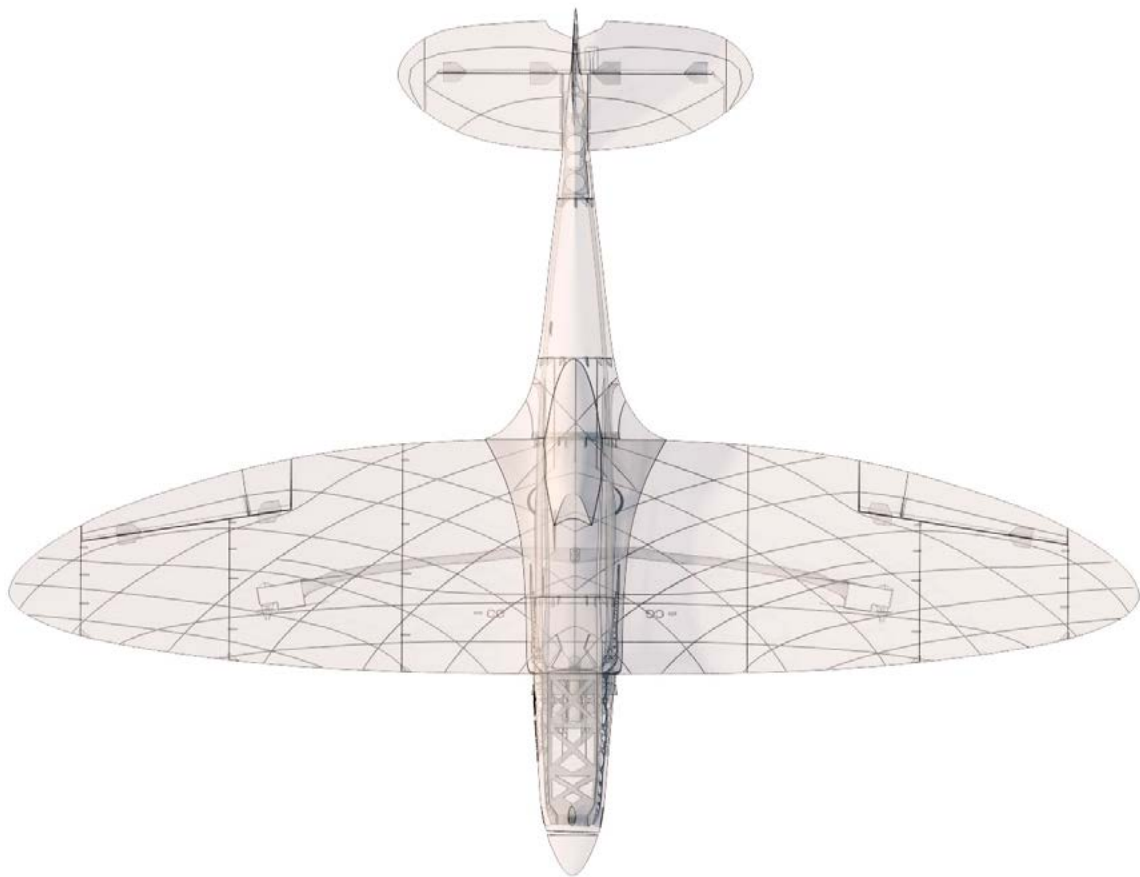




# User Guide

rev. 2016/11



Fully 3d printable

## Supermarine Spitfire Mk XVI

prusa original edition

scale 1:12, wingspan 973mm (38.3in)

**PRUSA**  
**RESEARCH**

## 3D Lab Print Supermarine Spitfire MkXVI – fully printable R/C plane for your home 3Dprinter

Future of flying - Print your own plane

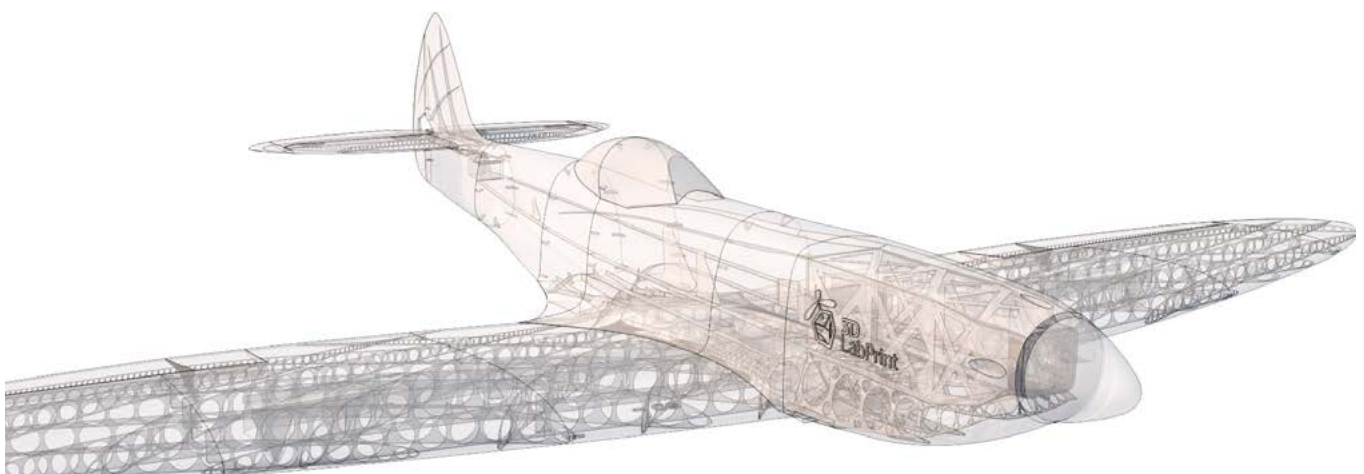
We still trying move things further, so this project is again full of other improvements for better durability , easier assembly , better geometry solution and so on..., we hope you enjoy it, although this print may test your competencies to and quality of your printer (welcome to the thin wall printing)

**The first fully printable** airplanes with suitable files prepared for your 3Dprinter. Flight characteristics are comparable or even better than classic build model airplane. Simply download and then print it anytime you need only for \$10 (filament cost). This is not a dream, now you can print this HI-TECH .... at home, print spar parts, and so on...

**Extensive hi-tech 3d structural reinforcement** which makes the model very rigid while still maintaining lightweight airframe and exact airfoil even when it is made only from plastic. This perfect and exact 3d structure is possible only due to additive 3dprinting technology. So welcome to the 21th century of model flying. Be The first at your airfield.

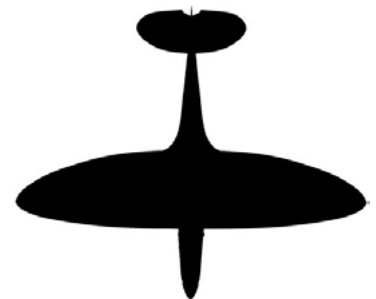
**Easy to assembly**, you do not need any extra tool or hardware, you only need to glue printed parts together and make pushrods for control. The rest of the assembly is very easy. Simply add brushless motor, ESC, servos and radio system. Don't worry, detailed step by step PDF/VIDEO is included.

You will get superb performance airplane with High efficient powerplant which let you fly 7+ minutes at full throttle with the speed exceeding 150 kph (HP setup). On the other hand low stall speed is achieved for easy landing.



## General specifications (HP setup):

Lenght:	800mm (31.5in)
Wingspan:	973mm (38.3in)
Height:	210mm (7.8in)
Wing area:	16.8 dm2
Wing loading:	50.1 g/dm2
Airfoil:	aircombat modified
Print weight:	432g
Empty weight(eq. w/o battery):	638g
Takeoff weight (6s 1300 lipo):	840g
Max takeoff weight:	1100g
Never exceed speed, VNE:	205 km/h
Design maneuvering speed, VA:	165km/h
Stall speed, VS:	30 km/h



### Powerplant

Propeller:	aeronaut ELP 9/6 or APC 9/6 – 9/7.5
Motor:	AX-4008Q/620KV, 22pole brushless HE electric motor
ESC:	Castle Creations TALON 25
Battery:	Turnigy nanotech 1300 mAh/6s/22.2V, 206g, 25C

### Performance measurment

Max RPM and Amps (static):	12 000/min with APC 9/6, current 19A
	11 550/min with APC 9/7.5, current 21A



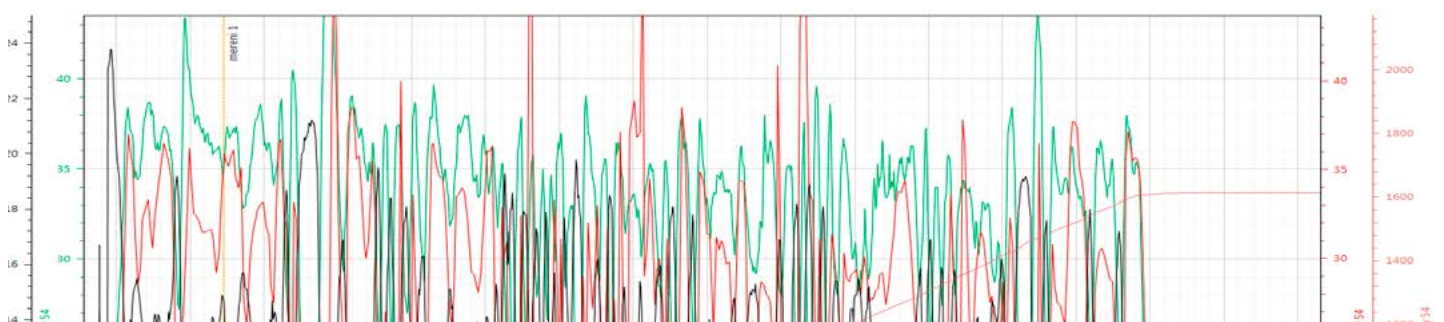
Max RPM and Amps (level flight):	13 700/min with APC 9/6, current 12A
	12 400/min with APC 9/7.5, current 13.5A

Max speed VH (level flight):	135 km/h – 67.5kn – 78 mph with APC 9/6
	150 km/h – 73kn – 84 mph with APC 9/7.5



Rate of climb:	29 m/s (5 373 ft/min) with APC 9/6
	32 m/s (5 728 ft/min) with APC 9/7.5

Flight time (6s 1300mAh/full):	7:40 with APC 9/6
	5:30 with APC 9/7.5
	7:40 with aeronaut ELP 9/6



## Supermarine Spitfire Mk XVI , History

The prototype of the Spitfire, designated Supermarine Type 300, took to the air for the first time on 5th March, 1936. The fighter was designed with a maximum accent on the aerodynamic cleanliness - its Chief designer, Mr. Reginald Joseph Mitchell utilised the experience gained during the design and development of the racing seaplanes. The fact that the experience paid its dividend has been proven by altogether 24 versions produced and with a total of 22 000 machines manufactured within following thirteen years...

## Included:

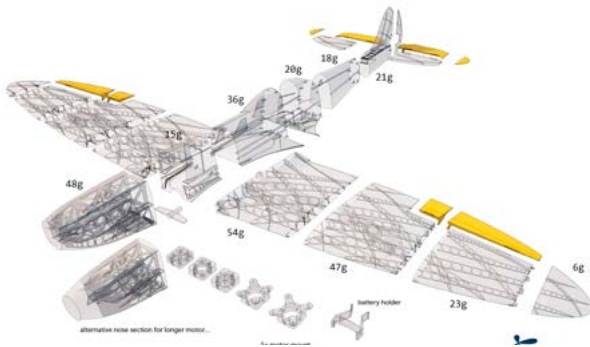
NOTE: This version is prepared as a supplement to your PRUSA i3 Original printer and contains only Gcodes, Userguide and Scale PDF markings

This userguide contains also some information regarding to full version which include also STL files and so on.

Thank you for your understanding.

## 1.Gcodes

Gcodes prepared for direct use, work with PRUSA i3 ORIGINAL printers. Separate parts are joined to print tasks/builds (each takes approx 6-10 hours). Gcode for separate parts also included so if you need print only one parts you could.



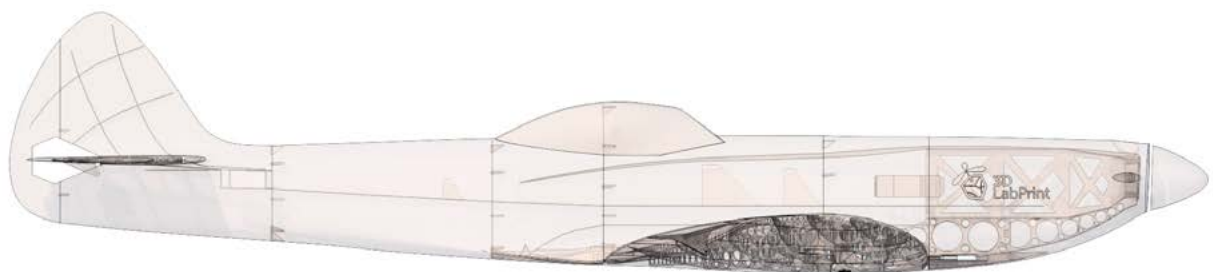
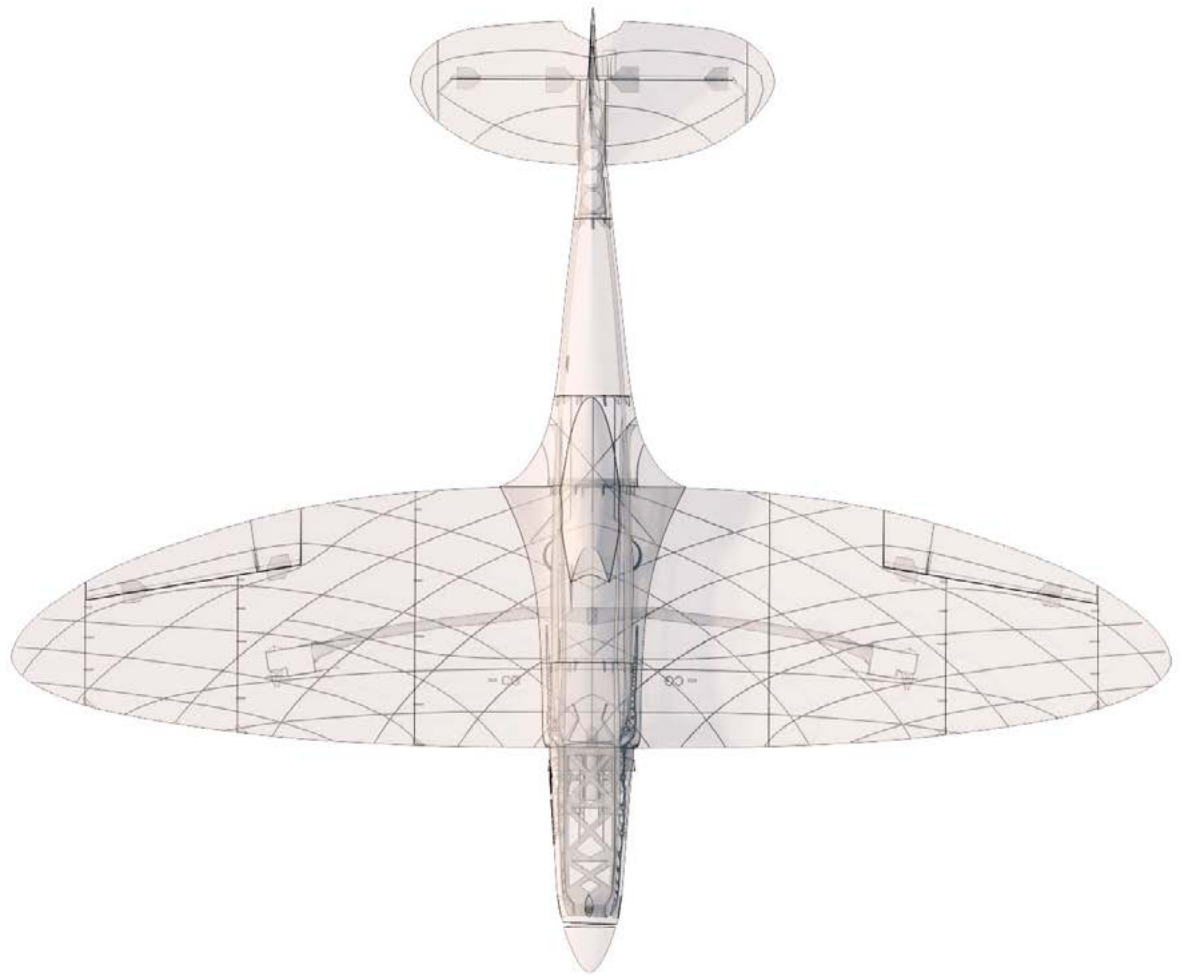
## 2.Step By Step PDF/VIDEO userguides

Apart from this userguide, please give a look to the Printing Guide with some Tips and Advices for airplane printing (Thin Wall Printing)

## 3.Scale markings PDF

Let print on thin adhesive foil and place on the model as needed, violet cut lines included...



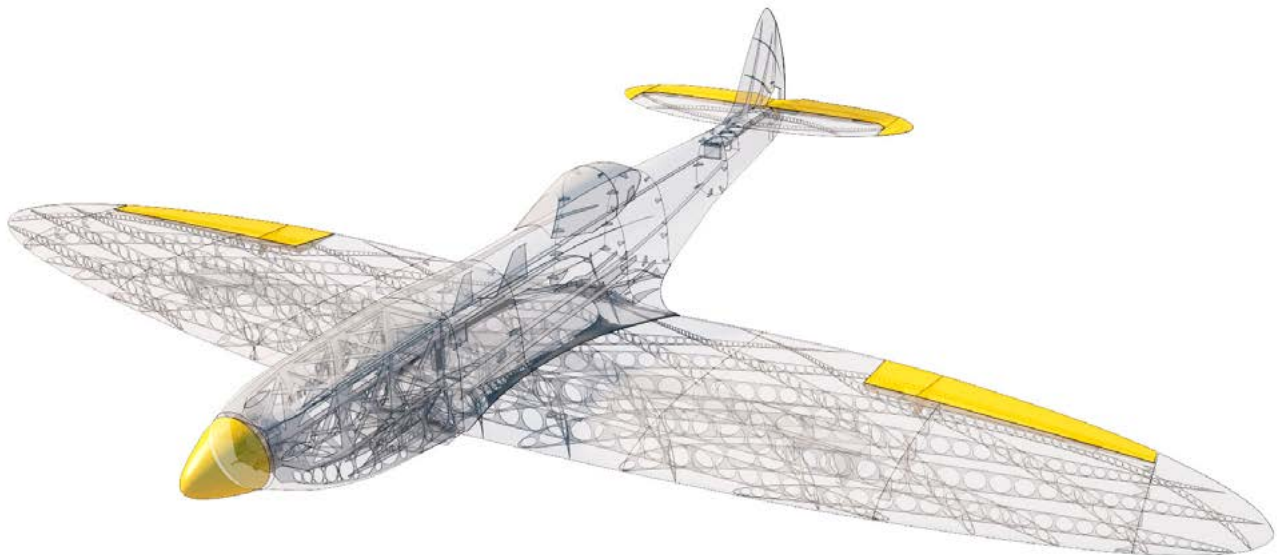


800mm (31.5in)





973mm (38.3in)



## Step By Step PDF/VIDEO userguide

1. Choose airplane at [www.3DLabprint.com](http://www.3DLabprint.com), our [Facebook](#) for live information...

Basic requirments (Spitfire MkXVI ):

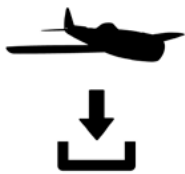


min volume 195/195/150mm (250/120/150)  
or 150/150/150mm (if you use splitted wing parts)  
nozzle 0.4mm recommended (0.35 or 0.5mm alternatively)  
Heated Bed recommended  
PLA filament (or PETG, APLA, htPLA, PC-max....) not ABS

... If you feel a little bit confused you can [download wing test part](#) from our websites or thingiverse, (the biggest part). Or contact [support@3dlabprint.com](mailto:support@3dlabprint.com)

## 2. Create account, download

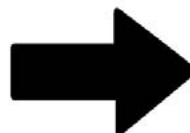
You will get download link for all files to your email (zipped) or you can log in to your account and download directly from our websites.



## 3. Gcodes preparing

options A Gcodes:

if your printer is i3 comptatible you can directly use [prepared gcodes](#), simply save each to SD card and let 3d printer do his job, HE temperature is set to 230 for best layer bonding, you can edit speed and temperature on your printer LCD only. If Gcodes does not work please proceed to the next options.



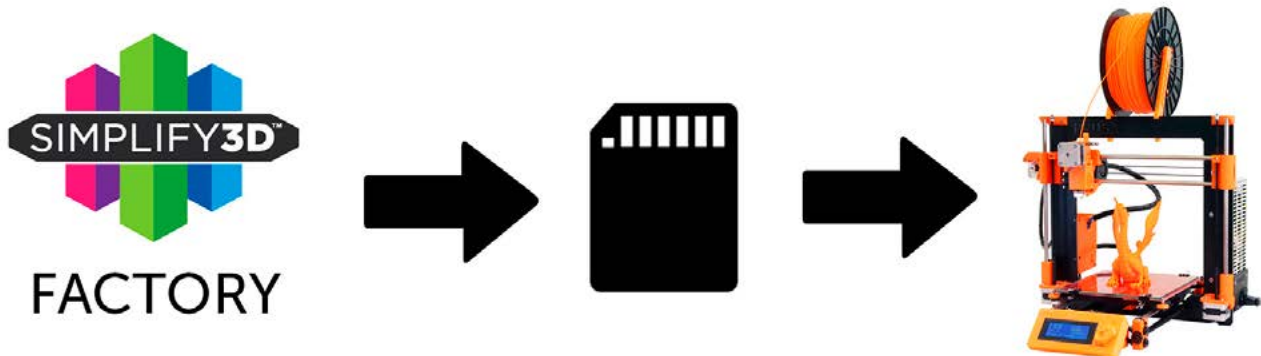
**NOTE:** This version is prepared as a supplement to your PRUSA i3 Original printer and contains only Gcodes, Userguide and Scale PDF markings  
Please use this A option...



### options B Factory files Simplify3D (recommended)

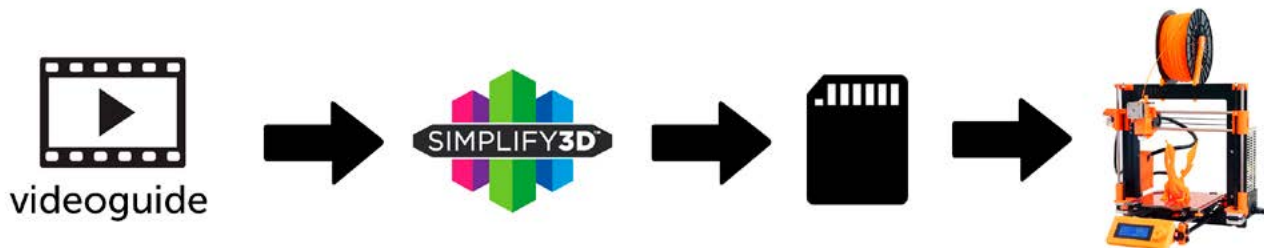
We prepare all you need in this files (basic FFF, parts arranged and so on...)

You can use this our setting as a start point and edit it as you need (adapt it for your printer), print only parts you need and so on... On most 3d printers it should work as it is, but please give a look to the setting and edit it if it is different to your printer, we are not liable for damages resulting from the use of our settings. If this does not work please proceed to the next option.



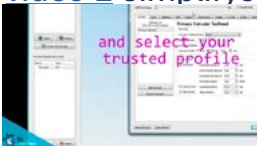
### options C Simplify3D manual setting (watch and learn)

Use our [video guide 2](#) for proper setting... this is very good option and you will learn a lot about Simplify3D and become an 3d expert. Of course you spend a lot of time and youtube pause button will become your friend.



AND... please give a look to VideoGuides:

#### [video 2 Simplify3D setting](#)



#### [video 12 before start printing](#)



#### [video about Thin Wall Printing](#)



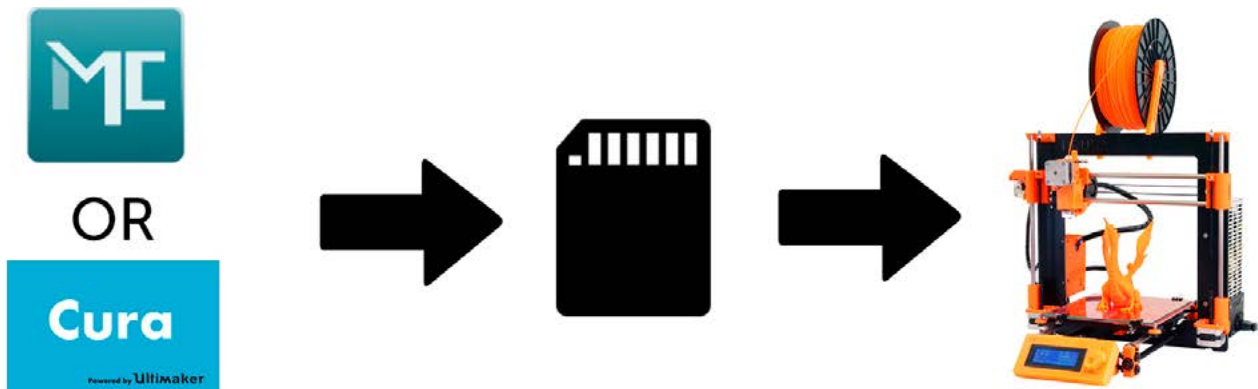
### options D CURA or MatterControl

MatterControl and CURA are free :-)) and also gives very good results and airframe is still strong enough, slicer setting is very easy.

Please try [find right extrusion multiplier and temperature](#) for good weight and bets layer bonding, give a look to parts weight list for proper multiplier setting.

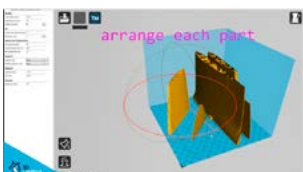
You can also use our [predefined](#) CURA or MC slicer setting file included in package (always adapt it for your printer, change build volume, filament diameter and so on... depends on your printer!!!):

<a href="#">CURA_wing_fuse.ini</a>	(wing and fuselage and so on... parts)
<a href="#">CURA_ailer_elev.ini</a>	(only ailerons, elevators and rudder parts)
<a href="#">CURA_thick.ini</a>	(motor mount, battery holder, spinner)
OR	
<a href="#">MC_wing_fuse.slice</a>	(wing and fuselage and so on... parts)
<a href="#">MC_ailer_elev.slice</a>	(only ailerons, elevators and rudder parts)
<a href="#">MC_thick.slice</a>	(motor mount, battery holder, spinner)

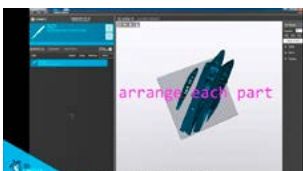


AND... please give a look to [VideoGuides](#):

### [video CURA](#) slicer setting



### [video CMatterControl](#) slicer setting



## 4. Print it

Save generated Gcodes and insert SD card to your printer, prepare your printer and start printing, we prefer to use SD than direct connection via USB Note: ABS filament is not suitable for this...

Scaling the model will lead to unusable result!

[video guide about printing](#)

you will need: PLA filament - good quality and strong PLA (we need good layer bonding)

Strong hair spray (or your favorite adhesive bed surface)

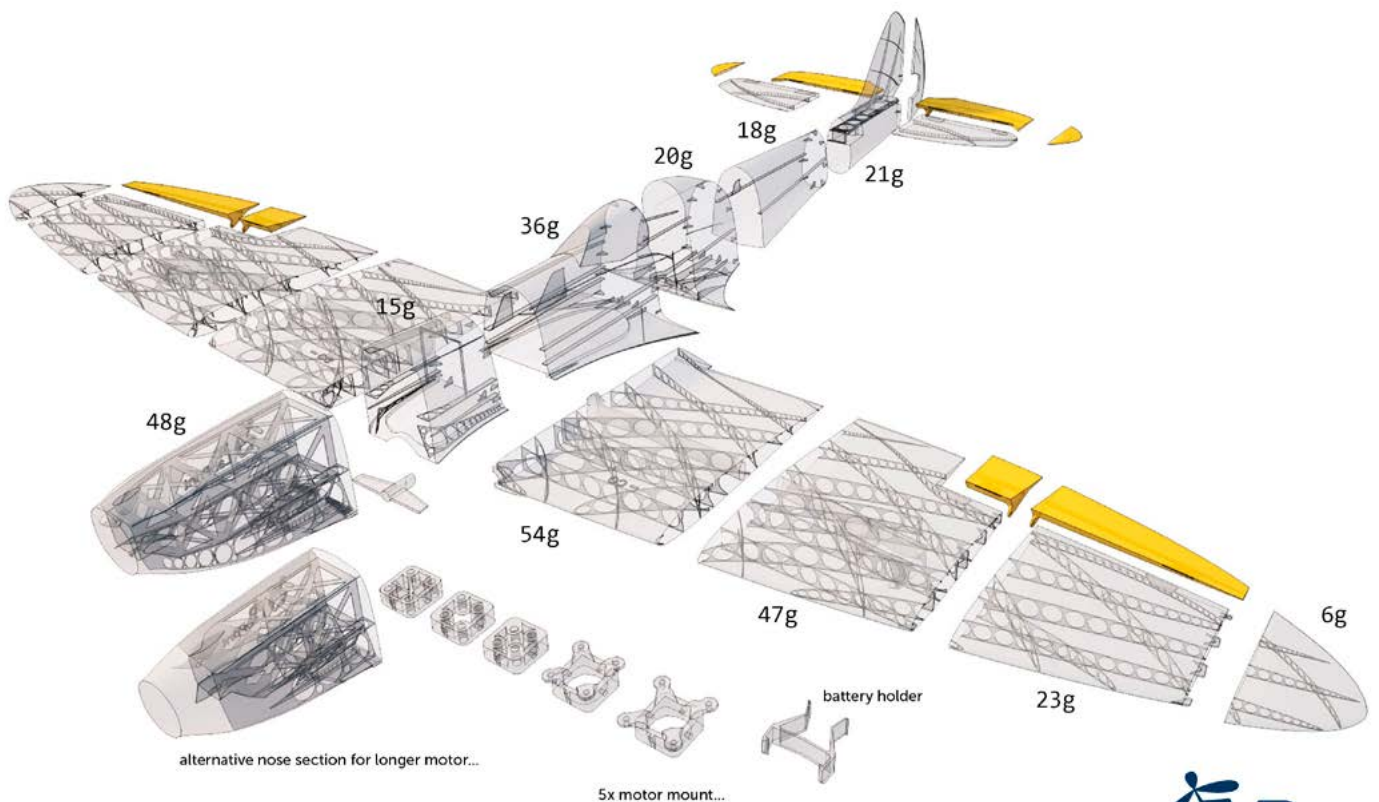
Razor blade

AND... please give a look to VideoGuides:

[video printing guide](#)



## Main parts weight list:



## Basic Typs and Advices

Plese Experiment with your [extrusion multiplier](#)...

Also [HotEnd temperature](#) is very important for strong result, please try increase temperature to find the best value ([200 up to 260 celsius](#))

Turn [OFF cooling fan](#) for better layer adhesion ([HE fan of course ON](#)) we dont need it for our thin wall printing...

We try lot of filaments and so far PLA is still the best for our models (2016).

You can try aslo PETG and PC-max from polymaker is very promising filament.

HEATED BED is very recommended, 60-70celsius (print without warping ends)

Looks like any standard quality PLA is OK for our planes, BUT it always depends on combination PLA vs. Extruder vs. HotEnd.

We find that some color of filament has lower layer adhesion also.

Nowadays there is lot of 3dprinters on the market, very most of them is OK for printing our aircrafts (specific thin wall printing...) suficient volume, heated bed, 0.4mm nozzle.

## Please give a look to Printing Guide:



### printing guide rev. 2016/06



Some Tips and Advices for airplane printing

#### Printing fully printable 3dLabPrint Airplanes

... If we want print aircraft there always be demand on low weight and enough strenght, with Thin Wall Printing we can achieve it ...

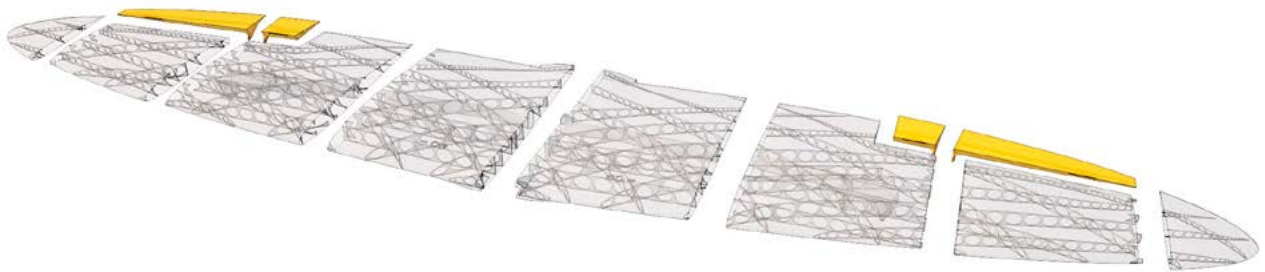
## 5. Assembling printed parts

### 5.1 Wing assembling

Glue wing parts with CA glue together, use activator and instal ailerons...

[See video guide #4](#)

you will need: [CA Glue - medium](#) or similar medium viscosity CA glue  
[Activator for CA Glue](#) or similar, but not-mechanical is better  
[AC Hinge Sheet](#) or similar  
 Scissors  
 Snap knife  
 Some cloth for wiping CA glue...

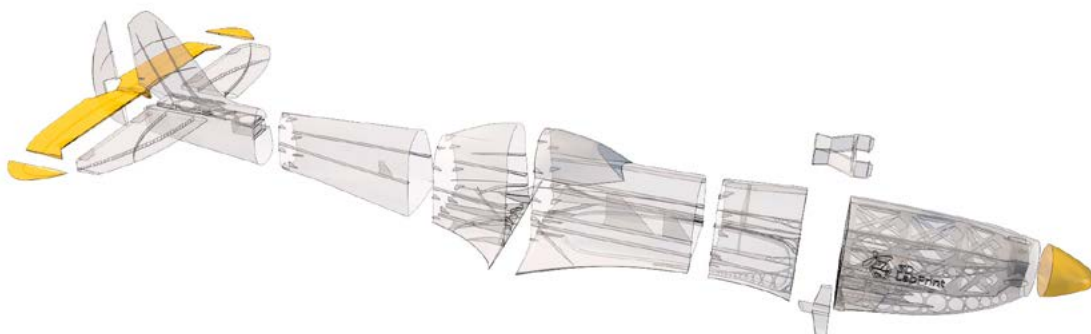


### 5.2 Fuselage assembling

Glue with CA glue fuselage parts together, use activator, instal elevator, instal peg, fine tune parts shape with knife or sandpaper f.e. when assembling slots for wing and fuselage, first! fine-tune peg with a hole in the wing!!!.

[See video guide #5](#)

you will need: [CA Glue - medium](#) or similar medium viscosity CA glue  
[Activator for CA Glue](#) or similar, but not mechanical is better  
[AC Hinge Sheet](#) or similar  
 Scissors  
 Snap knife or Sandpaper  
 Optionaly some cloth for wiping CA glue...





## 6. R/C equipment

### 6.1 motor setup

**HIGH PERFORMANCE SETUP** (if you like it hot, yeah) prop 9/6, 9/7 fast:

[See video guide #6](#) (for HP setup)

you will need: [Motor – AX-4008Q-620KV](#)

[Speed controler \(ESC\) – CC Talon 25](#) or similar 25A/6s

[3x PAIRS, 3.5mm Gold Connectors](#) - optional

[Battery 1300mAh/6s](#) – or 2x 1300/3s, better (use 2to1 serial connector)

[Male XT60 connector](#)

[Shrink Tube black](#)

Solder wire and Soldering Iron

[Hands free Holder](#) - optional

printed motor mount (25/25)

**ECO PERFORMANCE SETUP** (spent only 30 bucks without any soldering) prop 9/6 10/5:

you will need: [Turnigy D3530/14 1100KV](#) or similar 3530-35 1100kv

[30A Electronic Speed Controller](#) or similar 30-40Amps

[Turnigy 2200mAh 3S 20C](#) or similar 1500-2400/3s

printed motor mount, find the one which fits... (25/19)

**!please use fuselage\_01\_conversion.stl part for this setup!**

### 6.2 servos

Test and center all servos with servo tester or transmitter, then instal horns in midle position and cut wing Servos mount... use HXT900 or any 21x21x23mm

[See video guide #7](#)

you will need: 4x [9g Servo HXT900](#)

2x [Servo Lead Extension](#) or similar

Snap knife

Soldering Iron or Small handsaw or Dremel



## 7. R/C Equipment instaling

Instal prepared RC equipment: Motor, ESC, Servos...

Nose and motor mount are already in angle for compensating rotating propeller stream.

[See video guide #8](#)

you will need: Printed motor mount, find the one that fits for your motor...

2-4x Screw 3/12-30mm depends on motor-mount

Small screwdriver+

Your earlier prepared R/C equipment

3x Self Tapping Screw M3x8mm or similar

## 8. Pushrods

Made steel pushrod for ailerons, elevator, rudder and connect within servo arms...

[See video guide #9](#)

you will need: Steel pushrod, diameter 1.0mm

Pliers

[CA Glue](#) - medium

[Activator for CA Glue](#) or similar, but not mechanical is better

## 9. Finalization

Instal your reciever, connect batery, setup servos and etc. with your trasmitter, lock servo position, then instal propeller...

**!!!Make sure that the battery is placed properly and secured with wing battery holder, if battery moves during flight it can shifts the center of gravity backwards and aircraft will be uncontrollable!!!**

[See video guide #10](#)

you will need: Your own Rx/Tx system

Battery for your setup...

Foam strip for Li-Pol battery

Scissors

[Propeller](#) + printed spinner

Small screwdriver+

[CA Glue](#) - medium + [activator](#)

Scale markings printed to adhesive foil

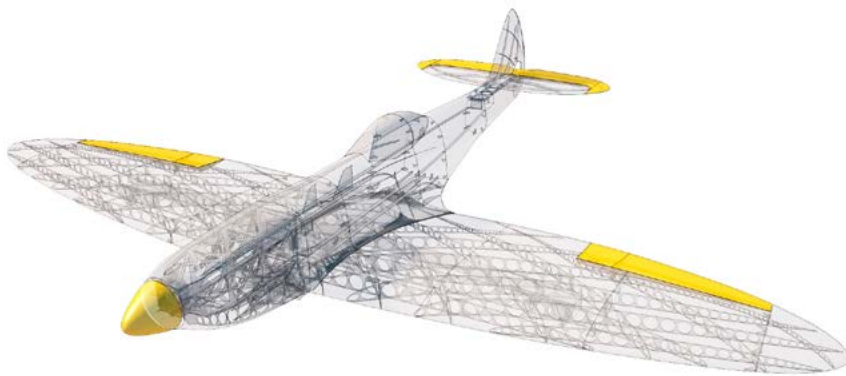
**!!!Never set ESC with instaled propeller, this is very dangerous!!!**

## 10. Go flying

Before flight check: **center of gravity is very important** (move it forward for the first flights see CG markings and chapter 11 below), battery properly charged, ailerons and elevator deflection check, your own flying skills or RC simulator training...

Then go flying: set full throttle, put the elevator little upwards (1-2mm) and throw it energetically to the wind approx 10 grades up, wait till plane gain speed, then fly it in your manner...

[See video guide #11](#)



## 11. Pilots Please Attention!!!

For the first flights we recommend set **center of gravity** of the airplane by about **5 mm forward** of the CG tag (nose heavy, this increases the stability) is also good to **increase expo** settings on your transmitter for elevator and ailerons to **80 %** (this calms response from your stick inputs)

Also you can decrease elevator and ailerons deflection.

Make sure the **battery is well fixed** in proper position if it moves during flight it will cause move CoG aft and will lead to uncontrollable flight behavior...

You can then return to the center of gravity (balance aircraft) the CoG points and expo set to 60 % as stated in the video/instructions... this gain back extra maneuverability when you will be sure with flying your airplane.

**!!!Never fly aft positioned CoG!!!**

**And Please, use this files only for your own purpose, do not send further... Thank you very much**