

User Guide

rev. 2017/12



Fully 3d printable

Piper Pawnee

scale ~ 1:8.8 wingspan 1.24m/48in

Piper Pawnee – fully printable R/C plane for your desktop 3Dprinter

Future of flying - Print your own plane.

Our never ending development process brought us to this so far biggest project, again full of improvements for better durability, easier assembly, better geometry solution and so on... We hope you enjoy printing, building and flying, although this build will truly test your abilities and your printer quality.

Welcome to the thin wall printing!

The first fully printable airplanes with files prepared for your 3Dprinter, with flight characteristics, comparable or even superior to classic build model airplane. This is not a dream, now you can print this HI-TECH at home. Simply download and print the whole plane or spare parts anytime you need just for a cost of filament only about \$20 for 1300g/36 oz

Extensive hi-tech 3d structural reinforcement making the model very rigid while maintaining a lightweight airframe and exact airfoil even it's just a plastic. This perfect and exact 3d structure is possible only thanks to additive 3dprinting technology. So welcome to the 21st century of model flying and be the first at your airfield.

Easy to assemble, you don't need any extra tools or hardware, just glue printed parts together and make pushrods for control surfaces. 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.



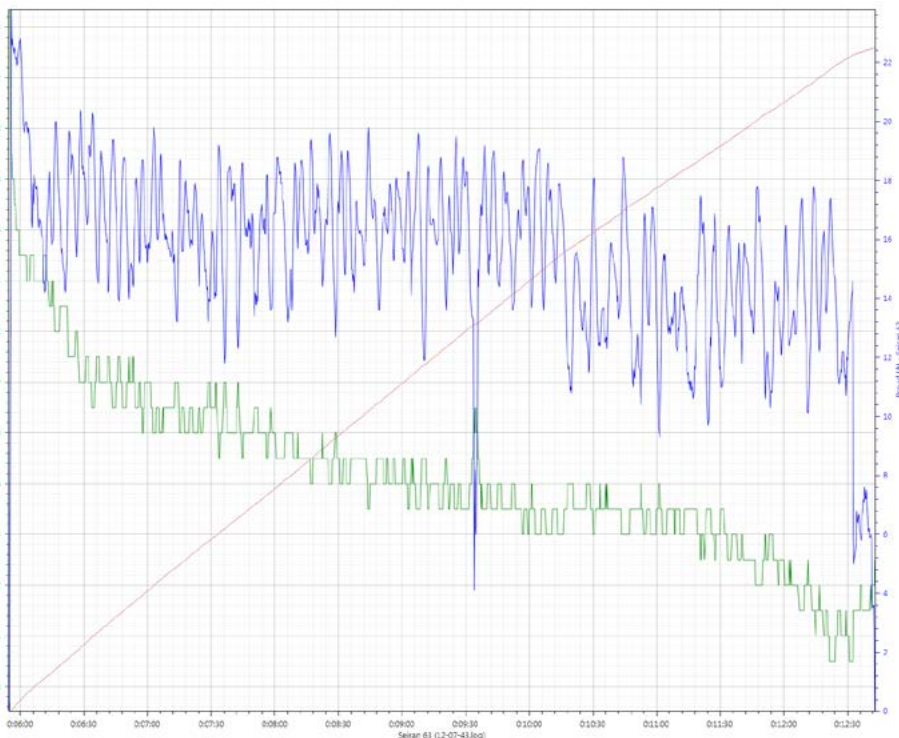
General specifications:

Length:	968 mm / 38,1 inch
Wingspan:	1240mm / 48.8 inch
Height:	380 mm / 14.96 inch
Wing area:	26.66 dm ² / 2.87 sq ft
Wing loading:	82.5 g/dm ² / 26.8 oz at sq ft
Center of gravity:	on the joint of wing parts
Airfoil:	3DLabPrint SPT508
Weight of all printed parts:	1300 g / 45 oz
Takeoff weight (6s 2700mAh Li-Pol):	2200 g / 77 oz
Max takeoff weight:	2500 g / 87.5 oz
Never exceed speed, VNE:	110 km/h / 68 mph
Design maneuvering speed, VA:	80 km/h / 50 mph
Stall speed, VS(full flaps):	38 km/h / 23 mph



Performance measurement:

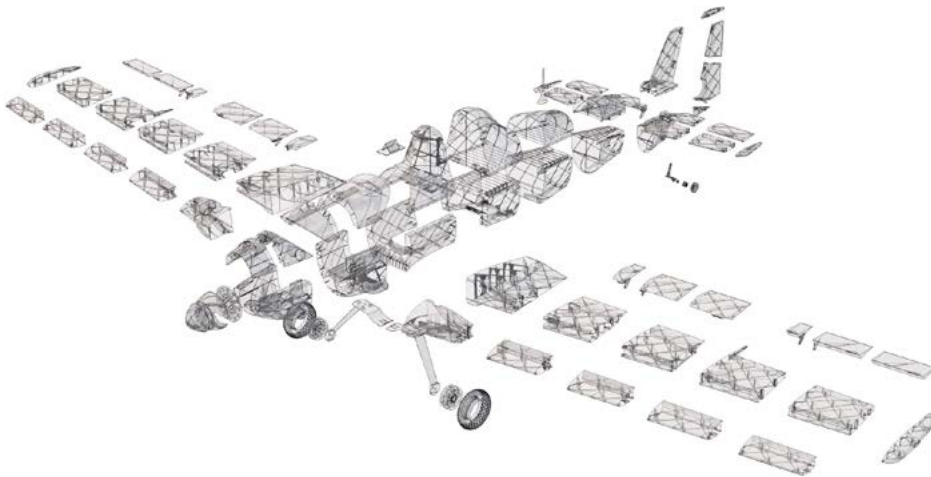
Max speed VH (level flight):	90 km/h – 48 kn – 55 mph
Rate of climb:	28 m/s (5 500 ft/min)
Flight time (6s 2700mAh):	12:00 min (+30% reserve)



Included:

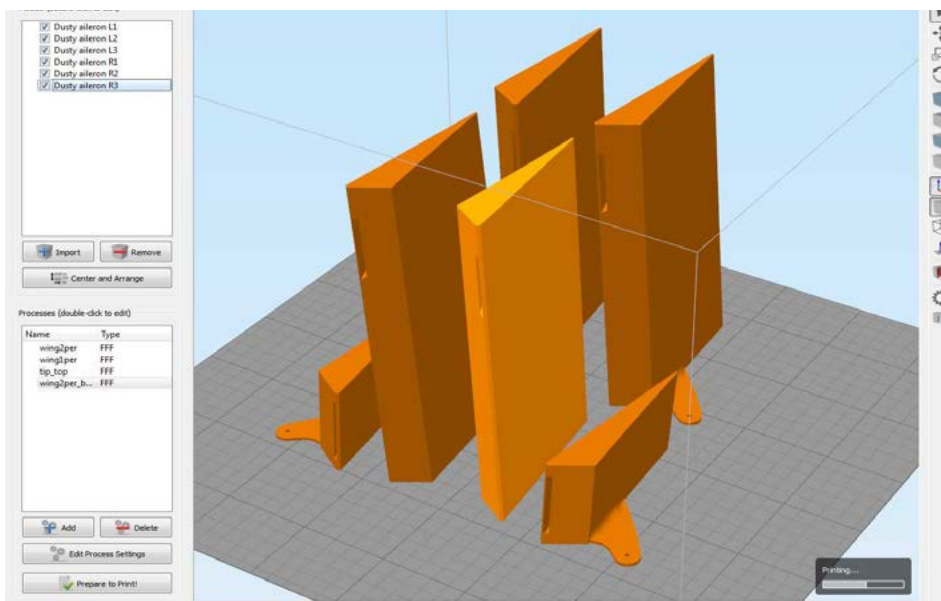
1. STL 3d files

Universal STL files designed for use with desktop FDM 3D printers and slicing software such as Simplify3D (highly recommended), CURA or MatterControl (our 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 take a look at Simplify3D



3. Step By Step PDF/VIDEO userguides

Apart from this userguide, please take a look at the Printing Guide on our website with some Tips and Advices for airplane printing (Thin Wall Printing).

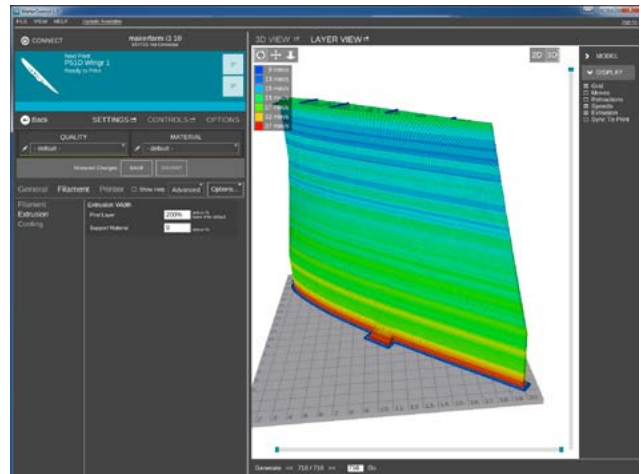
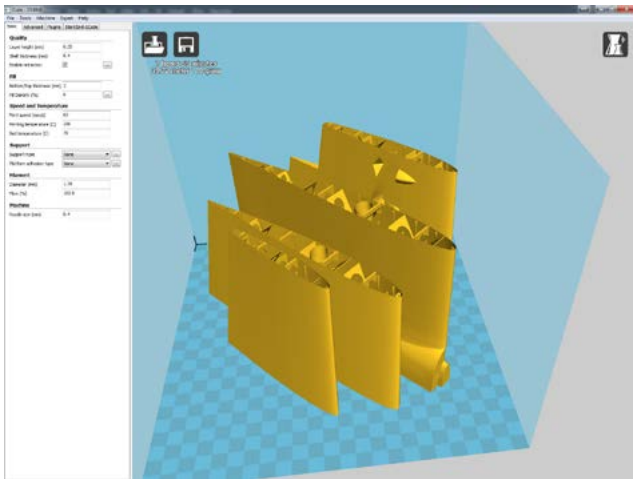
4. Gcodes

Basic Gcodes prepared for direct use, as universal as possible. It should work with Prusa i3 style printers. You could try to use them, but We can't guarantee compatibility with your printer.

Gcodes are 100% working with PRUSA i3 ORIGINAL 3d printers. You could always amend the starting script, temperatures and other values accessible from menu of your printer.

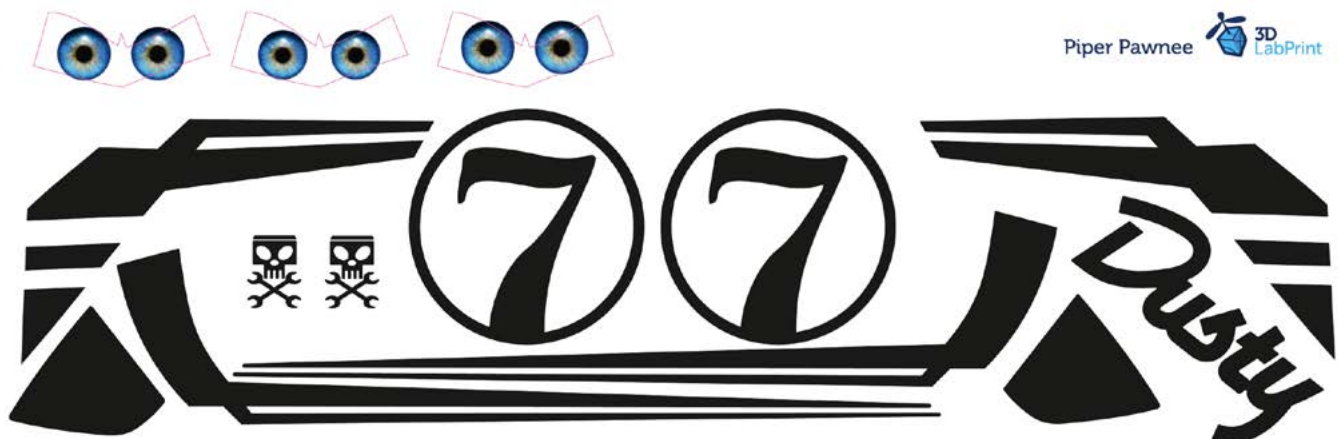
5. Prepared settings for CURA and MatterControl slicers

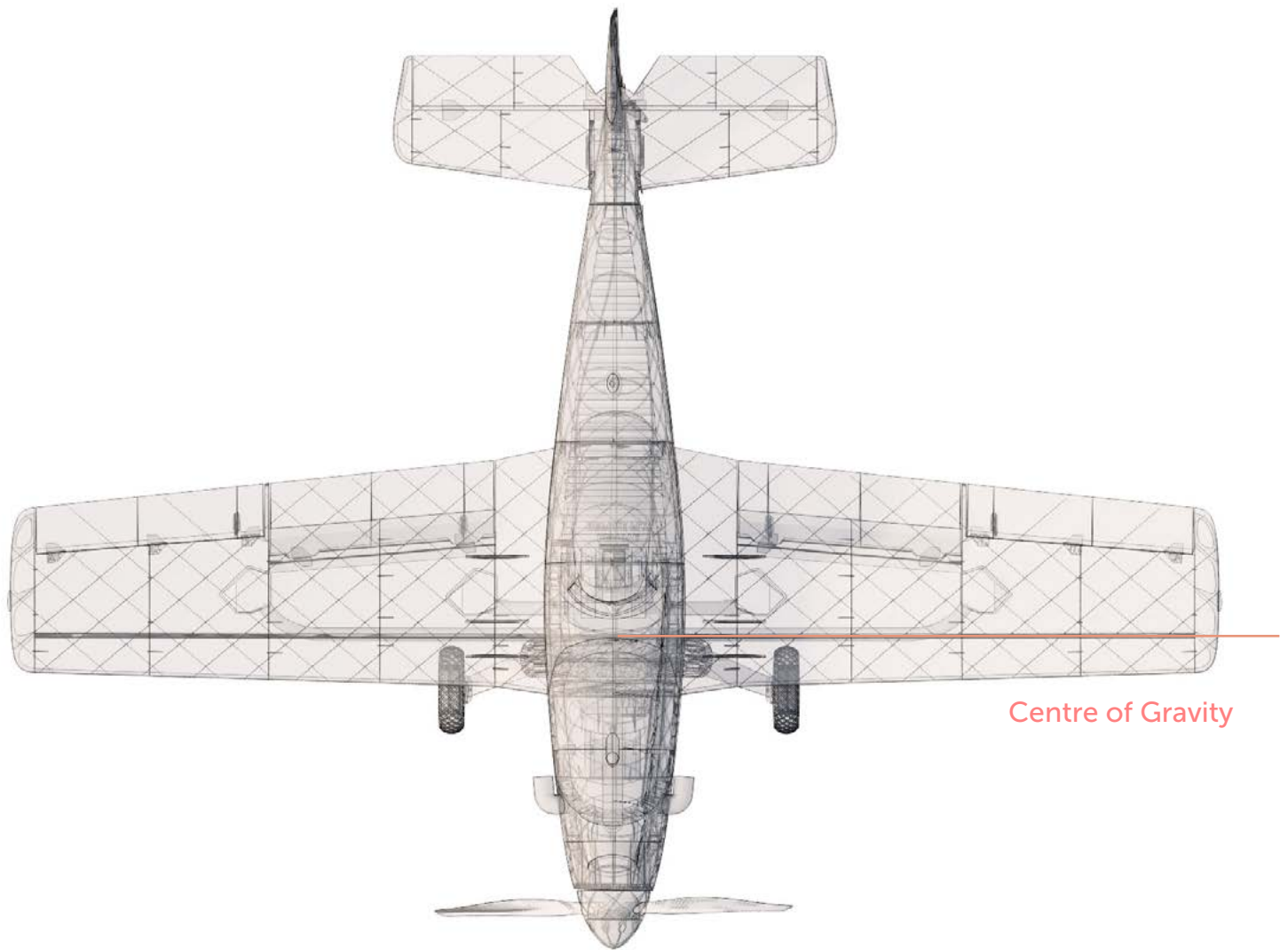
If you don't like Simplify3D for any reason, there is always the possibility to use another free slicer. You can use our basic setting (setting files) as a start point and alter according to your need.



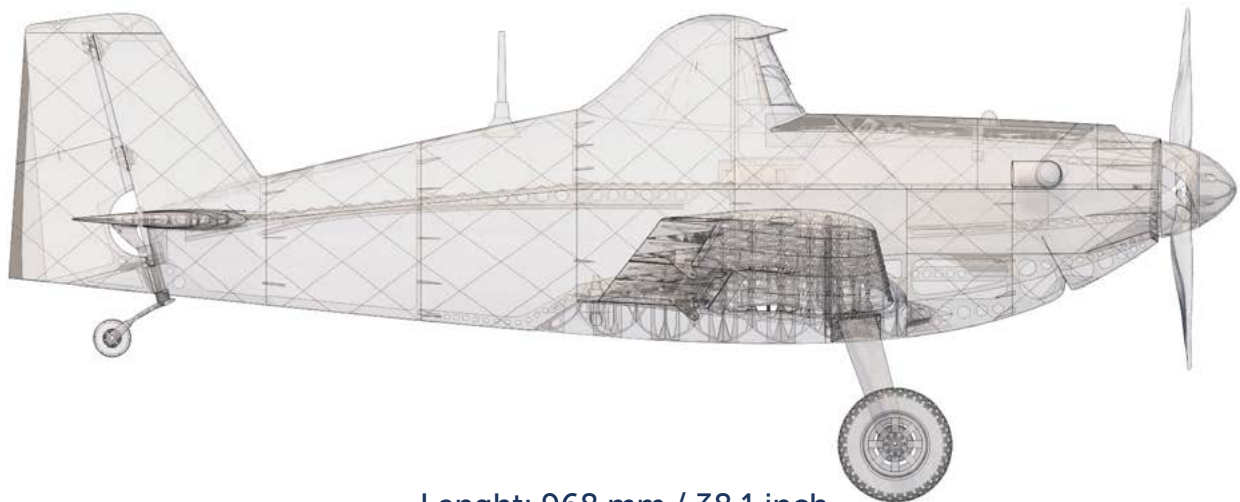
6. Scale markings PDF

Cut this PDF from thin self tape advertisement foil and place it on the model as needed.

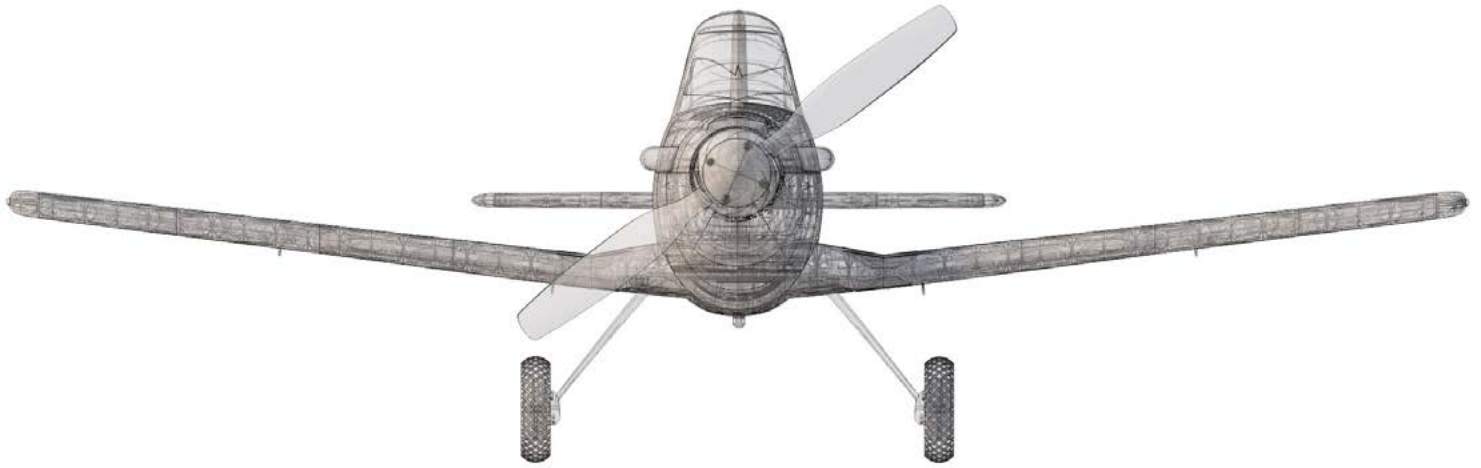




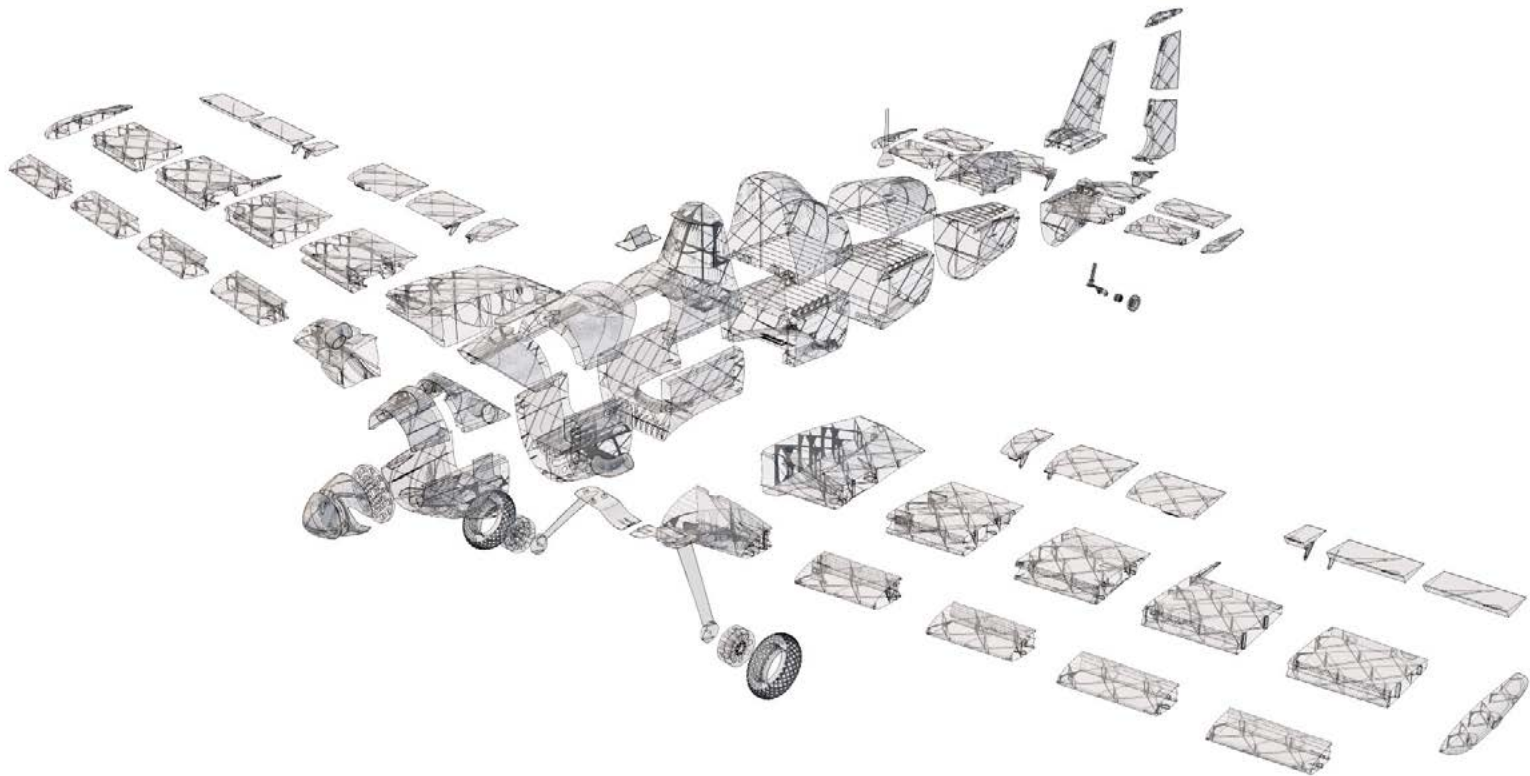
Wing area: 26.66 dm² / 2.87 sq ft



Length: 968 mm / 38,1 inch



Wing span: 1240mm / 48.8 inch



Step By Step PDF/VIDEO userguide (please watch all videos)

1. Choose airplane at www.3DLabprint.com. Our [Facebook](#) for live information.



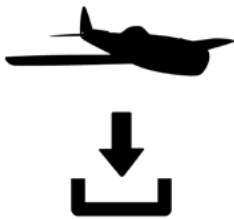
Basic requirements to print Piper Pawnee are 195/195/150mm build volume, recommended nozzle size 0.4mm (alternatively 0.35 - 0.5mm), heated bed is very recommended.

PLA filament (or PETG, APLA, htPLA, PC-max.... not ABS) and some flex for tires...

If unsure you meet the requirements, you can download and try to print test part from our [FORUM](#) (usually the biggest part)

2. Create account, download

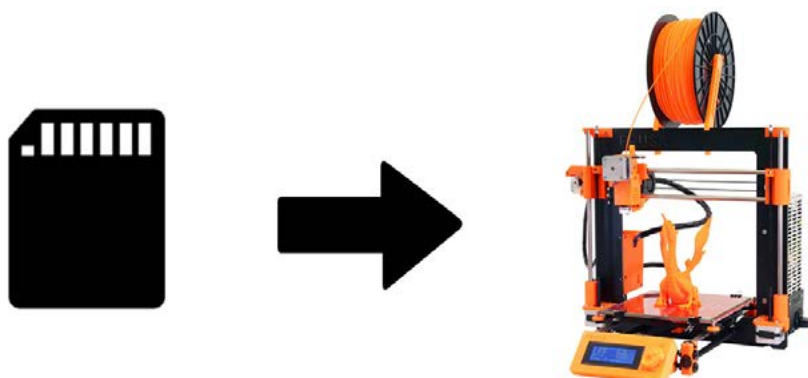
You'll receive the download link for all zipped files via email, or you can download directly from our website after login to your account, created automatically on checkout.



3. Gcodes preparing

option A - Gcodes

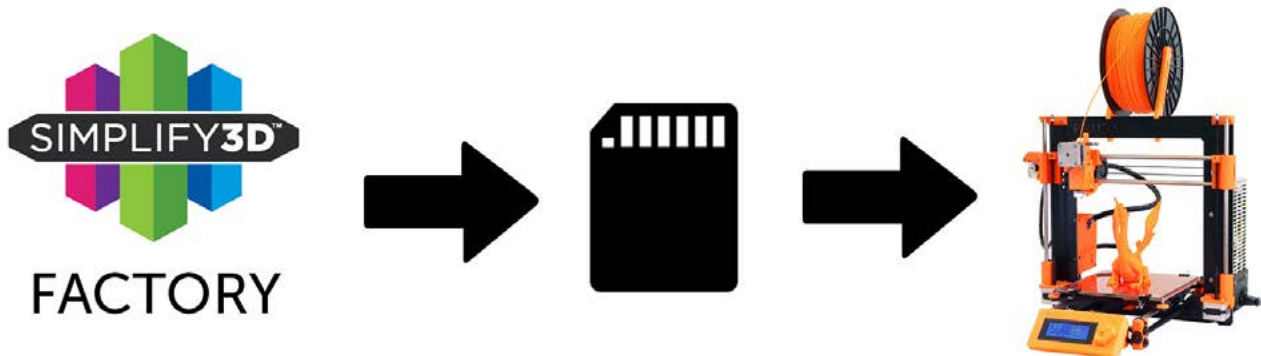
You can use the [precompiled gcodes](#) if your printer is compatible with Prusa i3. Simply save each file to SD card and let 3d printer do it's job. For best layer adhesion is the HE temperature set to 230°C. You can edit speed and temperature through your printer LCD or add a custom start script to the beginning of the Gcode if needed. Please proceed with the other options if the precompiled gcodes doesn't work for you.



option B - FACTORY files for Simplify3D (highly recommended)

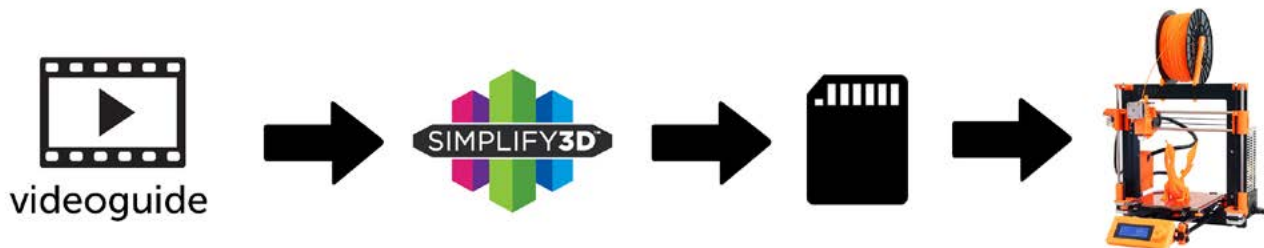
We prepared all you need in these files (basic FFF profiles, parts layout, and so on...)

You can use our setting as a starting point and edit according to your printer needs, print only the spare parts, etc... It should work as it is for most printers, but please go through the settings and edit it as needed. We are not liable for any damage resulting from the use of our settings. If for any reason this does not work for you, please proceed to the next option.



option C - Simplify3D manual setting (watch and learn)

Use our [VIDEOGUIDE](#) to build your own factory file. This is a very good option to learn a lot about Simplify3D and become a 3D expert. Of course you spend a lot of time and the YouTube pause button will become your best friend. For simplification we show only our basic setting (wings and fuselage), please use our prepared Factory files as a reference for the rest of parts, like motor mounts, control surfaces, etc.



AND... please watch our VideoGuides:

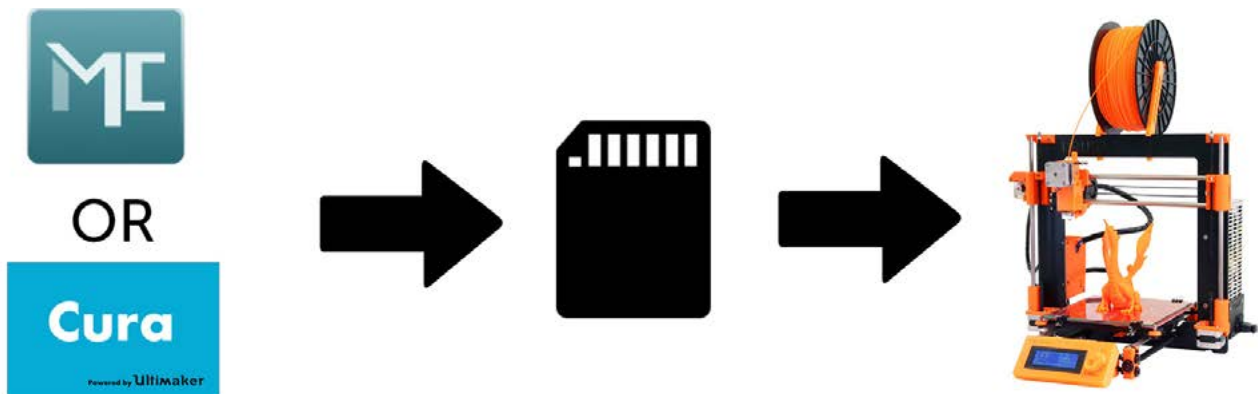
[video 2](#) Simplify3D setting

[video](#) about Thin Wall Printing

option D CURA or MatterControl (considered as the last resort, we recommend Simplify3D)
MatterControl and CURA are free and provide good results. The airframe is still strong enough, but don't expect the best quality. Both slicers lacks some very useful features, and finer settings, like multiple processes according to Z height, retraction options, layer start, etc. Please try to **find the best extrusion multiplier and temperature** for good weight and best possible layer bonding. Look at parts weight list for proper multiplier settings.

As a starting point you can use our predefined CURA or MC slicer setting file included in the package (always adapt it for your printer, change build volume, filament diameter, etc... according to your printer!!!) for some thick part you'll need to use support structure:

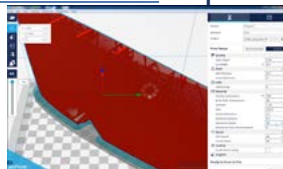
CURA_wing_fuse.ini	(wing and fuselage parts)
CURA_ailer_elev.ini	(only ailerons, elevator and rudder parts)
CURA_thick.ini	(motor mount, landing gear...)
OR	
MC_wing_fuse.slice	(wing and fuselage parts)
MC_ailer_elev.slice	(only ailerons, elevator and rudder parts)
MC_thick.slice	(motor mount, landing gear...)



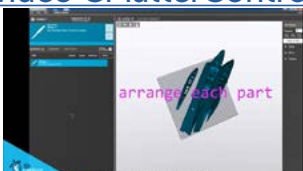
AND... please look at VideoGuides:

[video CURA slicer setting](#)

[CURA 2.3.1 import setting an newest](#)



[video CMatterControl slicer setting](#)



4.1 Print it

Save generated Gcodes to SD card and insert to your printer, prepare your printer and start printing. We prefer to use SD rather than USB connection.

Note: ABS filament is not suitable for this. Scaling the model will lead to unusable result!

Note: Ninja flex or similar fillaments could be a bit difficult to stick to PEI based surfaces.

You will need: PLA filament - good quality with constant diameter

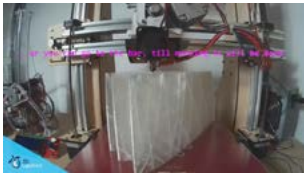
Strong hair spray (or your favorite adhesive bed surface)

Razor blade

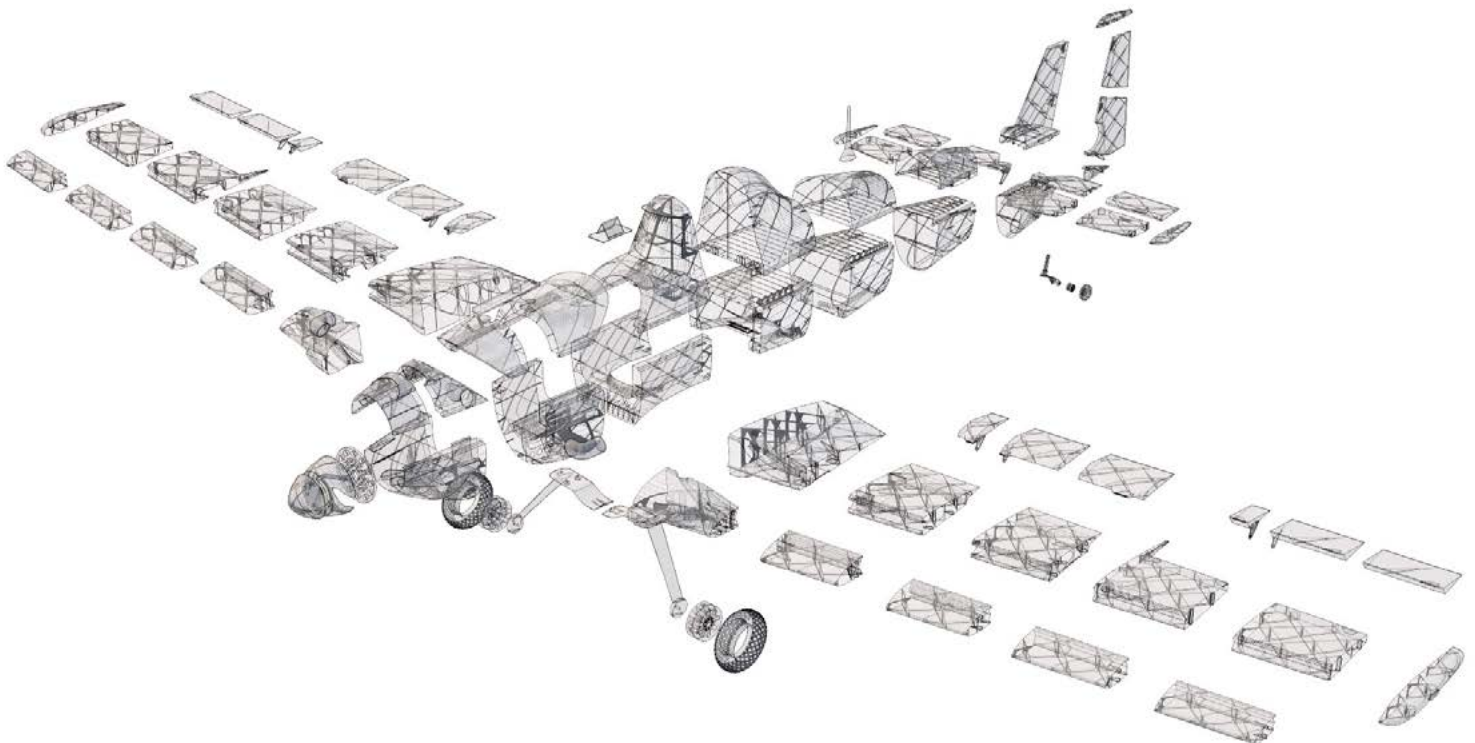
(not needed with PEI or simmilar bed surface, Mk2...)

AND... please look at VideoGuides:

[video printing guide #3](#)



Piper Pawnee - parts diagram:



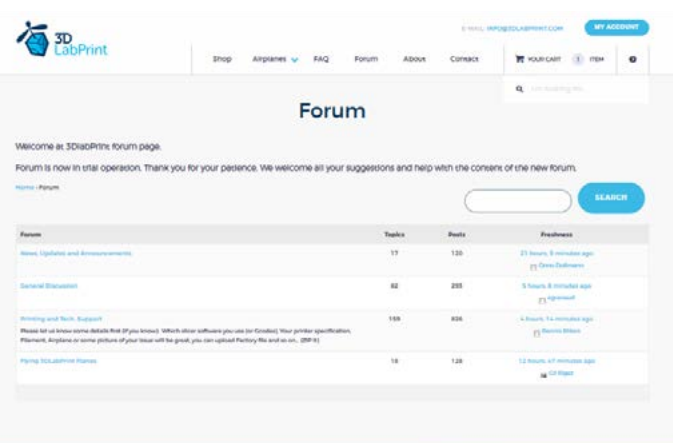
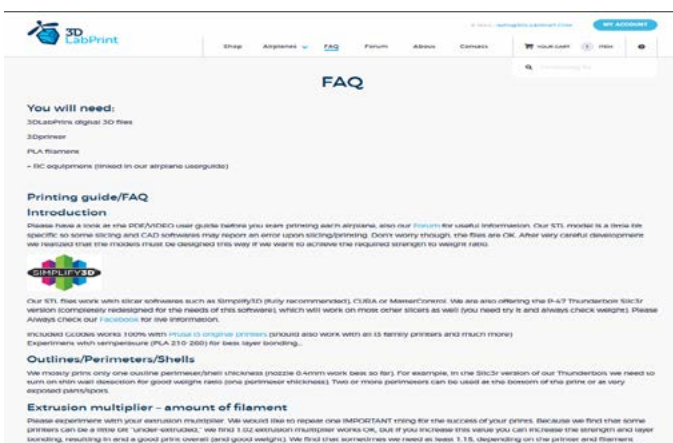
Basic Tips and Advice

Please experiment with your extrusion multiplier to achieve the same weights as in the list. **HotEnd temperature is very important** for a strong result. The reason is the plastic leaving the nozzle has to melt the previous layer to create solid joint. Please try increasing the temperature to find the best value (215° up to 260° Celsius). **Turn OFF cooling fan** (Heatbreak fan of course has to be left ON). Thin walls easily cool down on its own and the cooling fan worsens the layer bonding. You can use cooling fan for thick parts if needed...

Heated bed is very recommended, use 50-60° Celsius to print without warping ends. Any standard quality PLA is suitable to print our planes, but the result depends on combination of PLA vs. Extruder vs. HotEnd.

Some colors and brands of filament has lower layer adhesion, please do experiment with it. There are a lot of 3dprinters on the market, most of them are OK for printing our aircraft (specific thin wall printing...) with sufficient volume, heated bed, 0.4 mm nozzle.

Please look at [FAQ](#) and our [Forum](#) for next information: or [RCGroups 3Dprinted planes Forum](#)



Tip for printing flexible filament (used for printing tyres): it is a good IDEA to use some adhesive tape or foil... first layer adhesion could be too strong or too weak, depending on what filament you use... (picture: RubberJet - TPE32 245/30°C)

Heat the bed to 80°C after finish, remove tape with printed tyre and clear the bed with isopropylalcohol...

5. Assembling printed parts

5.1 Wing assembly

Use CA glue and CA kicker to glue the parts together. Glue the leading edge L1-L5 / R1-R5 (with aid of position locks). Continue by glueing the rest of the wing L7-L11 / R7-R11. Snap press the leading edge assembly to the rest of the wing without adding a glue, align it carefully and then pour the thin CA glue into the gap. Don't use the kicker here. Glue both halves of the wing together. Continue with glueing the ailerons and flaps, and fit these on standard CA hinges trimmed to the right dimensions. Finish the wing assembly by glueing the wingtips L6 / R6

Proceed the way shown in videoguide:

[See video guide #5.1](#)

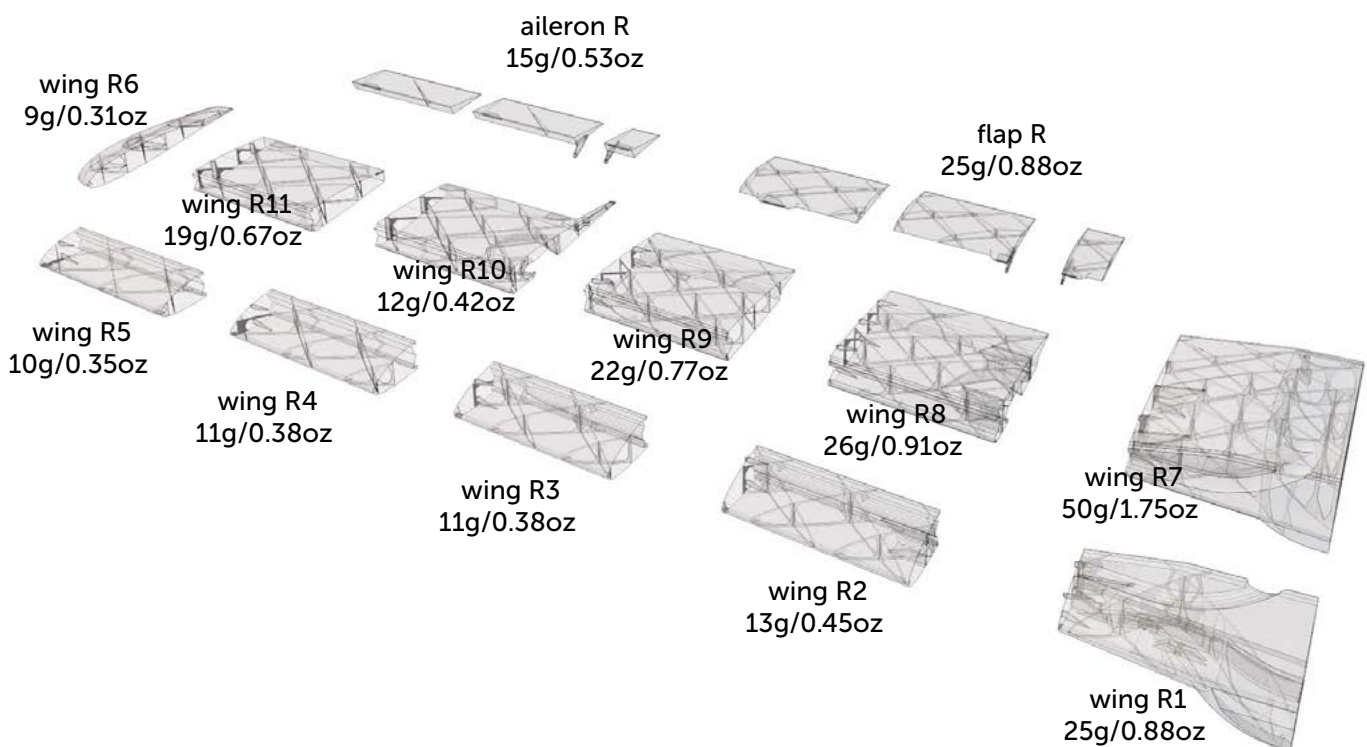
you will need:

[CA Hinge Sheet](#) or similar

[CA Glue - medium or similar medium viscosity CA glue](#)

[Activator for CA Glue](#) or similar, but gas pressurized aerosol is better

Snap knife



5.2 Fuselage assembly

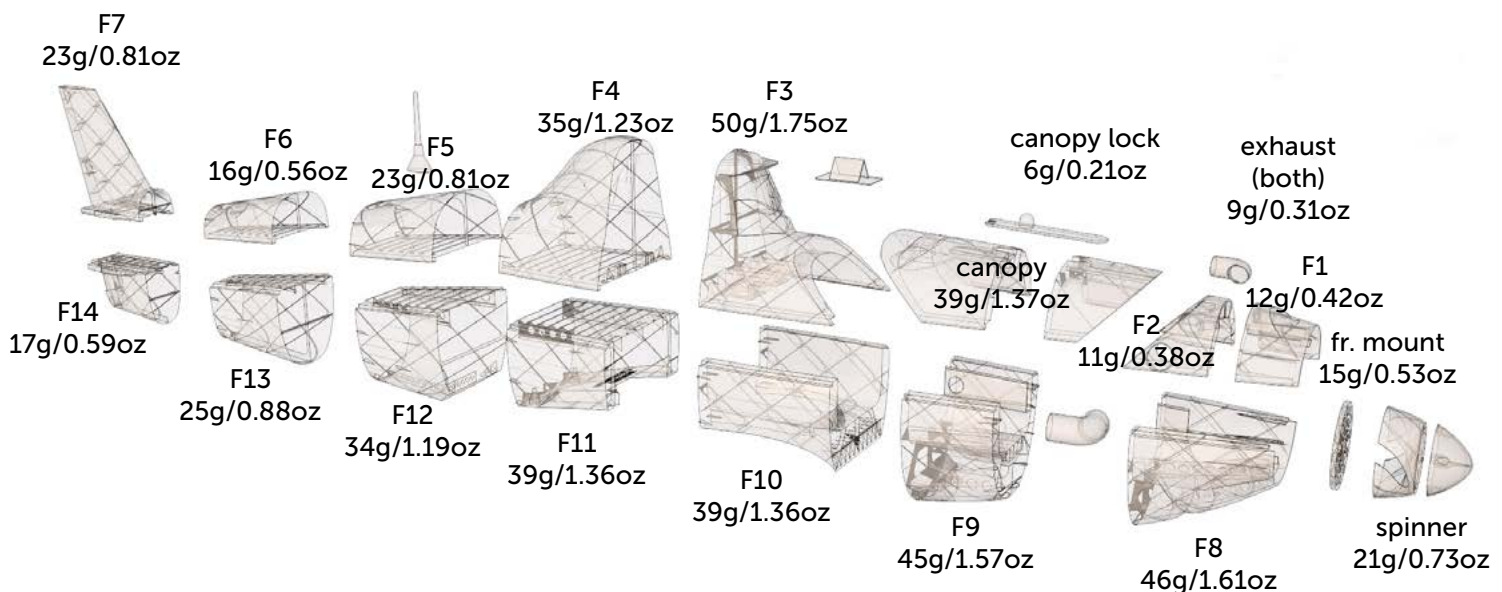
Use CA glue with CA kicker to glue the parts together. Glue fuselage parts F8-F14, F1-F2, F3-F7 (with aid of the position locks). You can use snap knife to clear any unwanted artefacts of printed parts, but mostly it is not necessary. Insert pen spring to canopy part, insert canopy lock, glue both canopy parts together and test a canopy lock functionality. Glue front upper part (F1-F2) to bottom assembly (F8-F14). Emplace the canopy and glue the back upper part (F8-F14) to the bottom assembly. Check the correct position. Use any hot tool to create an opening to the bottom side.

Proceed the way shown in videoguide:

[See video guide #5.3](#)

You will need:

- [CA Glue](#) - medium or similar medium viscosity [CA glue](#)
- [Activator for CA Glue](#) or similar, but gas pressurized aerosol is better
- 1x ballpoint pen spring (a spring from old ballpoint pen will work fine)
- 2x M4 blind nuts [MP-Jet 1007 AL](#) or Hobbyking M4 nuts [or similar](#)
- Snap knife
- Soldering Iron or any hot tool



5.3 Fuselage tail - rudder, elevator pushrods and servos

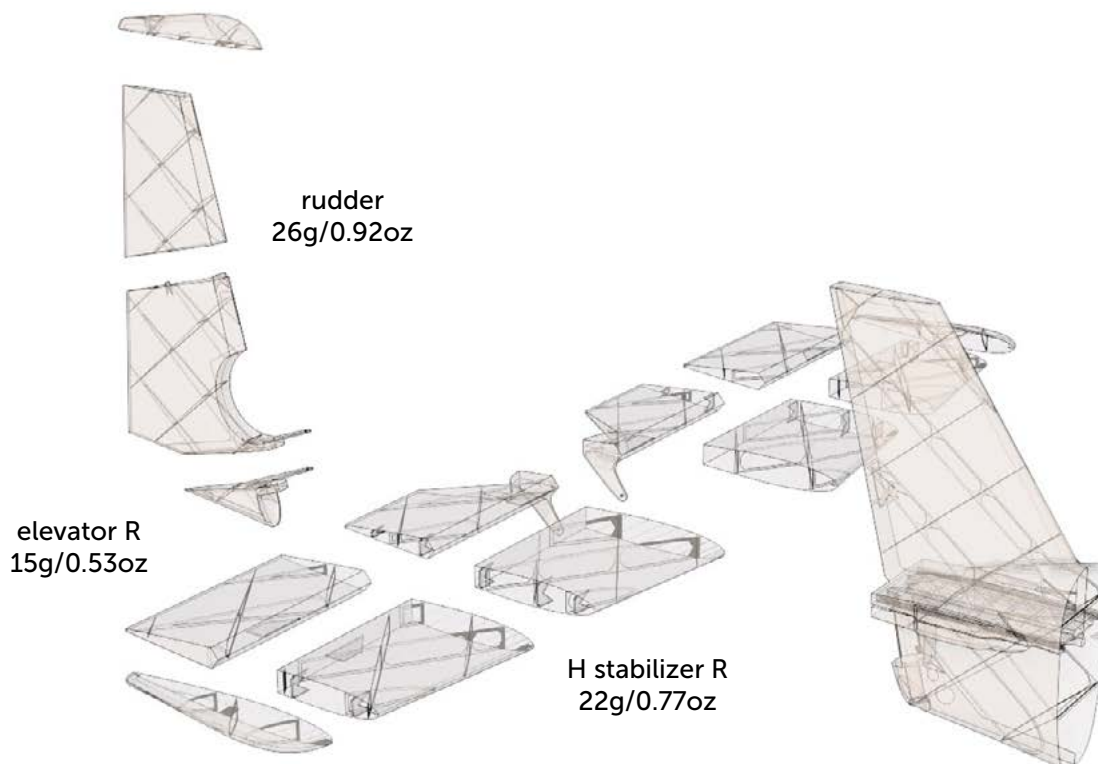
Now it's a good time to install tail stabilizers, elevator, rudder and pushrods. Use snap knife to clear the printed parts if needed. Glue the rudder parts, horizontal stabilizer and elevator. Glue it to the fuselage yet. Use CA Hinge Sheet for elevator and rudder. Use 1 mm / 20AWG pushrod wire for elevator and rudder pushrods. Make Z bend or use your preferred pushrods technique. We like these [Pushrod Keepers](#).

Proceed the way shown in videoguide:

[See video guide #5.3](#)

You will need:

- [CA Hinge Sheet](#) or similar
- [CA Glue](#) - medium viscosity CA glue
- [Activator for CA Glue](#) or similar, but gas pressurized aerosol is better
- 1.0 mm / 20AWG steel pushrod wire
- Wire cutter, Z bend pliers or pliers.
- Snap knife



6.1 Landing gear

Glue the main legs together with CA glue. Use small pieces of carbon rod 2mm or Toothpicks for reinforcement and as a position lock. Stretch printed tyres over the discs. Use suitable set of M3 self tapping nuts and washers to fit the main wheel on a M3 screw.

Proceed the way shown in videoguide:

[See video guide #6.1](#)

You will need:

- [CA Glue - medium viscosity CA glue](#)
- small pieces of 2mm carbon rod or similar (or wooden Toothpick)
- 2x M3x35mm screws
- 4x M3 nuts
- 8x M3 washers
- 7x 3/15mm self tapping screw
- snap knife or sandpaper



7.1 Servo installation

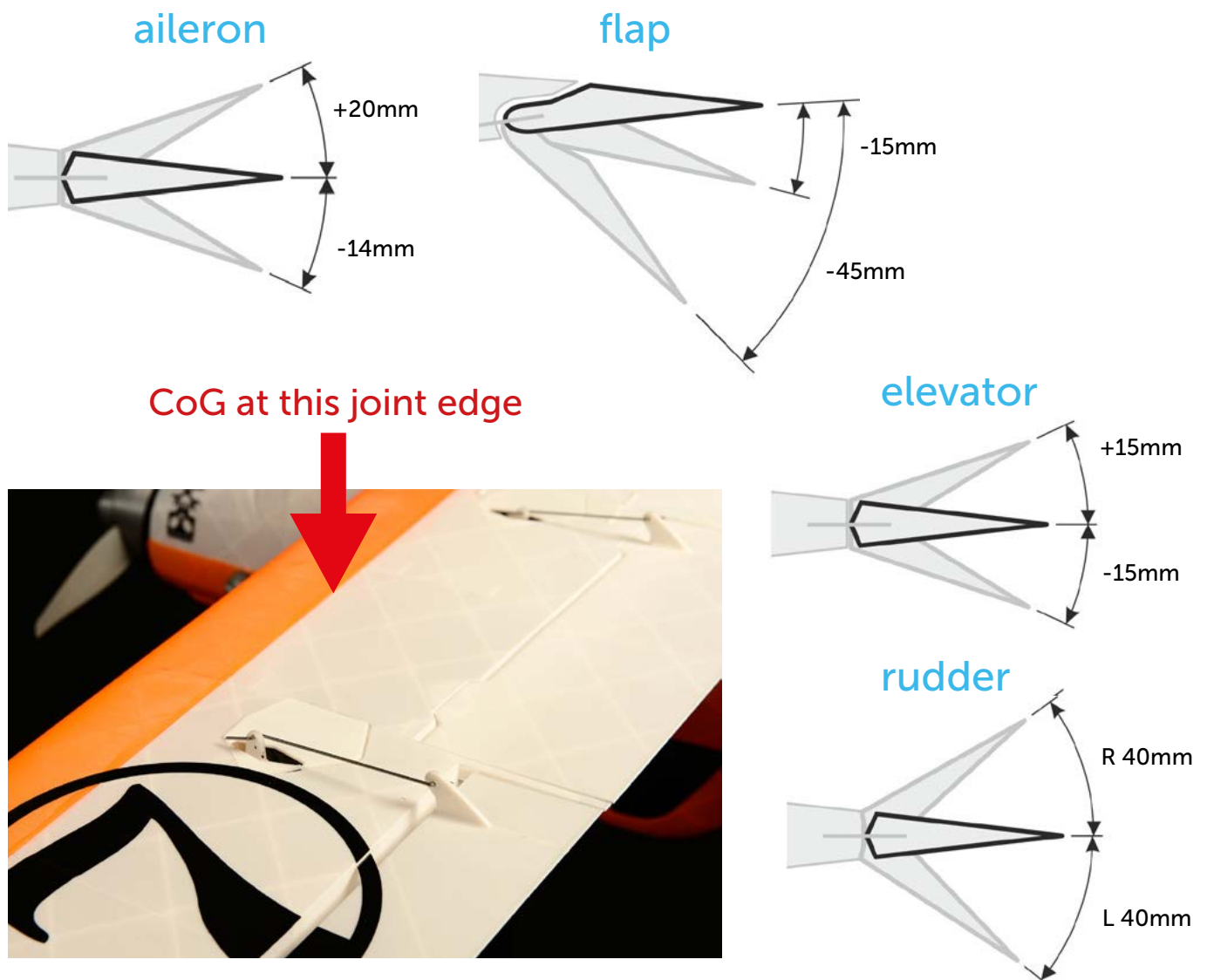
Our Piper Pawnee has been designed for 6pcs of mini servos 30x30x12mm. Mount two servos to the fuselage. Make Z bend at correct length of pushrods or use your preferred technique of pushrods connection. For wings and flaps use servos with extension cables. Glue covers for aileron and flap servos.

Proceed the way shown in videoguide:

[See video guide #7.1](#)

You will need:

- 6x Hitec HS-82 or similar, size: 30 x 30 x 12mm servos
- servo extension cables 300mm / 12 inch
- 1.0 mm /20AWG pushrod wires for elevator and rudder
- 1.2 mm /18AWG pushrod wires for flaps and ailerons
- Wire cutter, Z bend pliers or pliers.



8.1 Motor Setup installing

Attach the motor to the motor mount. Glue the whole assembly into the fuselage. Take care of the motor leads position.

Proceed the way shown in videoguide:

[See video guide #8.1](#)

You will need: CA Glue - medium viscosity CA glue
 4x M3x10mm screws
 4x M3 washers

Some tested setups:

SETUP A)

Motor: Turnigy Aerodrive SK3 - 4240-620KV Brushless Outrunner Motor
 ESC: YEP ESC 40A (2~6S) SBEC Brushless Speed Controller or similar at least 40A/6s
 all YEP ESCs are in heli mode by default, use YEP ESC Programming Card to change it to the plane mode.
 Battery: ZIPPY Compact 2700mAh 6S 35C or similar 6s weight approx 380-400g
 Propeller: APC Electro 11x5,5 or any similar

SETUP B)

Motor: Turnigy Aerodrive SK3 - 3542-1250kv Brushless Outrunner Motor
 ESC: HobbyKing 70A BlueSeries or similar at least 70A/3s
 Battery: ZIPPY Compact 4500mAh 3s 40c Lipo Pack or similar 3s weight approx 380g
 Propeller: APC Electro 11x5,5 or any similar

NOTE:

1. **YOU CAN USE ANNEALING** for front mount part to increase its thermal resistance. Cover it on a heatbed after the print is finished with a cup or something similar and heat the bed to 110°C for at least 30 minutes, or simply boil it in the water. [see this video](#)

2. Don't use overloaded setups with low efficiency that can overheat and melt printed parts.

3. If you find your setup is still too hot, USE **STRONG PLYWOOD** instead printed or aluminium motor mount part.



9.1 Decals/Painting

Cut the decals from thin advertisement foil or use any local advertisement or graphic company. Apply it to your model at will.

You can use any waterproof colors suitable for plastic to paint the model.

[See video guide #9.1](#)

9.2 Final completion and setting

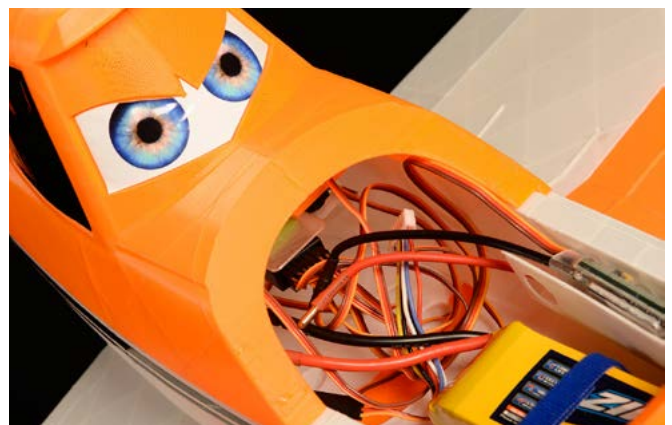
Install your receiver, connect battery, setup servos and etc. with your transmitter, check servo position. Set the recommended deflections. Check CoG point (joint of wing parts). Install the propeller as a last step to prevent injury.

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 becomes uncontrollable!

[See video guide #9.2](#)

You will need:

- your own Rx/Tx system, 7channel
- 2x M4 nylon screws or any M4 x 40mm
- adhesive velcro strip for Li-Pol battery
- battery strap



10. Pilots Please Attention!

For the first flights we recommend increasing the expo settings on your transmitter for elevator and aileron to 60% (this calms the response from your stick inputs) and possibly decreasing elevator and ailerons throws could help a bit.

Make sure the battery is well fixed in a proper position. In case it moves during a flight, it will cause the CoG shifts to the tail and can lead to uncontrollable flight behavior.

Check motor mount and screws before each flight...

Do NOT expose this PLA plane in direct sunlight or in a car. (max. PLA temp is about 60°C)

Spent at least 10 hours with RC flight simulator before you go out for the first time.

Recommended:

[Flite test: RC Planes for beginners](#)

[Basic to advanced ground handling take-off's and landing for warbirds](#)

Nose heavy plane flies badly, tail heavy flies once. Never fly tail heavy plane, always check your Center of Gravity.

Please, use these files only on your own. Don't re-distribute and publish! Thank you very much for supporting us...

... and enjoy your flight!



Shopping list

Printing material:	1,3kg of PLA filament
RC:	7 channel receiver for your RC system
Motor:	Turnigy Aerodrive SK3 - 4240-620KV Brushless Outrunner Motor
ESC:	YEP ESC 40A (2~6S) SBEC Brushless Speed Controller or similar at least 40A/6s (YEP ESC Programming Card) for change to plane mode
Battery:	ZIPPY Compact 2700mAh 6S 35C or similar 6s weight approx 380-400g
Propeller:	APC Electro 11x5,5 or any similar
Servos:	6x Hitec HS-82 or similar, size: 30 x 30 x 12mm servos 2x servo extension cables 300mm / 12 inch
Glue:	CA Glue - medium or similar medium viscosity CA glue Activator for CA Glue or similar
Other:	CA Hinge Sheet or similar 1x ballpoint pen spring (a spring from old ballpoint pen will work fine) 2x M4 blind nuts MP-Jet 1007 AL or Hobbyking M4 nuts or similar 1.0 mm /20AWG pushrod wires for elevator and rudder 1.2 mm /18AWG pushrod wires for flaps and ailerons 2 mm carbon rod (small piece for tail wheel axis and main leg reinforcement) or wooden Toothpick) 2x M3x35mm screws 4x M3 nuts 12x M3 washers 7x 3/15mm self tapping screw or any fitting screws velcro tape