3D LabPrint

# User Guide

rev. 2017/03

## Fully 3d printable

## Cessna 152 based trainer/sport airplane

scale 1:6.5, wingspan 1563mm (61.5in)

# Cessna 152 based trainer/sport airplane – fully printable R/C plane for your desktop 3Dprinter

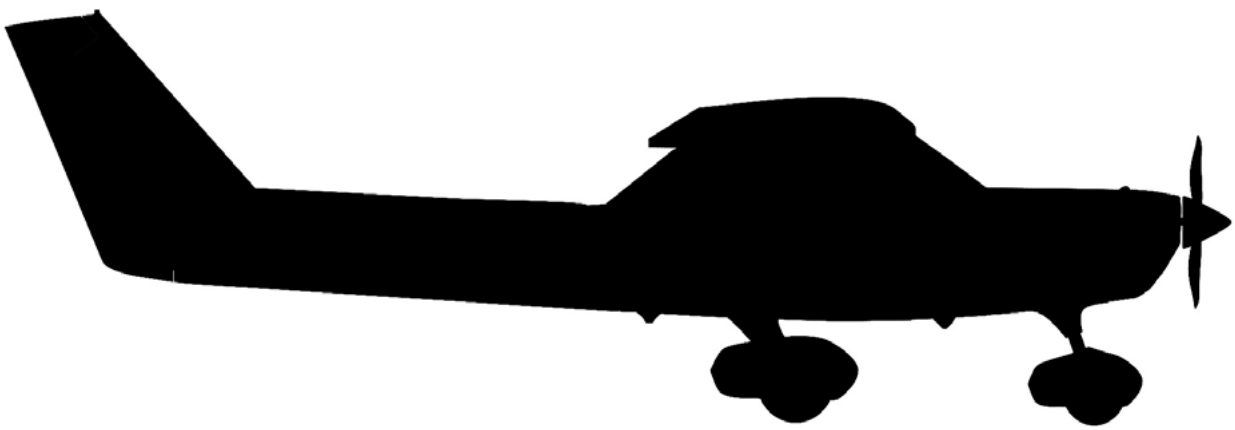
Future of flying - Print your own plane. Speedy guide

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 $18 (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 a 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 assemble,** 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.
This our aircraft ir specialy designed the way that you dont need any nuts or aditional joining elements, just click all printed parts together.
You will get a superbly performing training and durable airplane suitable even for hard landings (with easy to change landing gear). Our Cessna 152 is a spin-stall proof plane even in low speed tight turn.



## General specifications:

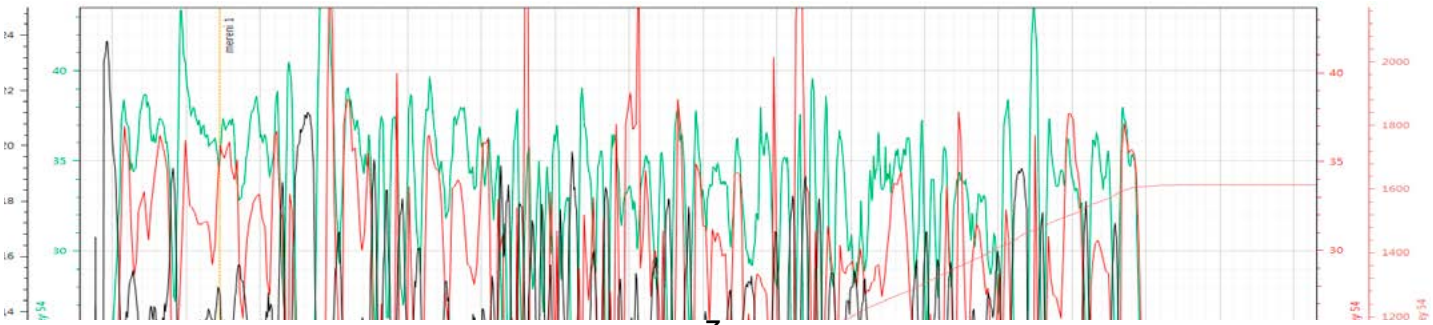
| | |
|---|---|
| Length: | 1220 mm / 48,0 inch |
| Wingspan: | 1563mm / 61.5 inch |
| Height: | 384 mm / 15.1 inch |
| Wing area: | 36 dm2 / 3.9 sq foot |
| Wing loading: | 54 g/dm2 / 17.70 oz at sq foot |
| Center of gravity: | 75 mm (0 in)<br>from leading edge<br>See CG tags on wings... |
| Airfoil: | 3DLabPrint modified |
| Print weight: | 1374 g / 48.5 oz |
| Empty weight (w/o battery): | 1724 g / 60.8 oz |
| Takeoff weight (3s 3000 lipo): | 1944 g / 68,6 oz |
| Max takeoff weight: | 2250 g / 79.4 oz |
| Never exceed speed, VNE: | 100 km/h / 62.14 mph |
| Design maneuvering speed, VA: | 70 km/h / 43.49 mph |
| Stall speed, VS(full flaps): | 24 km/h / 14.9 mph |

## Powerplant

| | |
|---|---|
| Propeller: | APC 11x5,5 |
| Motor: | Turnigy 3542/5 1000-1250KV or similar |
| ESC: | 40A Electronic Speed Controller<br>or similar 40Amps |
| Battery: | Li-Pol 3000mAh/3s/4s (11.1V),<br>at least 215g / 7.6oz, 25C |

## Performance measurement

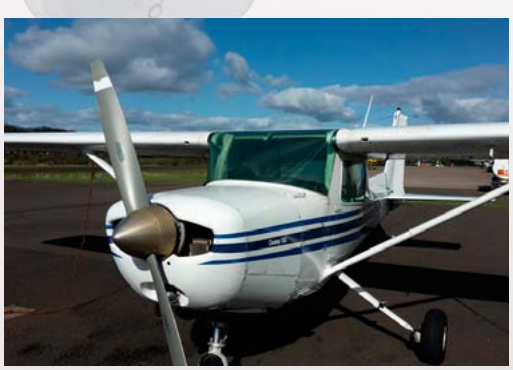
| | |
|---|---|
| Max speed VH (level flight): | 105 km/h – 56.7kn – 65.2mph with APC 11x6 |
| Rate of climb: | 23 m/s (5 373 ft/min) with APC 11x6 |
| Flight time (3s 3000mAh): | 7:40 with APC 11x5,5 |




# Cessna 152, History

The Cessna 152 is an American two-seat, fixed tricycle gear, general aviation airplane, used primarily for flight training and personal use. It was based on the earlier Cessna 150, including a number of minor design changes and a slightly more powerful engine running on 100LL aviation gasoline.
First delivered in 1977 as the 1978 model year, the 152 was a modernization of the proven Cessna 150 design. The 152 was intended to compete with the new Beechcraft Skipper and Piper Tomahawk, both of which were introduced the same year. Additional design goals were to improve useful load through a gross weight increase to 1670 lbs (757 kg), decrease internal and external noise levels and run better on the then newly introduced 100LL fuel.

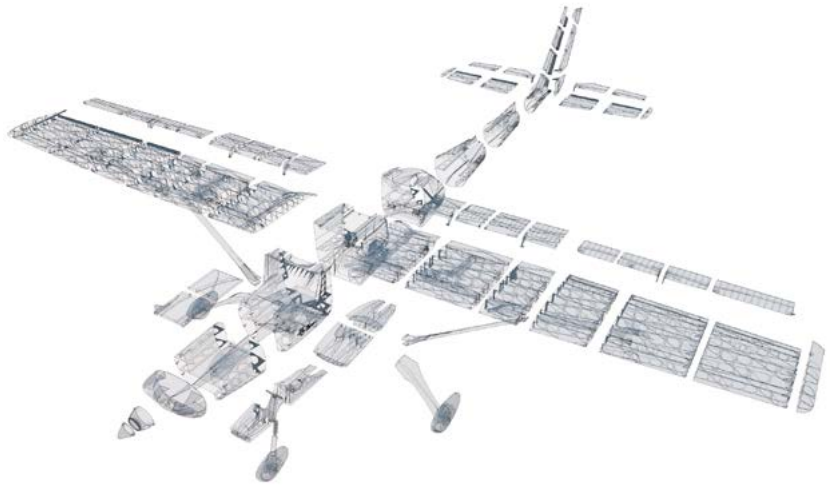
As with the 150, the great majority of 152s were built at the Cessna factory in Wichita, Kansas. A number of aircraft were also built by Reims Aviation of France and given the designation F152/FA152.
Production of the 152 was ended in 1985 when Cessna ended production of all of their light aircraft; by that time, a total of 7,584 examples of the 152, including A152 and FA152 Aerobat aerobatic variants, had been built worldwide.



# Included:

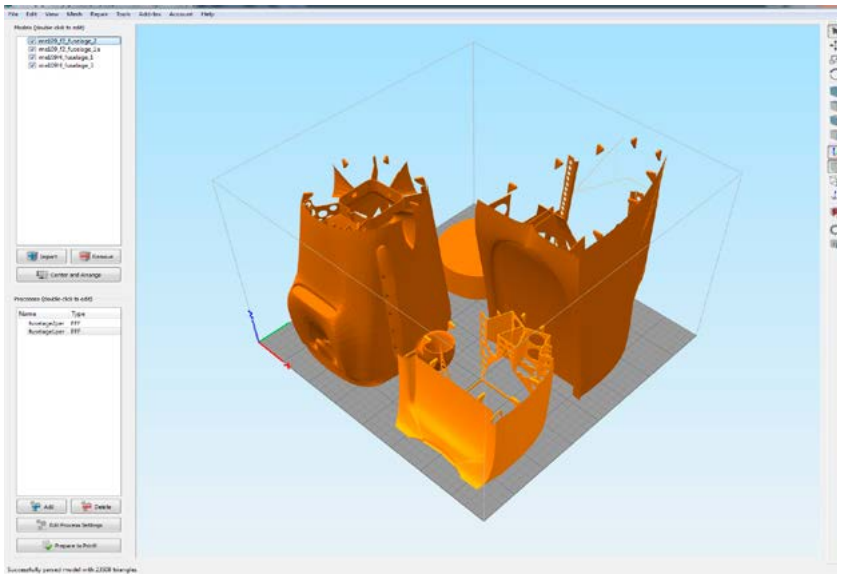
## 1. STL 3d files

Universal STL files designed for use with desktop FMD 3d printers and slicer software such as Simplify3D (recommended) CURA or MatterControl (these STLs are not compatible with Slic3r or Makerware slicers).



## 2. Factory files for Simplify3D slicer

with all our settings, these Factory files include all you need. Note: we use PRUSA i3 ORIGINAL printers so you may need to adjust the basic printing parameters to match your printer or use it as a starting point for you. Please look at Simplify3D



## 3. Step By Step PDF/VIDEO userguides

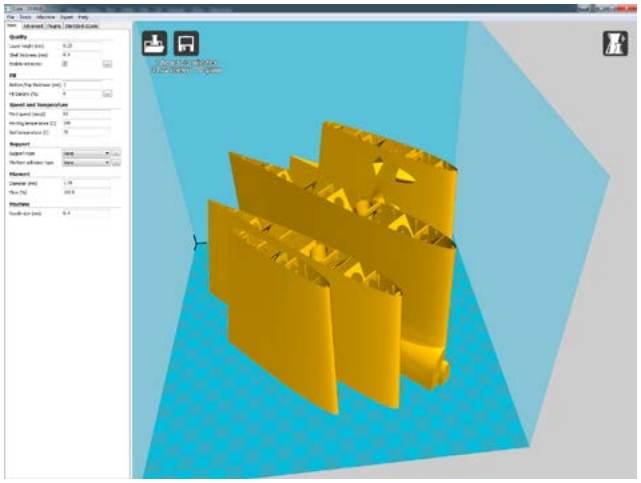
Apart from this userguide, please look at the Printing Guide with some Tips and Advicesfor airplane printing (Thin Wall Printing).

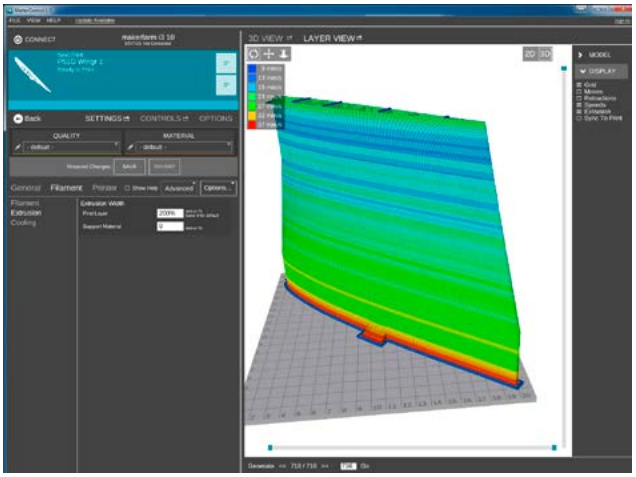
## 4. Gcodes

Basic Gcodes prepared for direct use, as universal as is possible. Should work with i3 style printers, you can try it out, but We cannot guarantee that it will work with your printer. 100% works with PRUSA i3 ORIGINAL 3d printers.

## 5. Prepared settings for CURA and MatterControl slicers

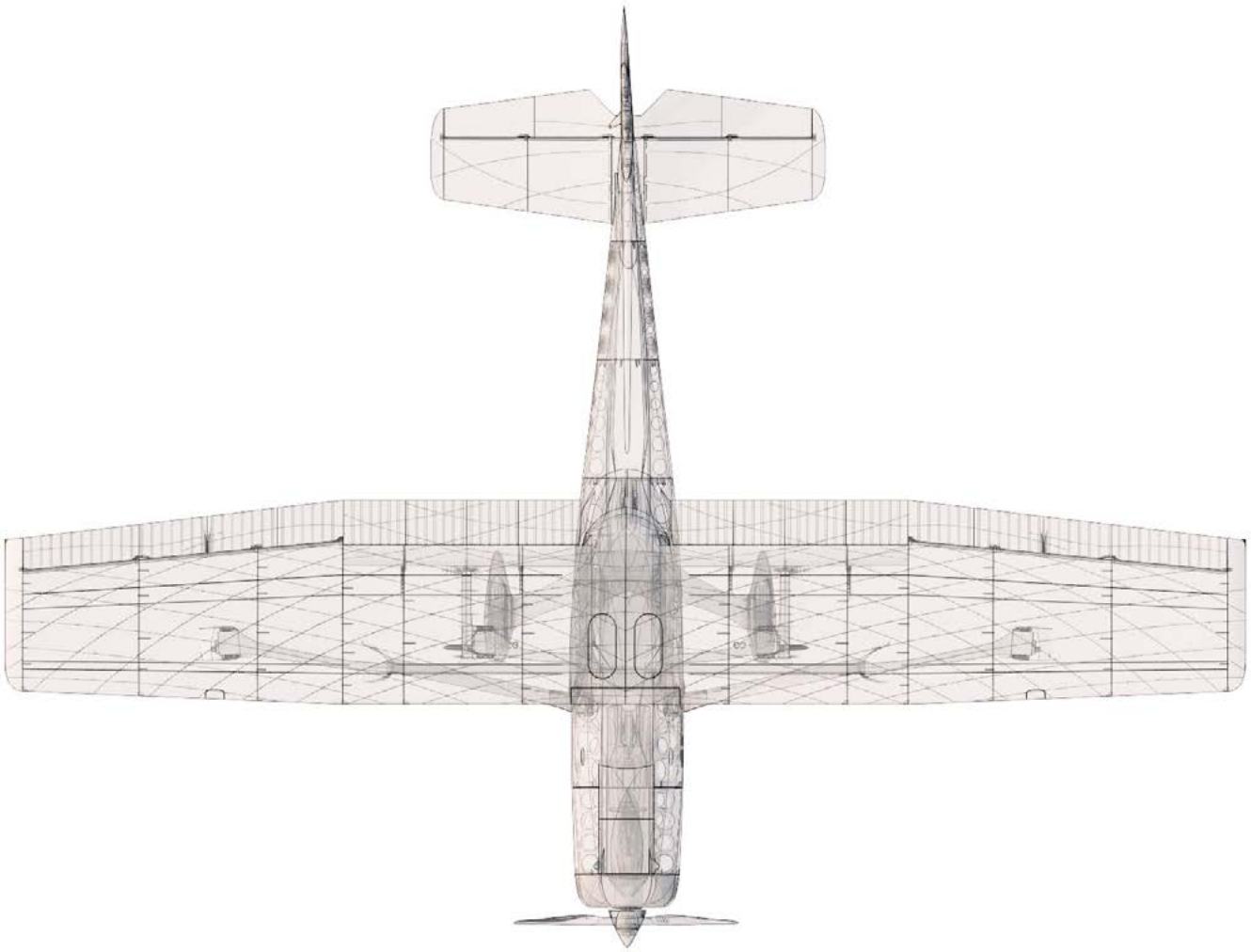
If you don't like Simplify3D for any reason, there is always the possibility to use another free slicer. You can use our basic setting (setting files) as a start point and edit it as you need.



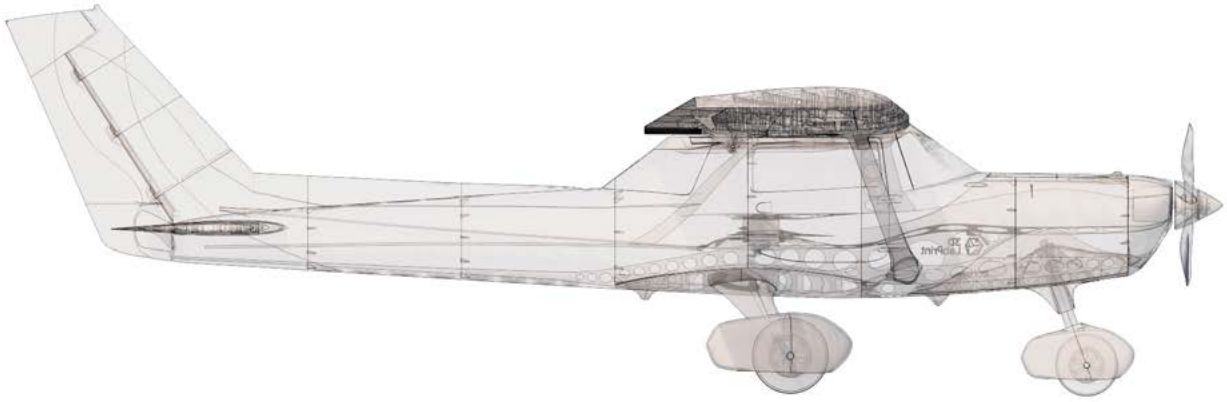


## 6. Scale markings PDF

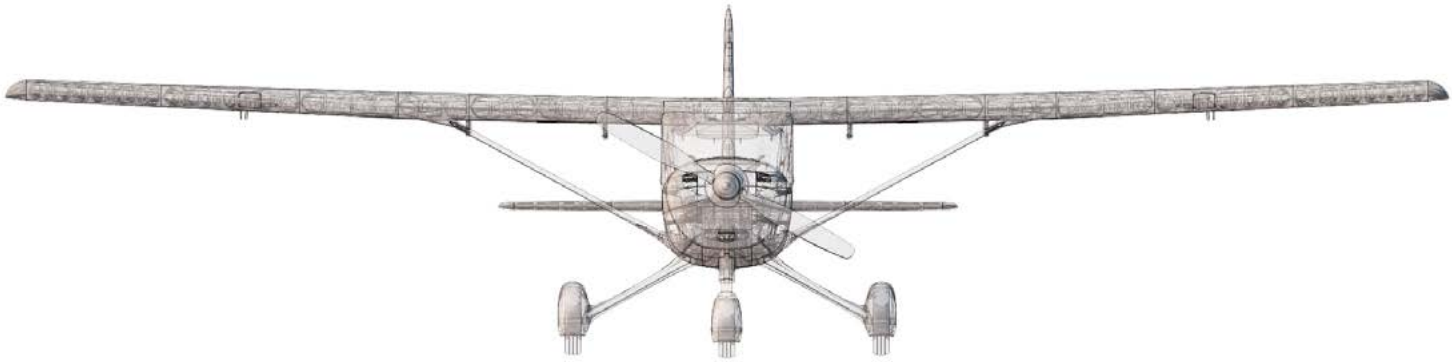
Print this scale PDF at thin self tape advertisement foil and place it on the model as needed. Violet cut lines included.



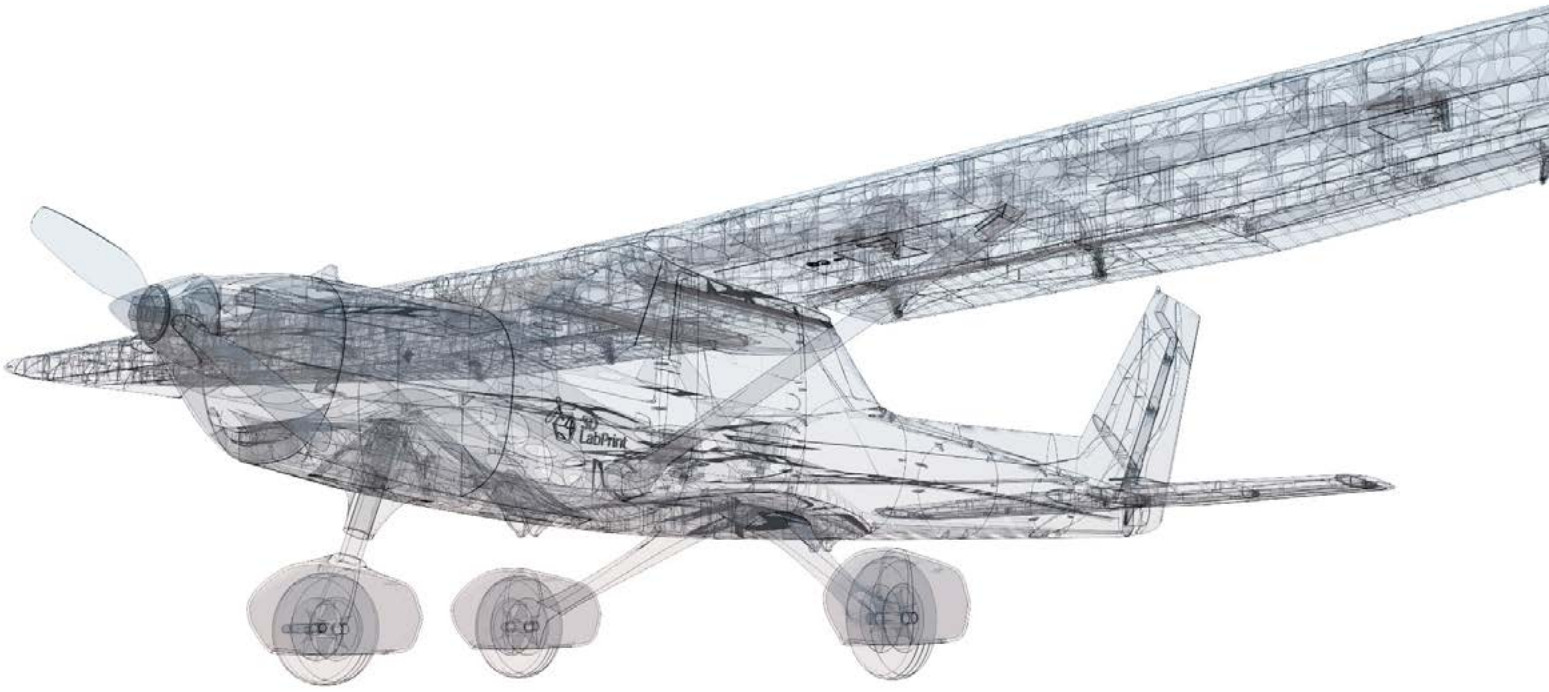
Wing area: 36 dm2 / 3.9 sq foot



Lenght: 1220 mm / 48.0 inch



Wing span: 1563 mm / 61.5 inch



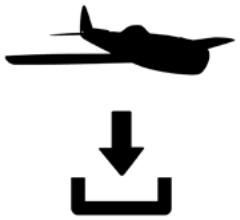
# Step By Step PDF/VIDEO userguide

## 1. Choose airplane at www.3Dlabprint.com. Our Facebook for live information.

Basic requirements for Cessna 152 is 195/195/150mm build volume. Nozzle 0.4mm recommended (0.35 or 0.5mm alternativelly). Heated bed recommended.
PLA filament (or PETG, APLA, htPLA, PC-max.... not ABS) and some flex for tires...
If you feel a little bit confused you can download test part from our FORUM (usualy the biggest part)

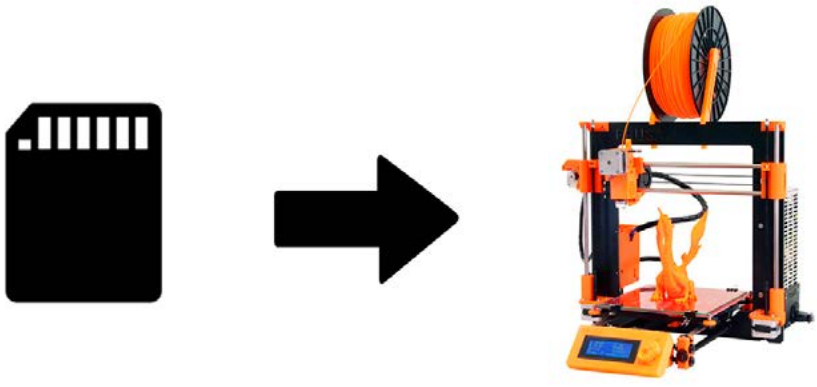
## 2. Create account, download

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



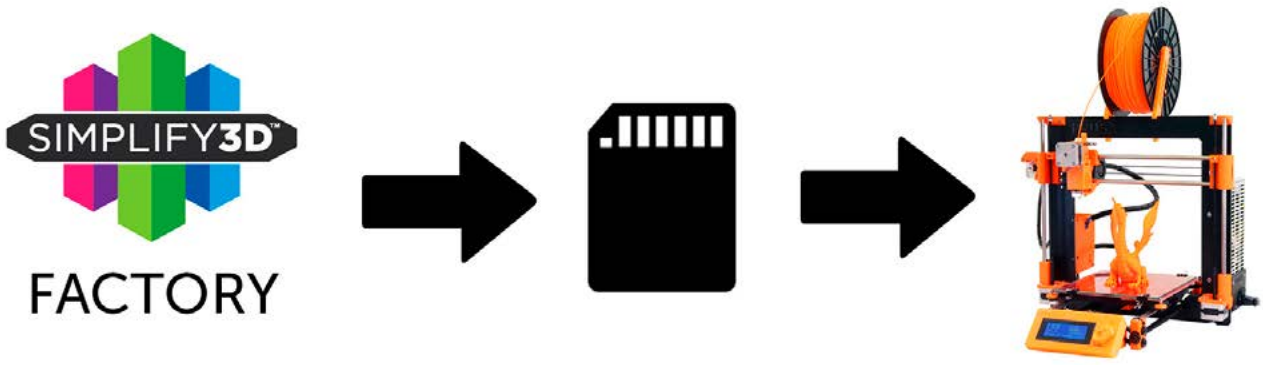
## 3. Gcodes preparing

option A Gcodes:
If your printer is i3 compattible you can directly use the prepared gcodes. Simply save each to an SD card and let 3d printer do his job. The HE temperature is set to 230°C 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.



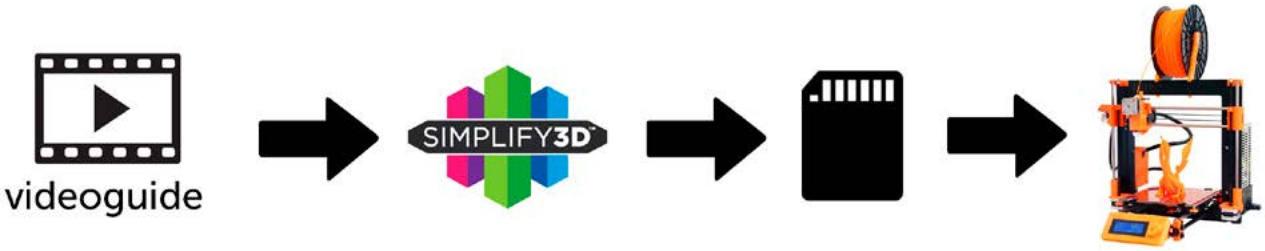
## option B Factory files Simplify3D (recommended)

We prepare all you need in thess files (basic FFF, parts arranged and so on...)
You can use our setting as a starting 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 look at the settings and edit it if it is different for 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.



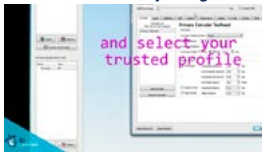

## option C Simplify3D manual setting (watch and learn)

Use our video guide for proper setting. This is a very good option and you will learn a lot about Simplify3D and become a 3d expert. Of course you spend a lot of time and the you-tube pause button will become your friend. Then please look to prepared Factory files with setting for rest of parts.




## AND... please look at VideoGuides:

video 2 Simplify3D setting

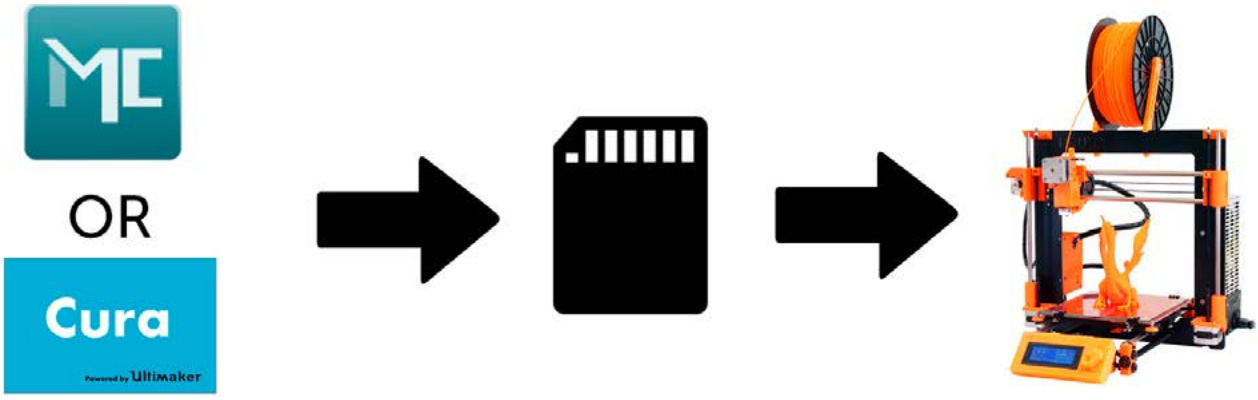



video about Thin Wall Printing

option D CURA or MatterControl (but note: we recommend Simplify3D)
MatterControl and CURA are free :-) and also give very good results and the airframe is still strong enough. The slicer setting is very easy.
Please try to find the right extrusion multiplier and temperature for good weight and best layer bonding. Look at parts weight list for proper multiplier settings.

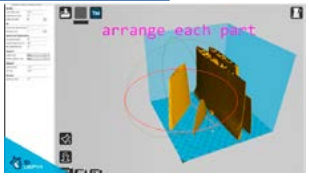
You can also use our predefined CURA or MC slicer setting file included in the package (always adapt it for your printer, change build volume, filament diameter and so on... depends on your printer!!!):

| | |
|---|---|
| CURA_wing_fuse.ini | (wing and fuselage (expect1) parts) + CURA_wing_tip.ini |
| CURA_ailer_elev.ini | (only ailerons, elevator and rudder parts) |
| CURA_thick.ini | (fuselage1 only, struts, holders, landing gear... ) |
| OR | |
| MC_wing_fuse.slice | (wing and fuselage (expect1) parts) + MC_wing_tip.slice |
| MC_ailer_elev.slice | (only ailerons, elevator and rudder parts) |
| MC_thick.slice | (fuselage1 only, struts, holders, landing gear... ) |

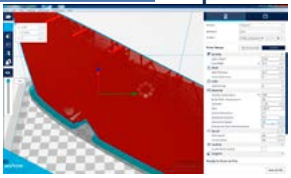



AND... please look at VideoGuides:

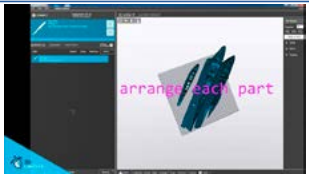
video CURA slicer setting




CURA 2.3.1 import setting



video CMatterControl slicer setting



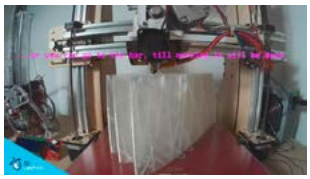
## 4. Print it

Save generated Gcodes and insert SD card to your printer, prepare your printer and start printing. We prefer to use SD rather than a direct connection via USB Note: ABS filament is not suitable for this. Scaling the model will lead to unusable result!

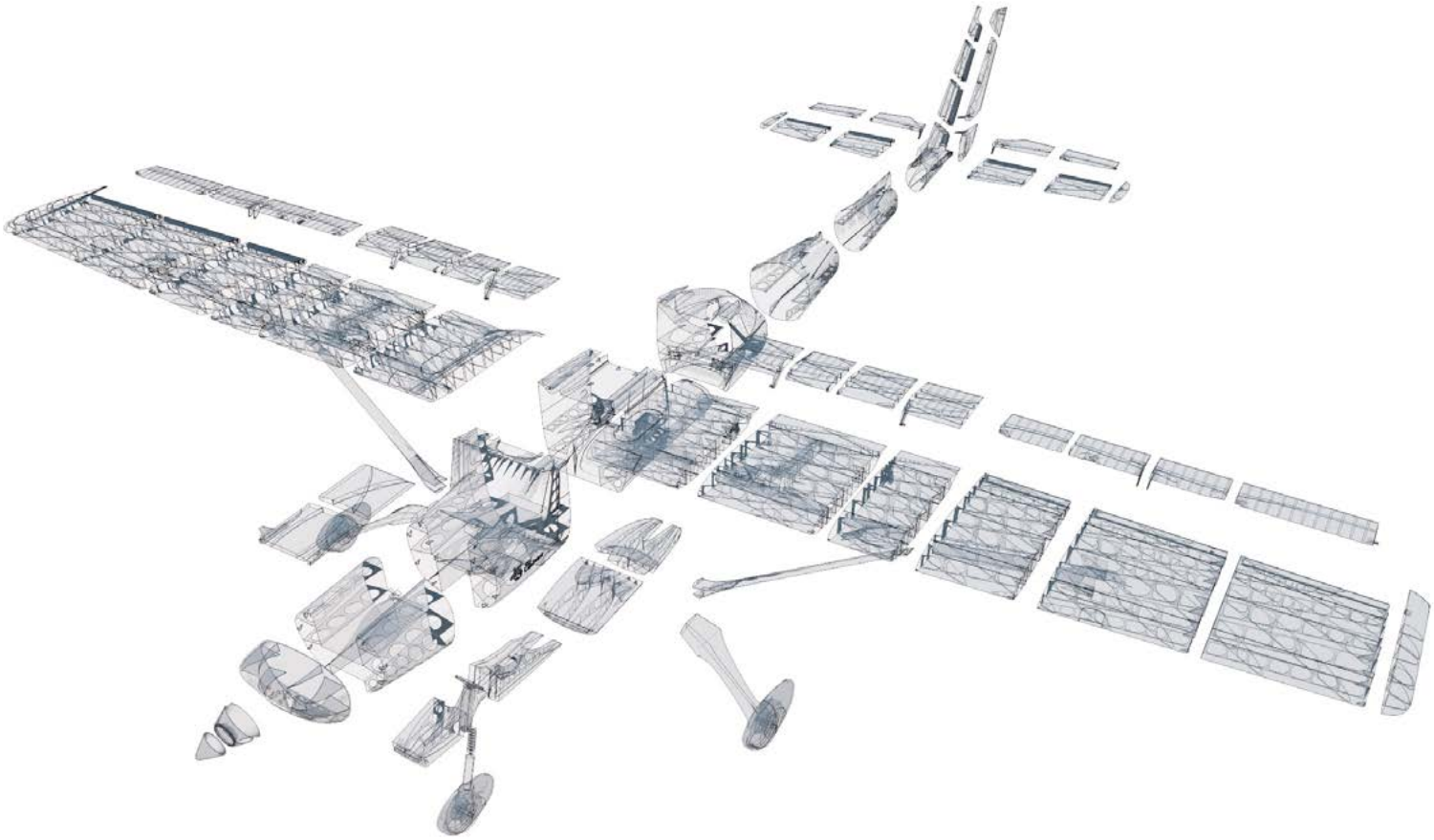
Video guide about printing:
You will need: PLA filament - good quality and strong PLA (we need good layer bonding)
Strong hair spray (or your favorite adhesive bed surface)
Razor blade
(disregard with PEI or simmilar bed surface, Mk2...)

AND... please look at VideoGuides:

video printing guide



## Cessna 152 - parts diagram:



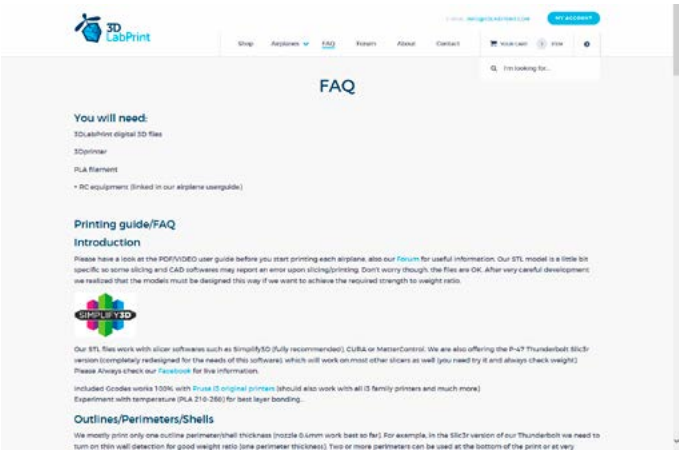
# Basic Tips and Advice

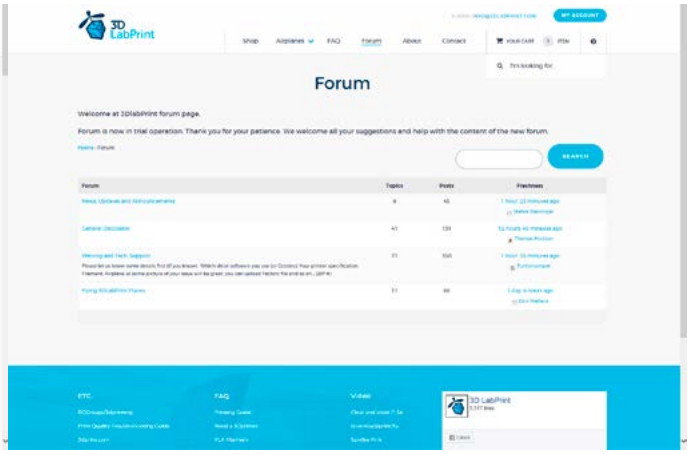
Please experiment with your extrusion multiplier.
Also HotEnd temperature is very important for a strong result. Please try increasing the temperature to find the best value (215° up to 260° Celsius).
Turn OFF cooling fan for better layer adhesion (HE fan of course ON). We don't need it for our thin wall printing. You can use cooling fan for thick parts...
We try lot of filaments and so far PLA is still the best for our models (2017).

Heated bed is very recommended, 50-60° Celsius (print without warping ends).
Looks like any standard quality PLA is perfect 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 are a lot of 3dprinters on the market, most of them are OK for printing our aircraft (specific thin wall printing...) sufficient volume, heated bed, 0.4 mm nozzle.

## Please look at FAQ and our Forum for next information:

### Need a help? our Forum is the best place... where we can help you



# 5. Assembling printed parts

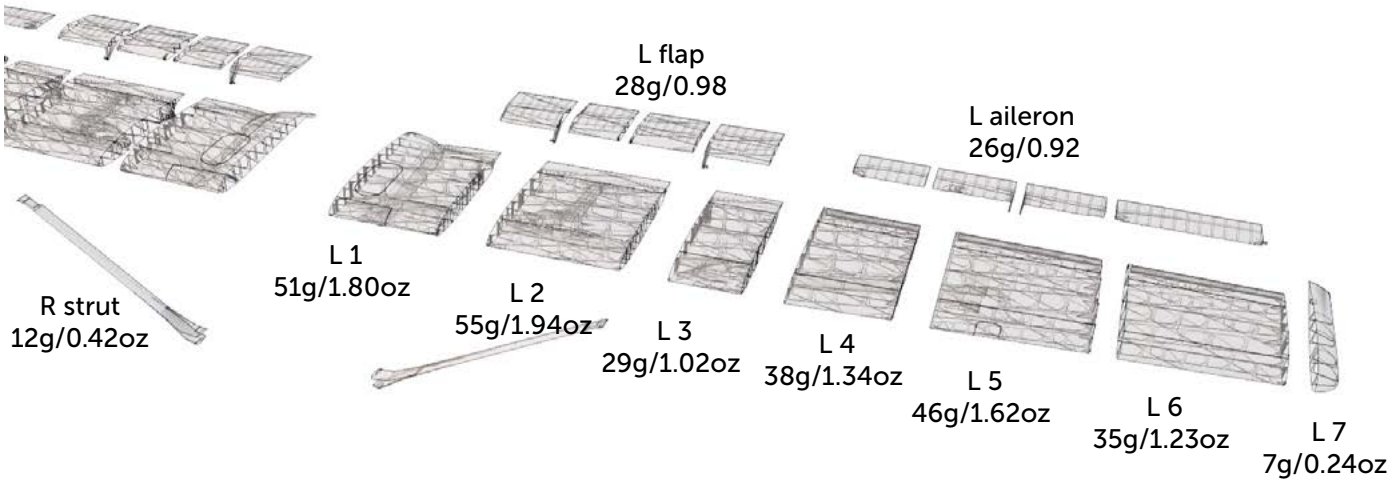
## 5.1 Wing assembly

Glue wing parts with CA glue together (position locks will help you), use activator. Install ailerons and flaps. You can use snap knife to clearing shape of some printed parts (mainly for the installation of the flaps and ailerons), but mostly it is not necessary.

NOTE: wing tips (L7) must be glued as a last , after instaling ailerons!!! (ailerons are locked with L7)

See video guide #4

you will need: CA Glue - medium or similar medium viscosity CA glue
Activator for CA Glue or similar, but gas presurized aerosol is better
Snap knife



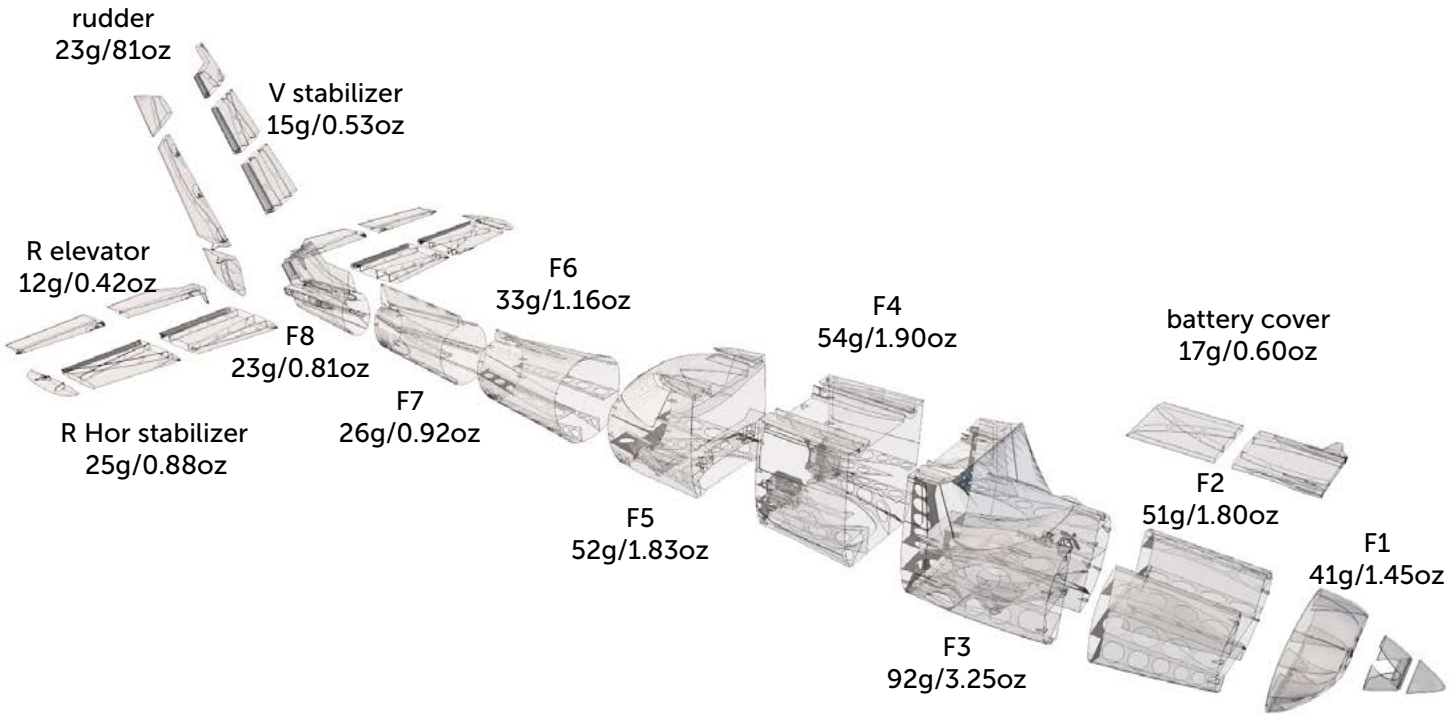
## 5.2 Fuselage assembly

Glue wing parts with CA glue together (position locks will help you) use activator. You can use snap knife to clearing shape of printed parts....

NOTE: Don't glue the tailparts yet !!! (for rudder, elevator and stabilizers proceed to next step)

See video guide #5

You will need: CA Glue - medium or similar medium viscosity CA glue
Activator for CA Glue or similar, but gas presurized aerosol is better
Snap knife
Soldering Iron or any hot tool



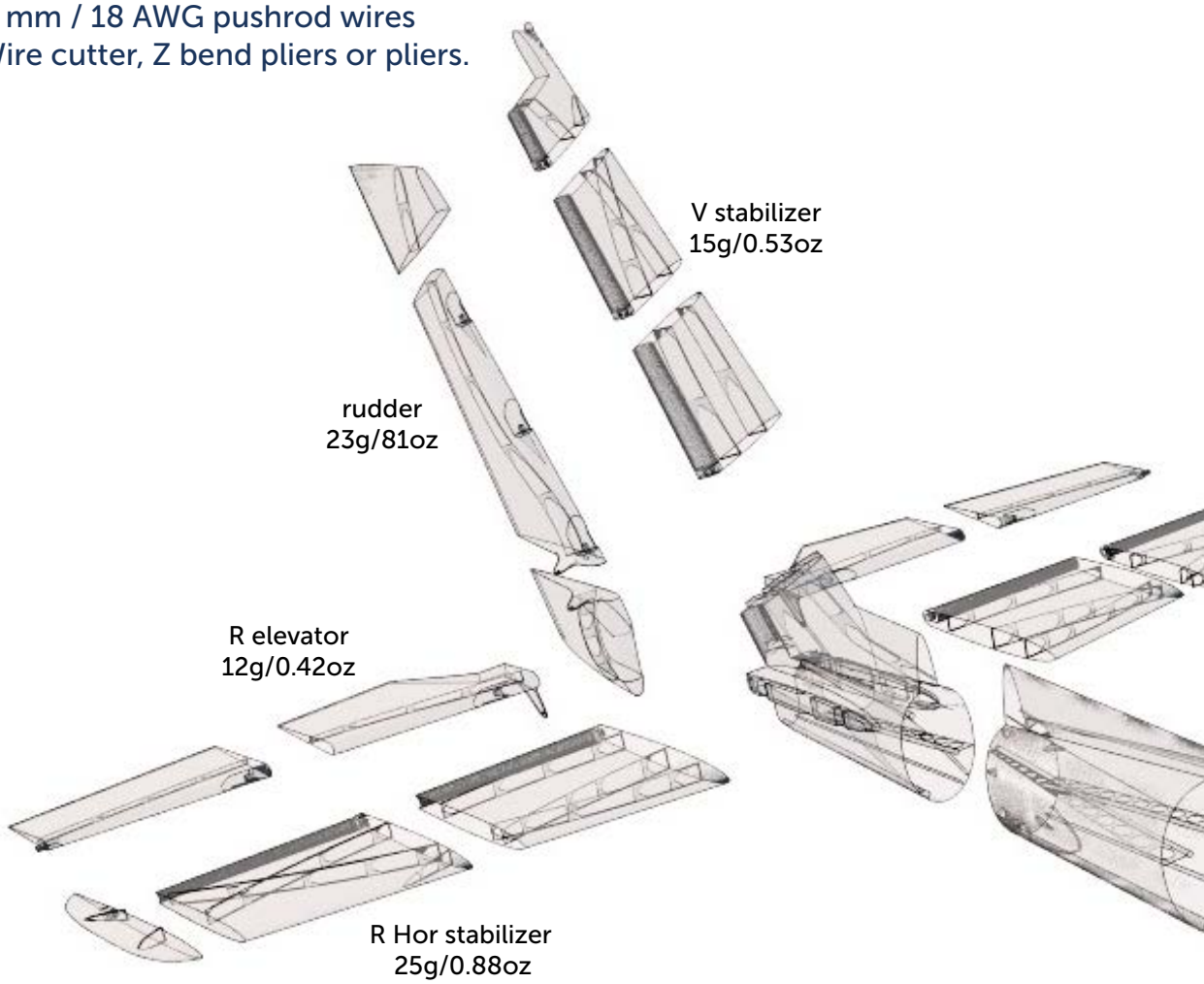
## 5.3. Fuselage tail - rudder, elevator pushrods and servos

Now is good time for install tail stabilzers, elevator, rudder and pushrods. Simply push 1 mm pushrods wires to back part of fuselage (into printed bowden). Make Z bend or use your liked pushrods attachment, we like this Pushrod Keepers. Thread pushrods and glue the elevator and rudder in correct position with CAglue. Cut rudder clearence for elevator movement with soldering Iron or any hot tool.
You can use snap knife to clearing shape of printed parts...

NOTE: horizontal stabilizer must be glued after instaling elevator!!! (elevator is locked with stabilizer)
NOTE: then asembly rudder with vertical stabilizer add pushrod and glue to the fuselage!!!

See video guide #6

You will need: CA Glue - medium viscosity CA glue
Activator for CA Glue or similar, but gas presurized aerosol is better
1 mm / 18 AWG pushrod wires
Wire cutter, Z bend pliers or pliers.



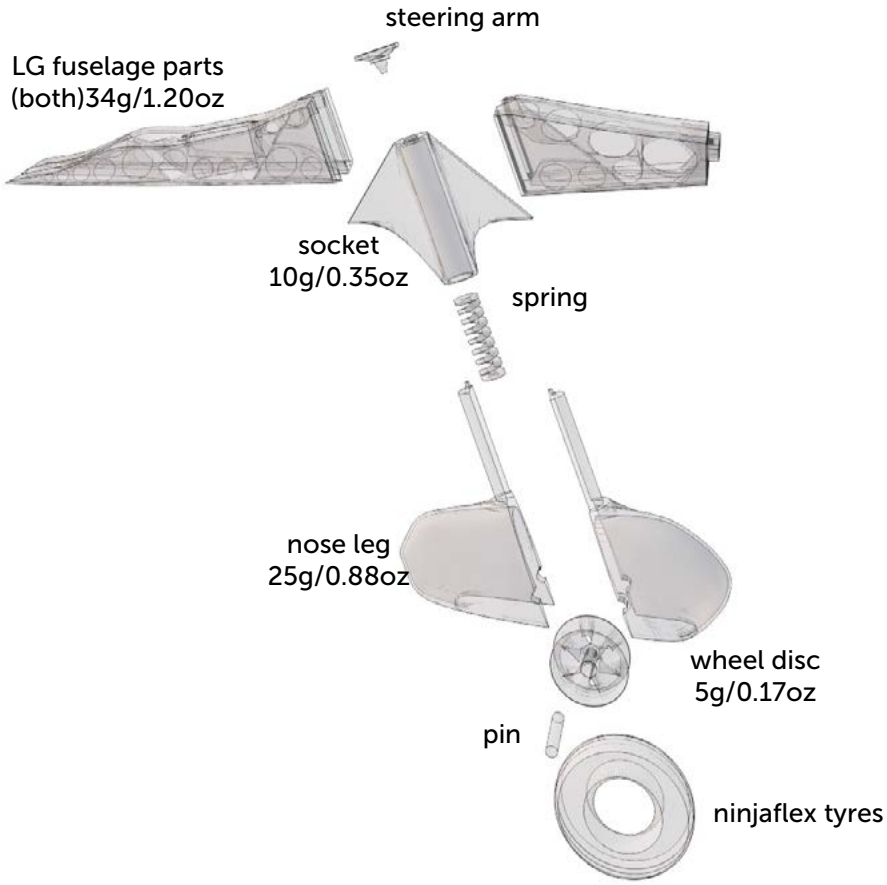
## 6.1 Landing gear - nose

Wow, printed springs! Yes it works! If you have doubts, you can use conventional metal springs of appropriate size(use to and bottom from printed one). Glue splited parts of landing gear and landing legs together. Sand it or use knife for smoth movement inside. Push pins to holes and check correct legs functionality.
Use 60mm wheel or print it(included)! Print tyres from ninjaflex or do experiment with any new rubber fillaments.

NOTE: steering arm must be glued only to spring (not the socket) and spring glued to nose leg!!!

See video guide #7

You will need: CA Glue - medium viscosity CA glue
Activator for CA Glue or similar, but gas presurized aerosol is better
Snap knife

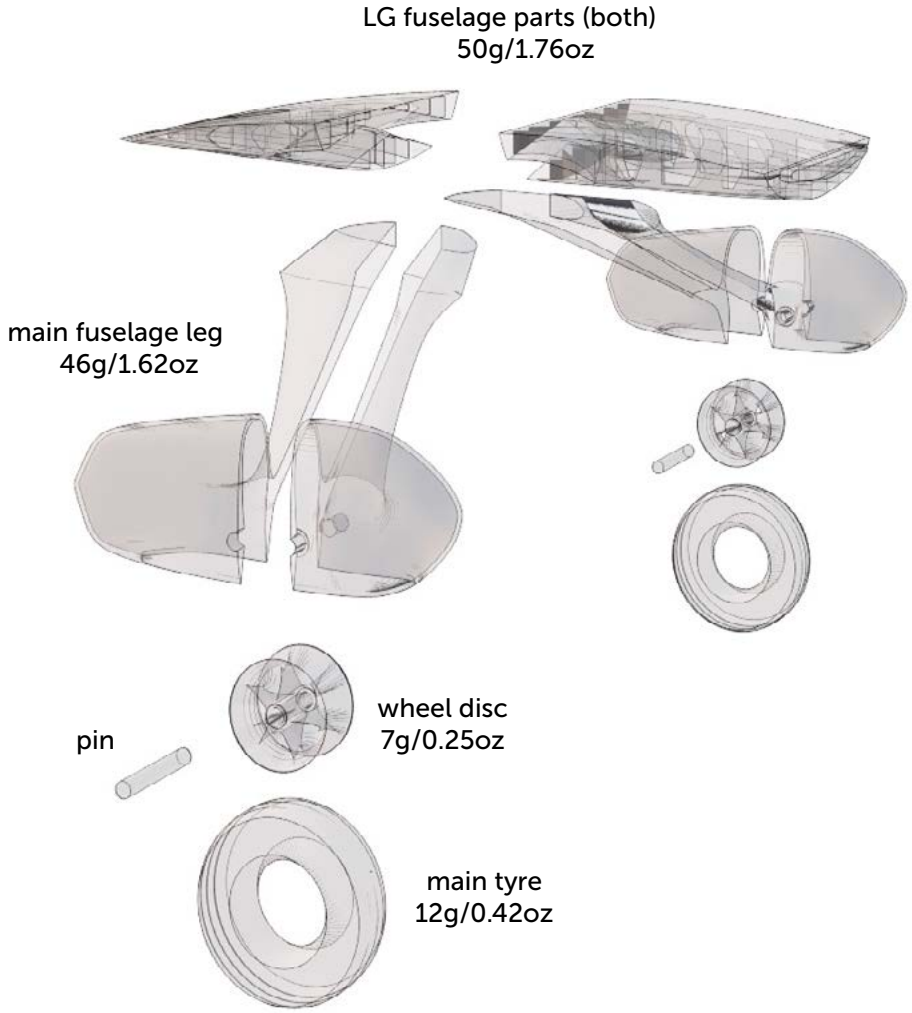


## 6.2 Landing gear - main

Glue splited parts of landing gear and landing legs together. Sand it or use knife for smoth movement inside. Push pins to holes and check correct legs functionality.
Use 70-75mm wheel or print it (included)! Print tyres from ninjaflex or do experiment with any new rubber fillaments.

See video guide #8

You will need: CA Glue - medium
Activator for CA Glue or similar, but gas presurized aerosol is better
Snap knife

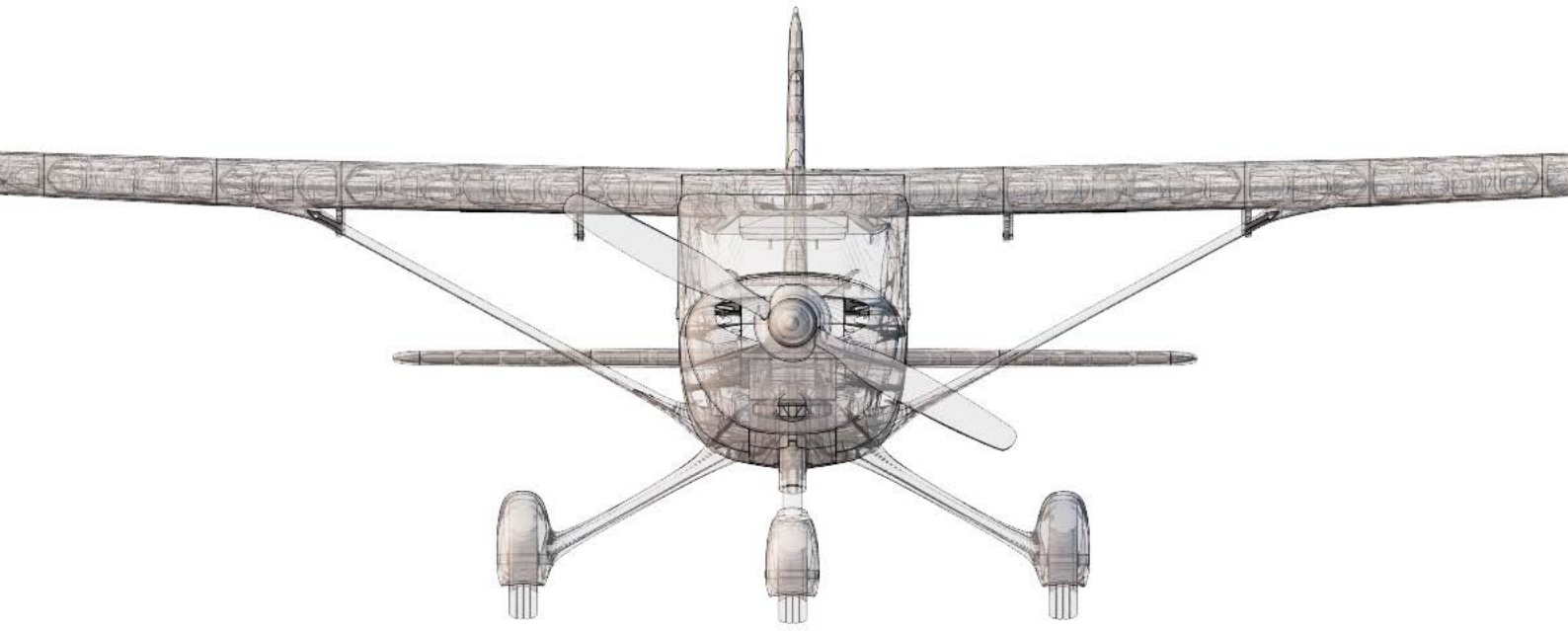


# 8. RC equipment and next Pushrods installing

Mount servo wire extenders at ailerons servos. Install servos and pushrods with Z blend for servo/controll arms or use your liked pushrods attachment, we like this Pushrod Keepers. Loosen the small screws on the motor body holding the shaft. Use a hammer to get the shaft in the correct position over a wooden block. Tighten the screws. Remove the retaining ring is not necessary.

See video guide #9

You will need:
1.5mm / 16 AWG pushrod wires for flaps only (use any steel wire)
7x Mini servo TR-1160A or simmilar Hitec 82/81 class
Motor setup with ESC
Servo wire extenders approx 300mm (2 pieces from package)
Wire cutter, Z bend pliers or pliers.



## 9.1 Final completion and setting

Install your receiver, connect battery, setup servos and etc. with your trasmitter, check servo position, then install propeller. Set recommended deflection from videoguide. Check CoG point (see CG- tags on wings)

Make sure that the battery is placed properly and secured. If battery moves during flight it can shift the center of gravity backwards and aircraft will be uncontrollable!

Never setup ESC with installed propeller, this is very dangerous!!!

You will need: Your own Rx/Tx system
Battery for your setup...
Adhesive velcro strip for Li-Pol battery and ESC
Propeller 11x5,5
Scale markings printed on adhesive foil
Servo wire extenders approx 300mm (2 pieces from package)

See video guide #10

## 9.2 Recommended motor setups

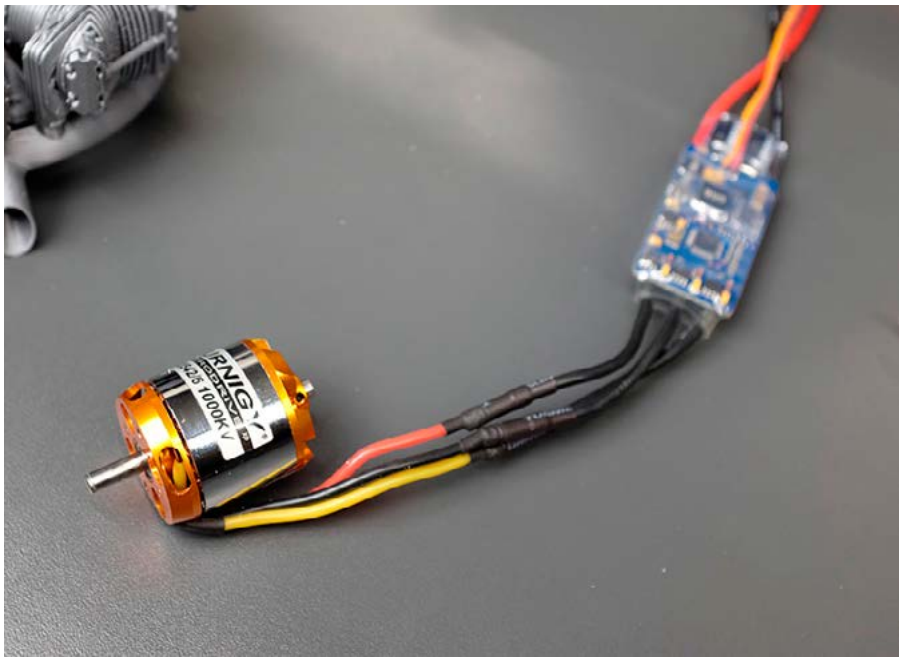
(or use your own with sufficient thrust and weight)

### Eco performance setup

Turnigy 3542/5 1250KV or similar
(move shaft forward as on photo)
40A Electronic Speed Controller or similar
Turnigy 3000mAh 3S 20C or similar
propeller two blade APC 11x5,5

### Performance setup

Turnigy 3542/6 1000KV or similar
(move shaft forward as on photo)
40A Electronic Speed Controller or similar
Battery 3000mAh/4s 40C or similar
propeller two blade APC 11x5,5




## 10. Pilots Please Attention!

For the first flights we recommend to set the center of gravity of the airplane by about 5 mm forward of the CG tag - nose heavy, this increases the stability (you can use heavier battery). Also is good to increase expo settings on your transmitter for elevator and aileron to 60 % (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 the CoG move aft and can lead to uncontrollable flight behavior.

You can then return to the proper center of gravity (balance aircraft). Set expo to 30-50 % ... this will gain back extra maneuverability when you are confident with flying your airplane.
Spent at leats 10 hours with RC flight simulator before you go out for the first time.

Short flight video

Flite test: RC Planes for beginners (but note: we use primary ailerons for turn, not only rudder)

Never fly aft positioned Center of gravity.

## Please, use these files only for your own purpose, do not send it further. Thank you very much. Enjoy your flight.