Curtiss P-40 Warhawk

Jenda „Fík“ Krapf

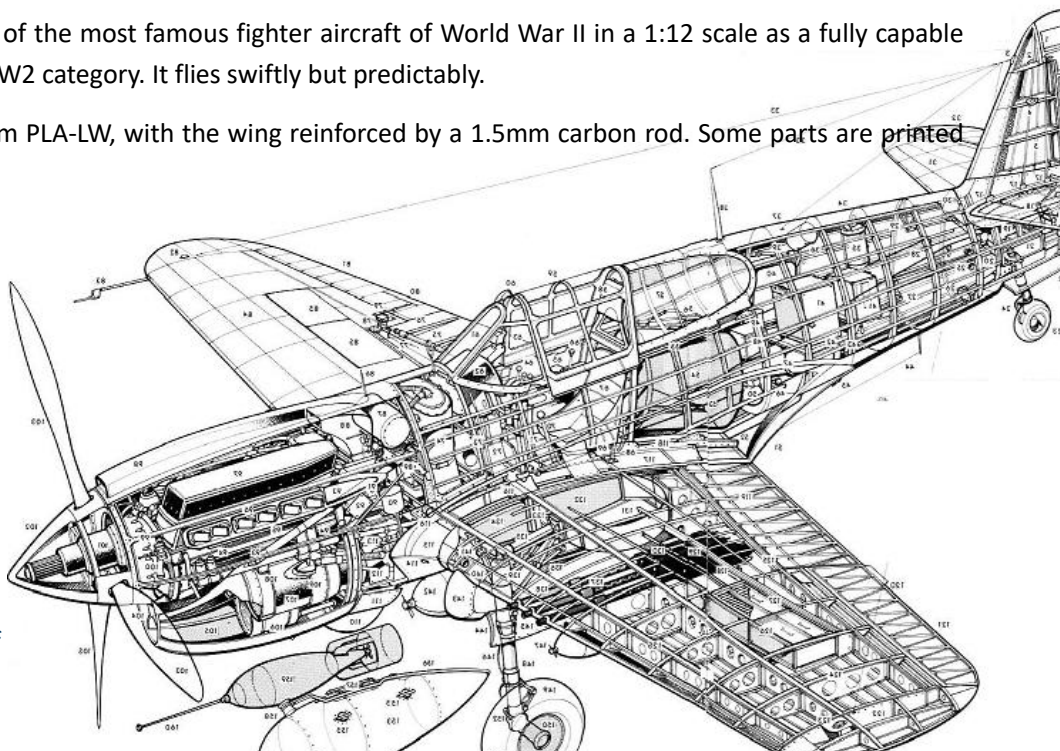
Historical

The Curtiss P-40 Warhawk is an American single-engined, single-seat, all-metal fighter-bomber that first flew in 1938. The P-40 design was a modification of the previous Curtiss P-36 Hawk which reduced development time and enabled a rapid entry into production and operational service. The Warhawk was used by most Allied powers during World War II, and remained in frontline service until the end of the war. It was the third most-produced American fighter of World War II, after the North American P-51 Mustang and Republic P-47 Thunderbolt; by November 1944, when production of the P-40 ceased, 13,738 had been built,[3] all at Curtiss-Wright Corporation's main production facilities in Buffalo, New York.

About the model

I designed a semi-scale model of one of the most famous fighter aircraft of World War II in a 1:12 scale as a fully capable combat machine for the Aircombat WW2 category. It flies swiftly but predictably.

The model is primarily 3D printed from PLA-LW, with the wing reinforced by a 1.5mm carbon rod. Some parts are printed from PLA or PETG.



General specifications

Wing-span :	980 mm / 38,2 inch
Length:	780 mm / 30,7 inch
Height:	233 mm / 9,2 inch
Wing area	15,9 dm^2 / 1,7 square feet
Print wight:	300 g / 10,6 oz
Wight fully equipped :	850 g / 30 oz
Wing profle:	Clark YH modifed
Center of gravity:	50 mm / 1,97 inch (from leading edge)

Recomend setup

Motor: AT 2312 1150 (2830) T-motor

ESC: 30A / 3-4S

Propeller two blades APC 9x5

Requirements

Recomend nozzle: 0,4 mm

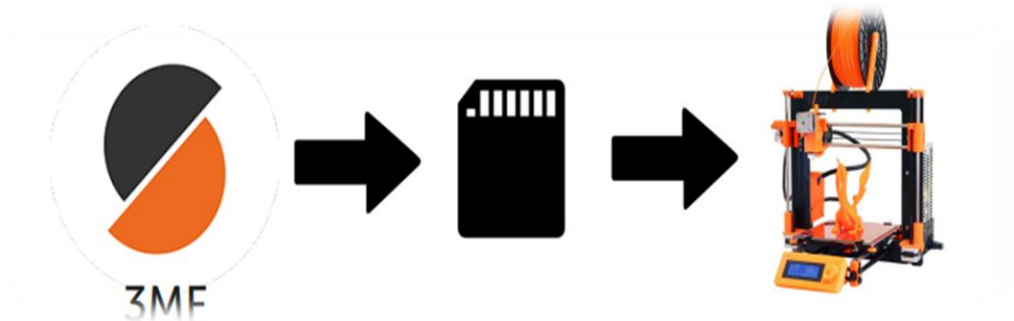
Print area 200x200x200 mm

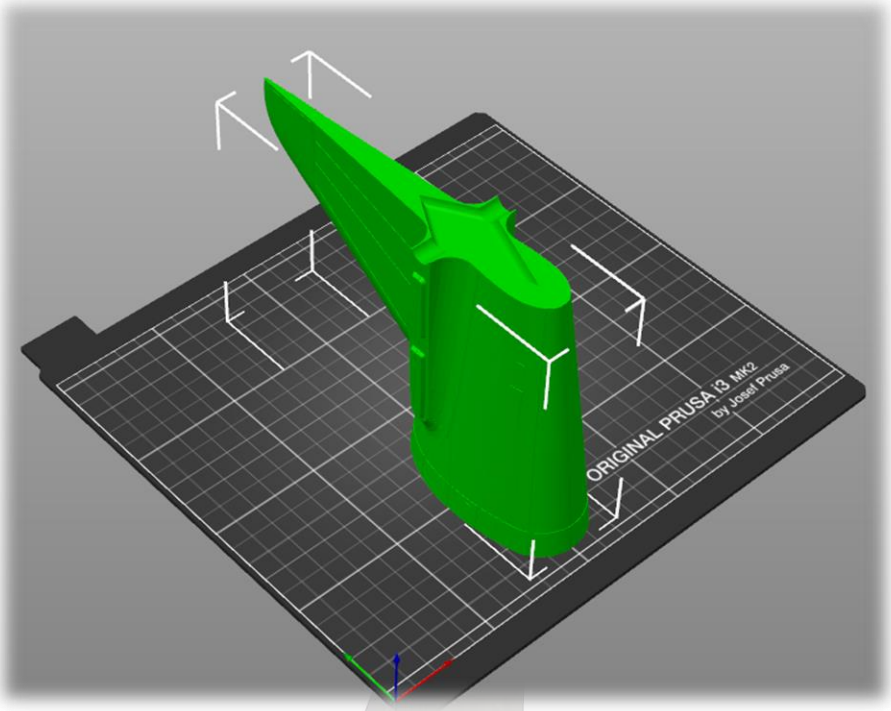
Prusha sliccer

Included

1- 3MF 3D files

3MF files can be used instead of standard STL files, but also include information about slicing in the new version of Prusa Slicer (since version 2.4). Open them directly in the Prusa Slicer as a project or import to the slicer of your choice.





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2- STL files- universal for any slicer

If you need STL files you can export them from 3MF files

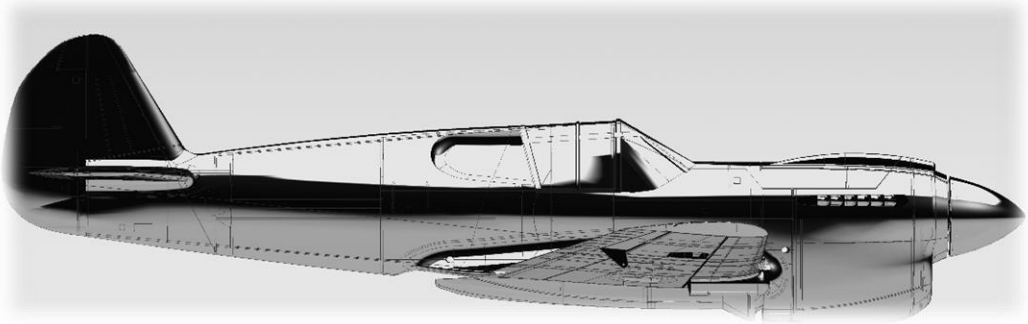
3- Printing guide from 3D labprint

Please see the Printing Guide for PrushaSlicer, Simplify3D Cura or Bambu studio setup to find some Tips and Advice for airplane printing (Thin Wall Printing). Remember: We use 0 retraction and 0.4 -0.5 flow with LW-PLA

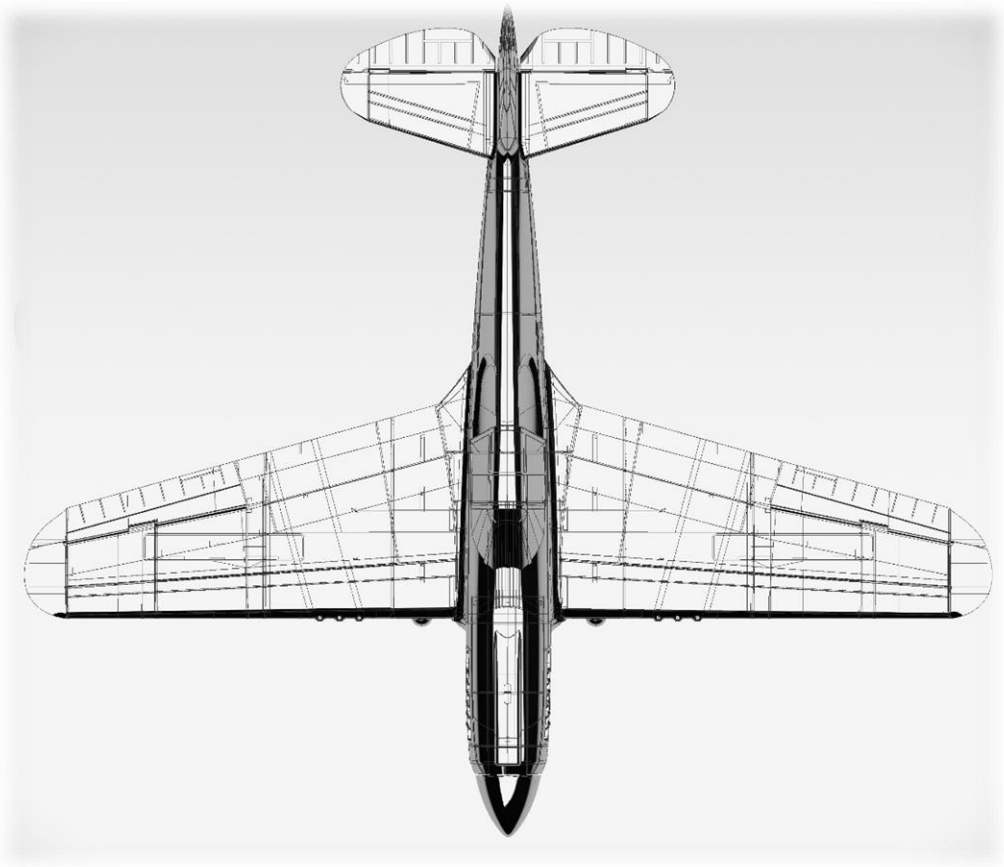
4- Scale markings PDF

You could print and cut the PDF in scale from thin self adhesive advertisement foil and place it on the model as needed.

P-40 Warhawk



Lenght: 780 mm / 30,7 inch



Wing Area: 15,9 dm^2 / 1,7 square feet

Step by step user guide

1- Prepare Gcodes

Please follow the guide in the Help section of 3Dlabprint website about Prusa Slicer setup.

Drag and drop the 3mf file to the Prusa Slicer window and open it as a Project. It will create a Generic 3DLabPrint printer, printing profile and materials. You can change printer profile on your own but remember We are using 0.5 multiplier and 0 retraction with LW-PLA.

Strong thin wall printing is a different discipline than printing Benchys what are the stock profiles usually optimized for. Once you tweak your profiles (retractions, etc.) you can easily switch the profile every time you open the 3mf file. All the slicing tweaks, such as added top/bottom layers etc., are stored in the models below, so it won't be overwritten.

2- Print it

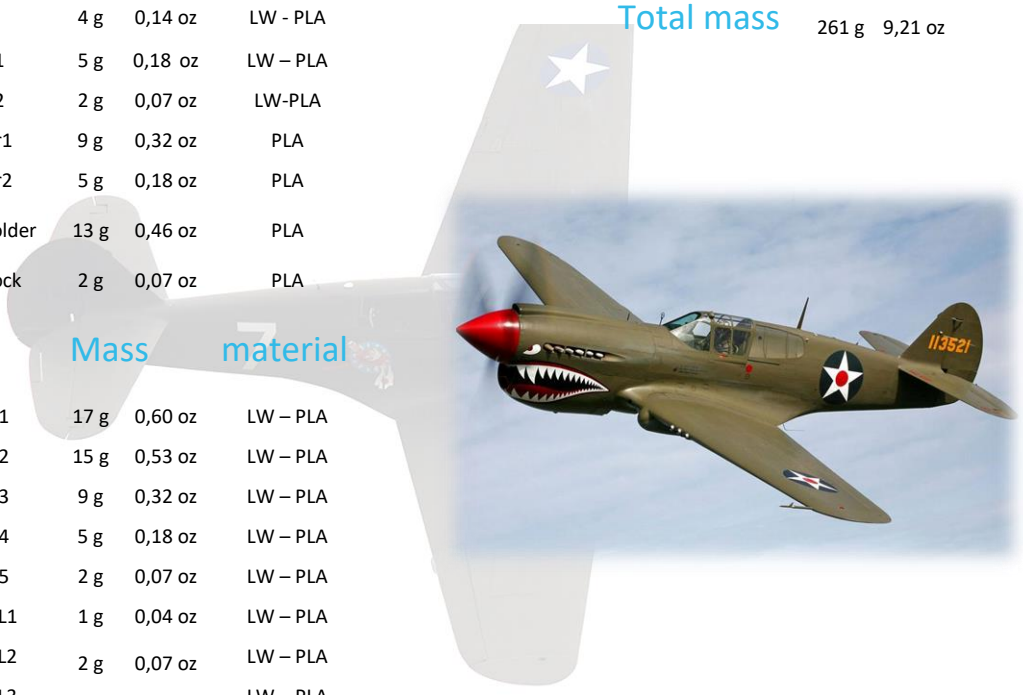
Save the Gcodes to the SD card and insert into your printer. Prepare your printer and start printing, we prefer to use SD card rather than direct USB connection. Scaling the model will lead to unusable result! you will need: LW-PLA filament - (Polylight LW-PLA) 3DLac, Strong hair spray, PEI or your favorite adhesive bed surface and razor blade.

3- List of parts

Fuselage	mass		material
F0	6 g	0,21 oz	LW - PLA
F1	12 g	0,42 oz	LW - PLA
F2	20 g	0,71 oz	LW – PLA
F3	6 g	0,21 oz	LW – PLA
F4	15 g	0,53 oz	LW – PLA
F5	9 g	0,32 oz	LW – PLA
F6	9 g	0,32 oz	LW – PLA
F7	4 g	0,14 oz	LW - PLA
Cover1	5 g	0,18 oz	LW – PLA
Cover2	2 g	0,07 oz	LW-PLA
Spinner1	9 g	0,32 oz	PLA
Spinner2	5 g	0,18 oz	PLA
Engine_holder	13 g	0,46 oz	PLA
Cover_lock	2 g	0,07 oz	PLA

Wing	Mass		material
Wing L1	17 g	0,60 oz	LW – PLA
Wing L2	15 g	0,53 oz	LW – PLA
Wing L3	9 g	0,32 oz	LW – PLA
Wing L4	5 g	0,18 oz	LW – PLA
Wing L5	2 g	0,07 oz	LW – PLA
Aileron L1	1 g	0,04 oz	LW – PLA
Aileron L2	2 g	0,07 oz	LW – PLA
Aileron L3	1 g	0,04 oz	LW – PLA
gondol L1	2g	0,07 oz	PLA
gondol L2	2 g	0,07 oz	PLA
Wing R1	17 g	0,60 oz	LW – PLA
Wing R2	15 g	0,53 oz	LW – PLA
Wing R3	9 g	0,32 oz	LW – PLA
Wing R4	5 g	0,18 oz	LW – PLA
Wing R5	2 g	0,07 oz	LW – PLA
Aileron R1	1 g	0,04 oz	LW – PLA
Aileron R2	2 g	0,07 oz	LW – PLA
Aileron R3	1 g	0,04 oz	LW – PLA
gondol R1	2 g	0,07 oz	PLA
gondol R2	2 g	0,07 oz	PLA
cooler1	7 g	0,25 oz	LW-PLA
cooler2	3 g	0,11 oz	LW-PLA
cooler3	3 g	0,11 oz	LW-PLA

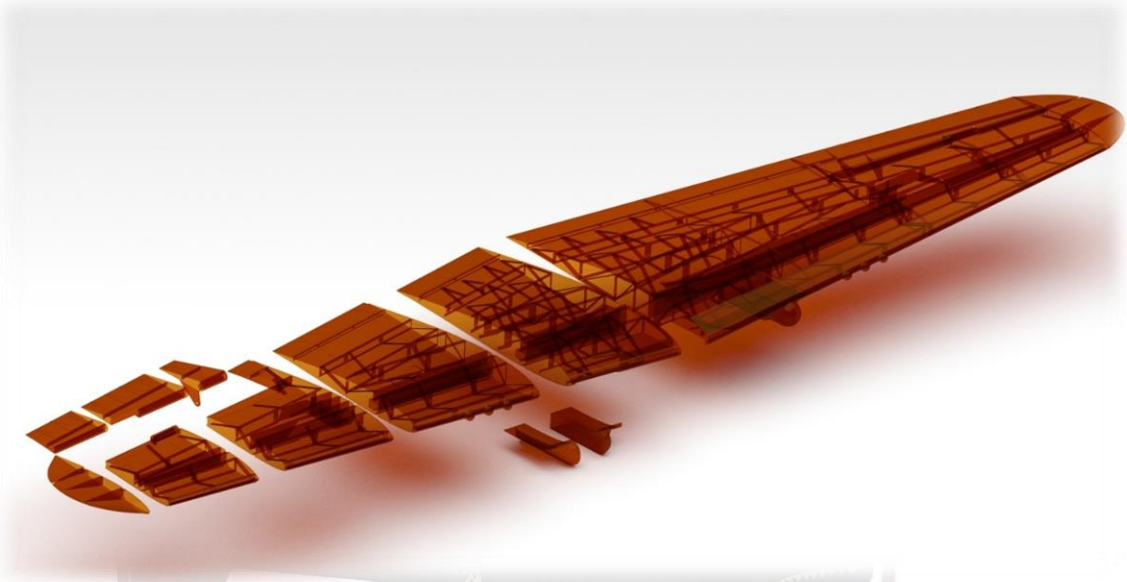
Tail	mass		Material
Stab L1	5 g	0,18 oz	LW-PLA
stab L2	1 g	0,04 oz	LW-PLA
elevetor L	3 g	0,11 oz	LW-PLA
Stab R1	5 g	0,18 oz	LW-PLA
Stab R2	1 g	0,04 oz	LW-PLA
elevetor R	3 g	0,11 oz	LW-PLA
Lever	1 g	0,04 oz	PLA
Total mass	261 g	9,21 oz	



4- Assembly P-40 Warhawk

a) Wing

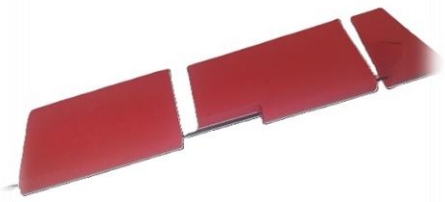
The wings consist of two halves (ten parts each), glued together in the middle. Print out all the parts of the wings and ailerons. If you want, you can also print the undercarriage nacelles (they do not affect the function or strength of the wings, they are only a mock-up accessory).



1) Use a sharp knife to remove burs from the printed parts, especially the wing locks. Calibrate the holes in the aileron hinges with a carbon rod.

2) Carefully assemble the parts (1-5) over the latches and glue straight on with thin instant glue. Make sure that the glue flows into the locks but does not leak unnecessarily into the surrounding area.

3) When you have assembled and glued the two wing halves separately, you need to glue the two parts together correctly. Glue them together with a thick instant glue. Apply glue to the mating surface of the wing, mainly around the perimeter of the profile, and carefully press the two parts together. The thicker glue will allow you to set the wings together as it will not harden immediately. Then spray the joint with activator.

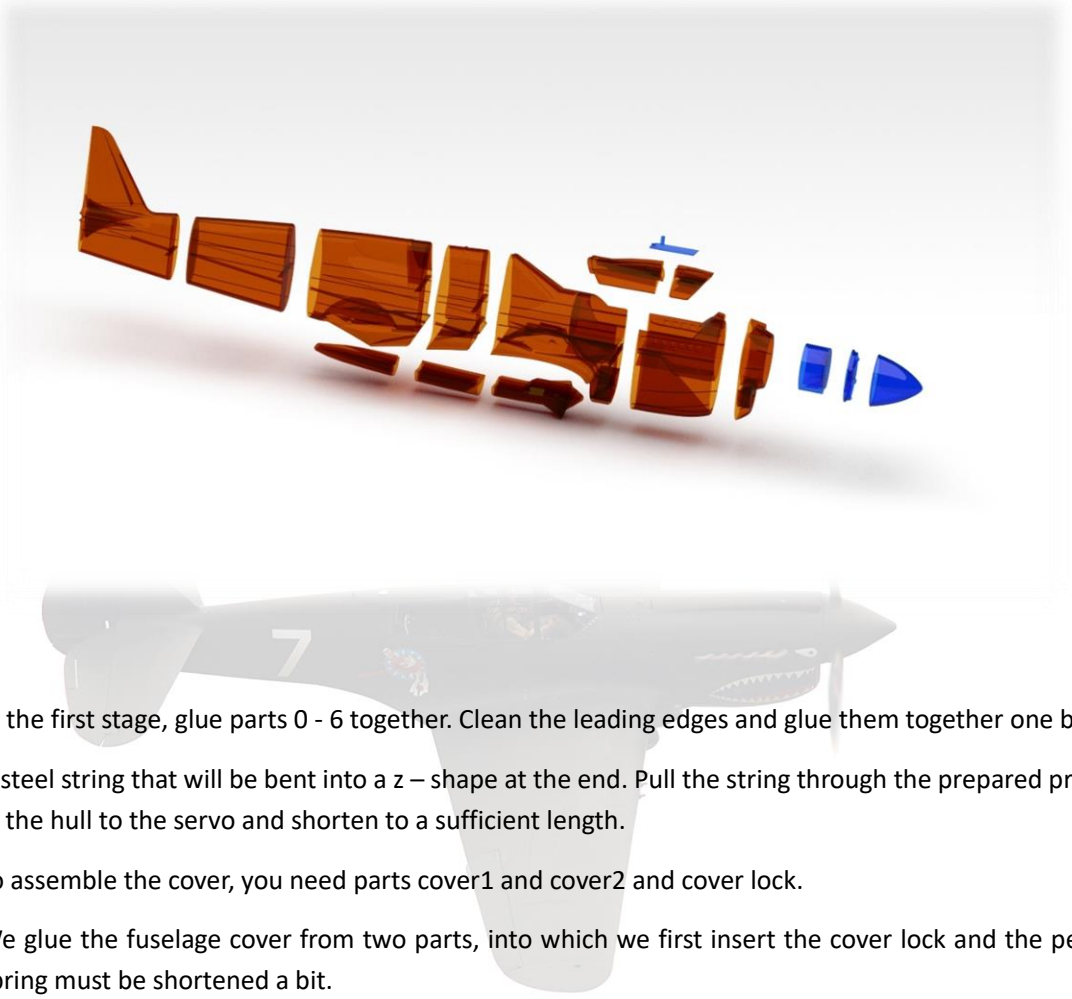


4) Assemble the ailerons separately. Sand the mating surfaces, place them on a flat base and glue them with medium-speed glue. Be careful not to glue the ailerons to the backing. Calibrate the holes in the axis of rotation of the ailerons with a piece of carbon rod ⌀ 1mm.

5) Cut 2 pieces of carbon rod ⌀ 1mm, longer than the aileron by approx. 10 mm, pinch it on one side of the wing and insert the rod into the wing from the groove in the end arc, then into the aileron, through the hinge and into the hole in the wing. Test that the ailerons turn freely. Finally, secure the stick in the final arc with a drop of thick instant glue. Be careful not to glue to the aileron too.
6) Secure the carbon rod at the end arc with a drop of thick instant glue. Be careful not to glue the aileron as well.
7) Check the carbon spar groove on the top and bottom of the wing. If there is any dirt or glue leaks in the groove, you need to clean it carefully.
8) Measure the carbon length of 1.5 mm on the underside of the wing. If necessary, the carbon can be adjusted slightly. Press the carbon into the groove in the wing.
9) After that, glue gradually from the center to the edge with thin glue and lock the carbon rod in the groove. After short sections use an activator. The carbon must be glued well, otherwise the wing may break in steeper turns. Finally, fill the space in the rod in the middle of the wing with glue. Repeat the same procedure on the top of the wing. On the top side of the wing, the carbon rod does not usually have to break.
10) Glue the landing gear nacelles into position.
11) At the point where the securing elastics pass over the trailing edge of the wing, we will reinforce the trailing edge with a 1.5 mm carbon rod (see photo). The carbon rod will prevent the trailing edge from being cut by the securing elastics.

b) Fuselage

The fuselage consists of 14 parts and three parts of cooler.



1) In the first stage, glue parts 0 - 6 together. Clean the leading edges and glue them together one by one.
2) A steel string that will be bent into a z – shape at the end. Pull the string through the prepared printed bowden in the hull to the servo and shorten to a sufficient length.
3) To assemble the cover, you need parts cover1 and cover2 and cover lock.
4) We glue the fuselage cover from two parts, into which we first insert the cover lock and the pen spring. The spring must be shortened a bit.

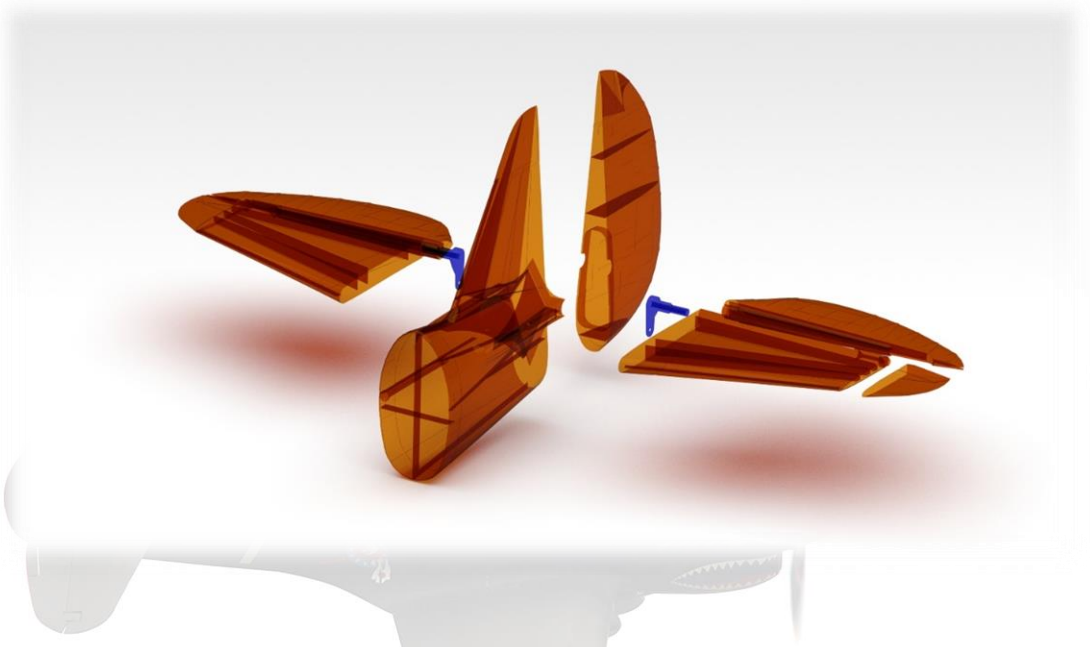
5) Select the engine mounting.
6) Attach the engine to the bed.
7) Place the part spinner 1 on the motor shaft.
8) Place the part spinner 1 on the propeller motor.
9) Use screws to attach spinner1 to spinner2.
10) Plug in the controller and store in the internal compartment.
11) Glue the engine bed into the fuselage
12) Place the electrical components such as the receiver, controller and batteries in the internal space with Velcro.
13) Place carbon tubes ⌀ 8 mm in the fuselage to attach the wings.
14) Insert the carbon rods into the prepared holes in the hull.

15) Trim the rear tube to blend in with the hull surface.

16) Cut the forward tube so that it is offset from the hull at least 25mm on each side.

c) Tail

The tail consists of 14 parts and three parts of cooler.



1) Glue stab L2 to stab L1 and stab R2 to stab R1.
2) Glue both keel surfaces (StabL1 and Stab L2) of the horizontal stabilizer part 6 in the prepared position. (Calibrate the center hole again).
3) Glue the PLA center lever together (Calibrate the center hole again).
4) Glue the elevator L and elevator R parts to the lever pins with thick glue. The elevator must be on the same plane The lever must be at right angles to the elevator and point downwards. Proceed carefully, after gluing and curing the glue there is no possibility to correct the position of the parts.
5) Attach the elevator lever to the Z end
6) Stretch a ⌀ 1 mm carbon rod rotation axis across the entire span. On one side, the carbon is again locked to the elevon. The elevator must move easily, the string in the bowden should not have too large hole.
7) Finally complete the hull by gluing part 7.

D- Servo Installation

Wing Servos:

1. Insert the wing servos into the pre-cut slots on the underside of the wings.
2. Route the servo cable from the slot to the wing center:
    - Put a steel or carbon rod through the tunnel first.
    - Attach the servo cable to it and pull it through the cable tunnel.
3. If necessary, use an extension cable to adjust the cable length.
4. Glue the servo into place using hot glue.
5. For better aerodynamics and aesthetics, cover the servo with adhesive tape, leaving an opening for the control horn.

Elevator Servo:

1. Place the elevator servo inside the fuselage according to the reference photo.
2. Glue it into place.
3. Install a blimp on the control horn for precise elevator trimming.

Servo Function Check:

1. Before installation, connect the servos to your RC system.
2. Ensure the control horns are set at their neutral position.
3. Turn on the RC system and check that the servos do not rotate unexpectedly.

Basic Aileron and Elevator Settings

Elevator:

- Neutral position: 0 mm
- Up: 12 mm
- Down: 15 mm

Ailerons:

- Neutral position: 0 mm
- Up: 14 mm
- Down: 10 mm

During the maiden flight and trimming process, you can adjust the deflections as needed.

5- Shopping list

Printing material: 0,5kg of LW-PLA and 0,1 kg PLA

RC: 4 channel receiver for your RC system

Motor:

Any motor for 3S - 6S Li-Pol with mass up to 100g

Hacker M Force V 8 620KV (for 6S setup)
Leopard LC3536 1100KV (for 3S – 4S setup)
Hacker M Force 3536CA-8 (for 4S setup)

Propeller:

9 x 5", 9 x 6" APC or Graupner

Controller:

Speed controller Flycolor 30A 2 – 4S LiPo or similar

Speed controller Flycolor 40A 2 – 6S LiPo or similar

Battery:

3 – 4S Battery LiPol 2200(3S) – 1800(4S)
6S Battery LiPol 1500 mAh/6s

Servos:

3 x Emax ES 08MAII or similar 9g servos metal gear
2 x servo extension cables 150mm

Glue:

CA Glue - medium viscosity
CA Gluue – fluide viscosity
Activator for CA Glue
glue sticks

Other:

2 x 1,5 mm / 1m carbon rod
1 x 1mm / 1m carbon rod

1x 0,8 mm / steel wire

4x M3 screws and nuts for motor mount

1 x servo blimp

Final Step: Enjoy Your Flight

With everything set up and properly adjusted, it's time to take your model to the skies.

✓ **Double-check all connections** – ensure servos respond correctly and control surfaces move smoothly.

✓ **Perform a range test** with your RC system before take-off.

✓ **Choose a suitable flying area** with enough space for safe manoeuvring.

Now, launch your aircraft, feel the thrill of flight, and most importantly—**Enjoy the flight!**