3D LabPrint

User Guide

Piper J-3 Cub

LW planes

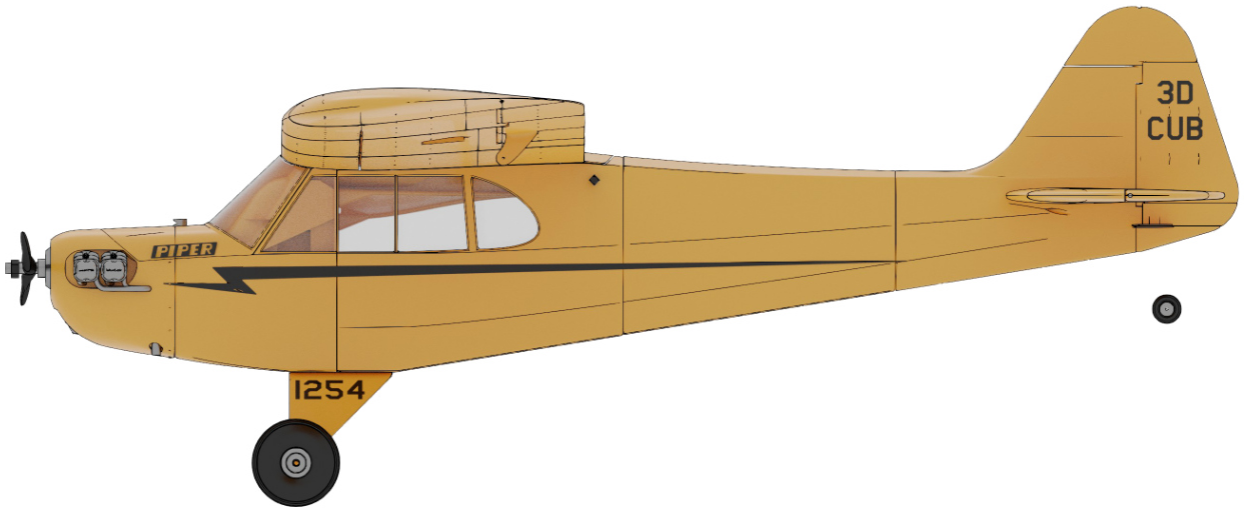
Piper J-3 Cub
fully printable R/C plane for your desktop 3Dprinter

Fully 3D printable RC model of the classic plane, specially designed as a cheap and easy to build SuperStable RC model for everyday flying. Many scale details such as airframe plating encourages to create realistic paint jobs. This plane has been designed for printing from PolyLight 1.0 LW-PLA active foaming filament, that allow even the small printed planes to be as light as any other RC plane building technique. Get ready for flying with this great performing flying legend!

The first fully printable airplane files prepared for your 3Dprinter, with flight characteristics, comparable or even supperior 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 $10.

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 assembly, 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. You'll get a superb performing airplane with highly efficient powerplant capable of flying 7+ minutes at full throttle and speeds exceeding 80 kph. Low stall speed is achieved for easy landing on the other hand.



General specifications:

Wingspan:	1068 mm / 42.0 inch
Lenght:	675 mm / 26.6 inch
Height:	310 mm / 12.2 inch
Wing area:	18,15 dm2 / 1.94 square feet
Wing loading:	31 g/dm2 / 15.3 oz/square feet
Center of gravity:	44 mm / 1.73 inch from leading edge
Airfoil:	LHK12 modified by 3DLabPrint
Print weight (LW PLA):	224 g / 7.90 oz
Empty weight (w/o battery):	380 g / 13.40 oz
Takeoff weight (3s 1300 lipo):	500 g / 17.63 oz
Max takeoff weight:	700 g / 24.70 oz
Never exceed speed, VNE:	70 km/h / 50 mph
Design maneuvering speed, VA:	50 km/h / 31 mph
Stall speed, VS:	15 km/h / 9.4 mph

Recommended setup

Motor:	Leopard LC2830 980KV (for 3S setup)
ESC:	Turnigy 20A / 3S or similar
Propeller:	two blade GWS 8 x 4 (ugly orange)
Battery:	LiPol 1300mAh / 3s

printed PET motor mount

Performance measurement

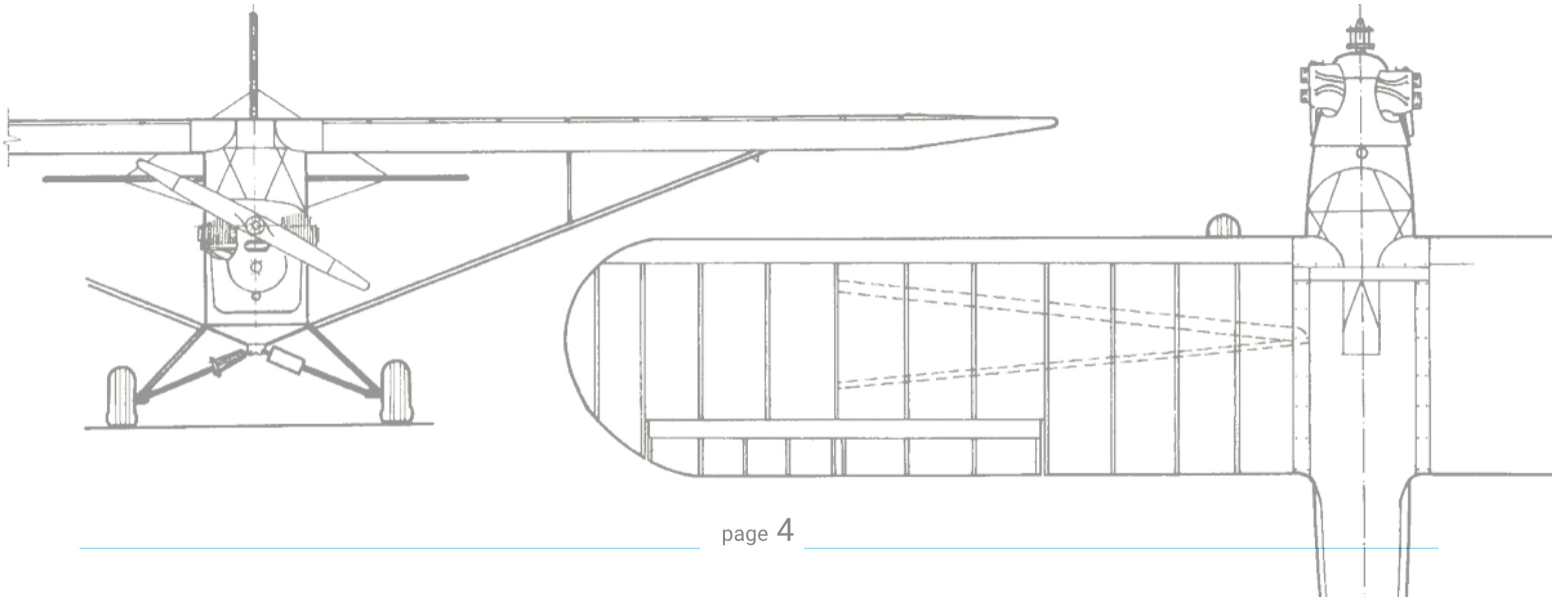
Max speed VH (level flight):	105 km/h – 56.7kn – 65.2mph with GWS 9x7,5
Rate of climb:	20 m/s (5 373 ft/min) with GWS 9x7,5
Flight time (3s 1300mAh/full):	7:30 with GWS 8x4

Piper J-3 Cub

OThe Piper J-3 Cub is an American light aircraft that was built between 1938 and 1947 by Piper Aircraft. The aircraft has a simple, lightweight design which gives it good low-speed handling properties and short-field performance. The Cub is Piper Aircraft's most-produced model, with nearly 20,000 built in the United States. Its simplicity, affordability and popularity invokes comparisons to the Ford Model T automobile.

The aircraft is a high-wing, strut-braced monoplane with a large-area rectangular wing. It is most often powered by an air-cooled, flat-4 piston engine driving a fixed-pitch propeller. Its fuselage is a welded steel frame covered in fabric, seating two people in tandem.

The Cub was designed as a trainer. It had great popularity in this role and as a general aviation aircraft. Due to its performance, it was well suited for a variety of military uses such as reconnaissance, liaison and ground control. It was produced in large numbers during World War II as the L-4 Grasshopper. Many Cubs are still flying today. Cubs are highly prized as bush aircraft.

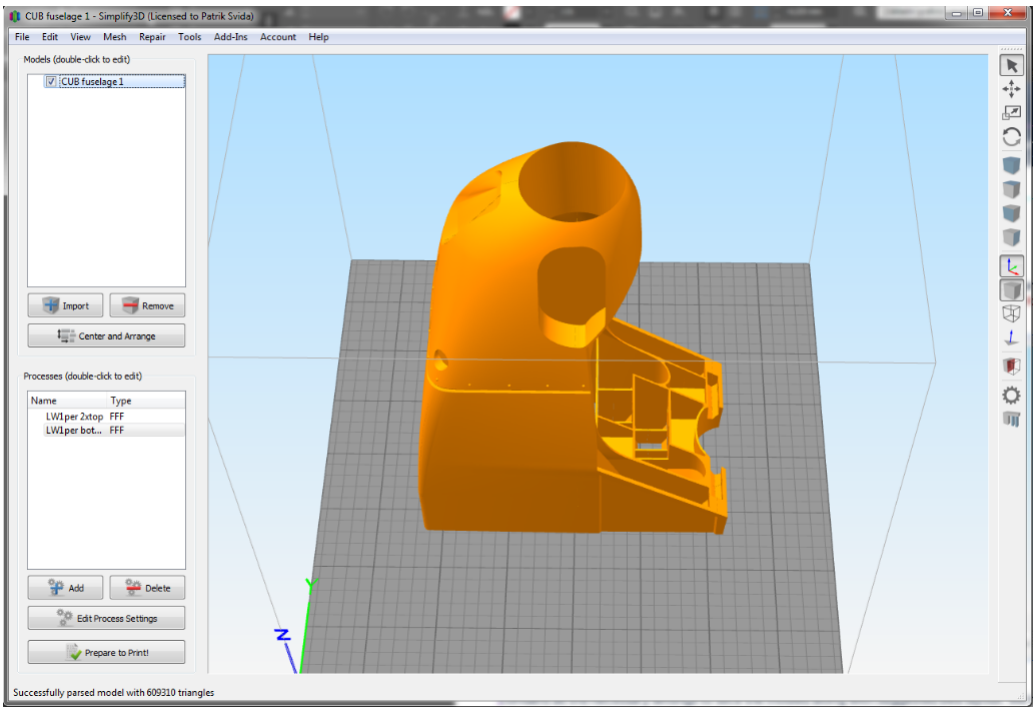


Included:

1. 3MF 3D files (primary)

Used instead of STL 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. The files contain settings for printing on a direct drive printer with dimensions 200x200x200 mm, that can be further adapted to suit your printer. The generic settings are compatible with Prusa MK2/3/3S printers.



2. Factory files for Simplify3D slicer

contains all the necessary settings to slice the models along with suggested bed layout. We're using PRUSA i3 ORIGINAL printers so you may need to adjust the basic printing parameters to match your printer or use these files as a start point for you.

3. Printing Guide in our Help Section

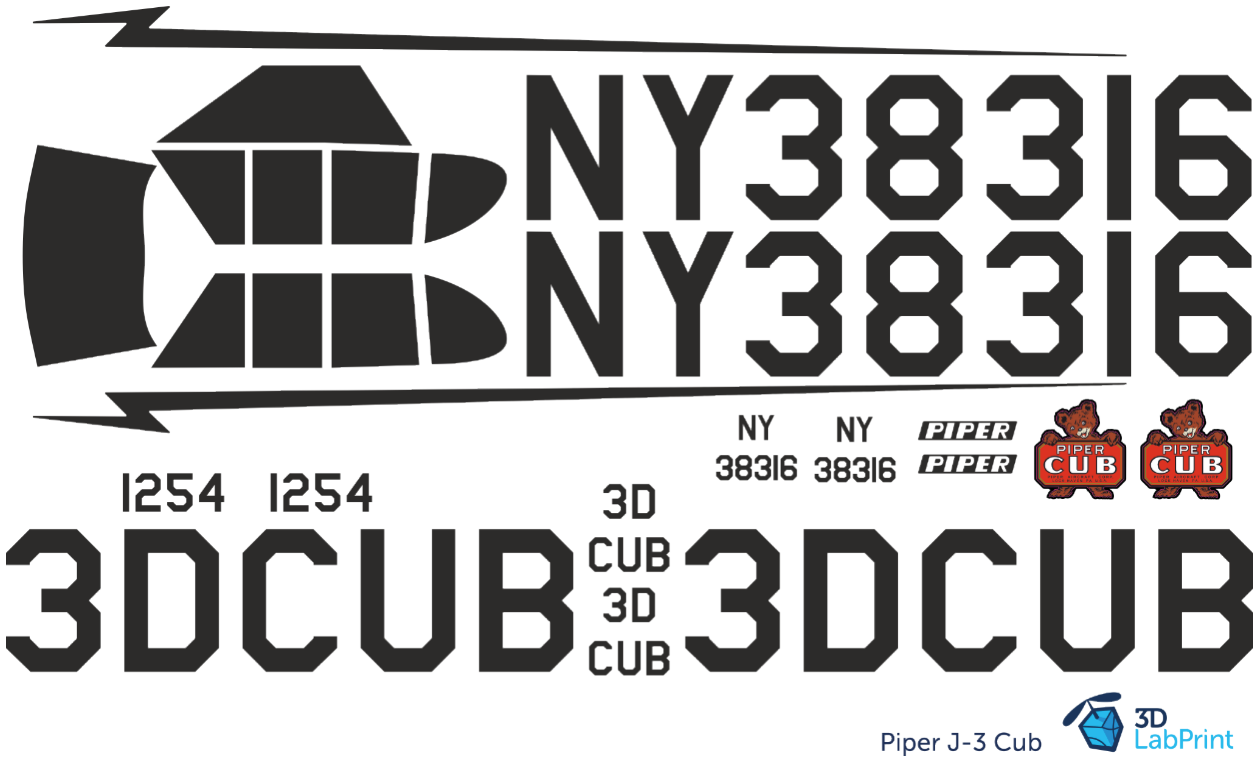
Apart from this userguide, please see the Printing Guide for PrusaSlicer, Simplify3D or Cura to find some Tips and Advice for airplane printing (Thin Wall Printing).Remember: We use 0 retraction and 0.4-0.5 flow with LW-PLA.

4. Gcodes

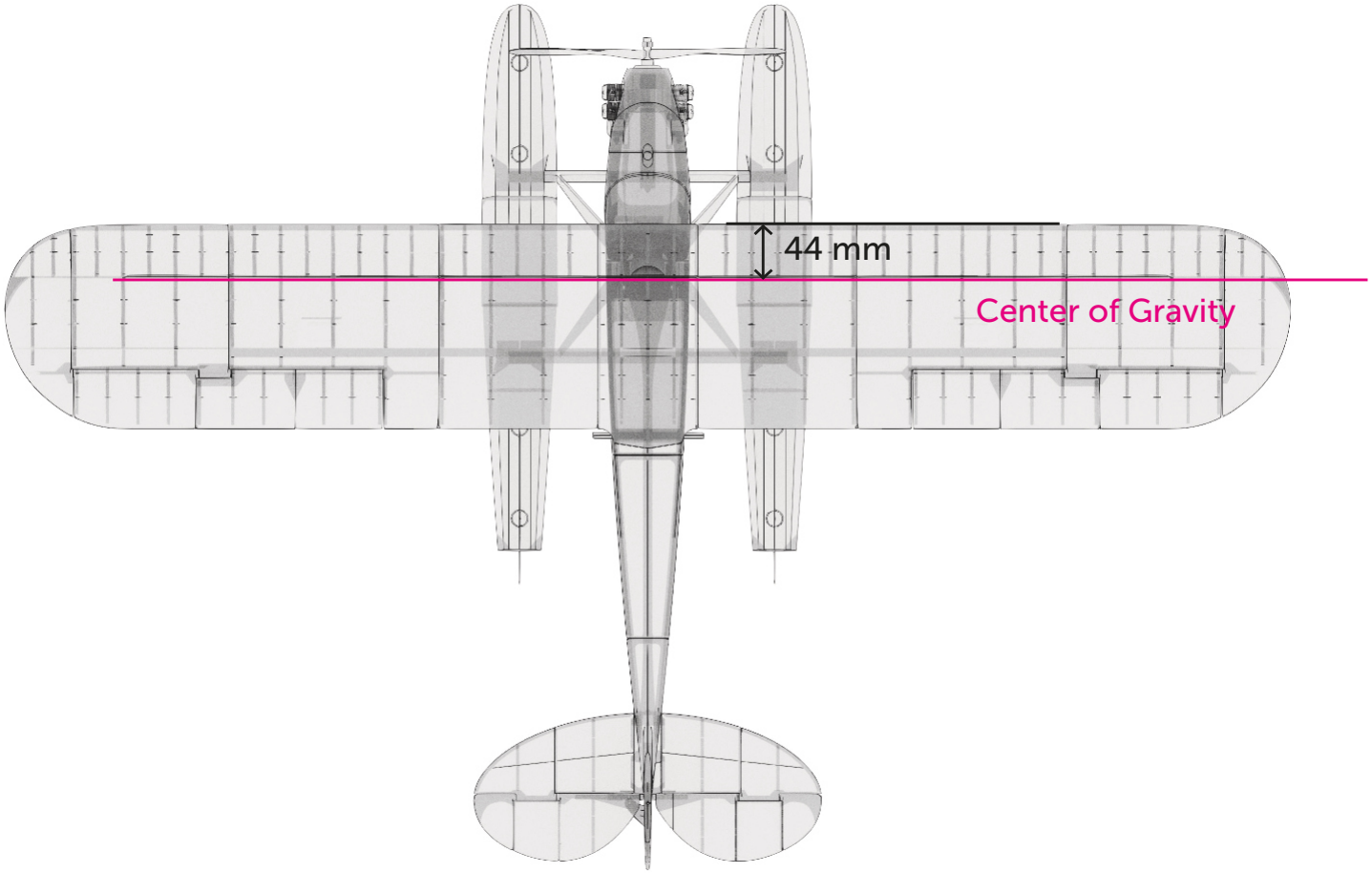
Basic Gcodes prepared for direct use, as universal as possible. Should work on i3 style printers, Give it a try, but we can't guarantee it will work on your printer. Wall thickness should be 0.55-0.67mm.

5. Scale markings PDF

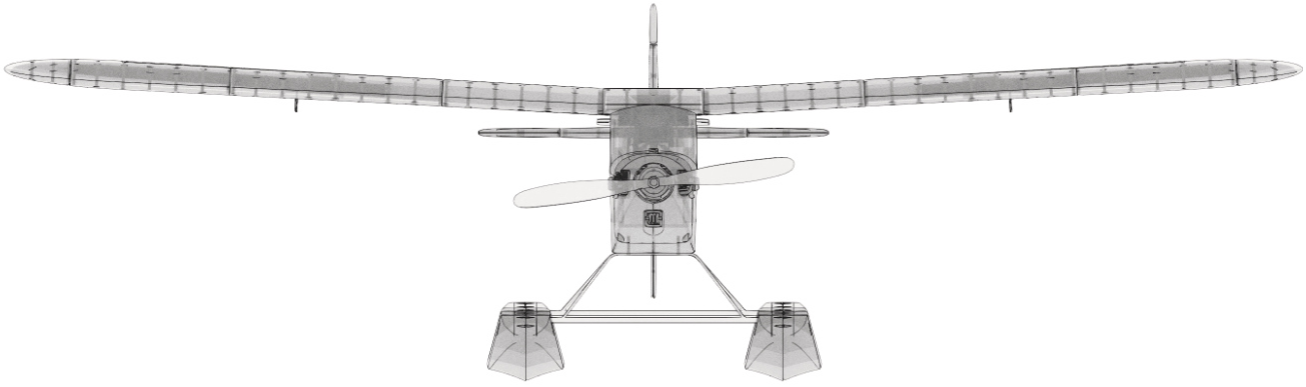
You could print and cut the PDF in scale from thin self adhesive advertisement foil and place it on the model as needed.



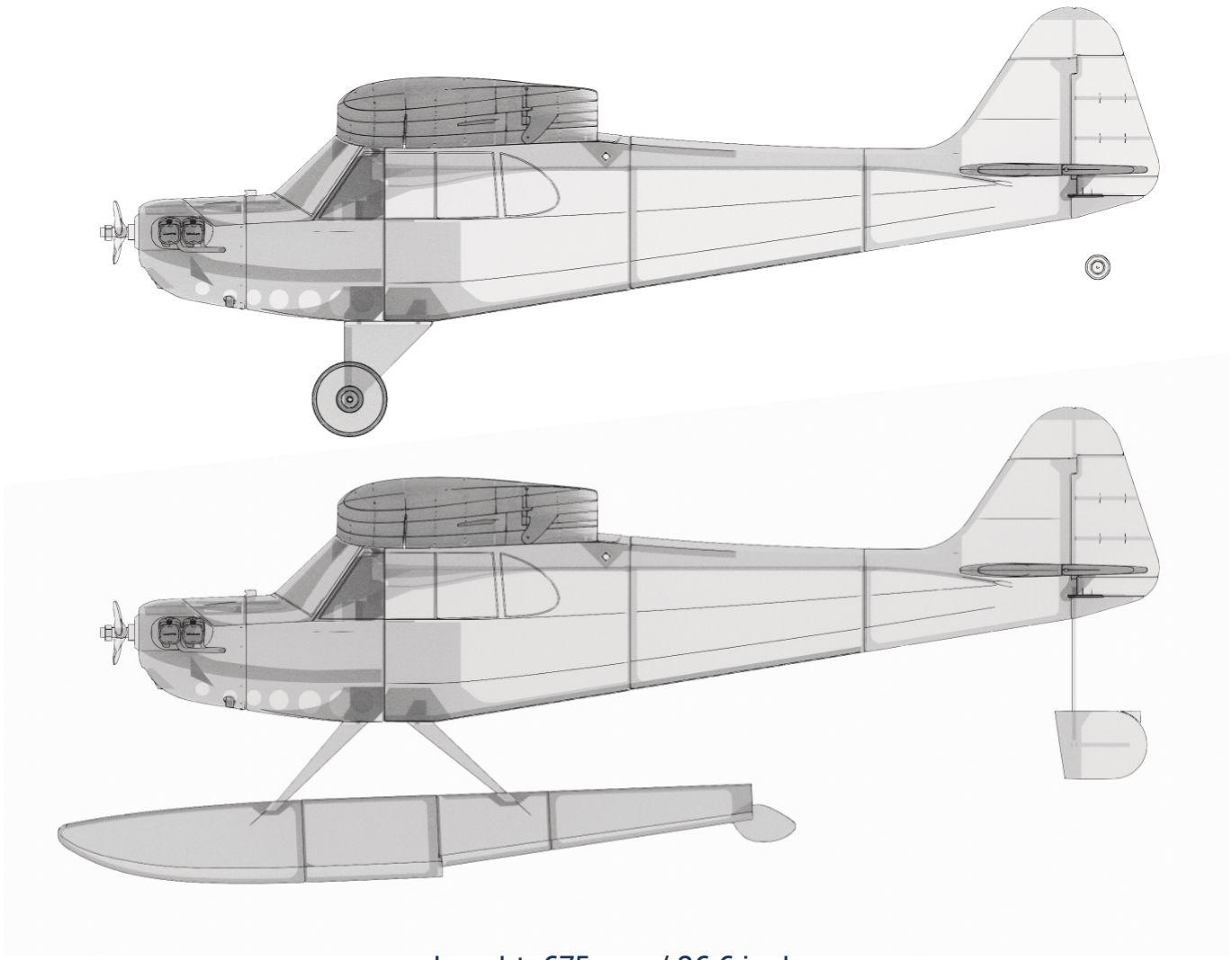
Piper J-3 Cub



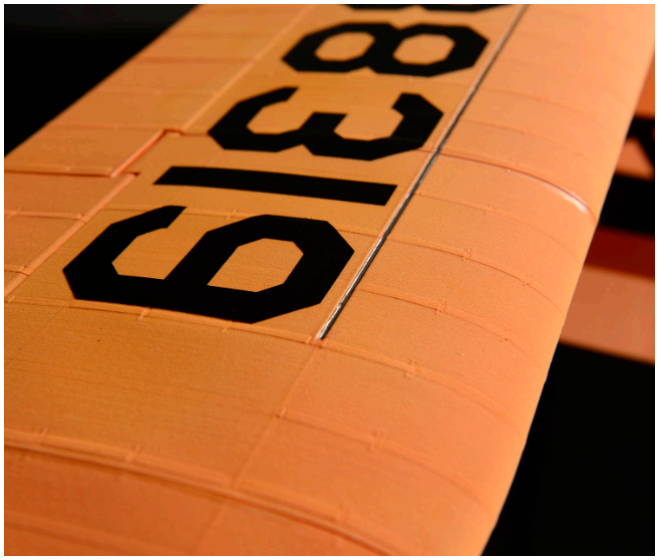
Wing area: 18,15 dm2 / 1.94 square feet



Wingspan: 1068 mm / 42.0 inch



Lenght: 675 mm / 26.6 inch



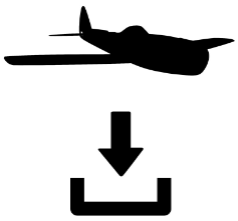
Step By Step PDF/VIDEO userguide

1. Choose airplane at www.3Dlabprint.com, visit our Facebook for latest info.

Basic requirments for A6M2 Zero are 200/200/195 mm volume, nozzle 0.4mm recommended (0.35 or 0.5mm alternativelly). Heated bed recommended. Designed to be printed with Polylight LW-PLA filament by 3DLabPrint.
Contact: support@3dlabprint.com

2. Create account, download

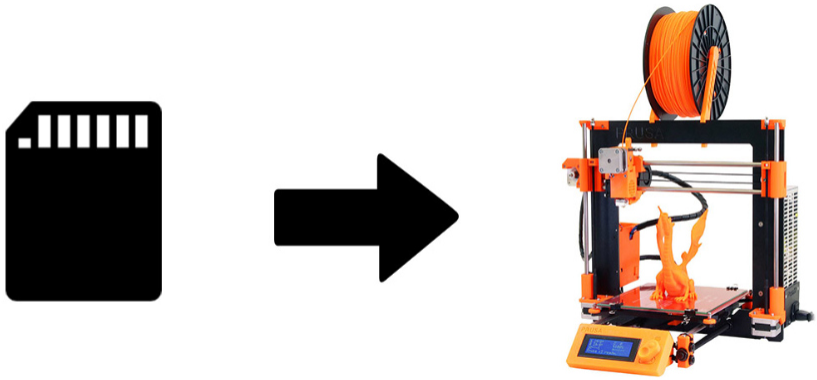
You will receive download link to all the zipped files to your email right after the checkout (please check your spam folder if not). If you are logged in with your account while purchasing the model, you will find the download link in your account's Downloads section on our website. Please contact support@3dlabprint.com if you have trouble getting the files.



3. Prepare Gcodes

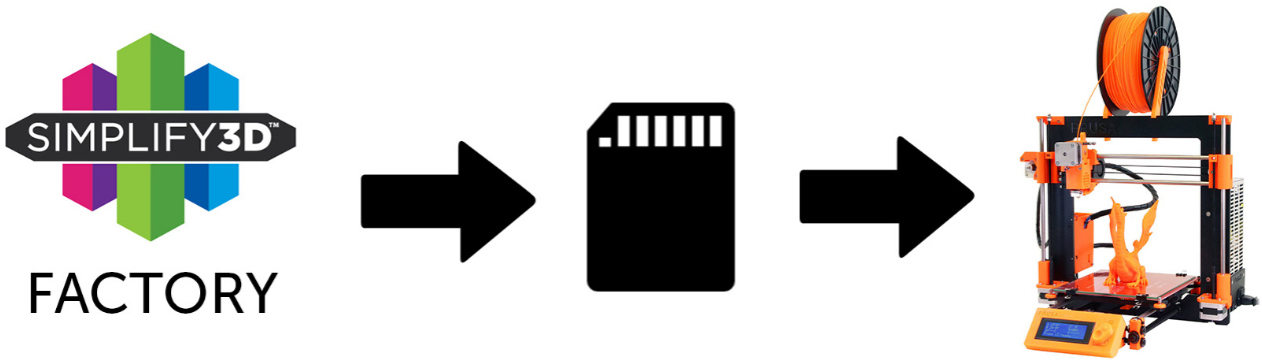
option A Gcodes:

if your printer is i3 comptatible you can use prepared gcodes directly. Just save them to the SD card and let the 3d printer do it's job. HE temperature is set to 240°C so the layers fuse together well, you can adjust speed and temperature only through your printer's LCD. If these Gcodes does not work for you, please proceed to the next options.



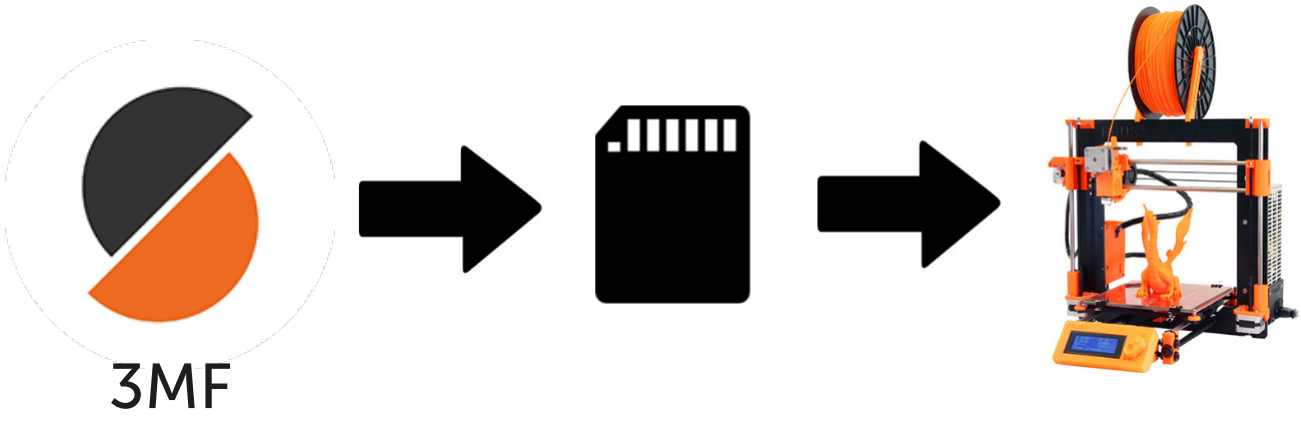
option B Factory files Simplify3D:

We prepared all you need in these files (FFF process settings, parts layout on bed, etc...)
You can use these settings as a start point. Adjust according to your need (adapt for your printer), print single parts and so on... Most 3d printers should work just with these settings, but please go through the settings and amend if necessary, we are not liable for any damage resulting from using our settings. If this still does not work for you, please proceed to the next option.



option C Prusa Slicer 3mf files (recommended)

Please follow the guide in the Help section of our 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. Please use these as a starting point instead of your printer profiles provided by your printer manufacturer. 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 everytime 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.
Remember: We are using 0.5 multiplier and 0 retraction with LW-PLA.



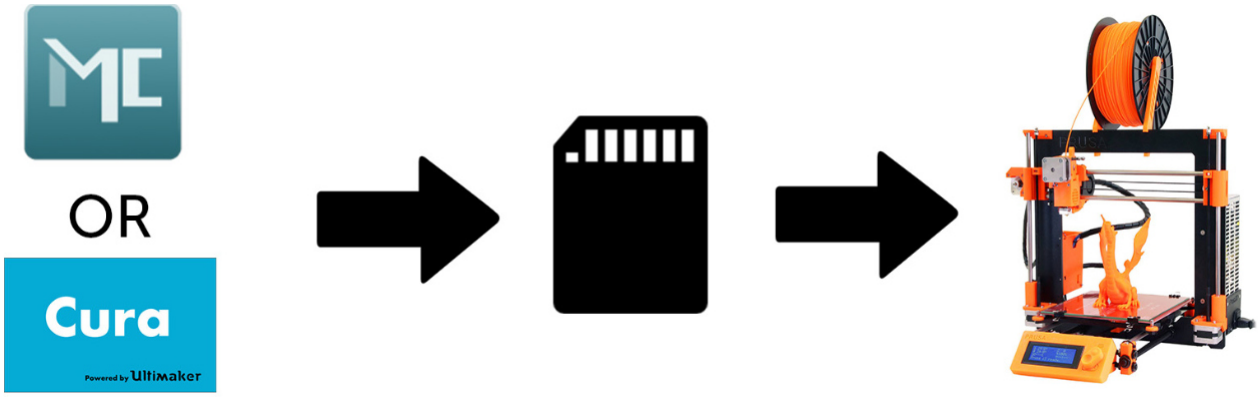
option D CURA or MatterControl

MatterControl and CURA are free and provide satisfactory 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 - see below (always adapt it for your printer, change build volume, filament diameter, etc... according to your printer!!!)

Please check our CURA guide on the website for the latest basic profile. Please visualise our presliced gcodes to see how the result should look like and try to achieve the same in your slicer. Remember: We are using 0.5 extrusion multiplier and 0 retraction with LW-PLA.



4. 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
Razor blade

AND... please watch our VideoGuides:

LW planes

Basic Tips and Advice

While stadard PLA filament could be used, this plane has been designed to be printed from foaming LW-PLA that means about 50% weight reduction on printed parts.

Please Experiment with temperature and extrusion multiplier (0.55-0.67mm Wall thickness). Hotend temperature is very important (220° up to 260° celsius). The temperature determines, how much the LW-PLA foams while printing. Cranking up temperature means, you can go lower on multiplier as the material will gain on volume. Turn OFF cooling fan for better layer adhesion (HE fan should be ON). We dont need it for thin wall printing. Heated bed is very recommended, 55-60° Celsius (to prevent warping ends).

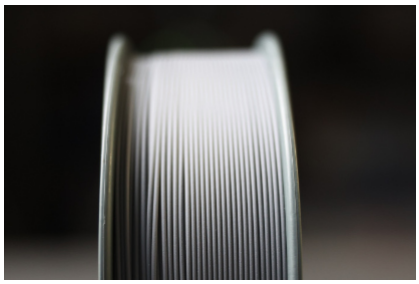
Price of the LW-PLA may look a bit steep at first glance, but since we're using 50% less material thanks to the foaming feature, the cost difference is not so high as it looks.

Please see the Printing Guide (Help Section)

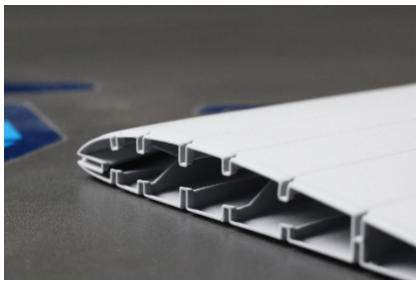
How to print PolyLight LW-PLA?

The basic print setup is almost the same as we use for standard PLA. The only difference is in extrusion multiplier set to 0.5 and turning off the retractions completely.

This results in parts with half the weight and still suitable mechanical properties, this model is designed mainly in VASE mode, even that expect some stringing inside and outside in some inpossible spots. Of course you can try to tweak the retractions for less stringing inside the parts, but there's a high risk of clogging the nozzle or throat. Increasing the retraction distance above 1 mm is not recommended at all and leads to nozzle clogs caused by foaming. Cleaning the hairy, but functional parts after printing with retractions completely disabled seems to be more efficient method. The nozzle is permanently pressurized and you don't need to worry about print failures. This method works fine even for bowden printers.



Extrusion multiplier 0,5 has been tested for easy print with massive weight saving around 50%. Feel free to experiment with extrusion multiplier and temperatures at will for the best results on your printer. This airplane is designed for **0.55 - 0.67mm** Wall thickness.
Cosmetic issues of the prints are easily fixed with snap knife or sand paper, as the LW is easily sanded and cut.



3DLabPrint Piper J-3 CUB weights (LW-PLA)

fuselage		
F1	26,2 g	0,92 oz
F2	24,4 g	0,86 oz
F3	13,9 g	0,49 oz
F4	10 g	0,35 oz
fuselage cover 1	1,8 g	0,06 oz
fuselage cover 2	5,3 g	0,19 oz
fuselage cover lock	0,5 g	0,02 oz
engine valves (pair)	12,2 g	0,43 oz
wings		
wing CENTRE	12,3 g	0,46 oz
wing L1	18,2 g	0,64 oz
wing L2	18,4 g	0,65 oz
wing L3	12,7 g	0,45 oz
wing L4	4,8 g	0,17 oz
wing R1	18,2 g	0,64 oz
wing R2	18,4 g	0,65 oz
wing R3	12,7 g	0,45 oz
wing R4	4,8 g	0,17 oz
aileron L1	2,9 g	0,10 oz
aileron L2	2,9 g	0,10 oz
aileron L3	3,6 g	0,13 oz
aileron R1	2,9 g	0,10 oz
aileron R2	2,9 g	0,10 oz
aileron R3	3,6 g	0,13 oz
tail		
horizontal stabiliser L1	2,5 g	0,09 oz
horizontal stabiliser L2	2,5 g	0,09 oz
horizontal stabiliser R1	2,5 g	0,09 oz
horizontal stabiliser R2	2,5 g	0,09 oz
elevator L1	2,1 g	0,07 oz
elevator L2	1 g	0,04 oz
elevator L3	0,9 g	0,03 oz
elevator R1A	0,5 g	0,02 oz
elevator R1B	1,8 g	0,06 oz
elevator R2	1 g	0,04 oz
elevator R3	0,9 g	0,03 oz
rudder 1	0,5 g	0,02 oz
rudder 2	0,5 g	0,02 oz
rudder 3	1 g	0,04 oz
rudder 4	1,2 g	0,04 oz
elevator junction	1,4 g	0,05 oz

gear		
gear main legs	23 g	0,81 oz
gear disc (pair)	7,6 g	0,27 oz
gear tyre (pair) FLEX	11,6 g	0,41 oz
tail wheel disc	0,4 g	0,01 oz
tail wheel tyre FLEX	0,4 g	0,01 oz
accessories		
motor mount	5,1 g	0,18 oz
battery holder	2,2 g	0,08 oz
cooler & exhausts	3 g	0,11 oz
rubber band holders	3 g	0,11 oz
printed weight	308 g	10,87 oz

floats		
float L1	23 g	0,81 oz
float L2	7,6 g	0,27 oz
float L3	11,6 g	0,41 oz
float L4	5,4 g	0,19 oz
float R1	23 g	0,81 oz
float R2	7,6 g	0,27 oz
float R3	11,6 g	0,41 oz
float R4	5,4 g	0,19 oz
tail rudder fin	1,7 g	0,06 oz
front float holder	13,1 g	0,46 oz
back float holder	13,1 g	0,46 oz
printed weight with floats	421 g	14,86 oz

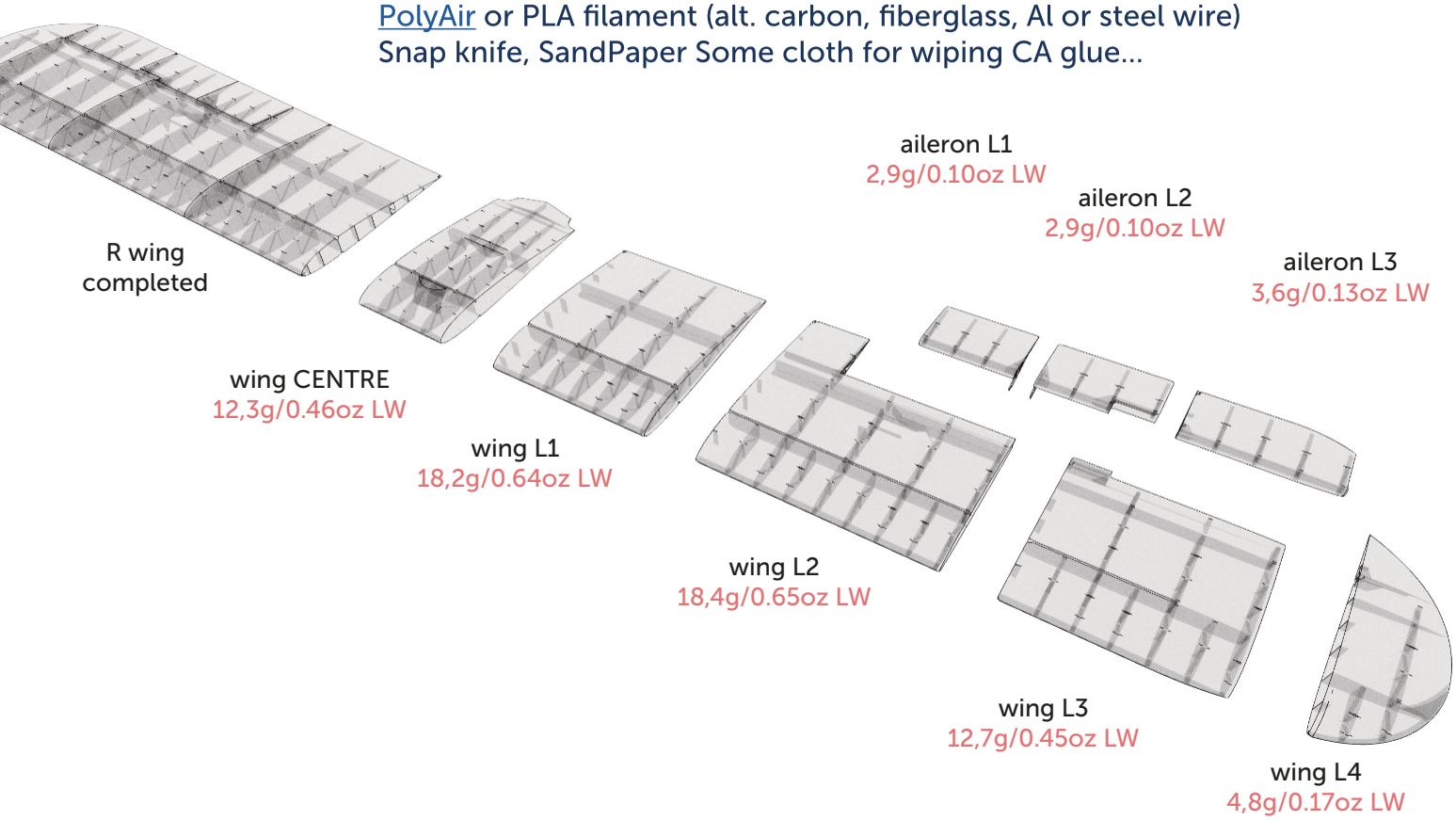
5. Assembly of printed parts

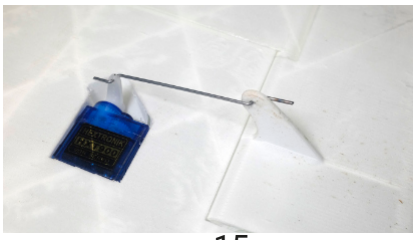
5.1 Wing assembly Piper J-3 Cub

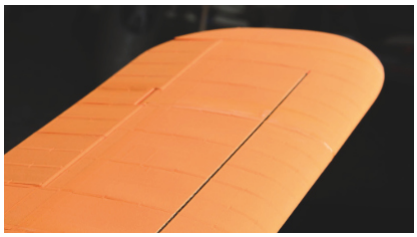
Glue wing parts wing CENTRE and L1-L4 together. The new 3DLabPrint lock system will help you. Repeat for the right side. Glue both halves of the wing together. Use the CA glue, (position locks and wing pins will help you to align the parts), and use activator to speed up the glue curing. Press in and glue a piece of PolyAir, PLA, PETG or 1.5 mm carbon rod into the top and bottom openning to create a wing spar and improve the rigidity of the wing.
On a flat surface glue the ailerons L1-L3 and repeat for the right side. Use a filament or suitable 0,8mm - 1,5mm carbon rod as a hinge for the ailerons. Just slide it in, there's no need to glue the hinge for easy aileron or servo replacement. Wall thickness should be 0.55-0.67

Video guide Piper J-3 Cub wing assembly

you will need: CA Glue - medium + Activator for CA Glue
PolyAir or PLA filament (alt. carbon, fiberglass, Al or steel wire)
Snap knife, SandPaper Some cloth for wiping CA glue...





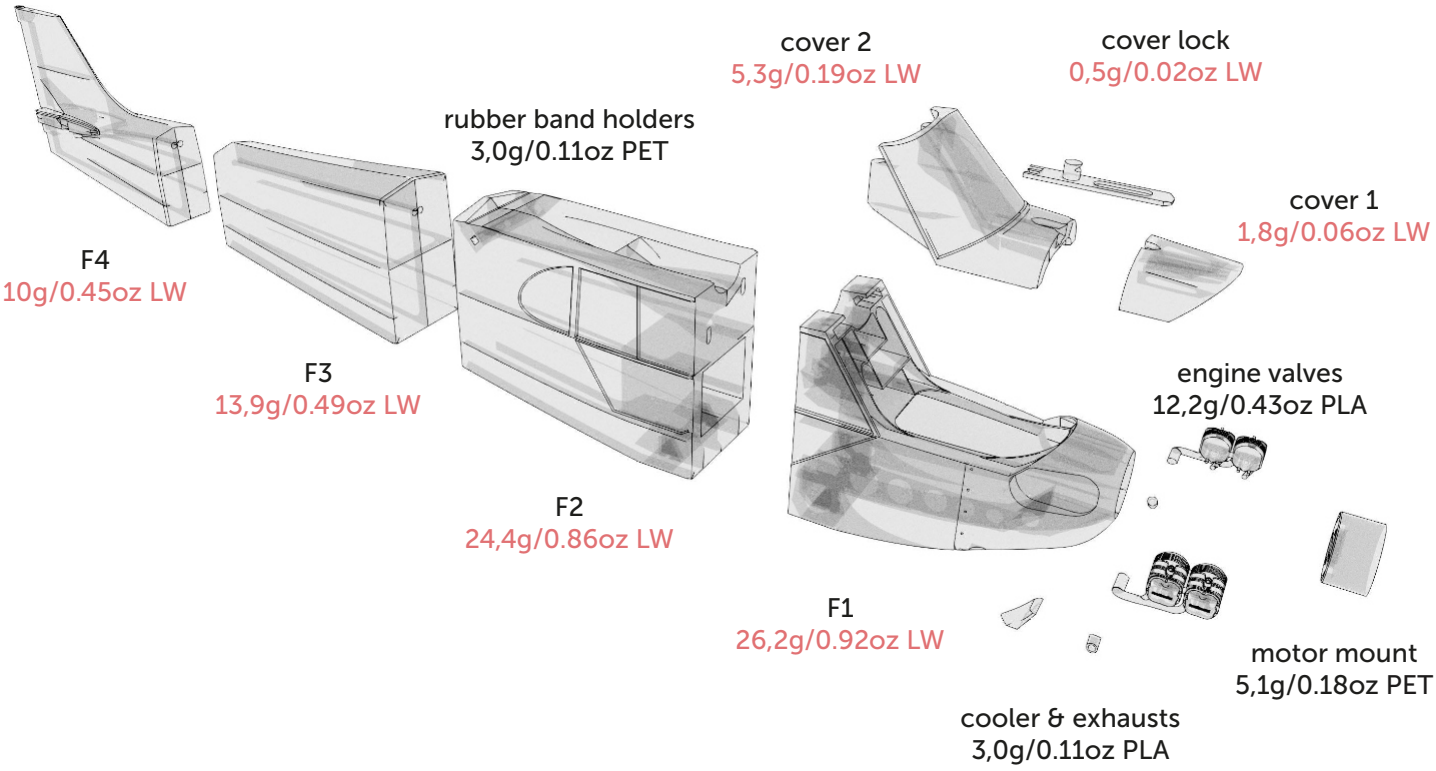


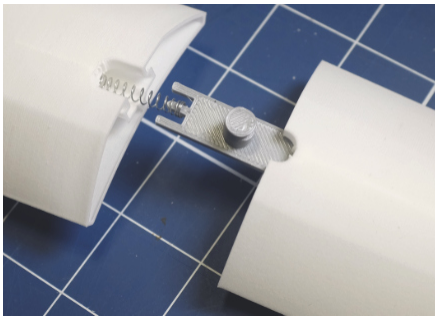
5.2.1 Fuselage assembly Piper J-3 Cub

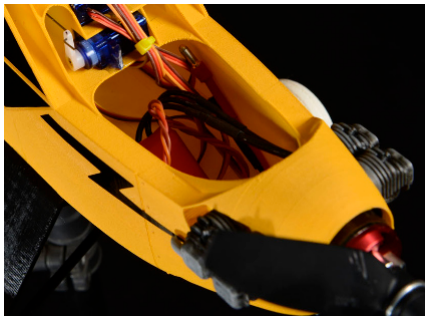
You can use snap knife for cleaning the surface of printed parts, but mostly it is not necessary. Glue fuselage parts F1-F4 with CA glue together. The new 3DLabPrint lock system will help you. Check the alignment of F4 part compared to the wing before glueing. Do not glue rudder part before tail and elevator assembly. Use any hot tool to remove the unnecessary material from F4 tail part for the elevator arm.
Insert printed rods making a rubber band wing holders. No need to glue it for easy replacement. Wall thickness should be 0.55-0.67.
For fuselage cover arm use a ball pen spring. Put it to the part 2 and glue with part 1 together.

See video guide Piper J-3 Cub fusselage assembly

you will need: CA Glue - medium + Activator for CA Glue
Snap knife, SandPaper Some cloth for wiping CA glue...
BallPen Spring




ball pen spring

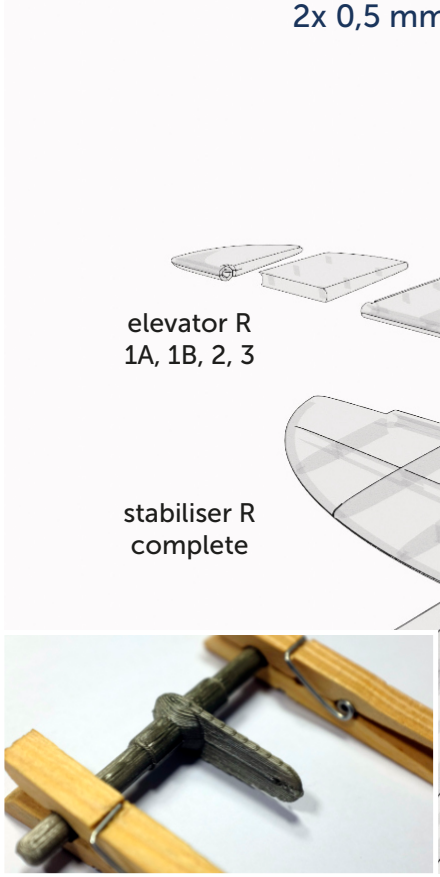


5.2.2 Tail assembly Piper J-3 Cub

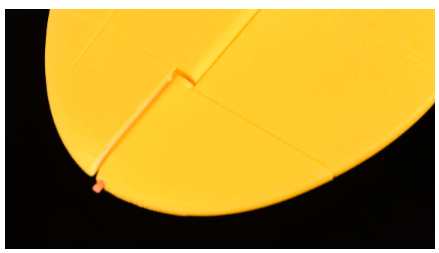
Glue L1 and L2 parts of the stabilizer and elevator. The profile is symmetric, so the left and right sides are identical. Glue the stabilizers perfectly perpendicular to the fuselage. Assemble both sides of the elevator with the elevator arm on a flat surface. Make a Z bend on the elevator and rudder 0,5 mm pushrod wire. Mount the elevator assembly to the stabilizer using the piece of PET filament. Elevator should move freely controlled by the pushrod and servo. Glue rudder part together and mount to the fuselage by piece of PET filament. Check the functionality of the elevator and rudder assembly carefully.

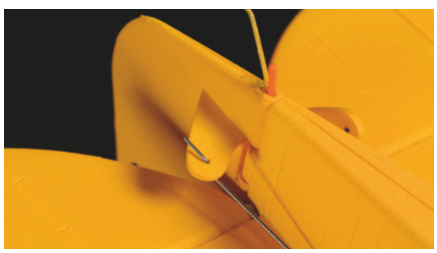
See video guide Piper J-3 Cub tail assembly

you will need: CA Glue - medium + Activator for CA Glue
Snap knife, SandPaper Some cloth for wiping CA glue...
2x 0,5 mm steel wire for pushrods



elevator arm – normal PLA!
Tip: After gluing, the elevator coupling is smoothed into a perfect shape using a drill and sandpaper.



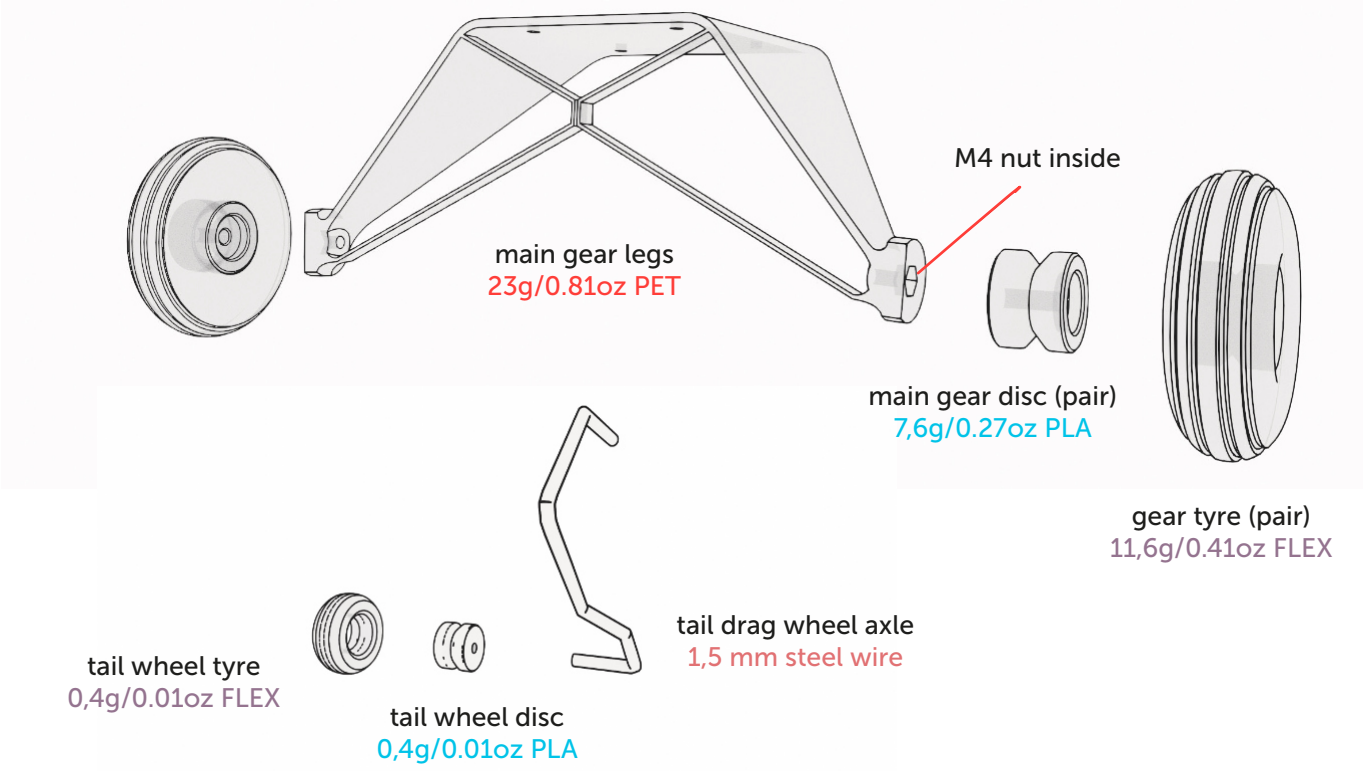


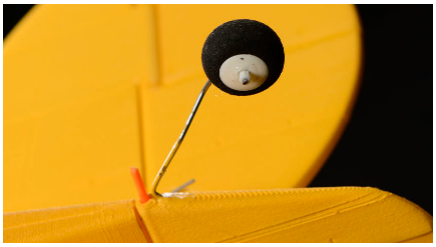
5.2.3 Landing gear assembly Piper J-3 Cub

Put gear tyres on the rims. Insert one nut into the printed chassis and use the other nut on the wheel axle as a counter-nut. Adjust the tightening of the bolt and the counternut so that the wheel turns freely. Tie the centre of the chassis legs together with an office rubber band. Tie the center of the chassis legs together with an office rubber band. Use the remaining 1mm wire to shape the rear chassis to your taste. Secure the rear wheel against sliding out with a small washer and cover with glue or crimp the small brass servo bushing with pliers. Weave the entire rear wire into the rudder and bend towards the rear. Check the functionality of the landing gear assembly carefully.

[See video guide Piper J-3 Cub landing gear assembly]

you will need:
2x M3 x 28-30mm screws for main wheel axle
4x M3 nuts + washers
Small piece of 1.5 mm steel wire for tail drag wheel axle
4x Self-tapping screw 3x10mm
office rubber band

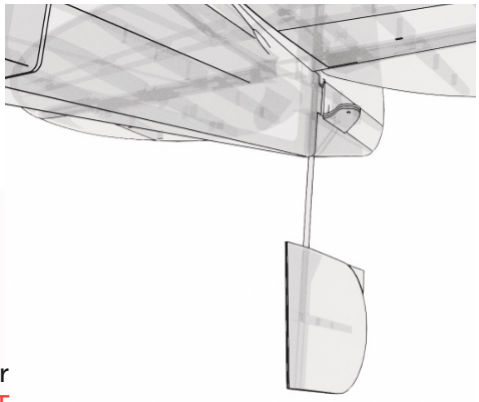




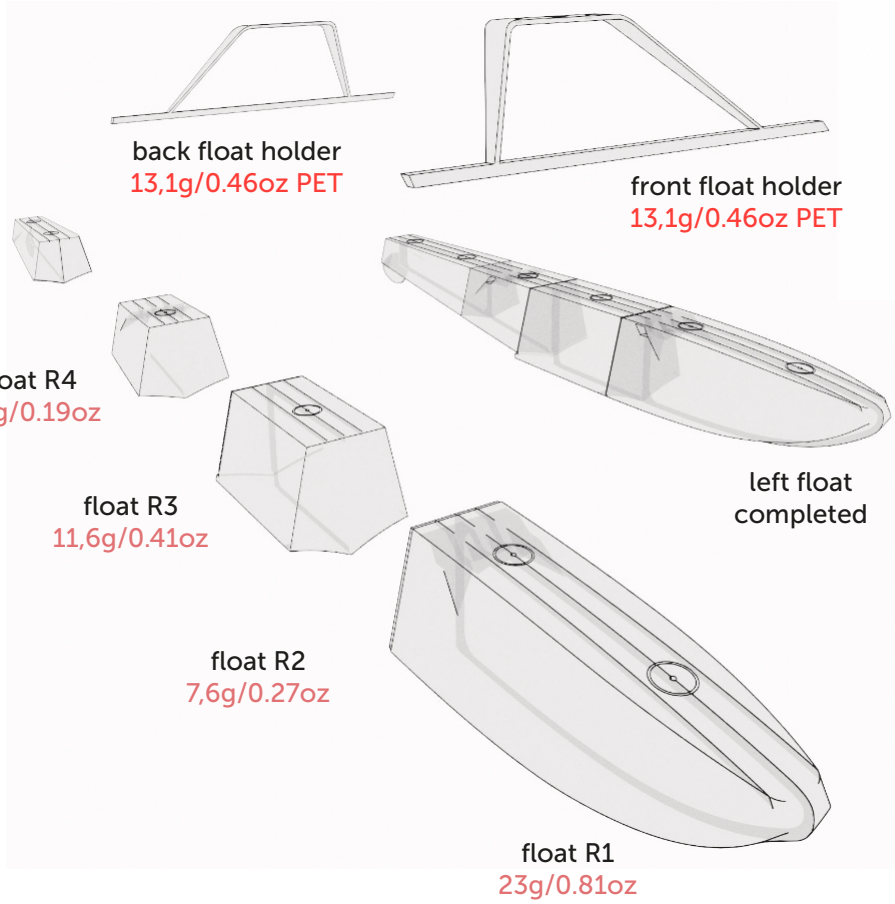
5.2.4 Floats assembly Piper J-3 Cub (experimental)

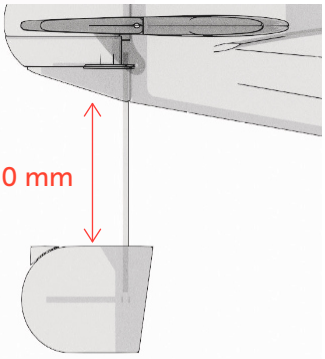
Glue the float parts 1 - 4 together for both sides. Paint the float well for perfect watertightness. The float attachment is marked with an arrow in the direction of flight to avoid confusion. Secure the entire main float to the hull with four screws.
The rudder tail fin is used to guide the direction of the aircraft on the water. Glue it to a 1.5 - 1.75 mm thick carbon rod. Glue the whole assembly into the rudder. The rear rudder extension has been experimentally determined to be xx mm and will be fine-tuned according to experience with flying on the water.

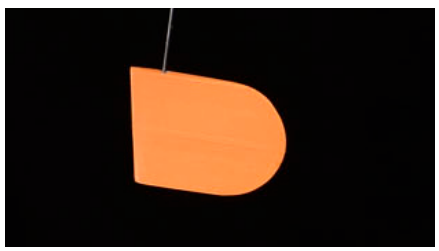
you will need: 200mm of carbon rod 1,5 - 1,75 mm
4x Self-tapping screw



tail rudder fin
1,7g/0.06oz LW





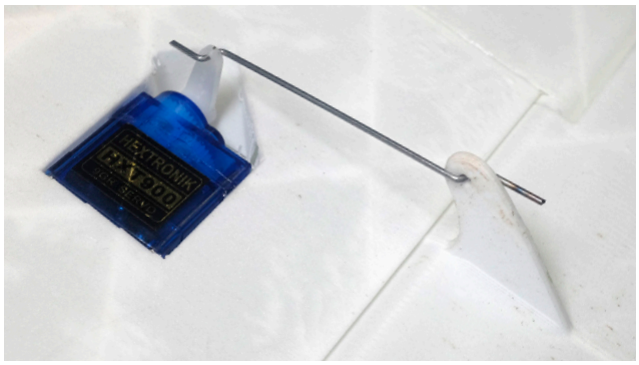


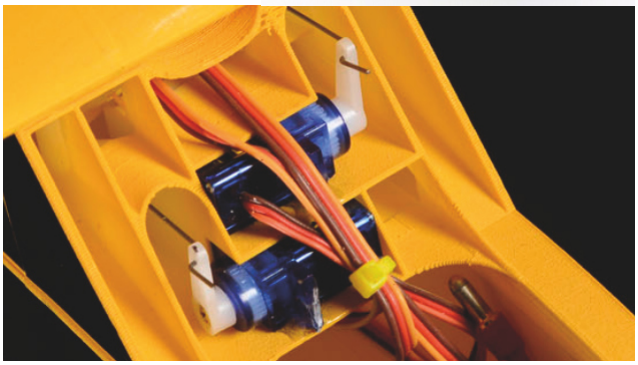
6. Servo installation

Cut the servo holder ears on aileron servos. Install the prepared servos to wing servo bays. Use a 1mm steel wire with Z bends as a linkage between the servos and aileron control horns. Elevator servo will be fixed by servo holder or directly glued in the fuselage.

See video guide Piper J-3 Cub servo assembly

you will need: 4x HXT900 or any similar sized servos
23x12x26 mm / 0.74x0.42x0.78 inches
Servo cable extension
Snap knife, Z pliers





7. Motor & ESC & battery holder

Fix the battery by velcro tape and mount it in the front of the fuselage, find the perfect balance and CG position by moving it. Mount the motor using 4x M3 screws and nuts to the printed universal motor holder 16 x 19mm. For long motors you can flip the holder to the front (as at picture). Glue universal motor mount with motor into the fuselage in right position.

See video guide motor setup

you will need:
4x M3x3mm screws

LW planes setup (230W)

Motor: any 2830 1000KV, opt1, opt2 or similar
ESC: any 20A/3s, opt1, opt2, opt3 or similar
Propeller: two blade GWS 8 x 4 (ugly orange) or opt1 or any 8/4 CCW
Battery: 1300mAh/3s, opt1, opt2, opt3 or similar
Batt. connector: XT60 or Gold Conn
printed PET mount 16 x 19 mm

8. Painting/marking and Final assembly/setting

See video guide Decals

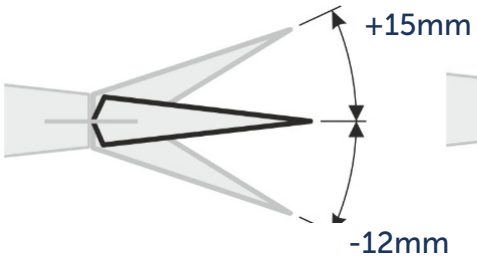
Another advantage of Polylight LW-PLA is that it can be dyed with almost anything. The surface for self-adhesive decals is ideally treated with a clear acrylic spray varnish. Use your imagination and send us photos of your aircraft on social networks.

See video guide Final setting

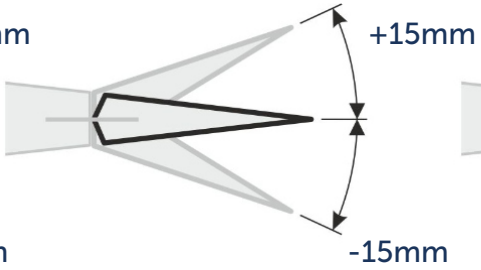
Refer to your R/C system userguide for setup information.
you will need: Your own Rx/Tx system
Velcro strip & Rubber Bands (for wing)

Install your reciever, connect battery, setup servos and etc. with your trasmitter, check servo position, then install propeller.
Make sure the battery is positioned properly and secured with velcro or battery holder, if battery moves during flight it can shift the center of gravity backwards and aircraft will become uncontrollable! Never set ESC with propeller installed, this could be very dangerous!

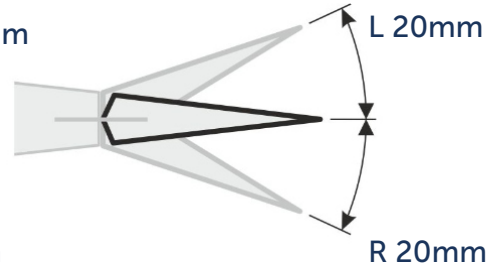
aileron



elevator



rudder



9. Go flying

Pre-flight check center of gravity is very important (move it 5mm forward for the first flights), battery properly charged, ailerons and elevator deflection check, your own flying skills or RC simulator training ...

Flight video of Piper J-3 Cub

10. Pilots Please Attention!

For the first flights we recommend setting the center of gravity to around 5 mm forward of the CG tag - nose heavy, this increases the stability (you can use heavier battery). Increasing expo settings on your transmitter for elevator and ailerons to 80 % calms response from your stick inputs. Also you can decrease elevator, rudder and ailerons deflection to calm down the plane.
Make sure the battery is well fixed in proper possition. If it moves during flight it will cause shifting of CoG aft and will result in uncontrolable flight behavior.

After gaining some confidence you can balance the plane to the Center of Gravity marks and set Expos to 60 % as shown in the video/instructions... this gains back extra maneuverability.

Never fly aft positioned Center of gravity.

Please, use these files only for your own purpose, do not redistribute or publish. Thank you very much. Enjoy your flight.

Enjoy the fun together!

Piper J-3 Cub is the next of new LW Planes series designed for easy and cheap flying. The build is simple even for a beginner. It's very low weight, easy assembly and fantastic flight characteristics makes this model an ideal plane for beginner RC pilots.

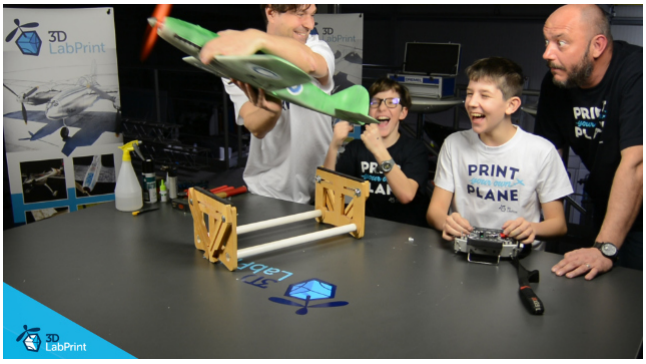
Very suitable for dads and kids. Children will learn some modern building skills and technology and most of all have fun. This is the reason, why every dad should have a 3D printer at home.

This model has been completely designed with the new PolyLight LW-PLA material in mind.

Parts printed from this LW-PLA are light, easily sanded and glued together. This model requires only about 300g of this material, that means it's a very cheap build. In case of accident, parts can be easily reprinted with just a filament cost.

We've been testing this material for a years before this plane was released... The material is using an active foaming technology to achieve lightweight, low density PLA parts. At around 230°C this material will start foaming, increasing its volume by nearly 3 times.

Almost all parts of this plane should be printed from LW-PLA (some specific parts needs PLA or PETg).



Shopping list

Printing material:	Polylight LW-PLA a few of PLA or PETg (elevator arm, motor mount, landing gear, ...)
RC:	R/C system, 5 or more chanels
Motor:	2830/1000KV, opt1, opt2 or similar
Propeller:	two blade GWS 8 x 4 (ugly orange) or opt1 or any 8/4 CCW
ESC:	any 20A/3s, opt1, opt2, opt3 or similar
Battery:	1300mAh/3s, opt1, opt2, opt3 or similar +connectors XT60 or Gold Conn
Servos:	4x HXT900 or any similar sized servos 23x12x26 mm / 0.82x0.47x0.86 inches Servo cable extension Snap knife, Z pliers
Glue:	CA Glue - medium + Activator for CA Glue
Other:	2x 1m or 0.8 mm pushrod wire 4x M3x3mm screws 2x M3 x 28-30mm screws for main wheel axle 4x M3 nuts + washers Small piece of 1.5 mm steel wire for tail drag wheel axle 4x Self-tapping screw 3x10mm office rubber band 0,3m of 1.5 – 1.75 mm carbon or fiberglass rod (for floats} Rubber Bands (for wing)