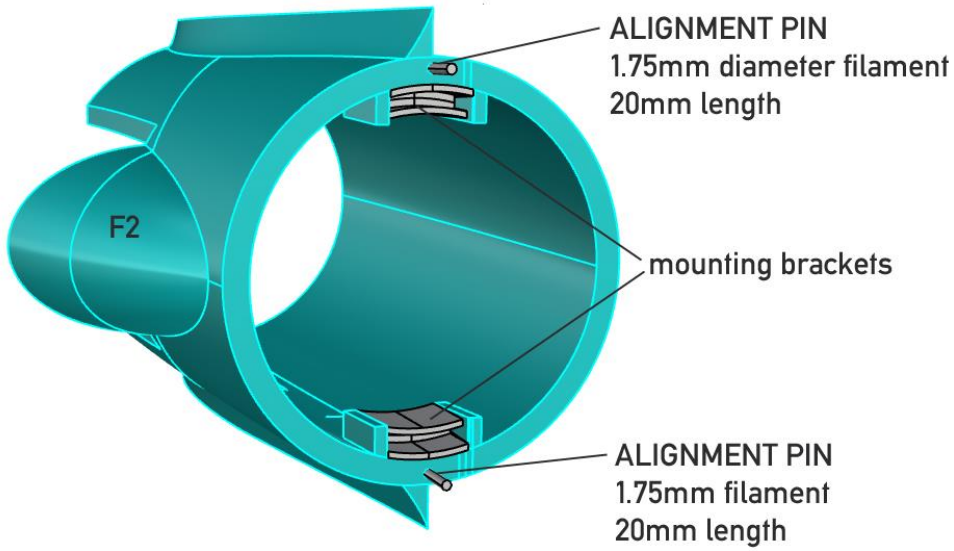
- PLA
- Print weight: 2.33g
- Print time: 8 mins



FORWARD FUSELAGE ASSEMBLY

- Cut fuselage alignment pins to a 20mm length from 1.75mm filament and insert into formers as shown. Trim as necessary to fit. Cutting the filament ends at an angle helps to insert in the alignment holes in the parts.
- Check that all parts fit together snugly. Separate parts again then apply glue to the front and rear of F1. Carefully reassemble parts and clamp until dry.
- Glue 10mm diameter x 3mm thick hatch magnet into the hole in the front of F2.
- Glue mounting brackets in rear of F2, ensuring closed end of bracket faces the front.

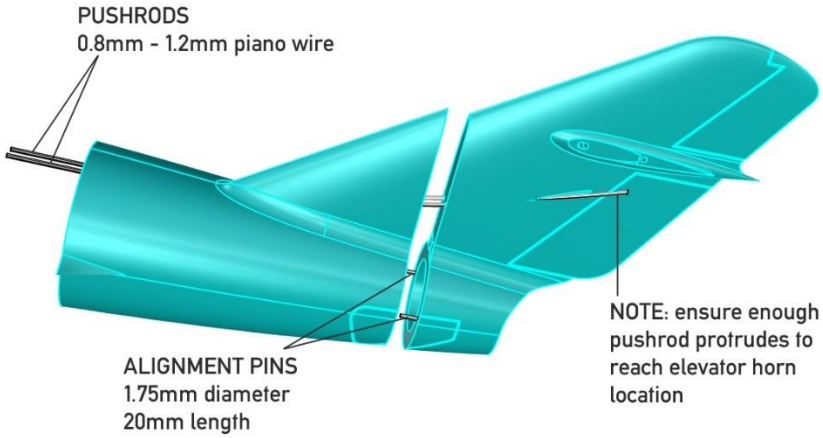




REAR FUSELAGE ASSEMBLY

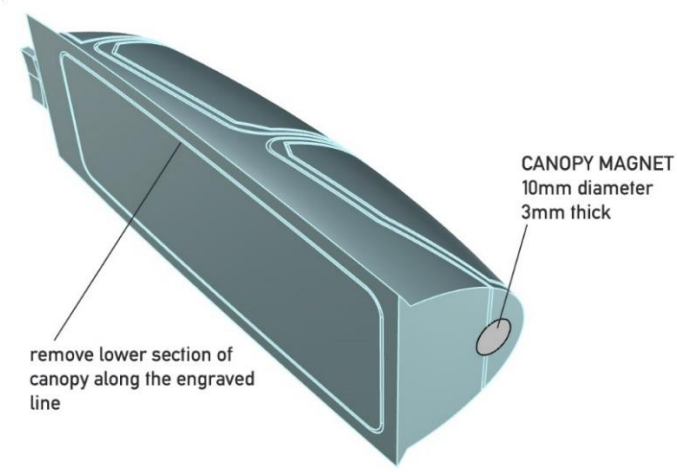
- Take two lengths of elevator piano wire pushrods and push through the pushrod channels in F3 and F4 until they slide freely. The channels will take up to 1.2mm (0.047in) diameter wire (maximum), but 0.8mm (0.031in) was used on the prototype and works fine.

- Cut fuselage alignment pins to the lengths shown on the diagram below from 1.75mm filament and insert into formers as shown. Do not be tempted to use solid pins here as a bit of flex is necessary to allow for the pushrod angle. Check that all parts fit together snugly. Separate F3 and F4 again then apply glue to the front of F4, ensuring glue does not get into the pushrod channels or on the pushrods . Carefully reassemble parts and clamp until dry. Set aside for now.



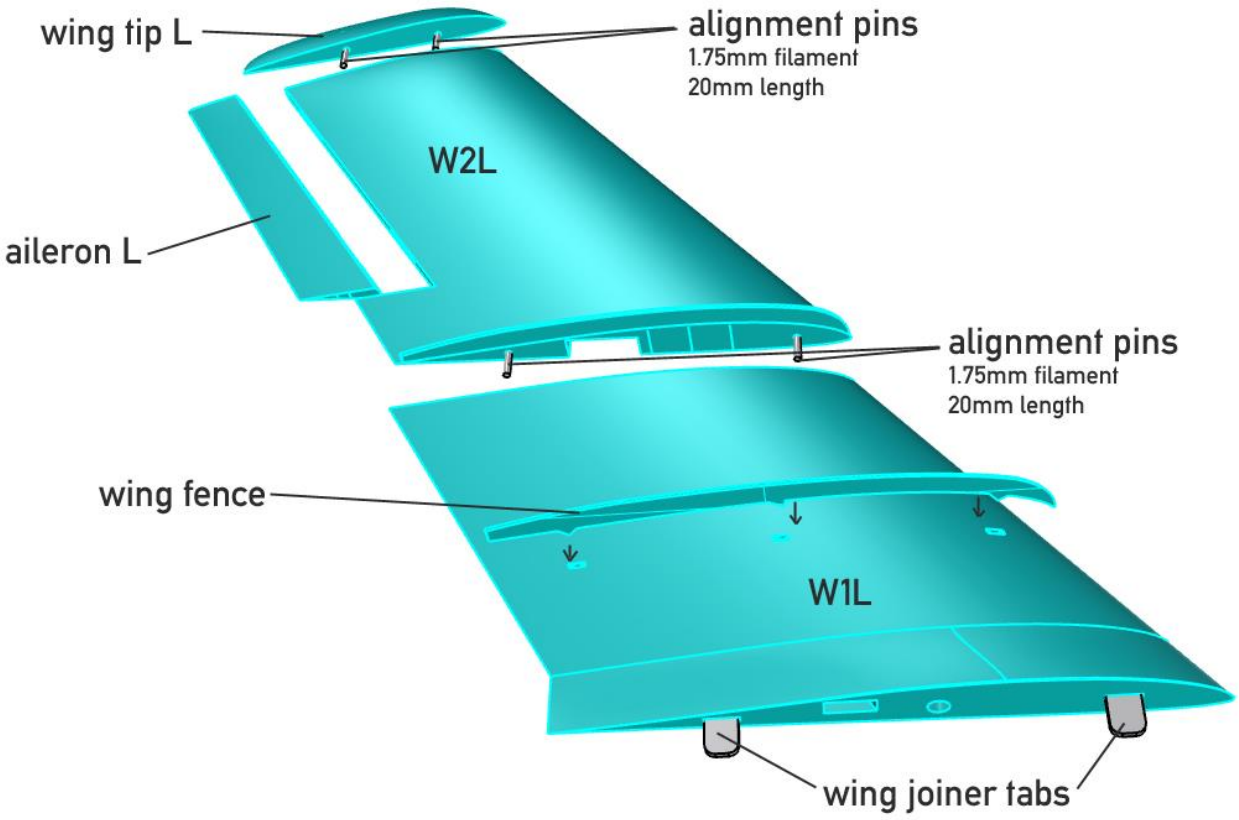
CANOPY ASSEMBLY

- Glue 10mm diameter x 3mm thick canopy magnet into the hole in the rear of the canopy . **IMPORTANT**! Make sure that the polarity of the magnet is correct so it attracts the hatch magnet in F2.
- Using a soldering iron or hotmelt glue gun nozzle, melt away the bottom section of the canopy , following the engraved line.



WING ASSEMBLY

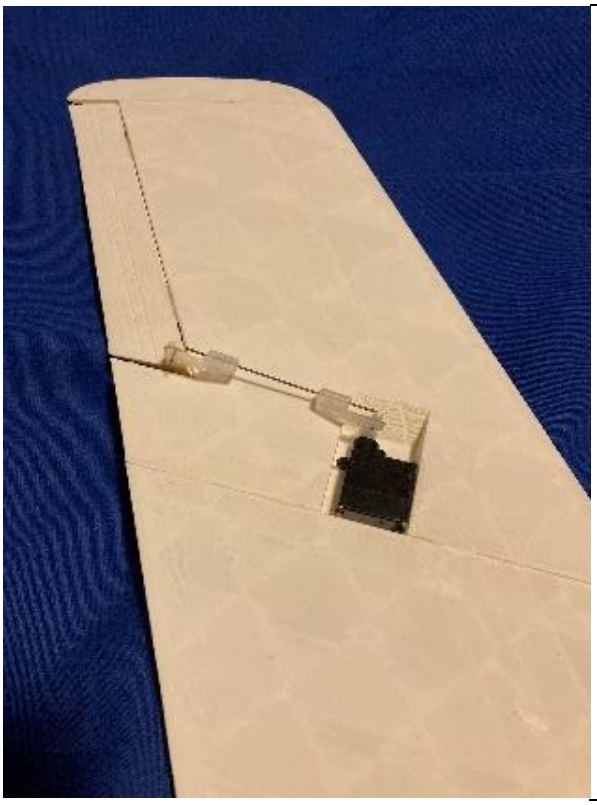
- Cut wing alignment pins 20mm in length from 1.75mm filament and insert into holes as shown. Check that all parts fit together snugly. Some light sanding of mating surfaces with a flat block may be necessary. Note that the wing tips are not added at this stage to make fitting the ailerons easier.
- Glue parts W1 and W2 together and clamp until dry.
- Glue flat wing joining plates into the wing root
- Clear out the holes in the top of W1 for the additional wing fence and trim and sand the tabs on the bottom of the wing fence until it fits snugly. Glue in place
- Cut aileron CA hinge sheet approx. 15mm x 18mm, two per aileron, trim to fit then glue aileron in place, leaving a gap of about 0.5mm to ensure free movement.
- Glue wing tip in place
- Repeat for other wing

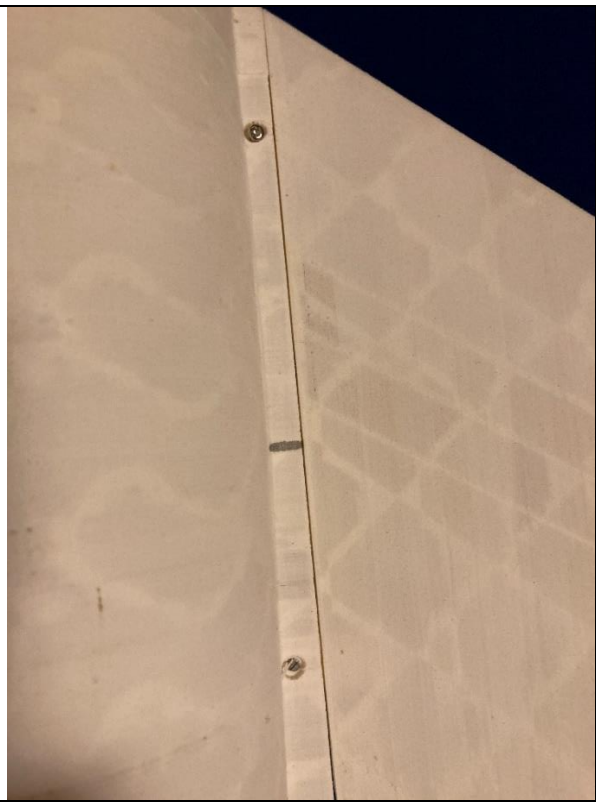


AILERON SERVO INSTALLATION

- Tape an aileron extension lead (about 450mm) to each aileron servo and feed through the hole in the wing assembly. Make sure the servo arm is attached and centred, then glue the servo in place with hot melt glue. NOTE: a servo thicker than 8mm will protrude slightly from the wing undersurface.

- Fit the 0.8-1.2mm pushrods with small clevises at each end. (see photo below)





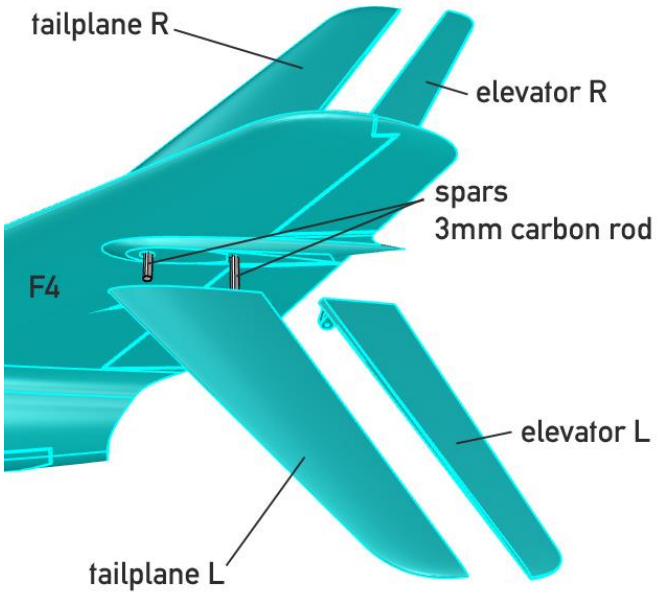
WING ATTACHMENT

- Cut WING JOINER from 6mm OD carbon tube or rod 220mm long, and place centrally through the hole in F2. Do not glue.

- Slide the wing assemblies onto the WING JOINER , feeding the aileron servo leads into the hole in the fuselage. Carefully drill a pilot hole through the fuselage and the wing joiner tabs.. Join with self-tapping screws about 10mm in length. (see photo above)

TAILPLANE & ELEVATOR ASSEMBLY

- Cut CA hinge sheet to dimension approx. 14 x 18mm for the tip and 17 x 18mm for the root of each elevator, and attach the elevators to the tailplane halves.



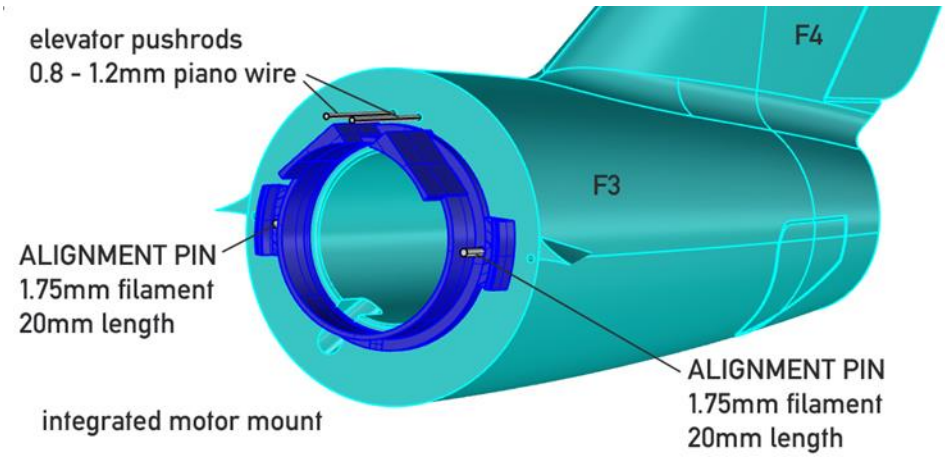
TAIL ATTACHMENT

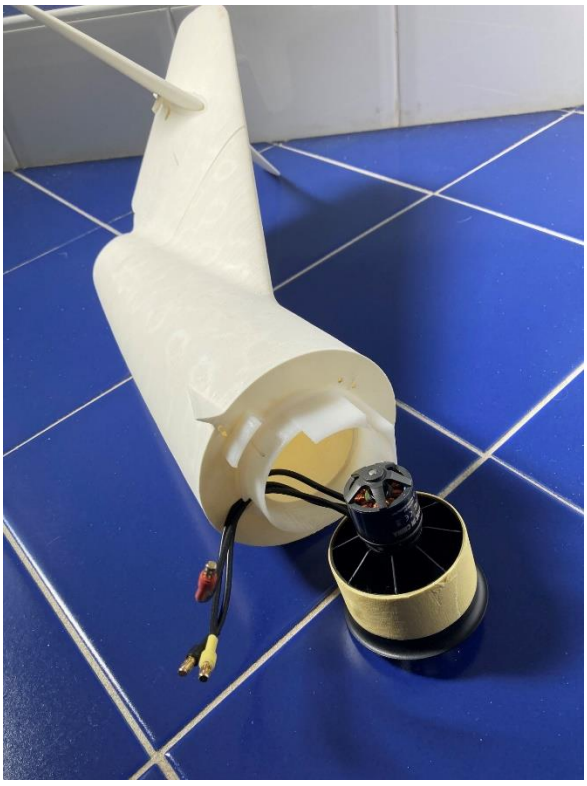
- Cut rear tailplane spar from 3mm carbon rod 96mm long, and place centrally through the rear (circular) holes in F4. Do not glue. Cut short front tailplane alignment spar from 3mm carbon rod 32mm long, and place centrally through the front(elongated) holes in F4. Do not glue.

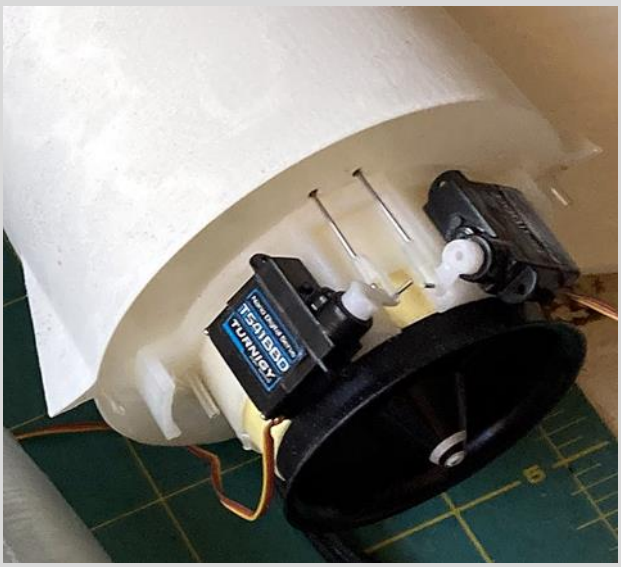
- Slide the tailplane/elevator assemblies onto the spars then carefully glue L and R tail assemblies to F4, ensuring the elevators are not glued. Clamp until dry.

INTEGRATED MOTOR & SERVO MOUNT ATTACHMENT

- Cut 2 x 20mm lengths of 1.75mm filament for the alignment pins, and place in the 2 inner holes on the left and right side of F3.
- Glue the integrated motor mount in place, noting that the two flat servo mounting plates face UP
- Wrap the rear of the EDF shroud in masking tape so that the EDF fits snugly in the MOTOR & SERVO MOUNT. The rear of the EDF sits level with the rear of the MOTOR & SERVO MOUNT. The motor leads exit the tailpipe through the keyhole shaped slot in F5. Secure the fan with small beads of hot melt glue joining the tape to the mount. These can be easily removed if desired for fan replacement.





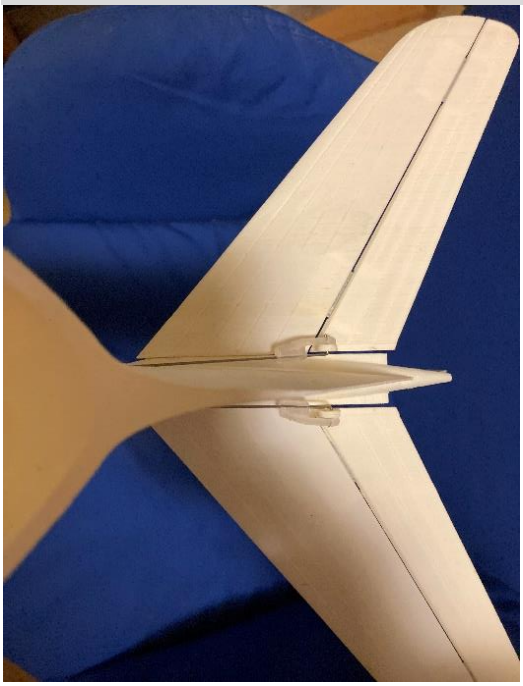


ELEVATOR SERVO ATTACHMENT

- Each elevator is driven by its own micro servo, one of which is connected to the elevator channel in the receiver, the other needs to be mixed through an auxiliary channel. A servo extension lead may be required.

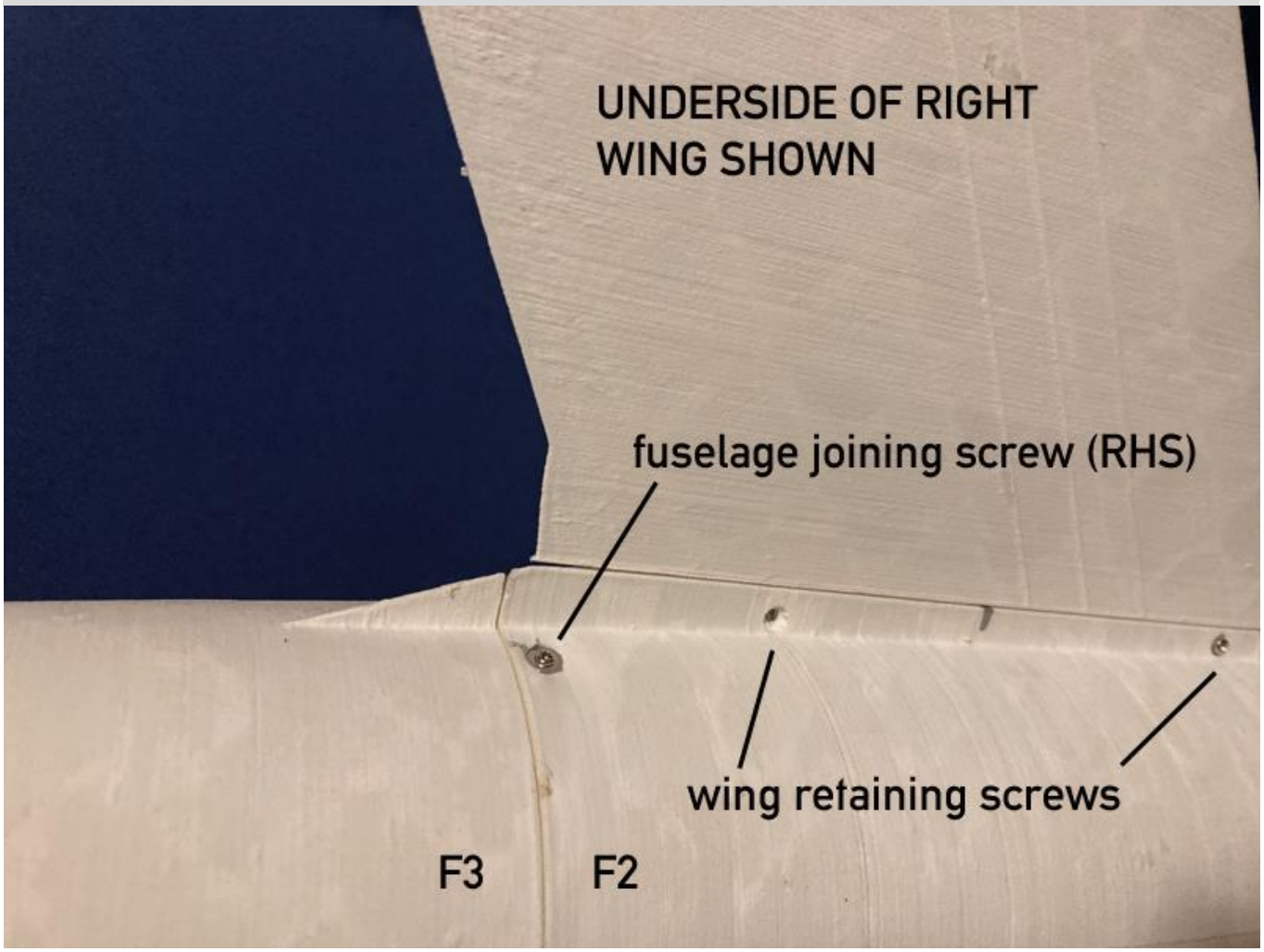
- Space is tight, and requires a micro servo of 8mm thickness. Any servo much larger than this (20 x 19.6 x 8.0mm) may not fit, or may require internal parts of F2 to be trimmed. Use hot melt glue to attach .

- Attach 0.8-1.2mm pushrods with clevis to servo end first, then bend, trim and connect at the elevator end last. Adjustments can be made on the transmitter if necessary to zero the trim.

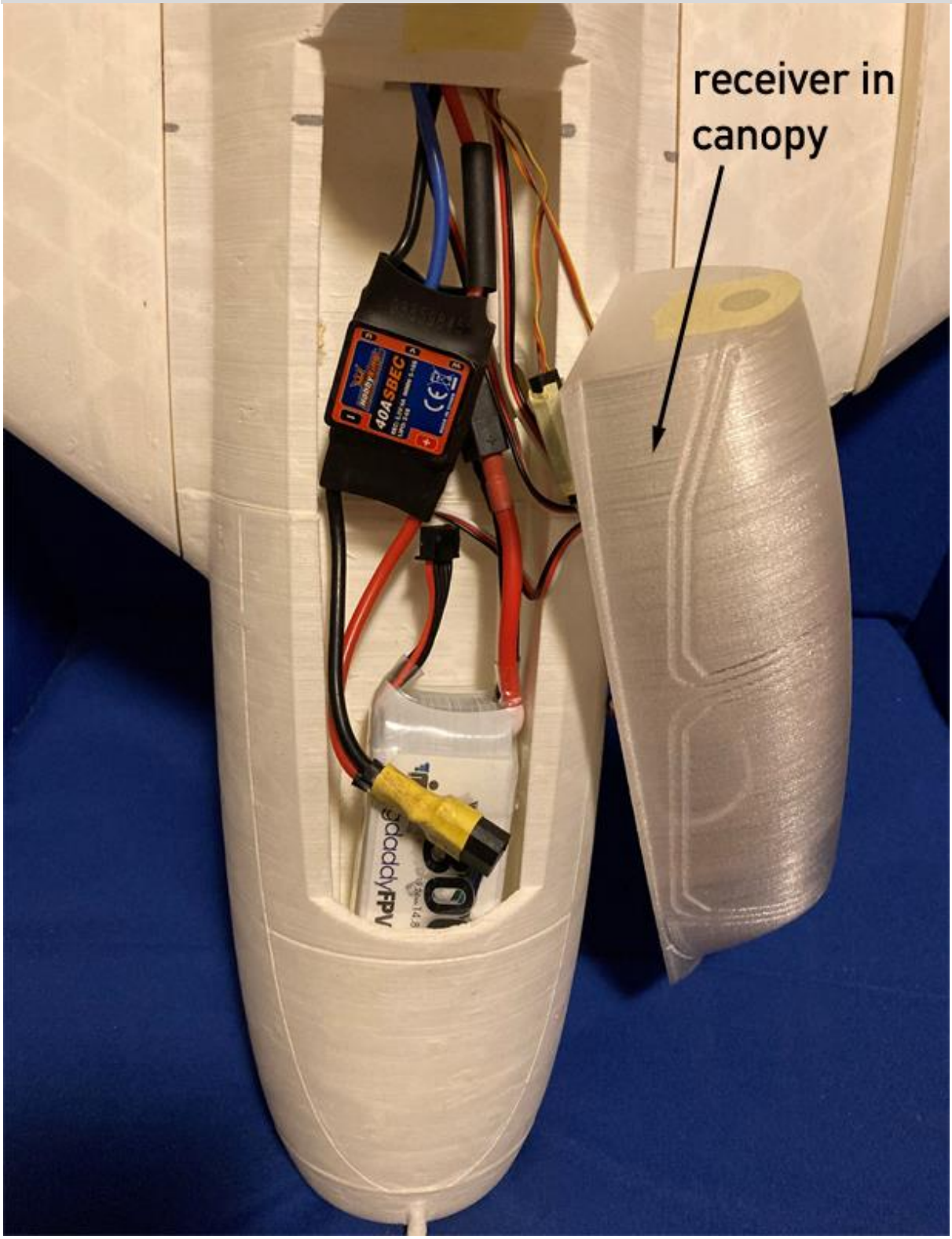


FUSELAGE JOINING

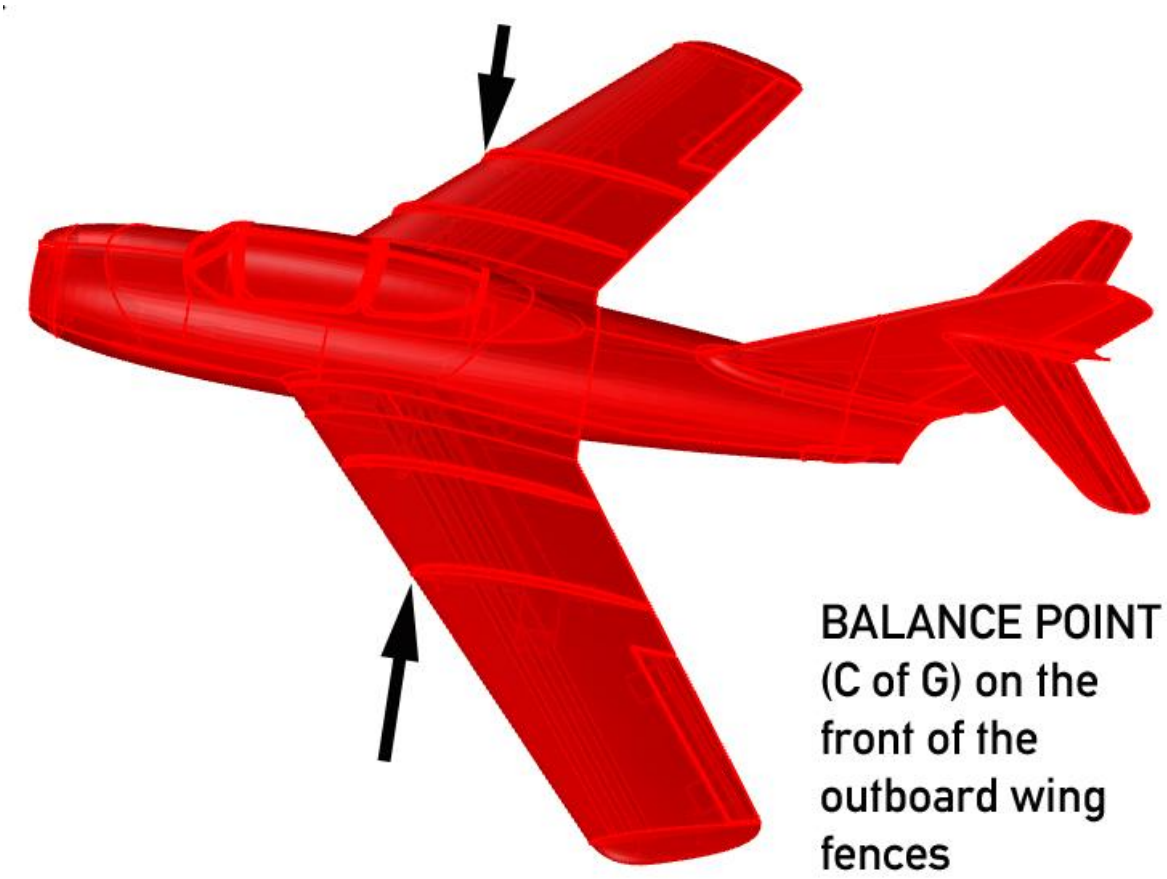
- Arrange the elevator & aileron servo leads and motor wires through the hole in the rear of the equipment bay, and carefully press together F2 and F3, using the wing trailing edge fairing for alignment.
- **USE MASKING TAPE TO HOLD FRONT AND REAR SECTIONS FIRMLY TOGETHER WHILST DRILLING HOLES.**
- FRONT AND REAR FUSELAGE ASSEMBLIES ARE HELD TOGETHER BY SELF-TAPPING SCREWS IN HOLES DRILLED THROUGH F2, F2 MOUNTING BRACKETS AND THE INTEGRATED MOTOR MOUNT
- **Pull the servo and motor leads into the equipment bay and secure so they will not be slack in front of the EDF (to avoid being drawn into fan).**



EQUIPMENT LOCATION



BALANCE POINT LOCATION



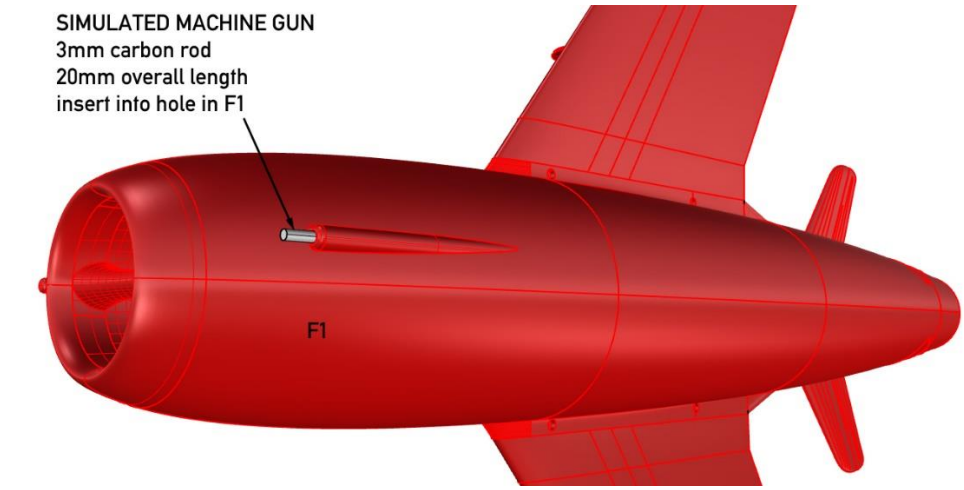
CONTROL THROWS measured at widest point of control surface

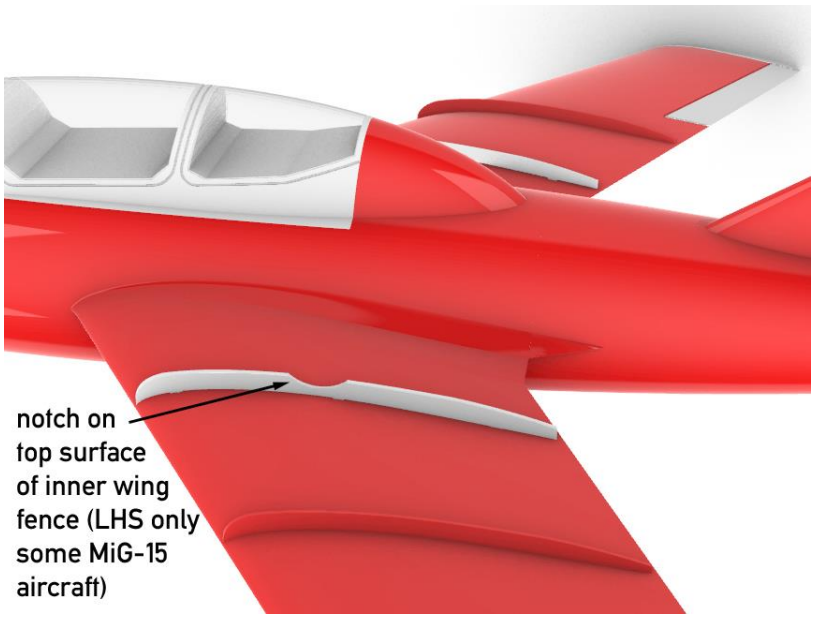
ELEVATORS:	**9mm UP/DOWN,**	**40% EXPO:**
AILERONS:	**5mm UP/DOWN**	**50% EXPO**

SCALE DETAILS (OPTIONAL)

The machine gun carried on the trainer may be simulated with a 20mm length of 3mm carbon rod inserted in the hole in F1 (the same rod that is used in the tail assembly).

Some MiG-15 aircraft had a notch cut out of the top of the inner wing fence, left side only. This is believed to be so that a backup flap position indicator can be seen from the cockpit. If you choose to model an aircraft with this feature, simply sand a half depth scoop 23mm long, starting 64mm back from the leading edge of the fence.





PARTS and EQUIPMENT LIST

- LW PLA filament (about 310g)
- PLA filament (about 60g)
- 50mm EDF for 4s (XFLY or FMS or similar). Multi-blade fans preferred for the best sound!
- Small 6ch receiver
- 4S x 1300 mAh battery (around 149g weight, size 73 x 34 x 28mm)
- 40A ESC
- 6mm OD carbon tube or rod about 250mm length
- 3mm diameter carbon rod 150mm length
- 2 x servo extension leads about 250mm length each for ailerons
- 2 x short servo extension leads for elevators (depending on servos used)
- CA hinge sheet
- Pushrod wire (0.8 -1.2mm diameter about 800mm length)
- 8 x small or micro clevises to suit pushrod wire
- 6 x Self-tapping screws (like servo mounting screws) approx. 10mm length
- Medium CA
- Accelerator for CA
- Clear Gorilla Glue
- Hot melt glue
- 2 x rare earth magnets 10mm diameter/3mm thick

DOCUMENT AMENDMENT LIST

4 SEPTEMBER 2023	VERSION 1.0	ORIGINAL ISSUE
10 SEPTEMBER 2023	VERSION 1.1	p.12 canopy print weight corrected to 32.29g. p.21 spelling p.24-26 additional information

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