Hawker Sea Fury

Assembly userguide

ADDIMP 3D Original

Release 2

May 2020

This 3D printed project permit to reproduce the Hawker Sea-Fury FB 11.

It is your responsibility to manufacture all of the parts necessary for the construction of this model.

All files are provided in stl format, compatible with the majority of slicers softwares in the 3D printing market.

1- Historic

The Sea Fury is a British aircraft designed and manufactured by Hawker Aircraft. Its design was initiated in 1943 with an aircraft initially named Fury.

As the Second World War ended, the RAF cancelled their order for this aircraft.

The Royal Navy needed a carrier aircraft to replace a great range of old aircraft being operated by the Fleet Air Arm, so the development of the Sea Fury proceeded, and the type began entering operational service in 1947.

It was the last propeller-driven fighter to serve with the Royal Navy, and one of the fastest production single engine aircraft ever built.

It was used during the Korean War in the early 1950s, as well as against the 1961 Bay of Pigs Invasion of Cuba.

The Sea Fury was fitted with the Bristol Centaurus engine, and armed with four wing-mounted Hispano V cannons (20 mm).

Developed as an aerial fighter aircraft, the Sea Fury was used as a fighter-bomber, as well as pure fighter.

The Sea Fury as an international life as both a carrier and land-based aircraft. It was operated by countries including Australia, Burma, Canada, Cuba, Egypt, West Germany, Iraq, and Pakistan. This plane fighting effectively even against the MiG-15.

The Sea Fury was retired by the majority of its military operators in the late 1950s and replaced by jet-propelled aircraft.

Since, number of aircraft were used in the civil sector, and several remain airworthy in the 21st century as heritage and racing aircraft.

2- Parameters

scale ~ 1:12

Length: 856 mm / 33 - 2/3 inch

Wingspan: 974 mm / 38 - 1/3 inch

Wing area : 18,1 dm²

Weight of the 3D printed parts : ~750 g,

Equiped weight between 1100 and 1350 g as per equipment

Wing loading : 67 / 70 g/dm²

Center of gravity is from 67 to 72 mm from leading edge

Construction skill	★★★☆☆	Experience with building some wood or fiber kits
Flying skill	★★★☆☆	Flying experience like aerobatic aircraft

Version history

Version 2	
New fuselage front area	Better access to electronics and motor
New wing	Weight reduction and increase in the negative twist of the wing tip
Version 1.2.1	
Ailerons L & R	3 parts instead 2
Release 1.2	
W1L & R	Add supports on radiator duct (factory & gcode)
W2L & R	Port guns on a separate part
W1L & R, F3 screw, rear belly	Enhance screw hole position
W1L & R	Add holes for toothpick at center wing
W1L & R, W2L & R	Add housing for Ø4 mm carbon tube (W1 & W2)
W2L & R	Reinforce gun bosses
Accessories	Added RS 4108 & Leopard 3536 motors mounts
Notice	Add § for the receiver mount

Release 1.1	
Accessories	Added DYS 4215 motor mount

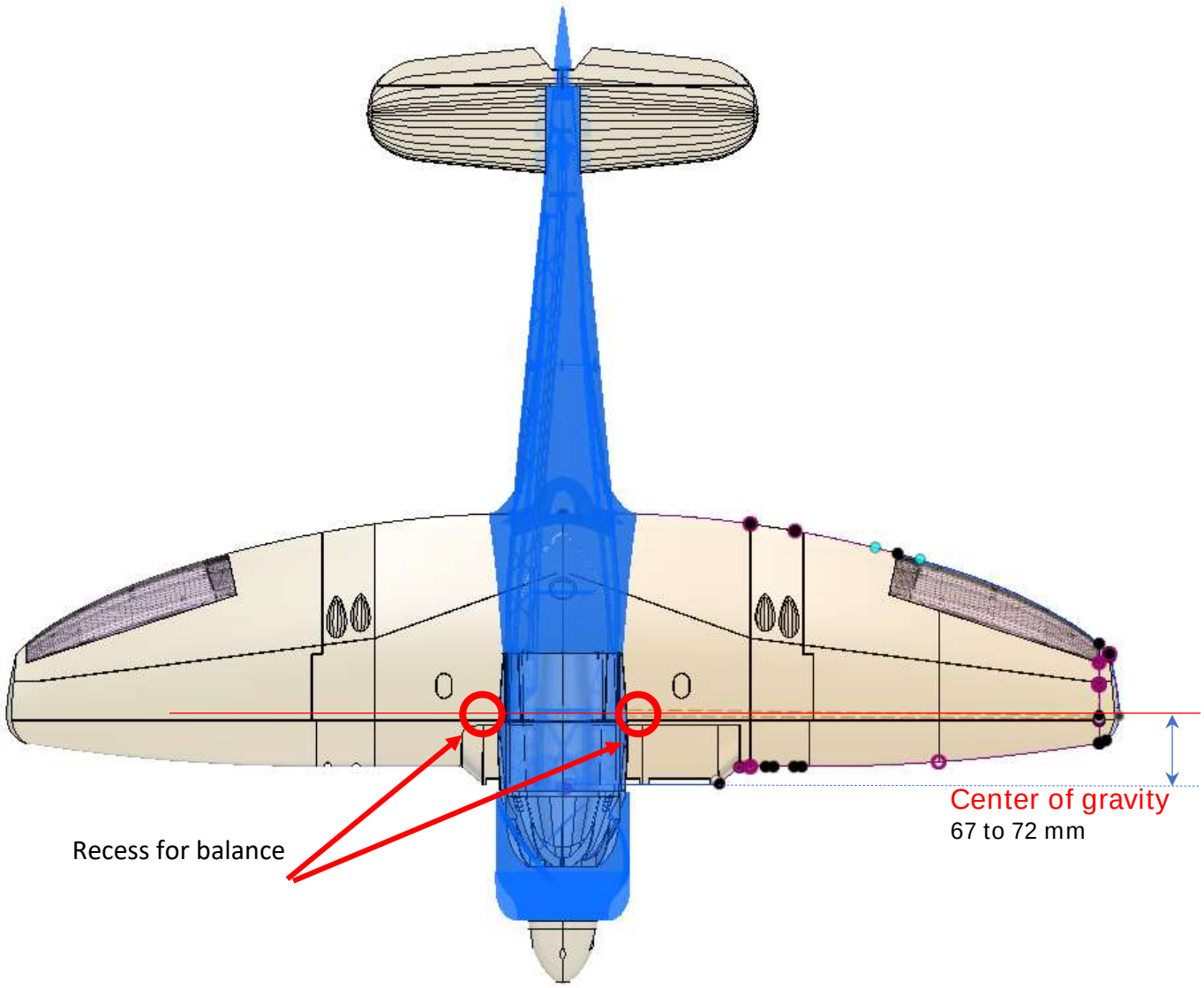
3- Content of the pack

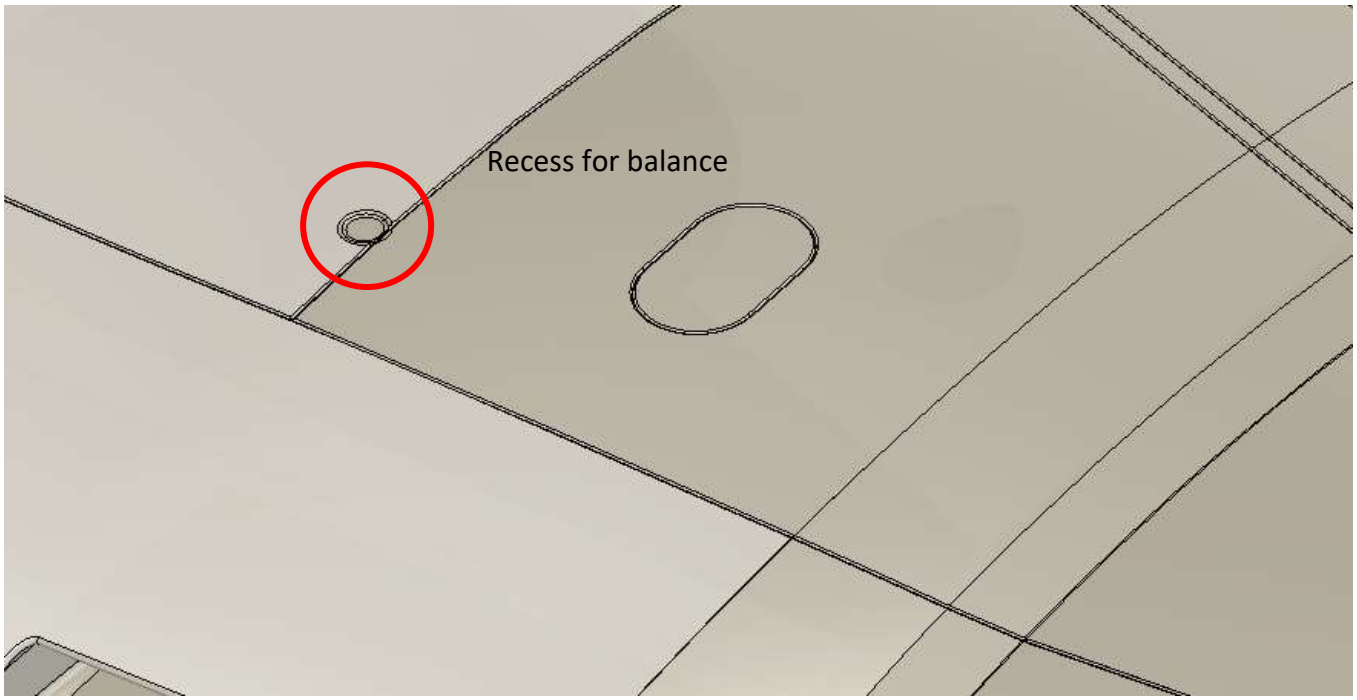
All the STL files, factory files (Simplify 3D) and G-codes.

this version can be made in 2 or 3 axis and the wing can be fixed either by screw or by rubber band.

The engine mount is installed using M3 screws + self-locking nut instead of self-tapping screws.

4- Balance





5- Requirements

All parts are printable on a 200 x 200 x 200 mm 3D printer with 0.4 mm nozzle.

Slicing software is Simplify 3D, all factory and G-codes files are provided for Ø1.75mm PLA materials.

All the printed parts need less than 1kg of PLA.

A profile for Simplify 3D is proposed as example in the directory ../factory (MK3PLA-3DP.fff)

Setup :

- 3S – PLA std:
  - Engine Pro-tronick DM 2825 - 950 kV
  - Engine Roxxy C3542 – 810 kV
  - ESC Pro-tronik 40 / 45 A
  - Battery LiPo 3S / 1800 to 2200 mA – 45C
- 6S :
  - Racerstar 4106 – 600 kV
  - Emax 3515 – 650 kV
  - propeller 9x6 or 9x7
  - ESC 40 / 45 A
  - Battery LiPo 6S – 1800 mA

⇨ Check the connectors between ESC and battery

- 3 (or 4) servos 8 à 16 g like Savox SH-0255 MG, Hitec HS-53, Hitec HS-40

- 2x Rubber band 120 x 10 mm or 1x M6 nylon screw and nut (wing fixation)
- Wire pushrod Ø1mm
- hinge sheet, thickness 0.3mm
- Ø2mm rod hard wood or carbon for the rudder hinges
- CA medium
- 1x Velcro strap 200 mm
- 2x servo extension cable for aileron, length 150 mm minimum.
- Option ; 1 carbon tube Ø4 mm x 380 / 500 mm
- Landing gear :
    - 2x Ø45 / 50 mm wheel for main gear, or print the one included
    - 1x Ø20mm for tailwheel

All accessories could be found at http://www.rcjetshobby.com/en/10000493-sets-addimp-3d

Pro-tronik motors : http://www.rcjetshobby.com/en/10000450-pro-tronik

Pro-tronik ESC : http://www.rcjetshobby.com/en/81-controleurs

6- Print settings

!! the use of the LW-PLA from Colorfab is explain in a specific file in the factory directory !!

Few quantity of parts needs special parameters, they are describe when needed.

G-Codes are based on Prusa Mk3 & Mk 3S, Ø1.75mm PLA.

The use with other 3D printer or filament will have different results. Even in the same brand of filament, color may change results.

As often as possible use the factory files to adapt to your 3D printer and your filament.

Example of possible parameters :

Nozzle diameter = 0.4 mm

General layer thickness = 0.25 mm

Extrusion width = 0.42 mm

Default printing speed = 60 mm/s

1st layer thickness = 80% or 0.2 mm

1st layer width = 105 to 110%

1st layer speed = 50 to 66%

Retraction distance, depend of the filament, ~ 1 to 2 mm, to be adjust

Retraction speed = 30 mm/s

Extra restart distance (distance to begin extrusion before printing the part) = 0.05 to 0.1 mm

Vertical lift (avoid collision between nozzle & part during travel moves) = 0.4mm

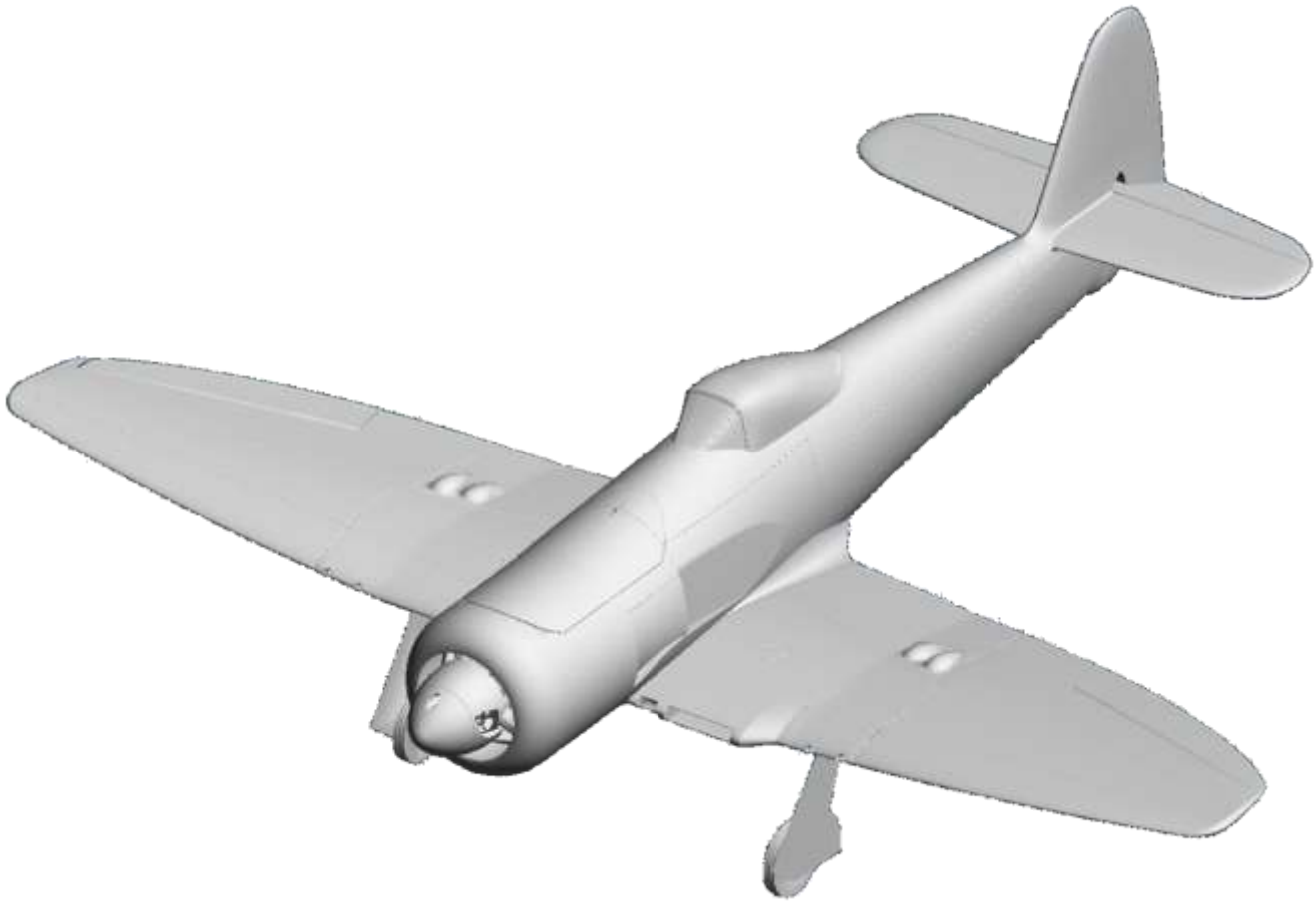
Possible wipe option activated, may replace a part of retraction.

The 3 or 4 fist layers should be at 2 outline / perimeter shells. The same for the 3 or 4 last (select outside shell first)

Temperatures

- Bed = 55 to 60° C
- Extruder = 215 to 230 °C
- No cooling

7- Sea Fury - parts diagram:



Part	Qtty	Weigth (g)	Comment	STL file	Factory file & G-code
Fuselage					
F1	1	79		Sea-Fury-1_12-F1	Sea-Fury-1_12-F1

F1 long nose	1		Elongated version	Sea-Fury-1_12-F1-long-nose	Sea-Fury-1_12-F1-long-nose
F2	1	61		Sea-Fury-1_12-F2	Sea-Fury-1_12-F2
F3	1	42		Sea-Fury-1_12-F3	Sea-Fury-1_12-F3-W_fix
F4	1	40		Sea-Fury-1_12-F4-rubber_band	Sea-Fury-1_12-F4
F5 (2 or 3 axis)	1	30		Sea-Fury-1_12-F5-2x Sea-Fury-1_12-F5-3x	Sea-Fury-1_12-F5-2x Sea-Fury-1_12-F5-3x
F6 – 2 axis only	1	5		Sea-Fury-1_12-F6	Sea-Fury-1_12-F6
Wing fixture support	1			Sea-Fury-1_12-wing-fix	Included in : Sea-Fury-1_12-F3-W_fix
Battery hatch					
Front cover	1	43		Sea-Fury-1_12-Bat-cover_Front	Sea-Fury-1_12-Bat-Hatch / Sea-Fury-1_12-Bat-Hatch-LN
Front coverLN	1		To be used with F1 long nose	Sea-Fury-1_12-bat-hatch-Front-LN	
Rear cover	1			Sea-Fury-1_12-Bat-cover_Rear	
Lock	1			1_12-Bat-cover_lock	
Lock housing	1			Sea-Fury-1_12-Bat-cover_housing	
Wing					
L1	1	73	Left & right **are not** symetricals	Sea-Fury-1_12-W1L	Sea-Fury-1_12-W1L, gcode with or without supports
R1	1	68		Sea-Fury-1_12-W1R	Sea-Fury-1_12-W1R, gcode with or without supports
L2	1	112	Symetrical	Sea-Fury-1_12-W2L	Sea-Fury-1_12-W2LR. Option integrated canons or separated port guns
R2	1			-	
Leading edge for cannons	1 + 1			Sea-Fury-1_12-LE-canons-L Sea-Fury-1_12-LE-canons-R	Include in Sea-Fury-1_12-W2LR-LE-canon
Smooth leading edge	1 + 1			Sea-Fury-1_12-LE-smooth-L	Include in Sea-Fury-1_12-W2LR-LE-smooth

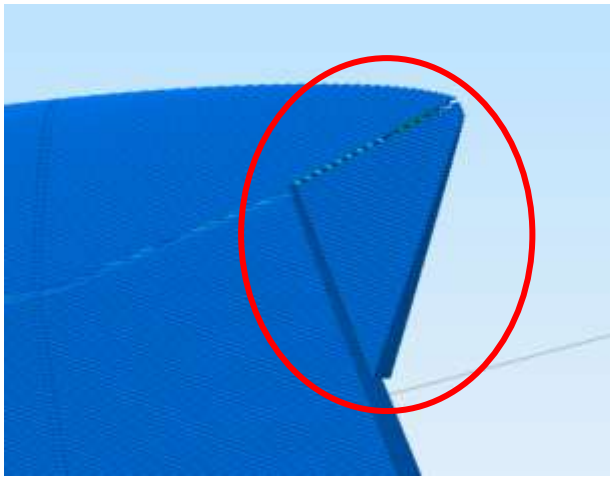
				Sea-Fury-1_12-LE-smooth-R	
L3	1	50	Symetrical	Sea-Fury-1_12-W3L	Sea-Fury-1_12-W3-LR
R3	1			-	
Left aileron / Right aileron	1+1	17	symetrical	Sea-Fury-1_12-Aileron-L-inter Sea-Fury-1_12-Aileron-L-mid Sea-Fury-1_12-Aileron-L-exter	Sea-Fury-1_12-Aileron-LR
Wing bellies (front & rear)	1+1	34	***Updated V1.2***	Sea-Fury-1_12-Wing-belly_front Sea-Fury-1_12-Wing-belly_rear	Sea-Fury-1_12-Wing-bellies
Servo mount & cover	(1+1)x2		symetrical	1_12-servo_mount_L / R 1_12-servo-cover_L / R	1_12-servos-mounts_LR
Tail					
Horizontal stabilizer	1+1	38	Symetrical	Sea-Fury-1_12-H-stab	Sea-Fury-1_12-H_stab
Elevator	1+1		Symetrical	Sea-Fury-1_12-H_stab-L-flap	
Vertical stabilizer	1	13		Sea-Fury-1_12-V-Stab-fix	Sea-Fury-1_12-V-stab-fix
Vertical stabilizer with rudder	1	20		Sea-Fury-1_12-V-stab-wi-rudder	Sea-Fury-1_12-V-stab-wi-rudder
Rudder flap	1			Sea-Fury-1_12-V-stab-rudder-low Sea-Fury-1_12-V-stab-rudder-up	
Accessories					
Motor mount for Pro-tronik DM2825	1			Sea-Fury-1_12-MM-2825	Sea-Fury-1_12-MM-2825
Motor mount for Leopard 3536	1			Sea-Fury-1_12-MM-3536	Sea-Fury-1_12-MM-3536
Motor mount for RacerStar 4108	1			Sea-Fury-1_12-MM-4108	Sea-Fury-1_12-MM-4108

Support pour moteur long. 35mm	1			Sea-Fury-1_12-MM-lng_35	Sea-Fury-1_12-MM-lng_35
Support pour moteur long. 40mm	1			Sea-Fury-1_12-MM-lng_40	Sea-Fury-1_12-MM-lng_40
Support pour moteur long. 43mm	1			Sea-Fury-1_12-MM-lng_43	Sea-Fury-1_12-MM-lng_43
Spinner Ø60 mm	1+1		2 blades	Sea-Fury-1_12-spinner-base-2_blades Sea-Fury-1_12-spinner-cone-2_blades	Sea-Fury-1_12-spinner-60
Spinner Ø68 mm	1+1		2 blades	Sea-Fury-1_12-spinner-big-base-2_blades Sea-Fury-1_12-spinner-big-cone-2_blades	Sea-Fury-1_12-spinner-68
Landing gear (option)					
Wing support	1+1		Symetrical	Sea-Fury-1_12-L-Main-gear-Wing-support	Sea-Fury-1_12-landing-gear-V2
Splint	6			Sea-Fury-1_12-LR-Main-gear-splint	
Main gear leg	2			Sea-Fury-1_12-LR-Main-gear-leg	
Main gear door	1+1		Symetrical	Sea-Fury-1_12-L-Main-door	
Tailwheel R leg	1+1		symetrical	Sea-Fury-1_12-R-tailwheel-leg	
Tailwheel support	1			Sea-Fury-1_12-tailwheel-support	
Main wheel hub	4			Sea-Fury-1_12-LR-Main-wheel-hub	Sea-Fury-1_12-main_wheel
Main wheel tyre	2			Sea-Fury-1_12-LR-Main-tyre	Sea-Fury-1_12-main_tyre
Main gear bending tool	1+1		Symetrical, for wire bending.	Main-Gear-L_bending-tool	4 shells, 40 % infill

8- Wings

First, check all the parts, remove all the residual skirt, to sand if needed the parts. Check that all hinge housings are clean and open.

There is a specific support to remove on W3, it is used to maintain the trailing edge during printing process.



Assemble all the parts without any glue, to check the well adjustment and alignement.

If you use the carbon tube option, check that it slides freely in its housing.

Then glue each section together, beginning by root section, L1 with L2, then L3.

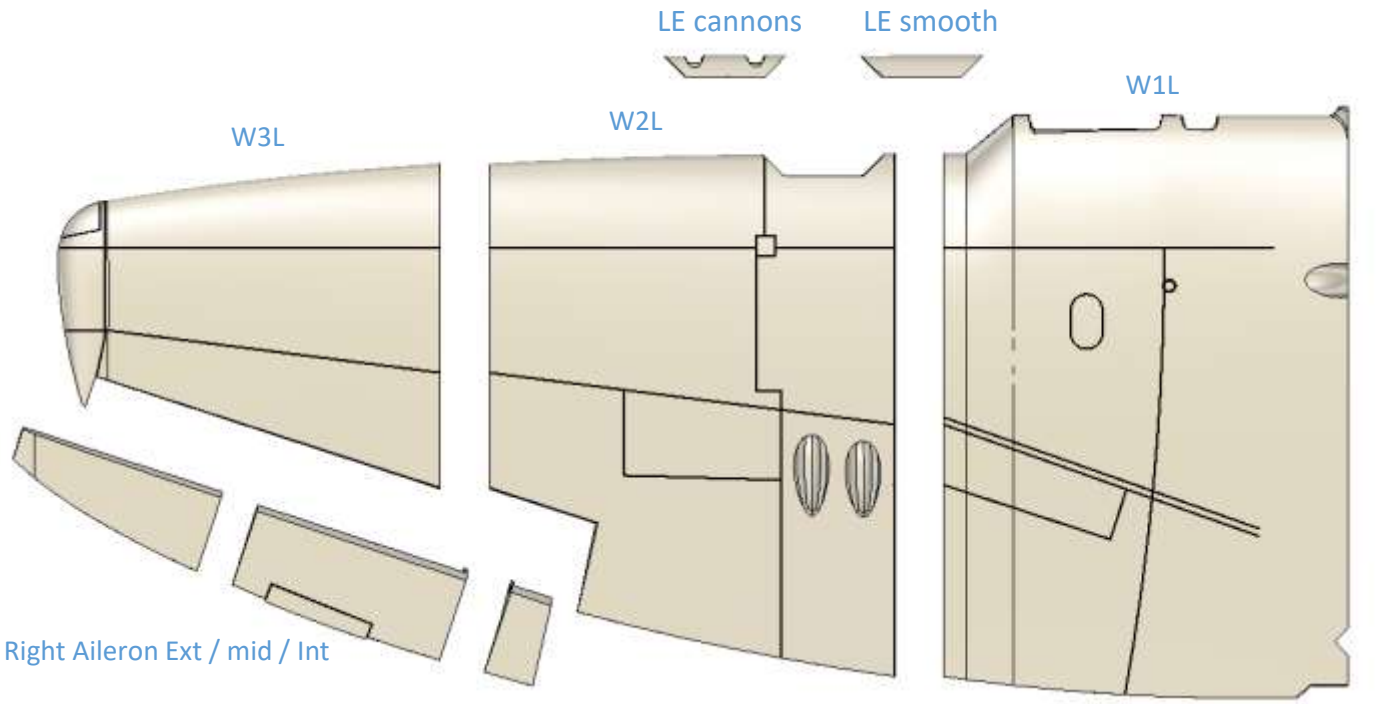
Same order for the right wing.

Assemble the three parts of the aileron (int / mid / ext).

There are two hinges by aileron. They must be cut in a 20 x 25 mm rectangle, then adjusted in place.

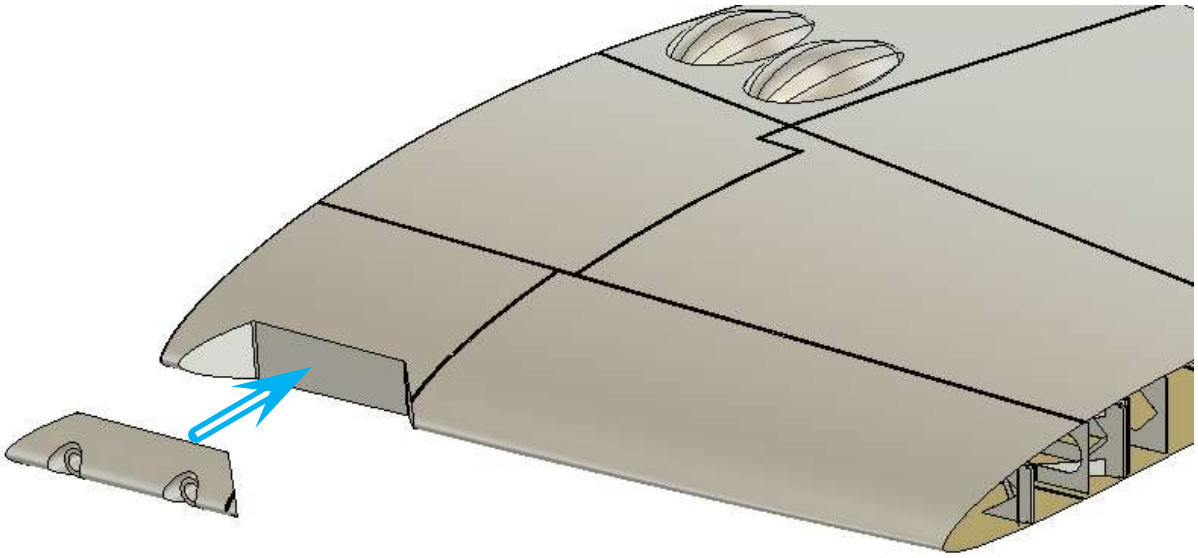
then assemble aileron with hinges and with wing before assemble the full wing.

Be careful not to twist the wingtip during the entire bonding process. You can use Ø2 rods to join the 2 wings together. Don't forget the Ø4mm carbon tube if you intend to use it.

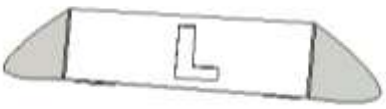


8.1- Leading edge (LE) with cannons or smooth

As option, local leading edge on W2 are proposed as separate parts to facilitate the printing. It could be cannons or smooth.



Both parts are identified Left (L) and Right (R)



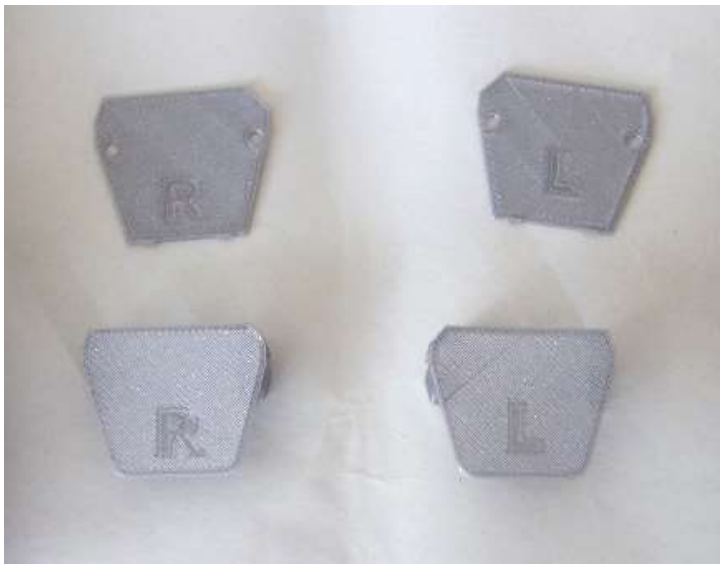
Parts should be glued on respectively W2R and W2L

W1L W2L W3L W4L

8.2- Servo mount

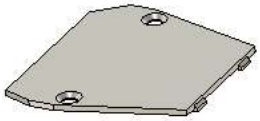
To facilitate the mount and setup of the servo, it is used a special mount with cover.

There is a mount for 16g servos and an other for 8g servos

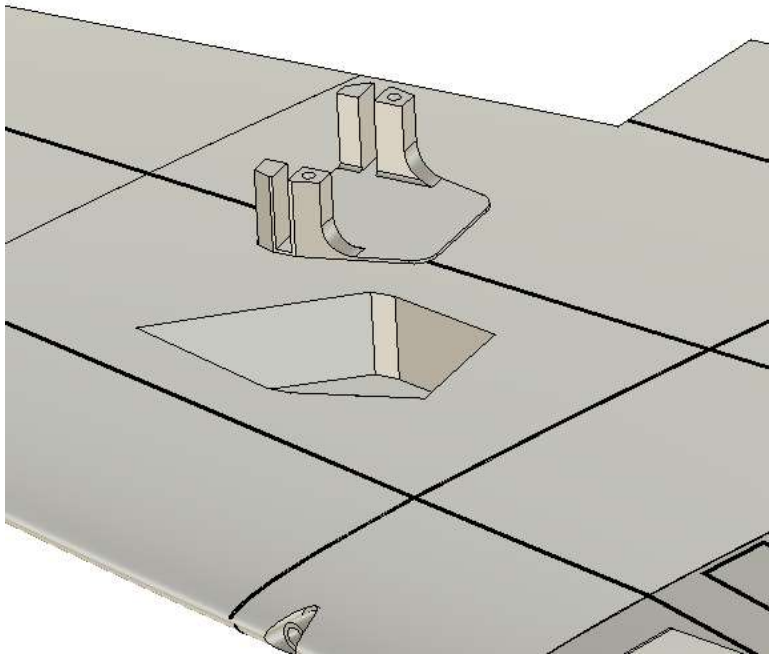


First, glue the mount to the wing. Each one have a letter to indicate the side (L for the left wing, R for right wing). You can use a servo to keep it straight.

Then fit the servo on the bay, adjust the linkage to the aileron easily, once finish, screw the cover to the mount with 2 screws 2 x 10



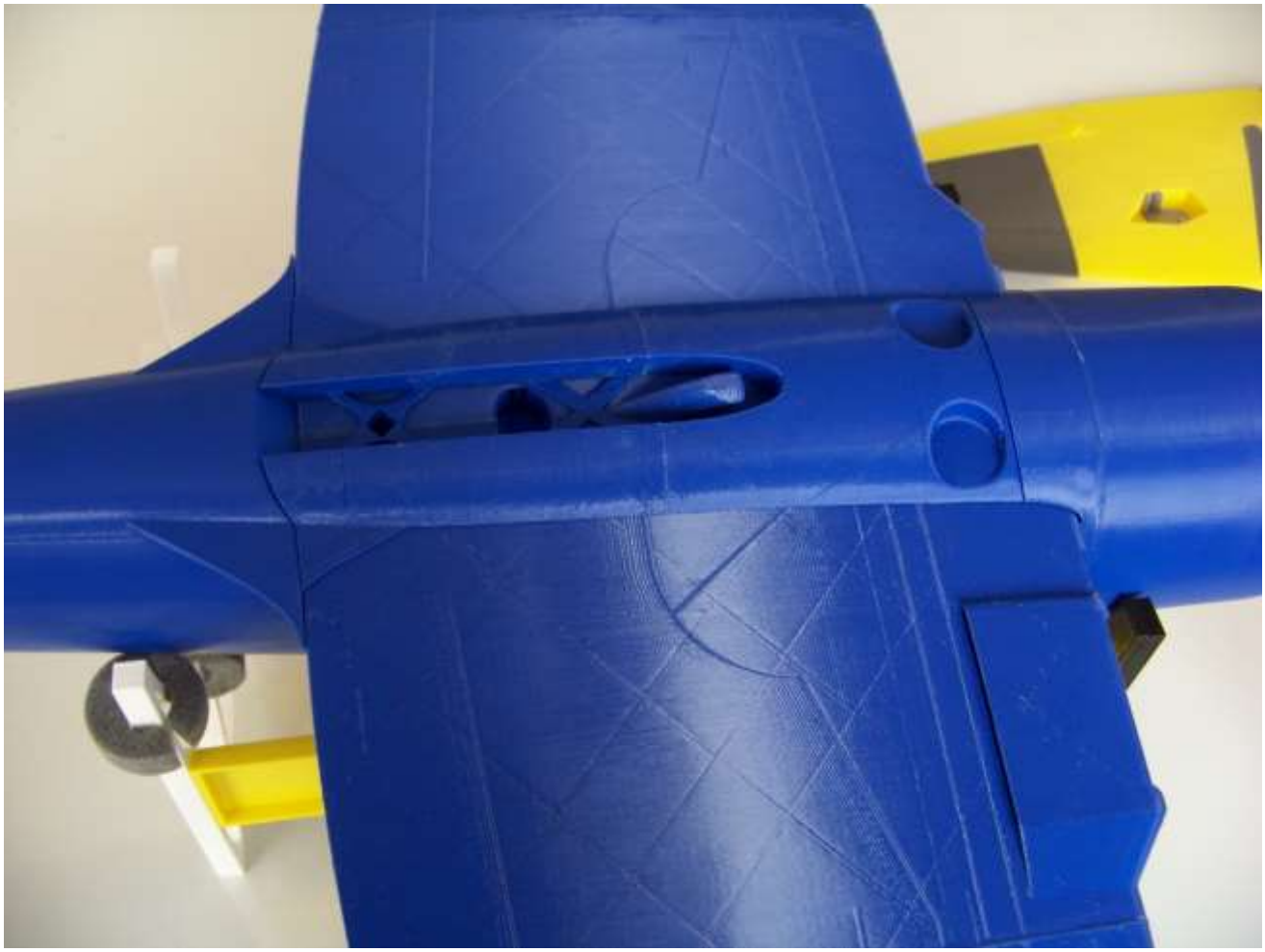
Left wing installation



3D

8.3- Wing bellies

They are glued together, then glued on the wing. Working with the wing under the fuselage is better to help center.



9- Fuselage

Assembly diagram, for details, see following pages

The version with or without rudder flap is realized with sections F5 and F6. The other sections are common to both versions.

F2

- cut opening(s) for servo(s)
- install elevator servo and the one for the rudder if needed
- provide ESC installation (length of motor cables)

F3

- glue with F2
- glue the support for the wing nut and rubber band, don't glue the center part, it will be cut later

F4

- glue with F3
- cut the lower opening under F3 !!! beware of the wing fixture

F5

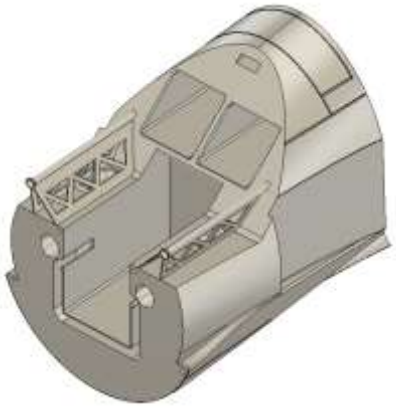
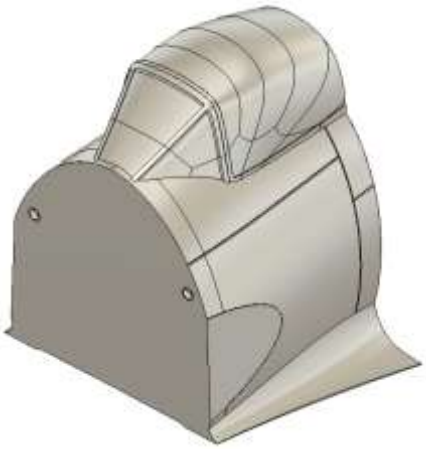
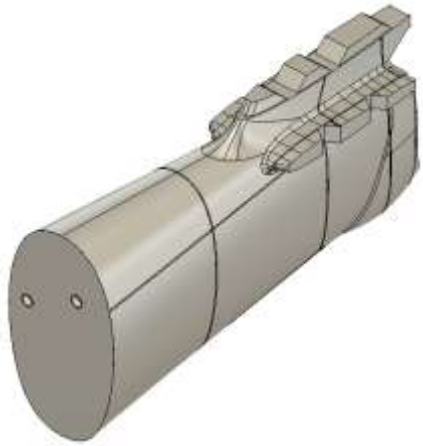
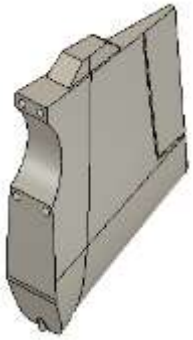
- select the 2 or 3 axis part
- open the elevator control area
- glue with F4

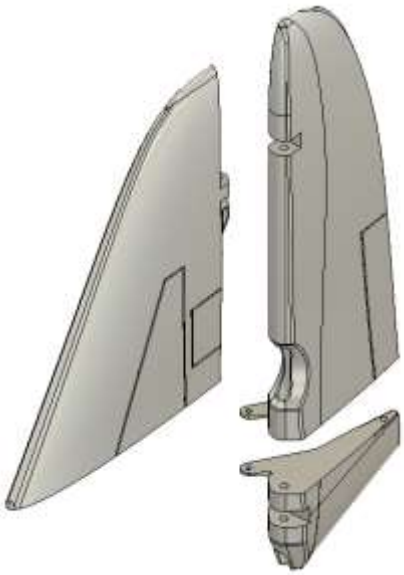
F1

- choose normal length or elongated version (help to balance with lightweight motor setup)
- install battery strap
- install the M3 self-locking nuts
- glue with F2

Final

- install wire pushrod for elevator (and rudder)
- glue the H stabs on the fuselage
- install the two elevator flaps, glue with hinges on the H stabs
- glue F6 for the 2 axis option only
- glue the V stab as per the 2 or 3 axis option
- if the rudder flap is install, then install the flap on the V stab with a Ø2mm rod

F1 – normal or long nose	F2
	
F3	F4
	
F5 - 2 axis	F6 – (2 axis only)
	

F5 – 3 axis	
	
H Stabilizer	
	
Fixed rudder	V stab with rudder
	

9.1- Motor mount

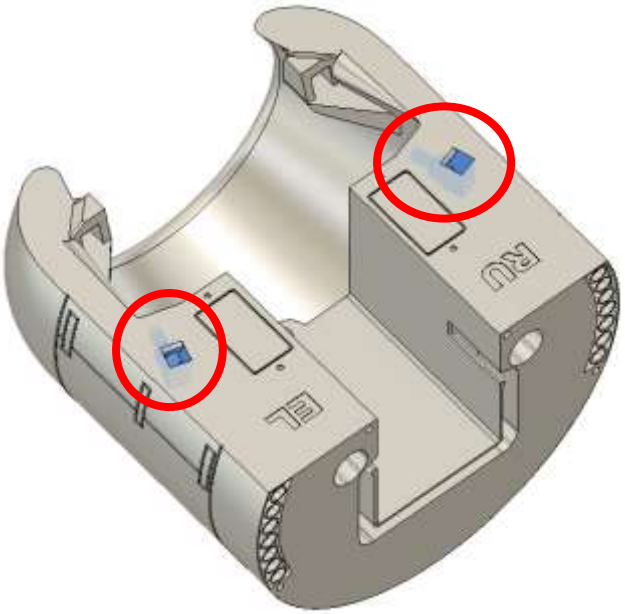
The motor is installed with a specific support. It is installed from the front.

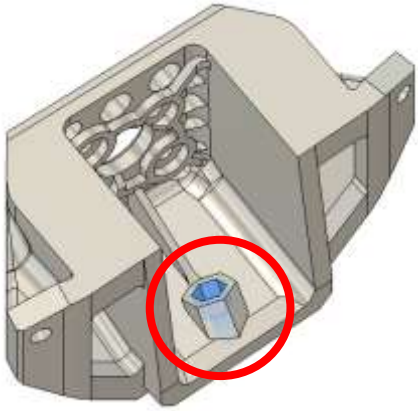
The support is fixed by 3 M3 x 18 screws + self-locking nuts in the aircraft structure.

There are several versions of motor supports corresponding to the main dimensions of the trade.

If you wish to use another engine, do not hesitate to ask us for a special support specifying the dimensions of your engine.

Install 2 of the M3 nuts in the housings in F1, the last is on the motor mount.

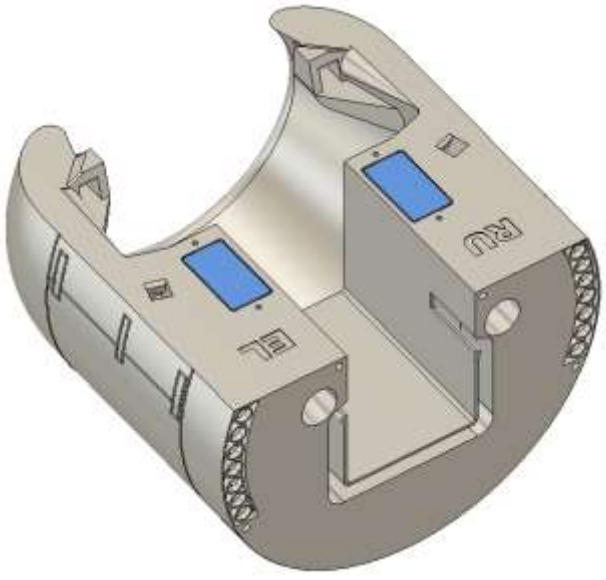




Use a needle nose pliers to facilitate the placement of the nuts. A point of CA glue allows to fix the nut in place.

Also install the strap for the battery. The openings come out of print.

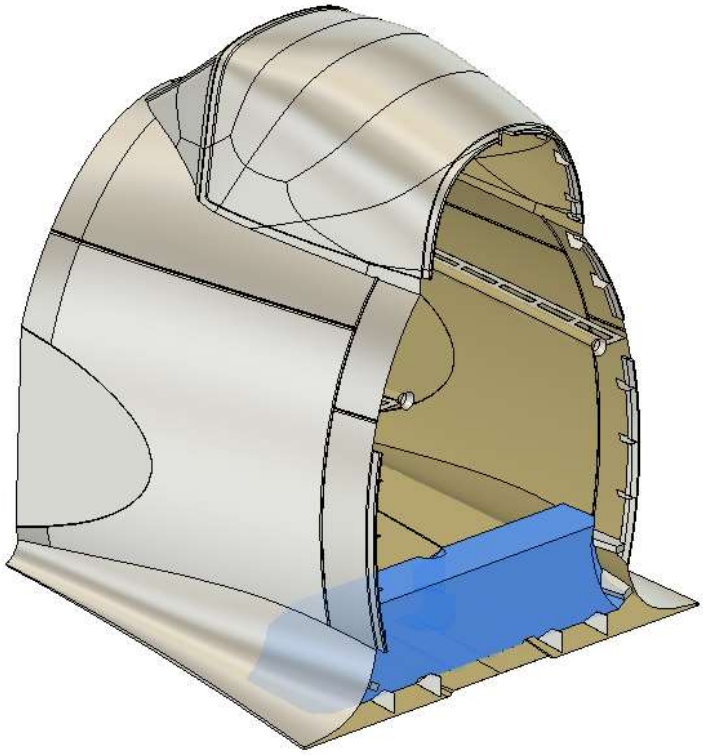
Cut along the contour for the passage of the servo (s), then install the servo (s); elevator at « EL », rudder at « RU ».

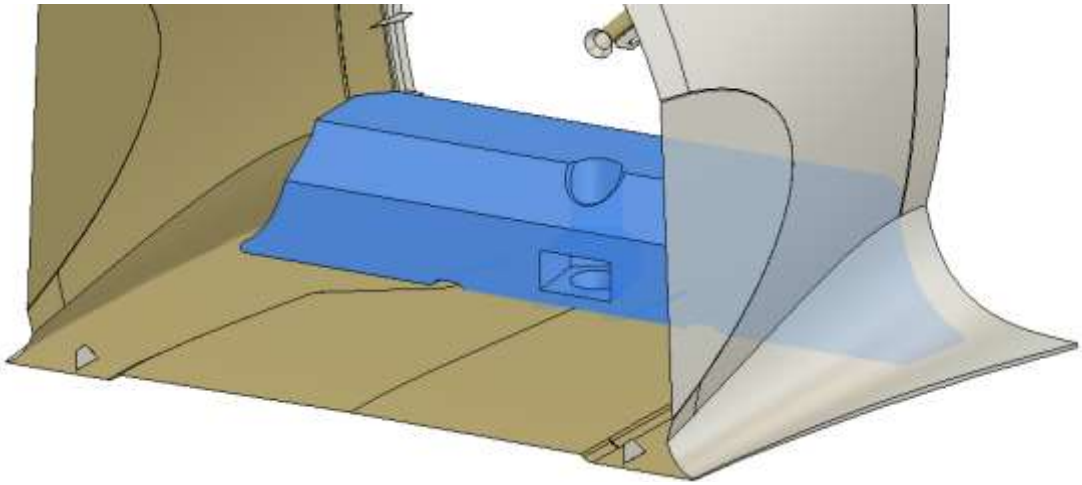


9.2- F3 preparation

Glue the wing mounting bracket. The opening for the nut passage forward.

The support is glued to the level of the F4 centering ribs.





9.3- Fuselage assembly (F1 to F6)

First, check all the parts, remove all the residual skirt, to sand if needed the parts.

Check that all sections of the tube for the elevator and rudder pushrods are well cleared and fully open along the entire length.

Assemble all the parts without any glue, to check the well adjustment and alignement.

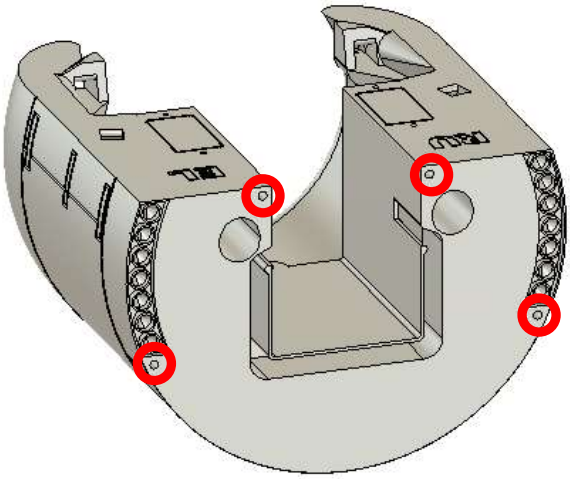
F1 with F2 are assembled together using a Ø2 mm x 6/8 mm rod ; toothpick or filament. Check the diameter of the different holes receiving these rods. If necessary, re-drill until Ø2.

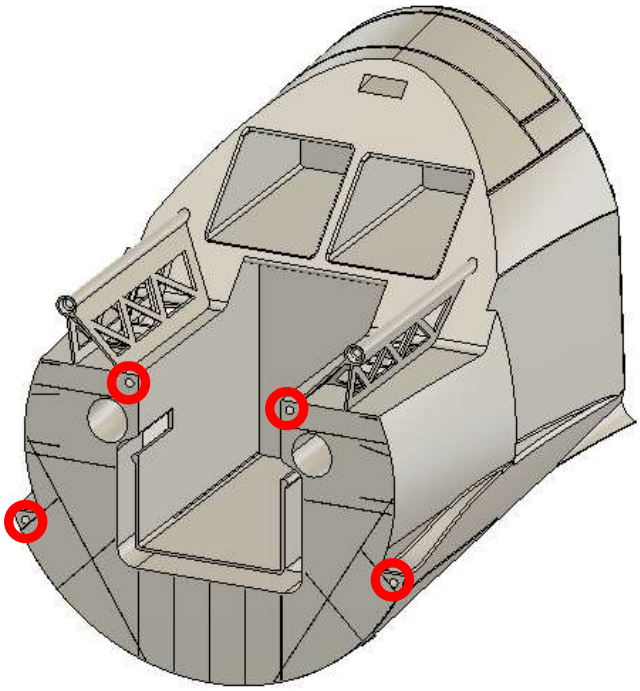
All other sections are centered with ribs.

Place the toothpick or the pin in a hole, then cut at 2 mm height

At this time, you can install the battery strap before assembly F1 with F2

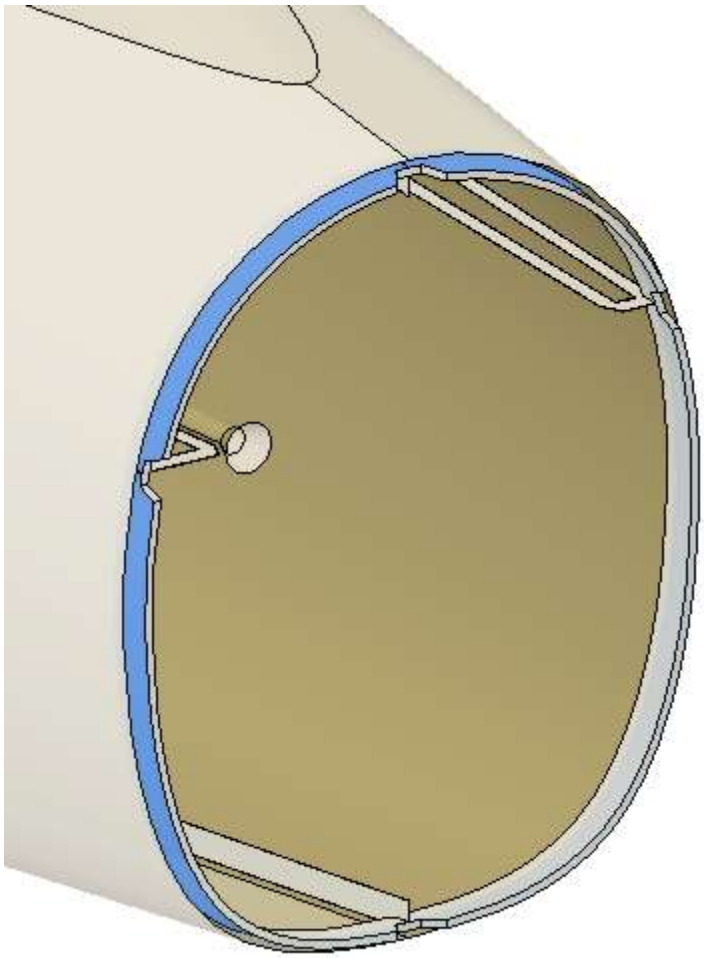
F1 / F2 pins locations





Assembly of other sections

A peripheral rib helps with centering, check the absence of plots or wires linked to the print



!!! do not bond F6 part to the fuselage until horizontal stabilizer is mount !!!

You can glue each part from F1 to F5 together.

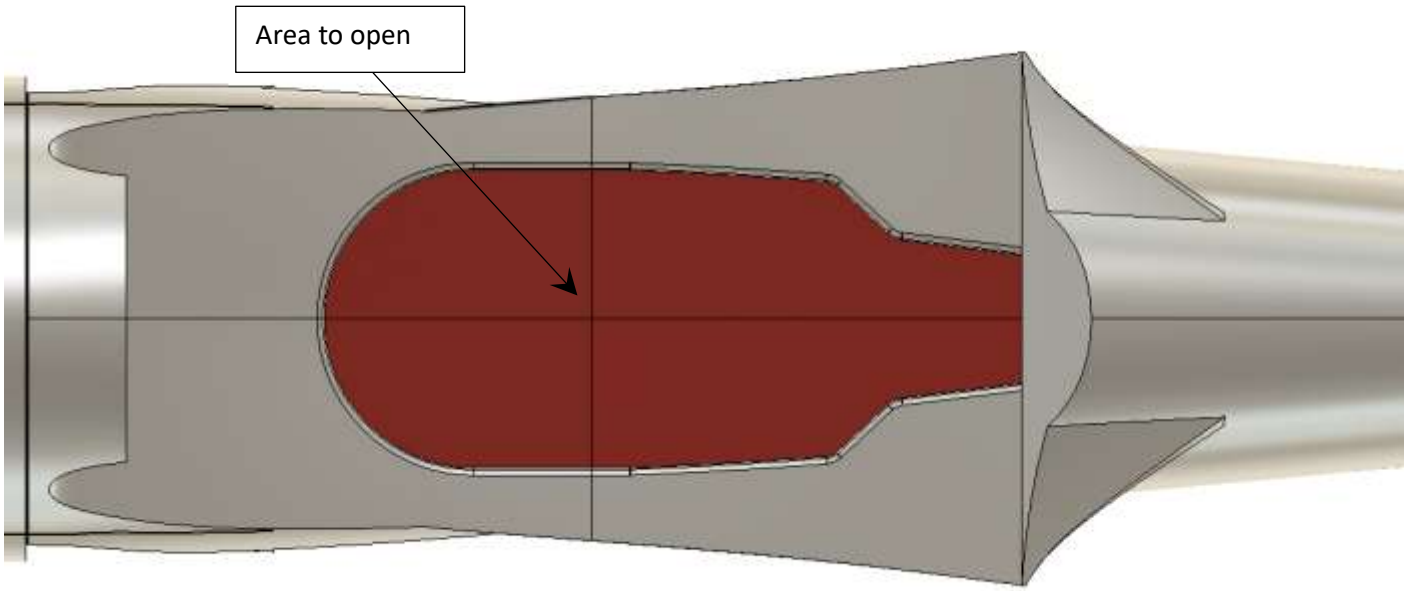
Use CA with activator if needed.

9.4- Section F2 – F3 (rubber band or screw option)

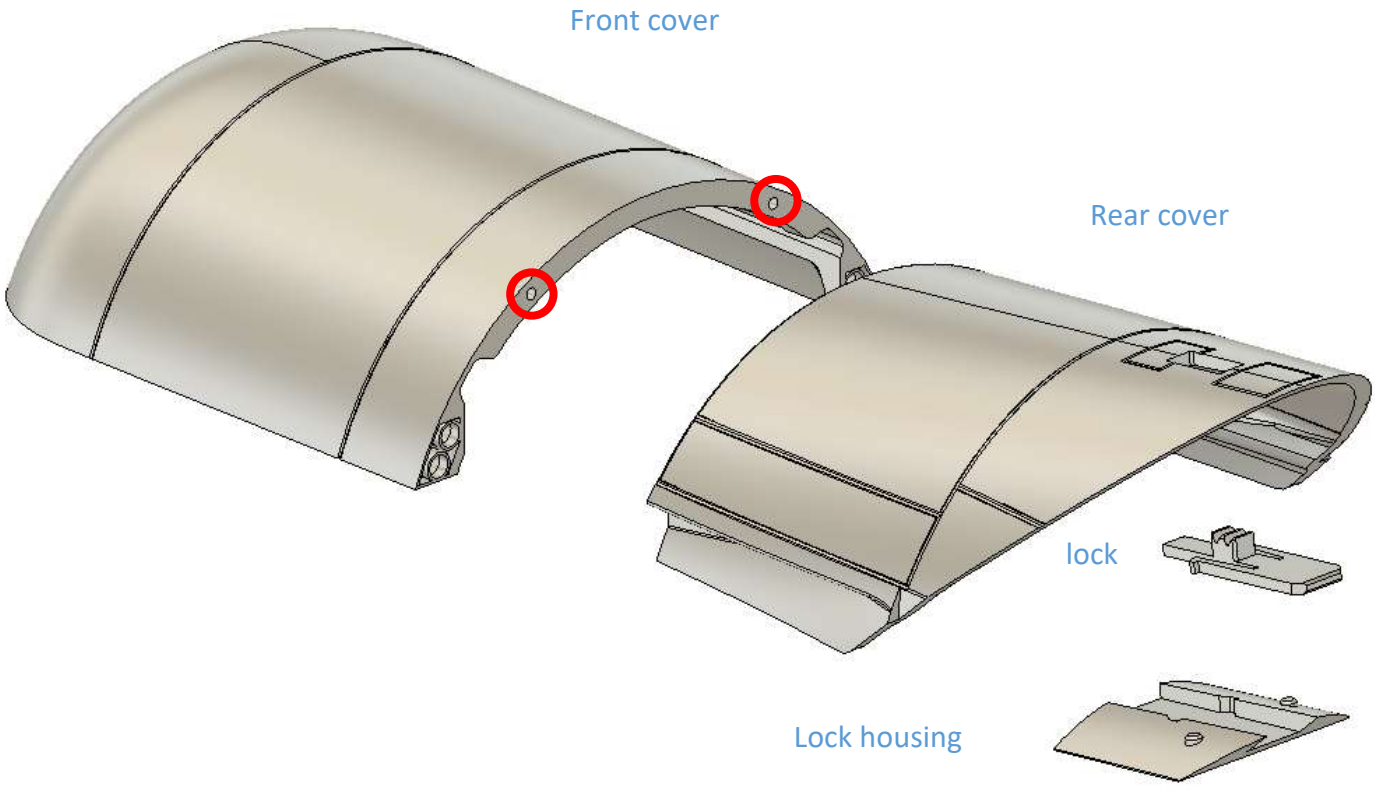
Once the whole fuselage glued (F1 to F4 at least), it is necessary to open the underside of F2 & F3 to give access for electronics.

You can use cutter, electrical driller or hot cutter.

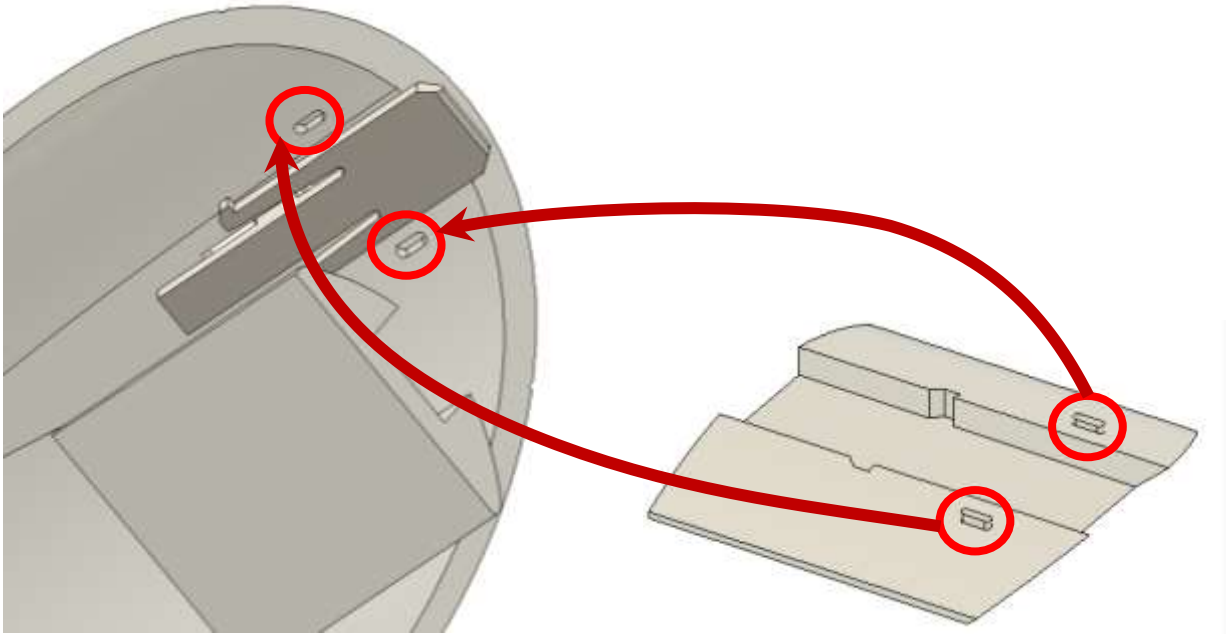
Paie a special attention to the internal wing support which is very close to the cutout.



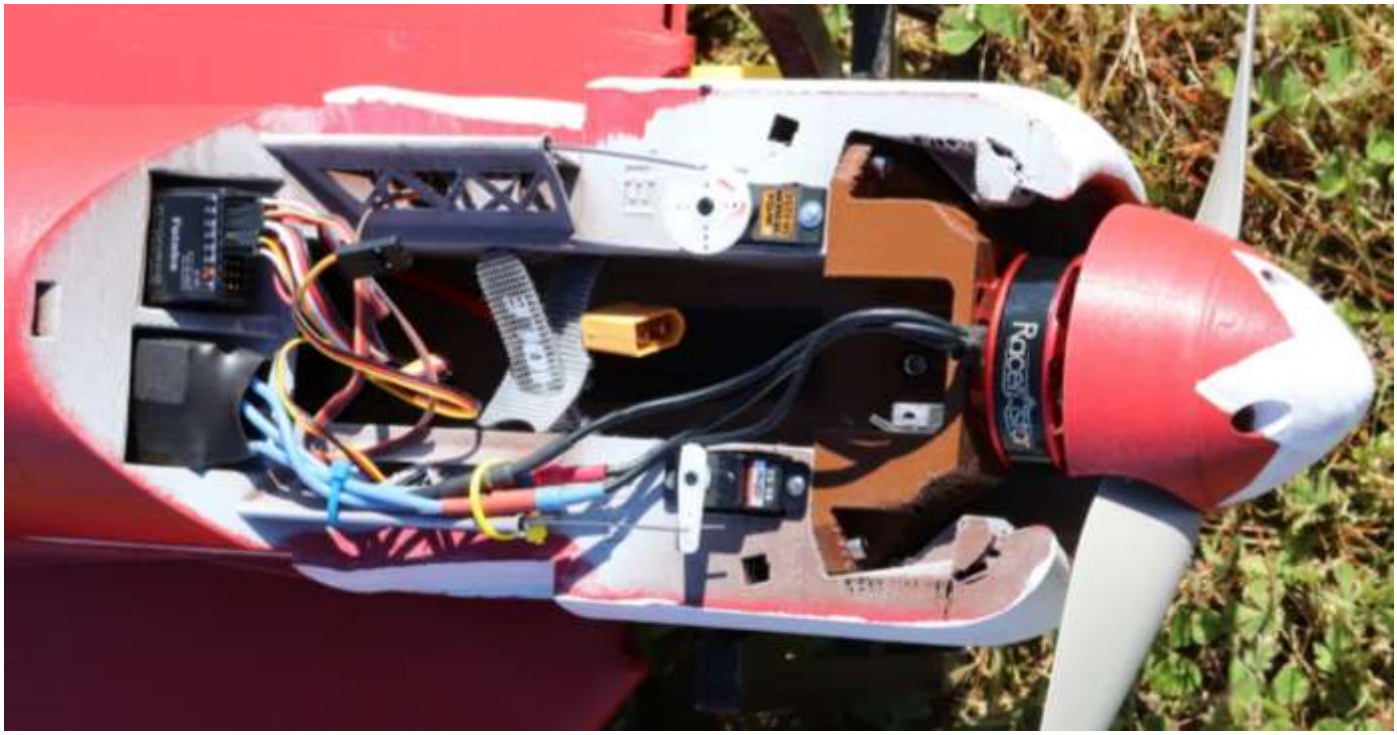
9.5- Battery hatch



First, glue front & rear part, you can use Ø2 mm rod tohelp centering.
Put the lock in the rear part, see below. This lock use a clip instead a spring.
Then glue the lock housing under the rear cover. Take care to not glue the lock.



Large access to the battery and the motor

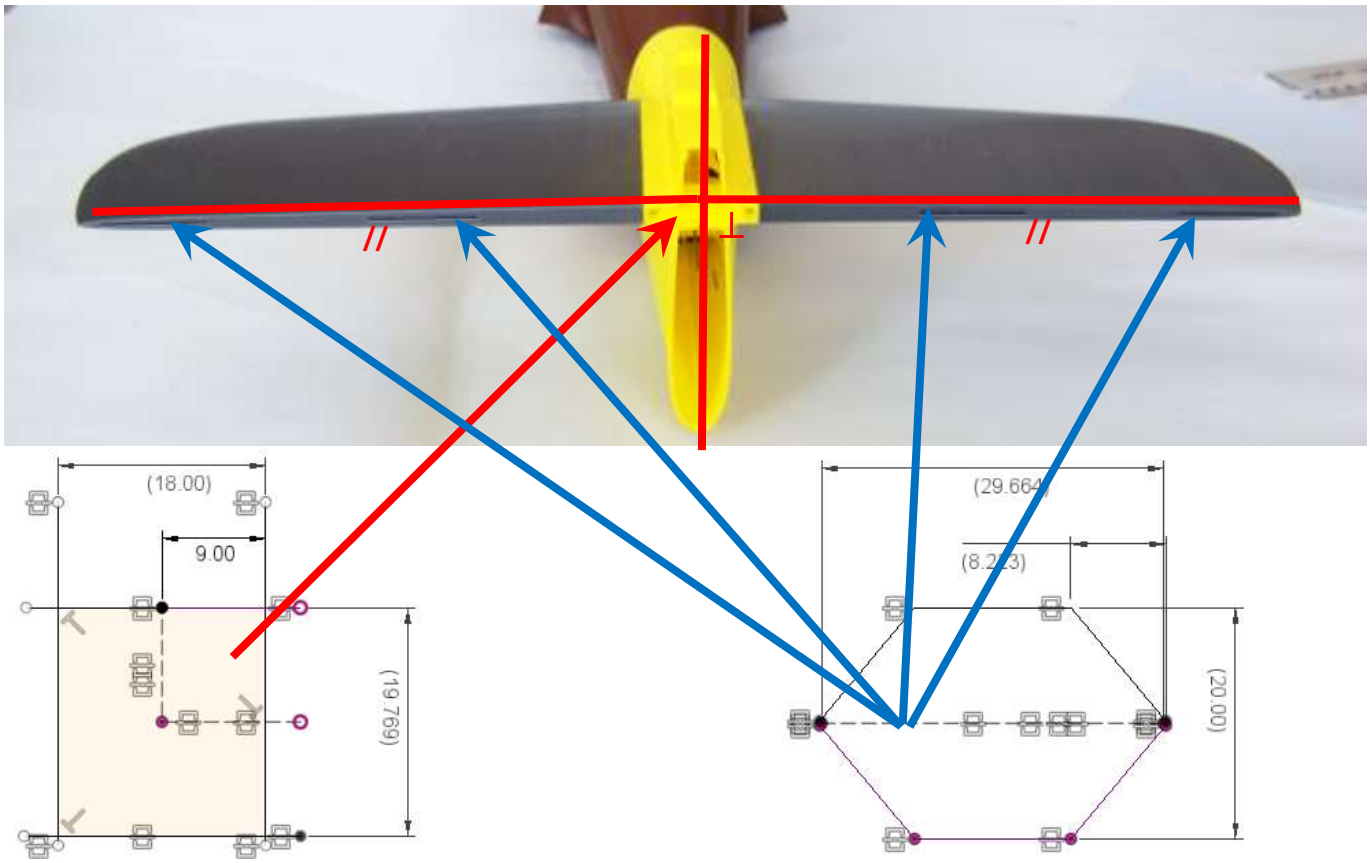


10- Tails, elevator pushrods and servos

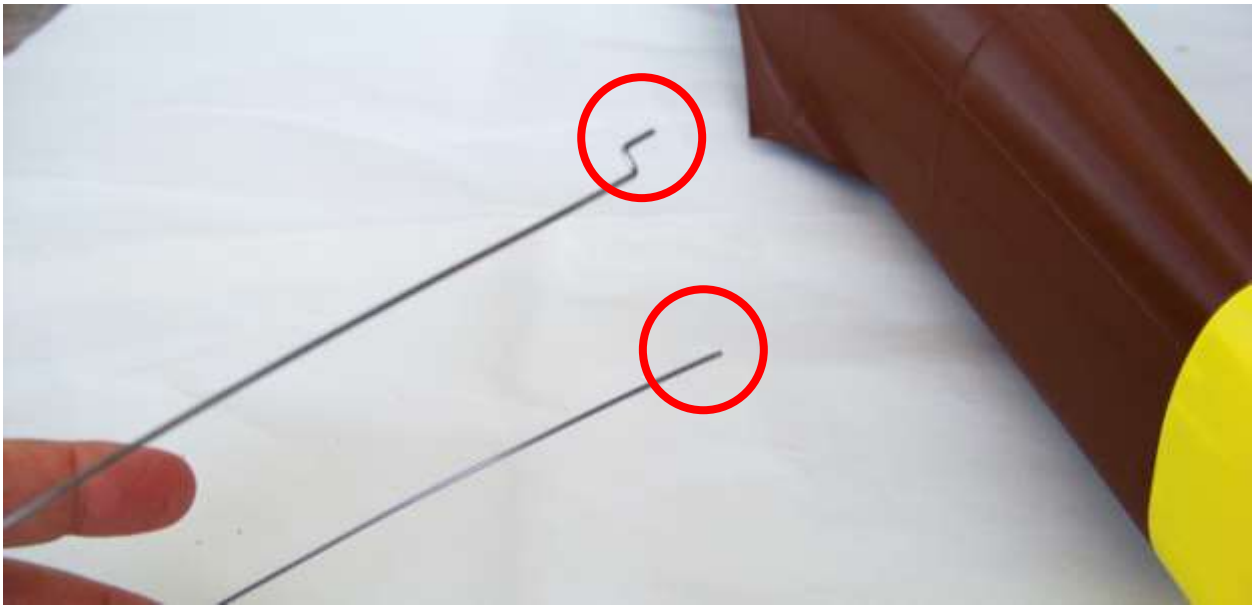
Use CA glue and activator (if needed) for assembly.

First, glue the horizontal stabilizer to the fuselage. Check the correct angularity between these 2 elements.

Once done, glue the hinges, if using film, cut as per the cut out below and adjust on parts.

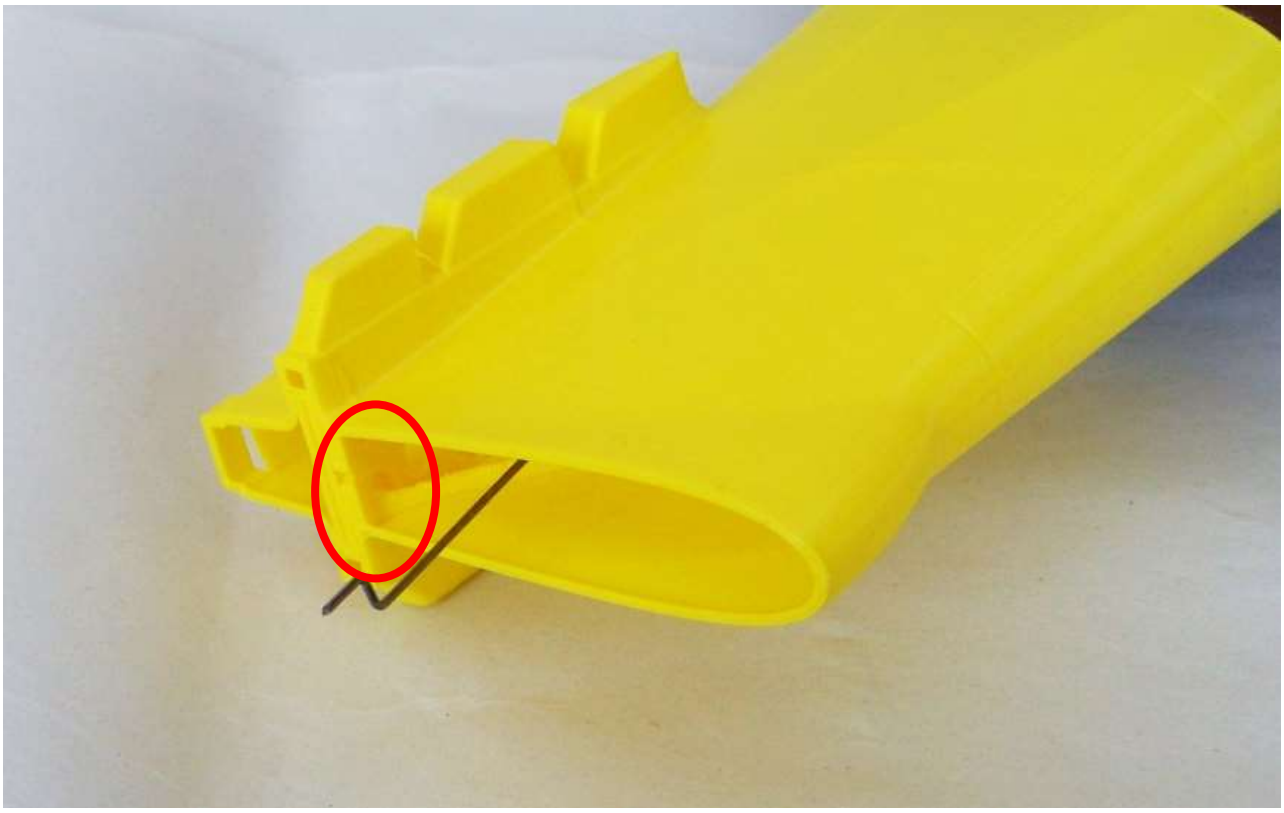


Prepare the Ø1 mm elevator pushrod wire, use a Z bend pliers at one extremity only.

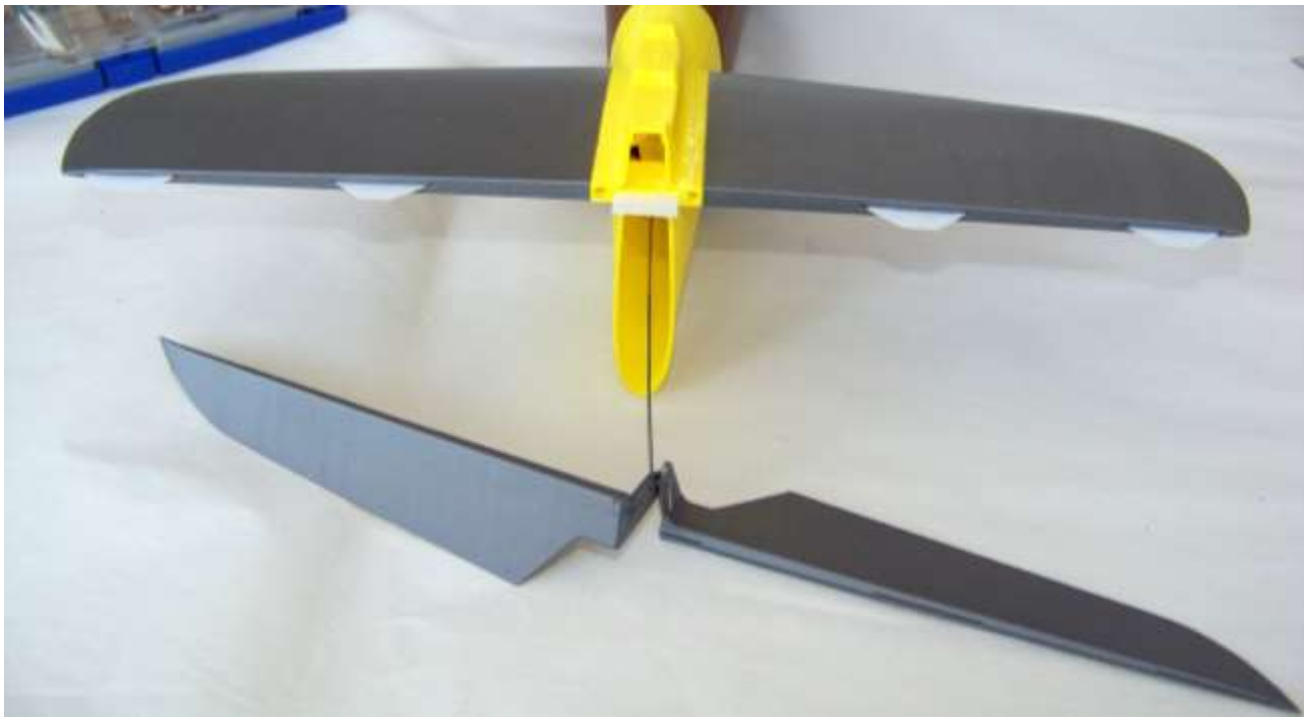


Put the pushrod wire on the fuselage, Z bended extremity at the elevator side.

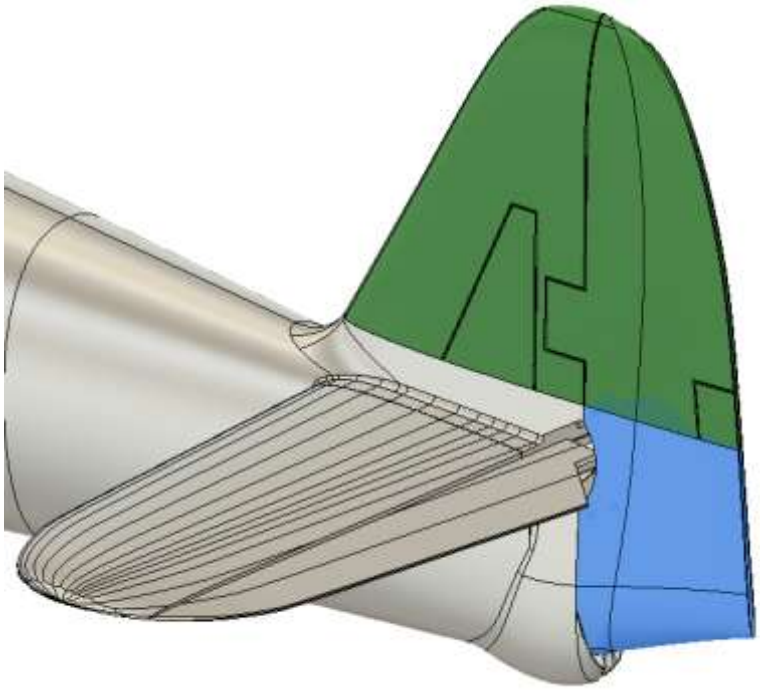
Cut the plastic on the area below.



Install the elevator on the pushrod, then glue the elevators to the hinges.

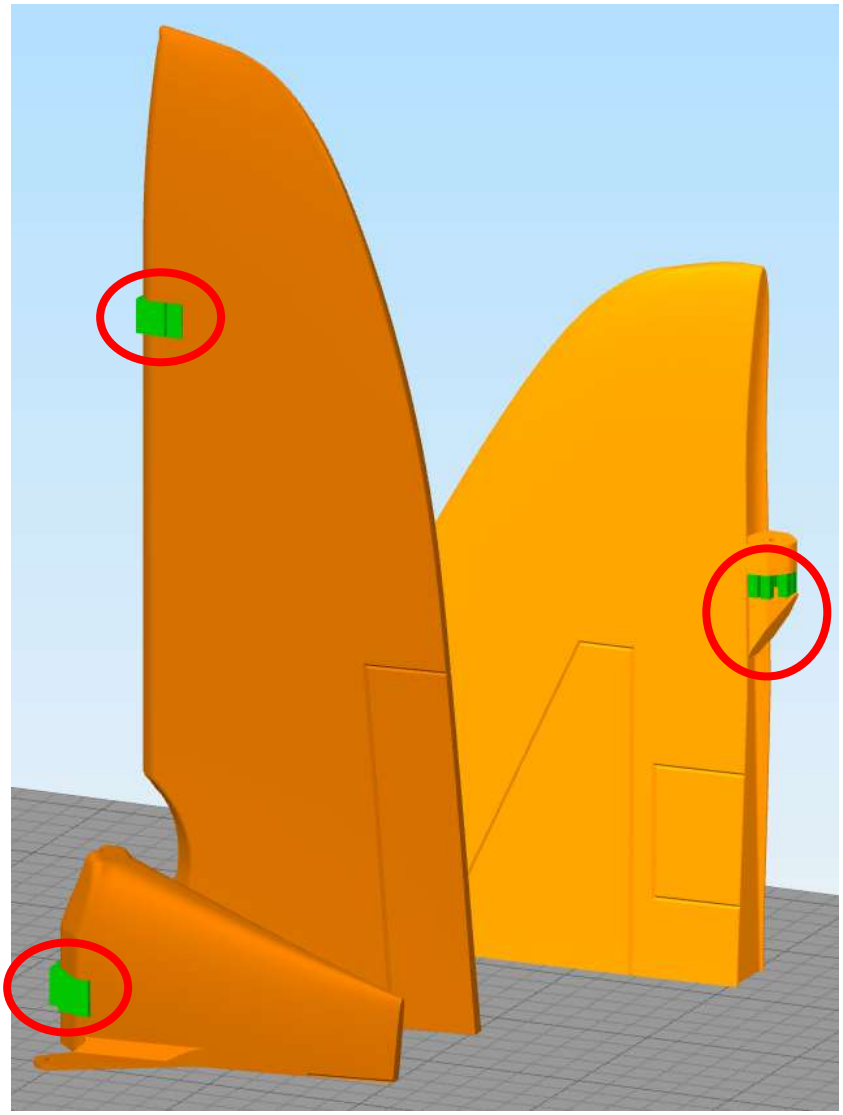


Finish with gluing F7 and the vertical stabilizer.



Option With rudder flap

Remove all the supports on the fin and the rudder flap.



Check the passage of the Ø2 mm hinge rod in all the parts, drill again if necessary.

The length of the axle must be 128 mm +/- 1

Once the whole H-stab assembly is glued on the fuselage, glue the fin. Check perpendicularity.

Carry out the length of the rudder pushrod in the same way as for the elevator.

Connect the horn of the rudder flap to the pushrod, then present the assembly on the fuselage, push the pin completely into the rudder flap.

Secure with a drop of cyano the axis in the lower part of the rudder flap.

11- Wing fixture

11.1- With rubber band

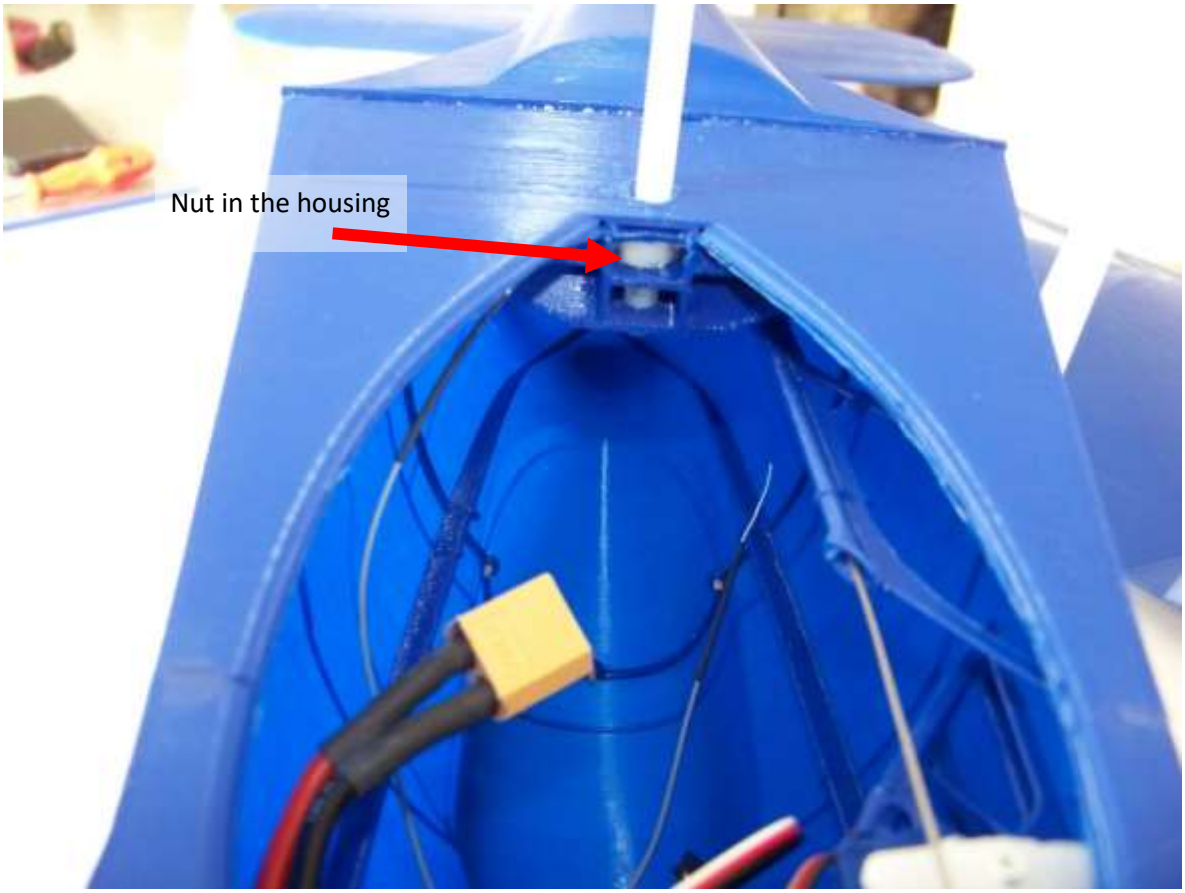
Use 120mm rubber band, attach around the printed rod

With wing

11.2- With screw and nut

Use M6 nylon screw and nut. If use ¼ '' screw and nut, you may have to adapt le nut's housing.

First, adjust the housing for the nut, then, glue it with CA bond.



12- Receiver ans ESC

Both can be installed on a specific housing in F2

13- Setup

For aileron and elevator, use +/- 8 mm displacement, 25 to 30 % exponential.

For the first flights, you can start with more exponential and / or reduced displacement.

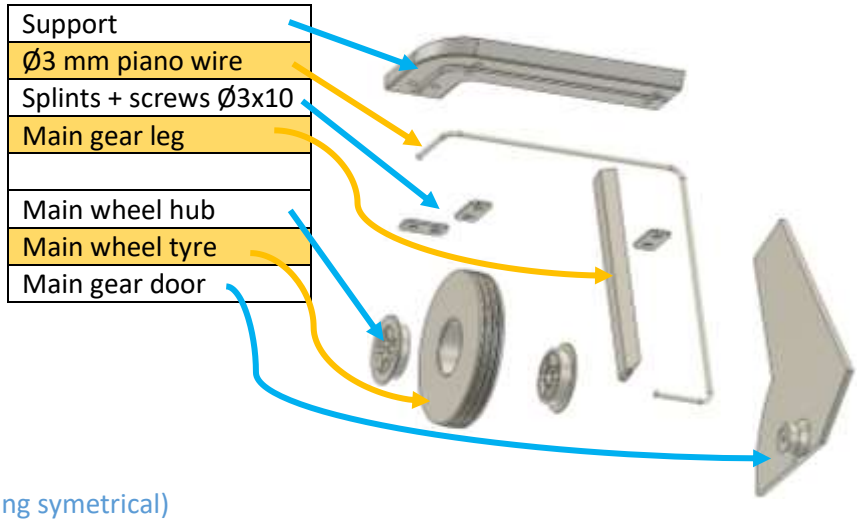
Do not forget that the manual launch involves a low speed for the first meters of flight,

14- Landing gear (optional)

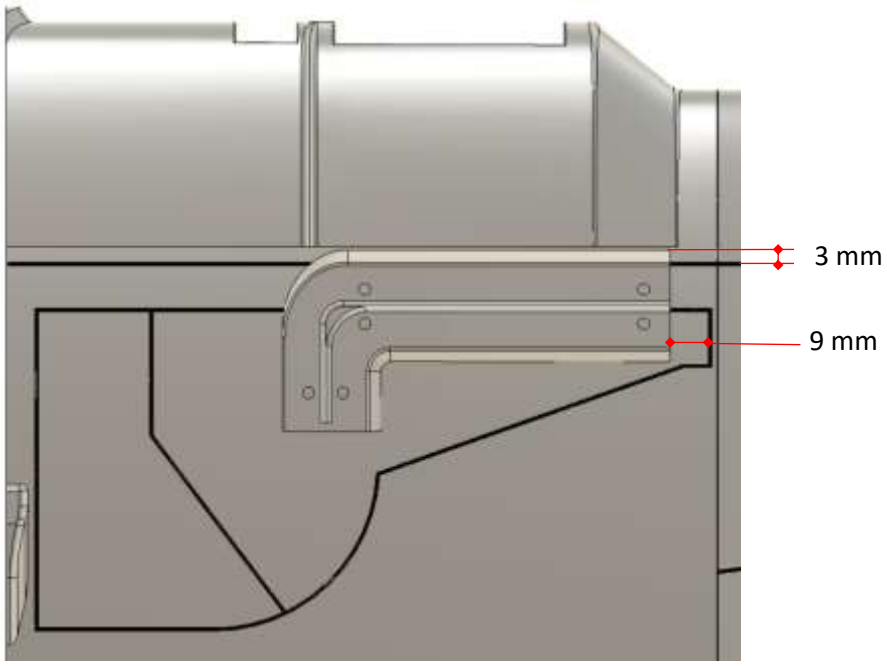
Left landing gear

Assembled

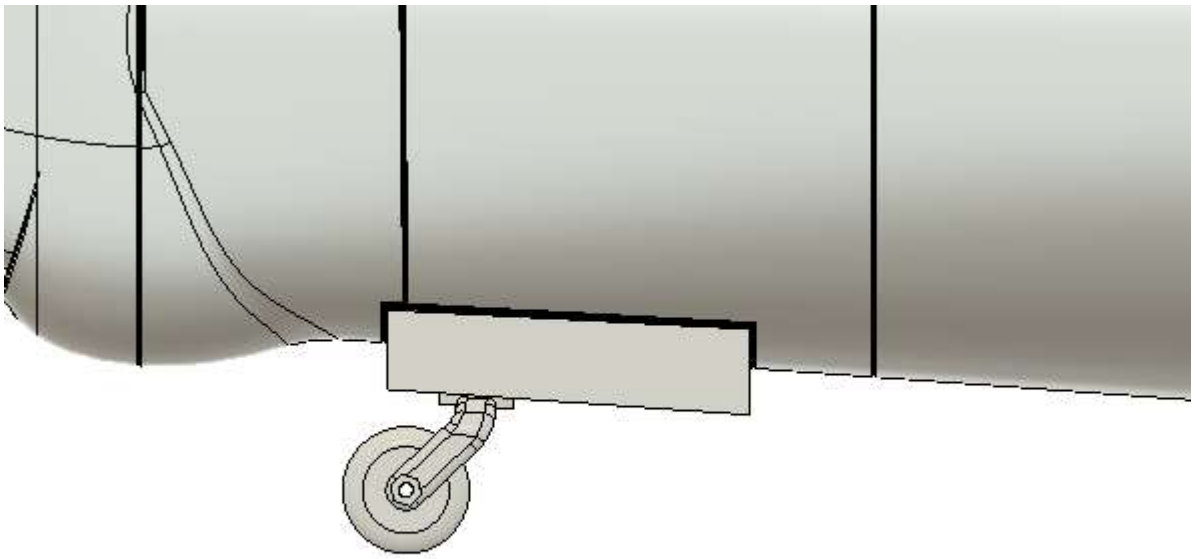
Exploded view



Installation (Left wing shown, Right wing symetrical)



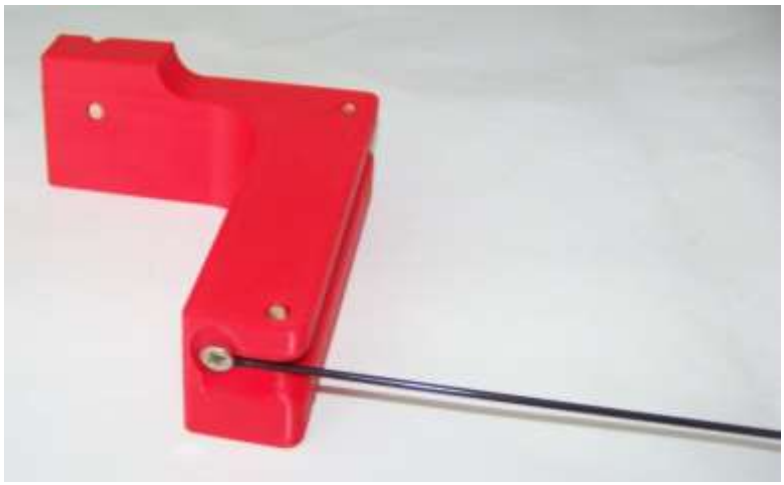
Tailwheel installation



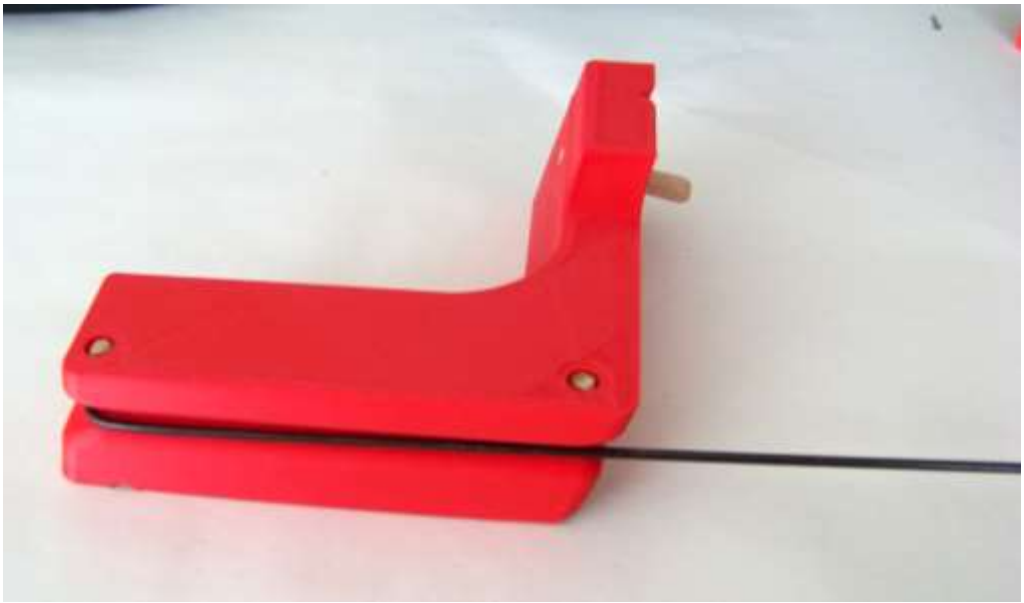
The use of the tool to bend the piano wire

1- Install Ø6 mm hard wood or metal pin in the holes and a Ø4 mm screw in the lower hole

2- Put the wire along the screw, tight it.



3- Bend the wire along the path on the tool

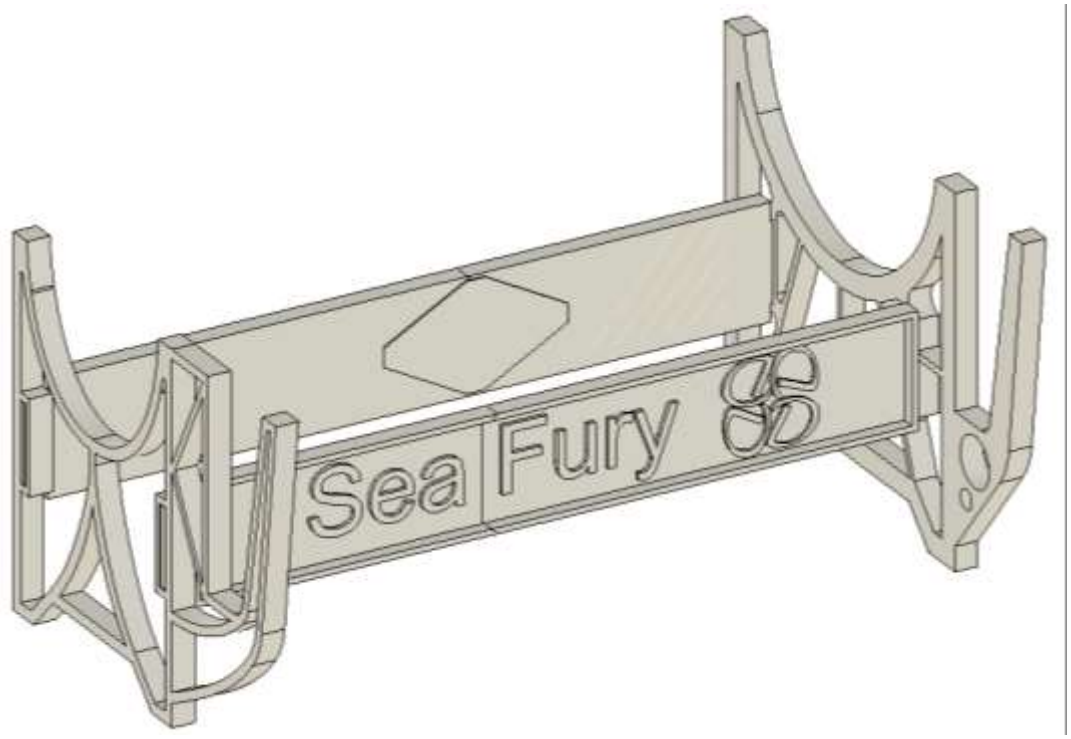


4- cut the wire at the correct length with the tool

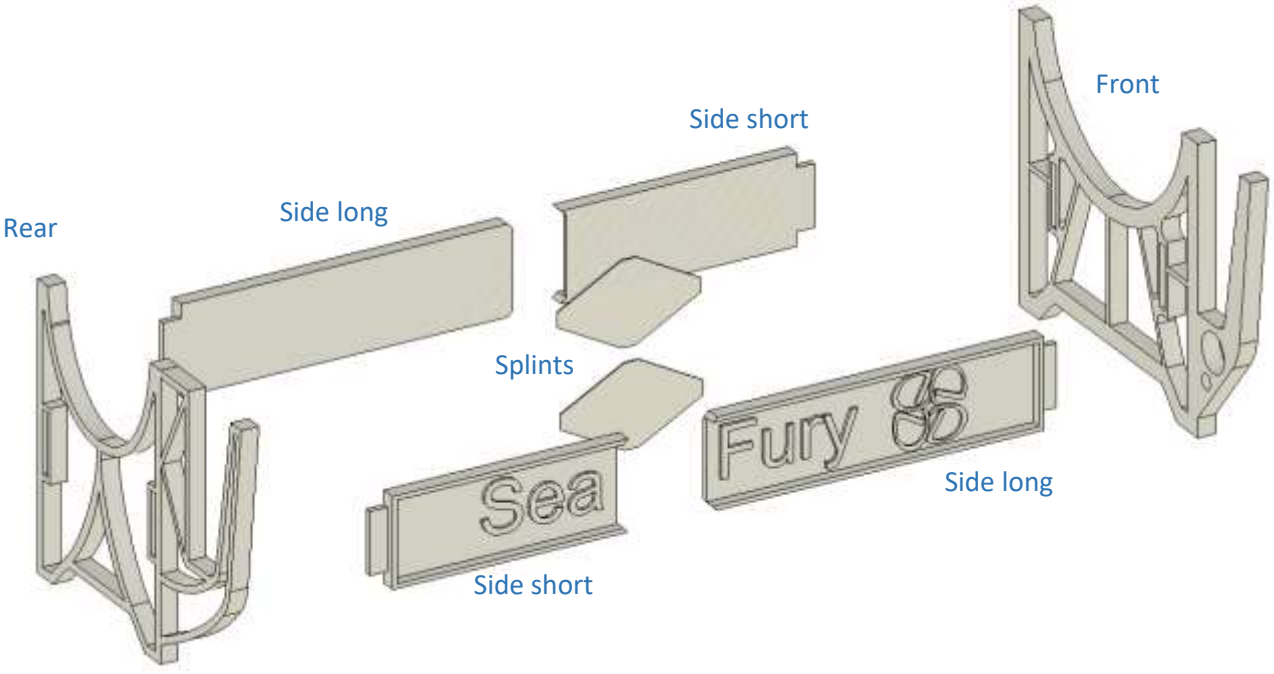

Cut here

15- Stand

A stand is provided as is. It help you to work around the plane and is helpful at field to support the plane fully assembled.



Part	Quantity	File
Front	1	Sea-Fury-1_12_Stand-Front.stl
Rear	1	Sea-Fury-1_12_Stand-Rear.stl
Side short	2	Sea-Fury-1_12_Stand-Side-front.stl
Side long	2	Sea-Fury-1_12_Stand-Side-rear.stl
Splint	2	Sea-Fury-1_12_Stand-Splint.stl



16- Paint & markings

You can find some stickers from https://callie-graphics.com/collections/hawker-sea-fury, select 1/12 scale.

Many informations could be find on wikipedia.

In the doc directory, you will find some stickers to print yourself on the file deco.pdf

There are many web site which propose photos of the Sea Fury. Below some ideas.

F-AZXJ, https://www.airliners.net/search?keywords=F-AZXJ

G-CBEL, https://www.airliners.net/search?keywords=G-CBEL

G-FURY, https://www.airliners.net/search?registrationActual=G-FURY

NX15S, https://www.airliners.net/search?keywords=NX15S

NX232MB, https://www.airliners.net/search?keywords=NX232MB

NX878M, https://www.airliners.net/search?registrationActual=NX878M

17- Pilots Please Attention !!

- For the first flights we recommend to reduce the displacement for elevator and aileron to +/- 8mm.
- **Make sure the battery is well fixed in proper position. If it moves during flight it will cause the CoG move aft and can lead to uncontrollable flight behavior.**
- **Check motor mount and screws before each flight...**
- **Do NOT leave this PLA plane on direct summer sun or in car. (max. PLA temp is about 50°C)**
- **Never fly aft positioned Center of gravity.**
- **Flying at high speed and practicing high-G maneuvers puts the airframe of the aircraft under great stress which can lead to breakage in flight.**
    - **➔ Be vigilant and careful when you practice this type of flight, no express or implied warranties do not engage ADDIMP 3D or its partners.**
    -
- **Respect your local reglementation for flying.**

Please, use these files only for your own purpose.

Do not send it further.

Thank you very much and enjoy your flight.

18- Informations and contact

For all informations, please contact us :

contact@addimp-3d.com

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