

User Guide

rev. 2020/04



Fully 3d printable

VL Pyörremyrsky

scale 1:12, wingspan 850 mm / 33.5 inch

VL Pyörremyrsky

fully printable R/C plane for your desktop 3Dprinter

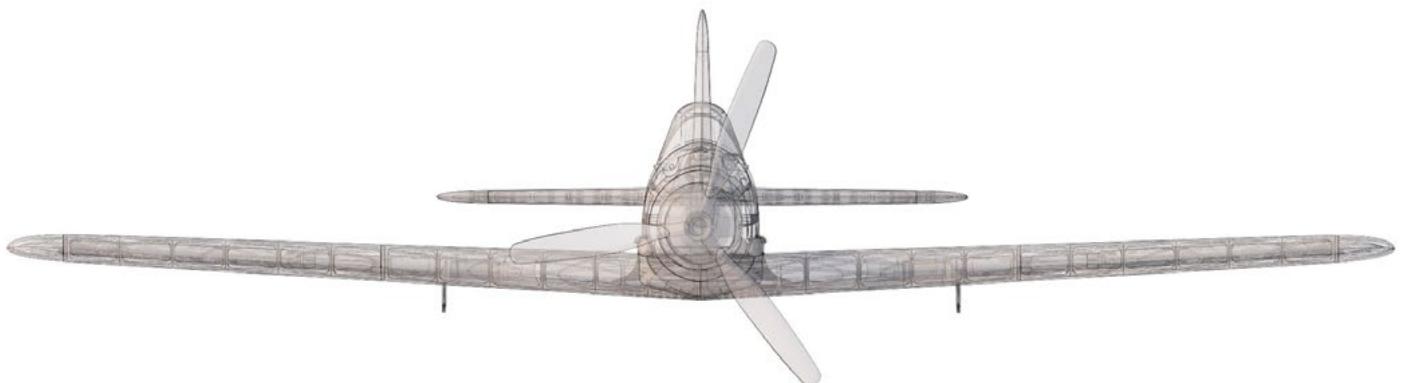
Fully 3D printable RC model of the finish attack plane, specially designed to meet ACES and EPA aircombat requirements, but also as a cheap and easy to build RC model for everyday flying. Many scale details such as armament, airframe plating or exhausts encourages to create realistic paint jobs. This plane has been designed for printing from foaming LW-PLA filament, that allow even the small printed planes to be as light as any other RC plane building technique. Get ready for battle with this great performing flying legend!

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 \$16

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 (HP setup):

Wingspan:	850 mm / 33.5 inch
Length:	750 mm / 29.5 inch
Height:	170 mm / 6.7 inch
Wing area:	15,9 dm ² / 1.61 square foot
Wing loading:	31 g/dm ² / 15.3 oz/square foot
Center of gravity:	60 mm / 2.34 inch from leading edge
Airfoil:	LHK508 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:	100 km/h / 62 mph
Design maneuvering speed, VA:	50 km/h / 31 mph
Stall speed, VS:	15 km/h / 9.4 mph

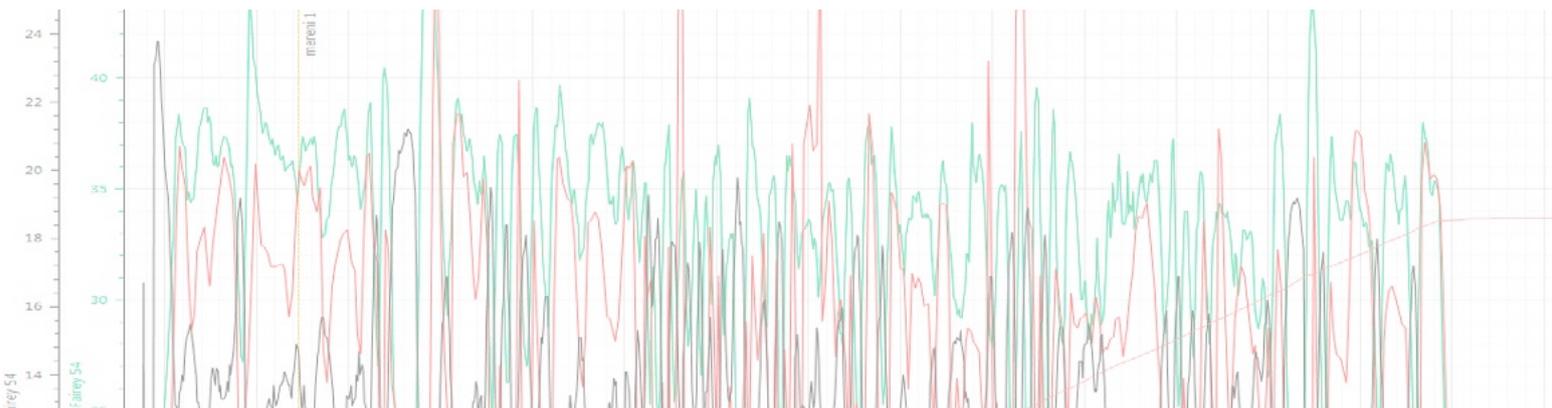


Recommended setup

Motor:	Leopard LC2830 980KV (for 3S setup)
ESC:	Turnigy 20A / 3S or similar
Propeller:	two blade GWS 9 x 7,5 (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 9x7,5





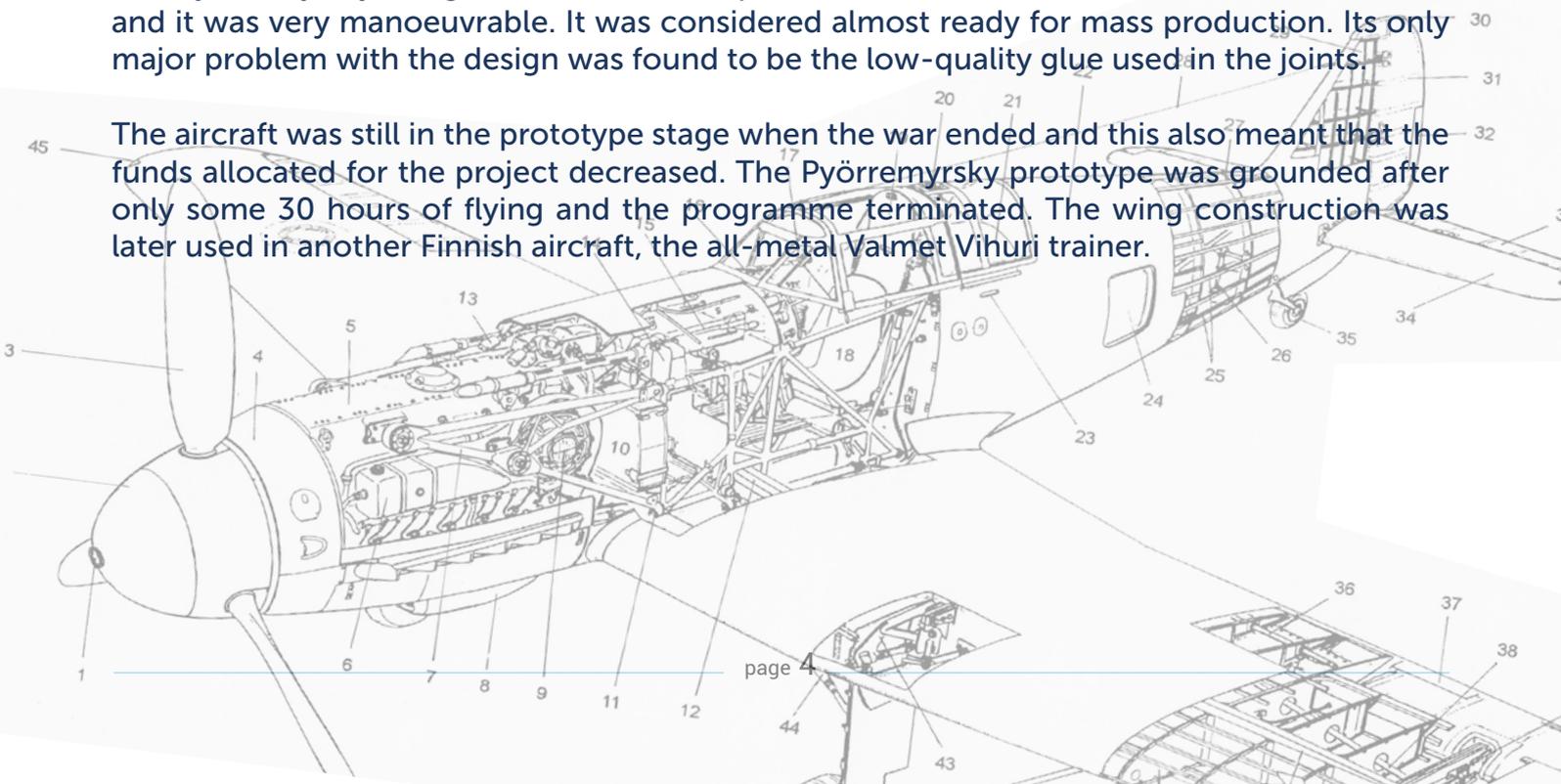
VL Pyörremyrsky (Wooden Messerschmitt), History

On 26 November 1942 the Finnish Air Force ordered two Pyörremyrsky prototypes to be built. The aircraft were to be ready by May 1944. One prototype was later cancelled and only one aircraft was ever built. The aircraft designation VMT Pyörremyrsky is also sometimes used, as the factory had been formed into the State Metal Factories (Valtion Metallitehtaat) during the construction of the aircraft. The Finnish Air Force airplane code letters PM gave the plane nickname Puu-Mersu (Wooden Messerschmitt), but the plane was an independent design.

The use of wood in the construction of the aircraft was maximized due to the scarcity of metals. The goal was to create a fighter with similar flight qualities to the German Messerschmitt Bf 109G. The engine and the propeller were taken from the Bf 109G. The Pyörremyrsky prototype PM-1 made its first flight on 21 November 1945 at Härmälä, piloted by Esko Halme.

The Pyörremyrsky design was considered quite successful. It could outclimb the Bf 109G-6 and it was very manoeuvrable. It was considered almost ready for mass production. Its only major problem with the design was found to be the low-quality glue used in the joints.

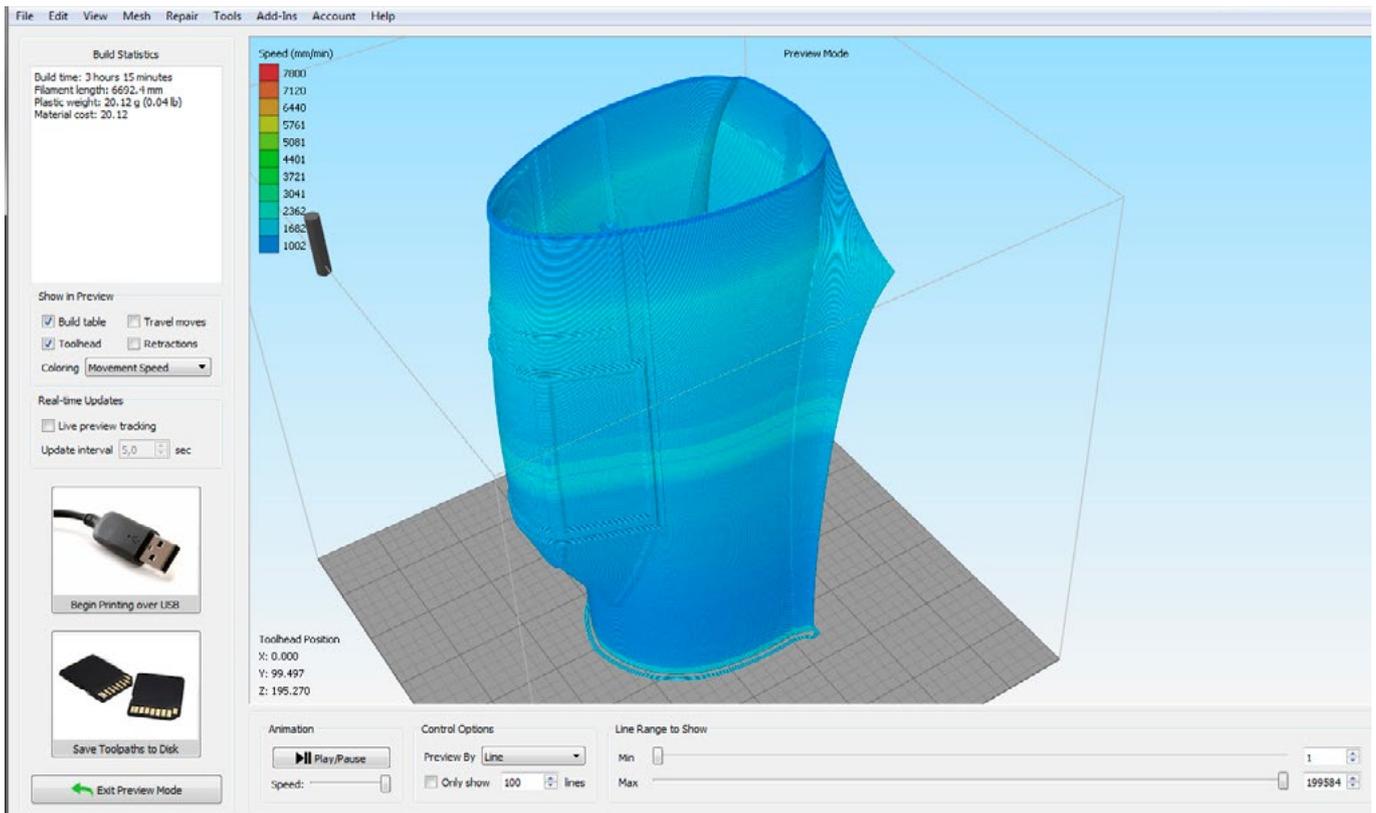
The aircraft was still in the prototype stage when the war ended and this also meant that the funds allocated for the project decreased. The Pyörremyrsky prototype was grounded after only some 30 hours of flying and the programme terminated. The wing construction was later used in another Finnish aircraft, the all-metal Valmet Vihuri trainer.



Included:

1. STL 3d files

Universal STL files designed to be used with desktop FDM 3d printers and slicer software as Simplify3D (recommended), CURA or MatterControl (these STLs are not compatible with Slic3r).



2. Factory files for Simplify3D slicer - preferred

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. Please check the [Simplify3D](#)

3. Step By Step PDF/VIDEO userguides

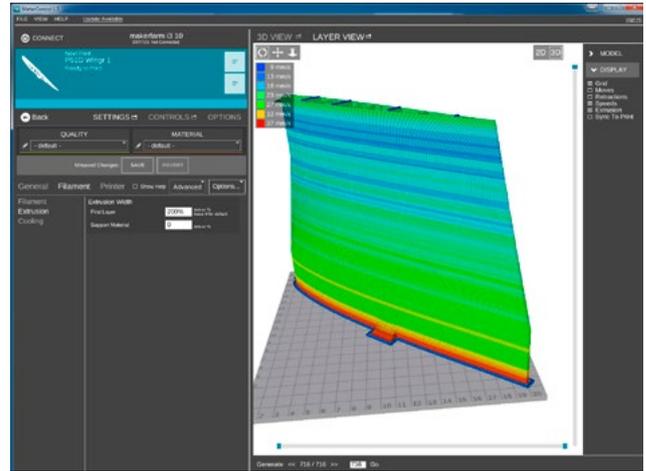
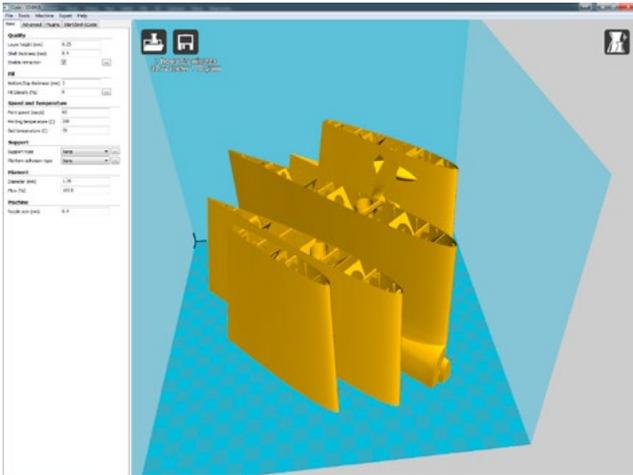
Apart from this userguide, please see the Printing Guide to find some Tips and Advice for airplane printing (Thin Wall Printing).

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.

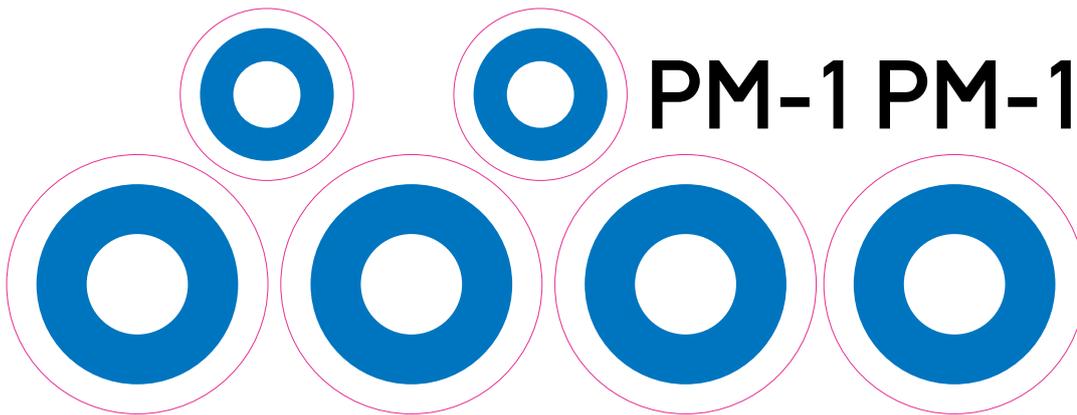
5. Slice on your own with CURA or MatterControl slicers

If you for any reason don't like Simplify3D, there is always option to use another free slicer
Please follow our [Cura guide](#) in the Help section of the website where you can find the basic single-wall profile. **Remember: We use 0 retraction with LW-PLA.**

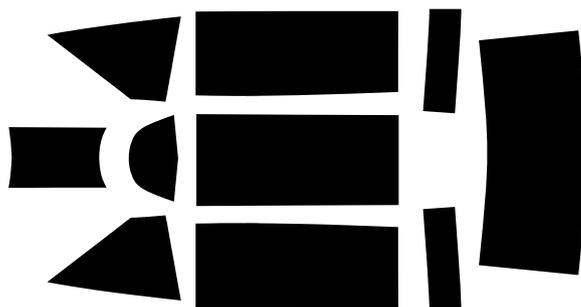
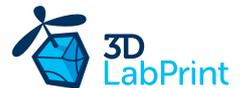


6. Scale markings PDF

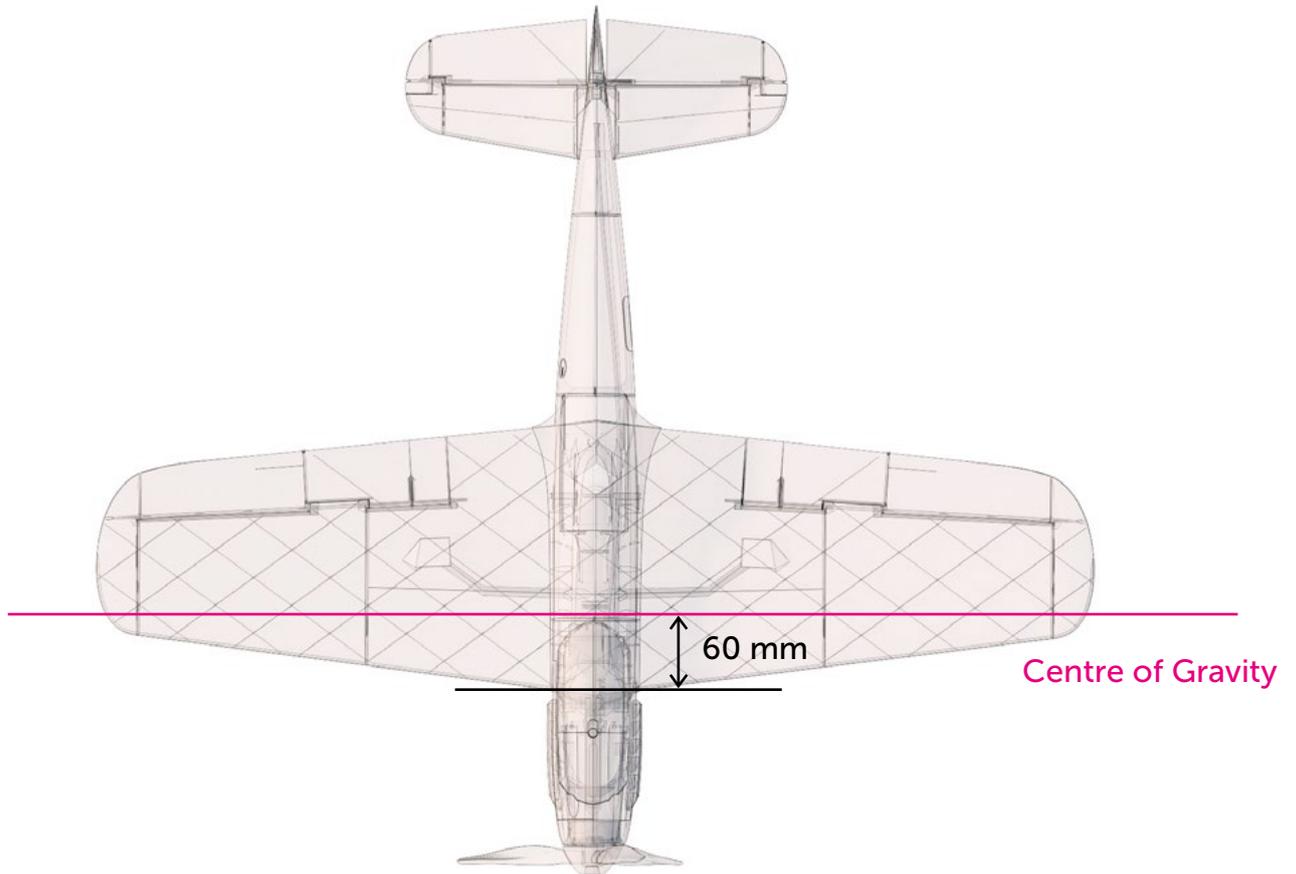
You could cut this PDF in scale from thin self adhesive advertisement foil and place it on the model as needed.



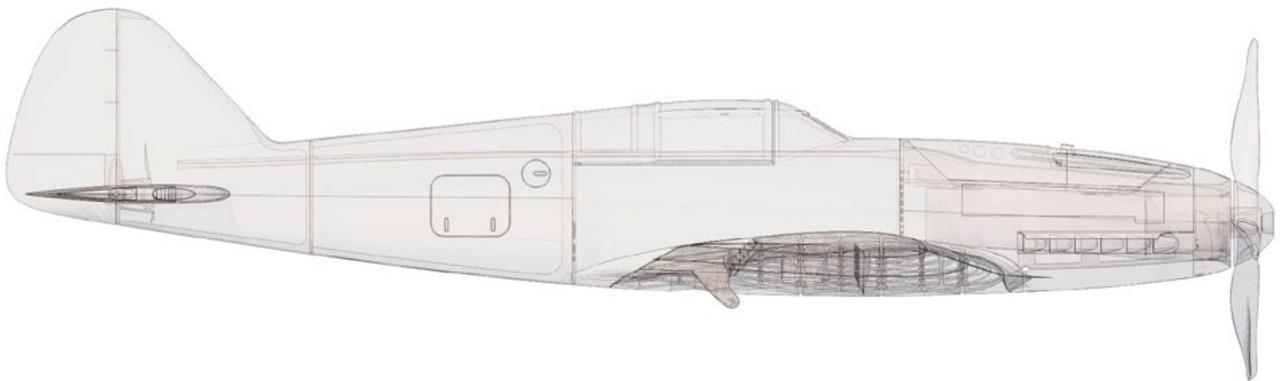
VL Pyörremyrsky



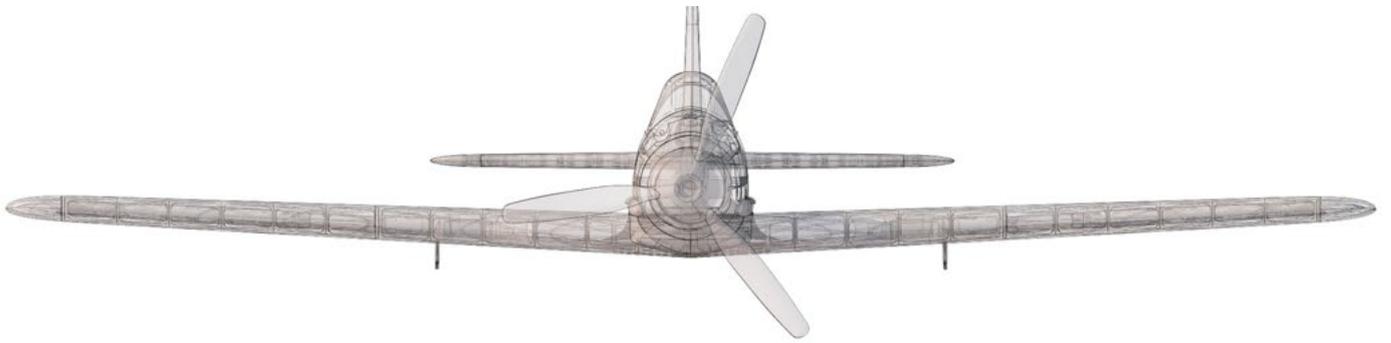
VL Pyörremyrsky



Wing area: 15,9 dm² / 1.61 square foot



Length: 750 mm / 29.5 inch



Wing span: 850 mm / 33.5 inch



Step By Step PDF/VIDEO userguide

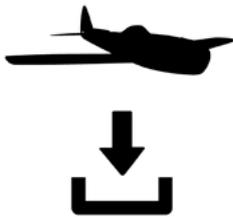
1. Choose airplane at www.3DLabprint.com, visit our [Facebook](#) for latest info.



Basic requirments for VL Pyörremyrsky are 195/195/195 mm volume, nozzle 0.4mm recommended (0.35 or 0.5mm alternatively). Heated bed recommended. Designed to be printed with LW PLA filament by Colorfabb.
Contact: support@3dlabprint.com

2. Create account, download

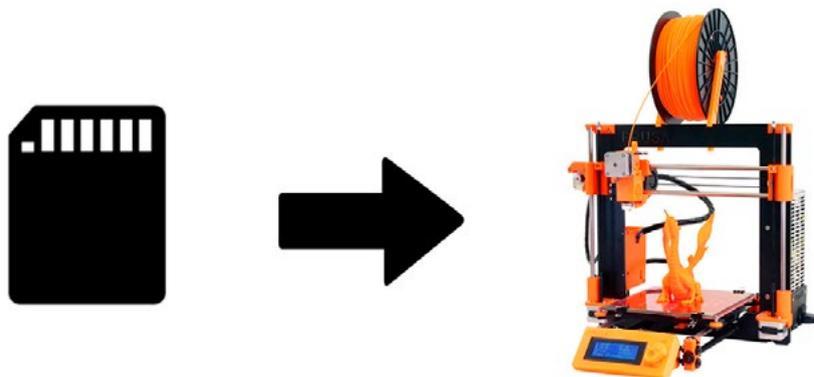
You will receive download link to all the zipped files to your email (please check your spam folder if not) or you can log in to your account and download directly from our websites.



3. Gcodes preparing

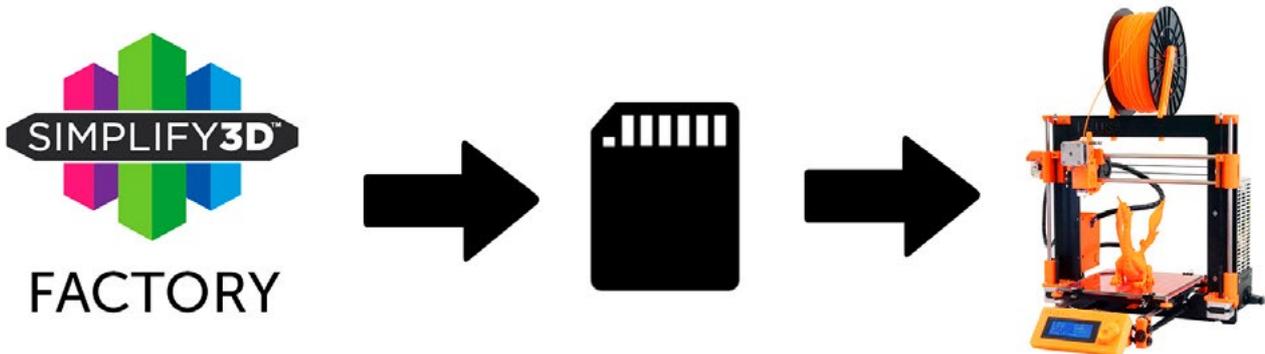
option A Gcodes:

if your printer is i3 comptabile 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 230°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.



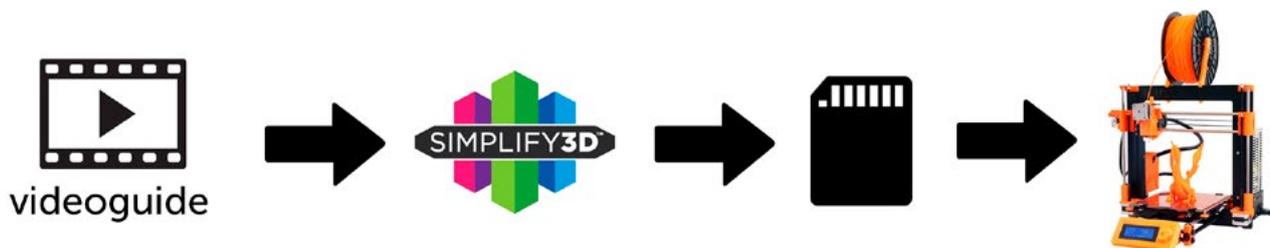
option B Factory files Simplify3D (recommended):

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.

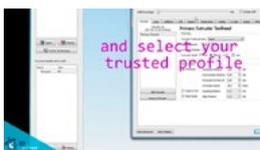


option C Simplify3D manual setting (watch and learn):

Use our [video guide 2](#) and check our [Simplify3D reference guide](#) for proper setting... this is very good option and you will learn a lot about Simplify3D and become an 3d printing expert. **Remember: We use 0 retraction with LW-PLA.**



AND... please watch our VideoGuides:



[video 2](#) Simplify3D setting



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

option D CURA or MatterControl

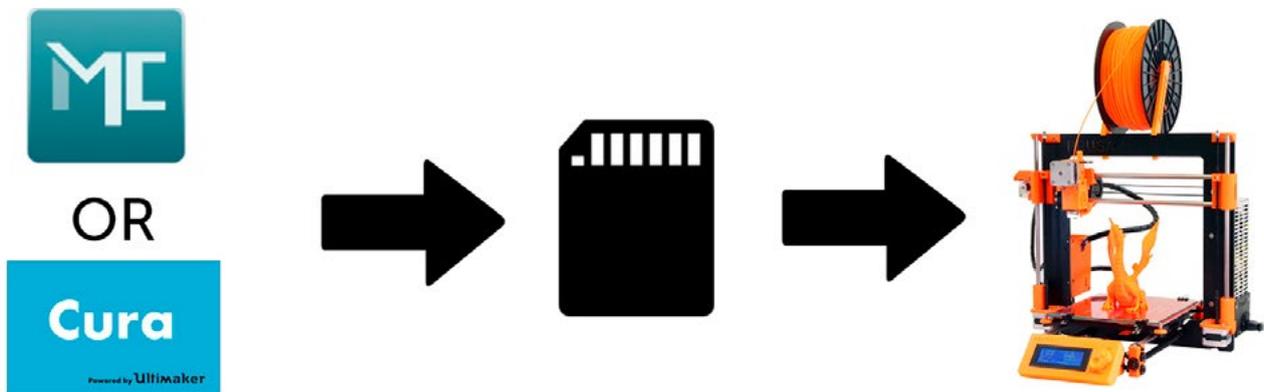
MatterControl and CURA are free and provide satisfactory results. The airframe is still strong enough, but don't expect the best quality. Both slicers lacks some very useful features, and finer settings, like multiple processes according to Z height, retraction options, layer start, etc.

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 use 0 retraction with LW-PLA.**



Please watch our VideoGuides...



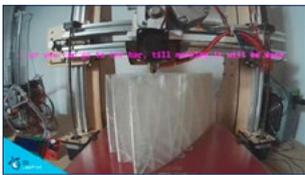
4. Print it

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 - (by ColorFabb)
3DLac, Strong hair spray, PEI or your favorite adhesive bed surface
Razor blade

AND... please watch our VideoGuides:

[video printing guide](#)



Basic Tips and Advice

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

Please Experiment with temperature and extrusion multiplier. 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 don't 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.

LW-PLA by ColorFabb comes in two colours. White and Black. We found no difference in printing of both colours, but the black colour will probably attract the sunrays more, causing warping of the thin wall surface. There are many 3d printers on the market, most of them are capable of printing our airplanes (specific thin wall printing...) sufficient volume, heated bed, 0.4mm nozzle.

Please see the [Printing Guide \(FAQ\)](#):



Enjoy the fun together!

VL Pyörremyrsky is the first 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.

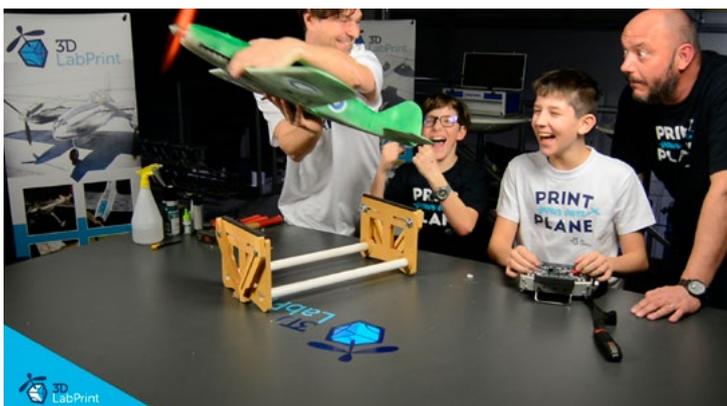
This model has been completely designed with a new LW PLA material by ColorFabb in mind.

Parts printed from this LW PLA are light, easily sanded and glued together. This model requires only about 220 g 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 half a year 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.

All parts of this plane should be printed from LW-PLA.

Possibly VL Pyörremyrsky can be printed from normal PLA but the plane will be too heavy for relaxed flying. Standard PLA printed model therefore could not be recommended for beginners. You should use heavier battery also to compensate Center of Gravity of the plane in this case.



VL Pyörremyrsky weights of printed parts

<i>fuselage</i>	LW PLA
F1	24 g
F2	19,4 g
F3	12,5 g
F4	9,2 g
fuselage cover 1	4,2 g
fuselage cover 2	3 g
fuselage cover arm	2,8 g
<i>wing</i>	
wing L1	29,3 g
wing L2	17 g
wing L3	2,7 g
wing R1	29,3 g
wing R2	17 g
wing R3	2,7 g
aileron L1	1,6 g
aileron L2	3,3 g
aileron L3	4,5 g
aileron R1	1,6 g
aileron R2	3,3 g
aileron R3	4,5 g
<i>tail</i>	
stabiliser L1	4,6 g
stabiliser L2	1 g
stabiliser R1	4,6 g
stabiliser R2	1 g
elevator L1	4,8 g
elevator L2	0,5 g
elevator R1	4,8 g
elevator R2	
elevator arm (PLA)	1,1 g
rudder	4,0 g
<i>accessories</i>	
motor mount (PLA)	6,5 g
spinner (PLA)	4,8 g
all printed parts	224,8 g

How to print 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, but expect some heavy stringing inside and outside. 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.

Cosmetic issues of the prints are easily fixed with snap knife or sand paper, as the LW is easily sanded and cut.

[See video guide #4.1 \(clearing LW-PLA parts\)](#)

[Official guide by ColorFab - How to print LW-PLA](#)

[Video of print LW-PLA](#)



colorFabb B.V.
The Netherlands

LW-PLA
shop:

[https://colorfabb.com/
lw-pla-natural](https://colorfabb.com/lw-pla-natural)

email sales:
sales@colorfabb.com
email support:
support@colorfabb.com

5. Assembly of printed parts

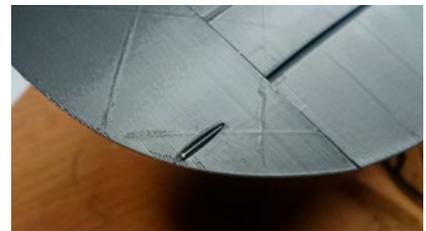
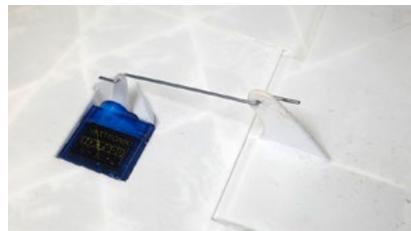
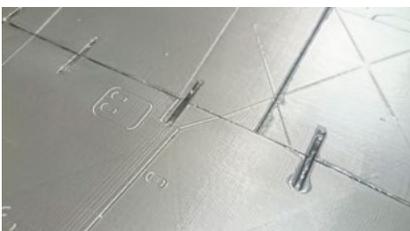
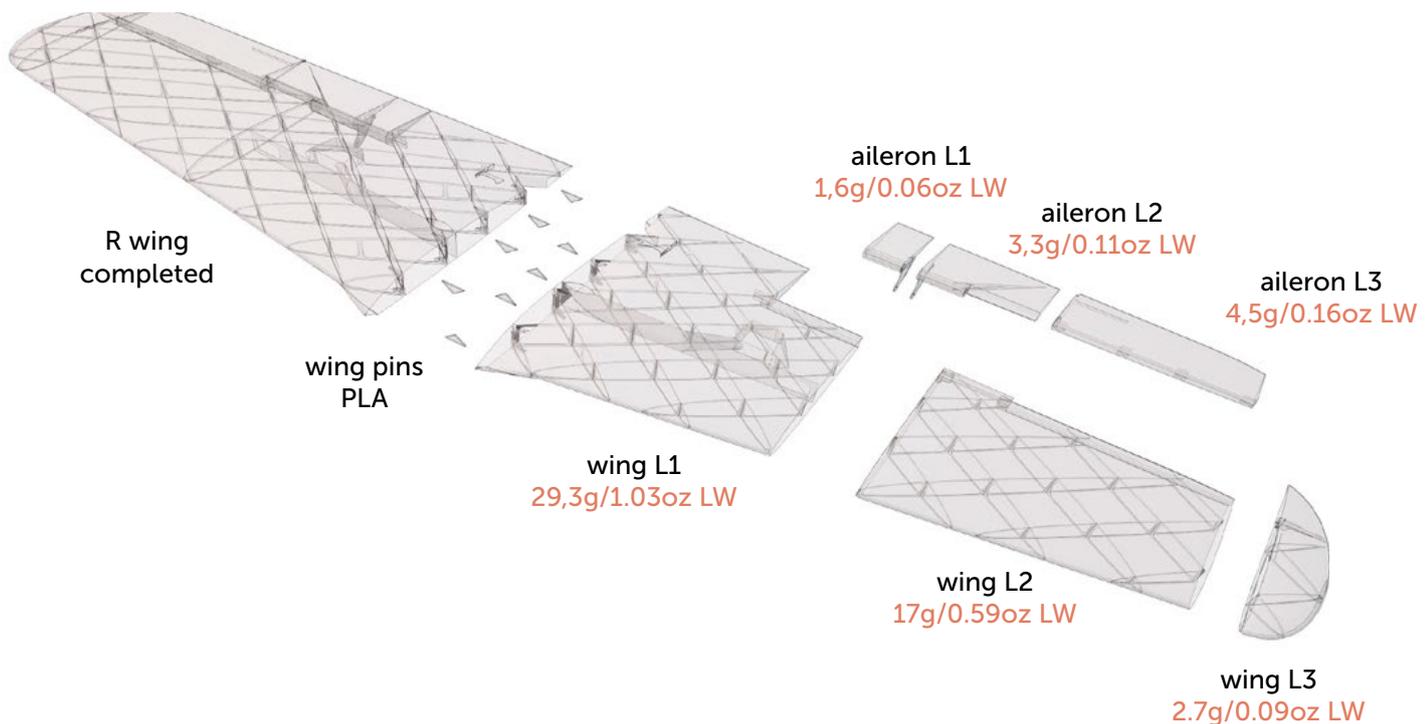
5.1 Wing assembly VL Pyörremyrsky

Glue wing parts L1-L3 perfectly together. The new 3D LabPrint 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.

On a flat surface glue the ailerons L1-L3 and repeat for the right side. Use a suitable 0,8mm - 1,2mm carbon rod or wire as a hinge for the ailerons. Just slide it in, there's no need to glue the hinge for easy aileron or servo replacement.

[See video guide #4.2](#)

you will need: [CA Glue medium viscosity + activator](#)
 0,8 - 1,2 mm carbon, fiberglass or steel wire for aileron hinge
 Snap knife, Some cloth for wiping CA glue...



5.2.1 Fuselage assembly VL Pyörremyrsky

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. Zkontrolujte kolmost dílu F4 na uložení křídla dílů F1 a F2 před zalepením. 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.

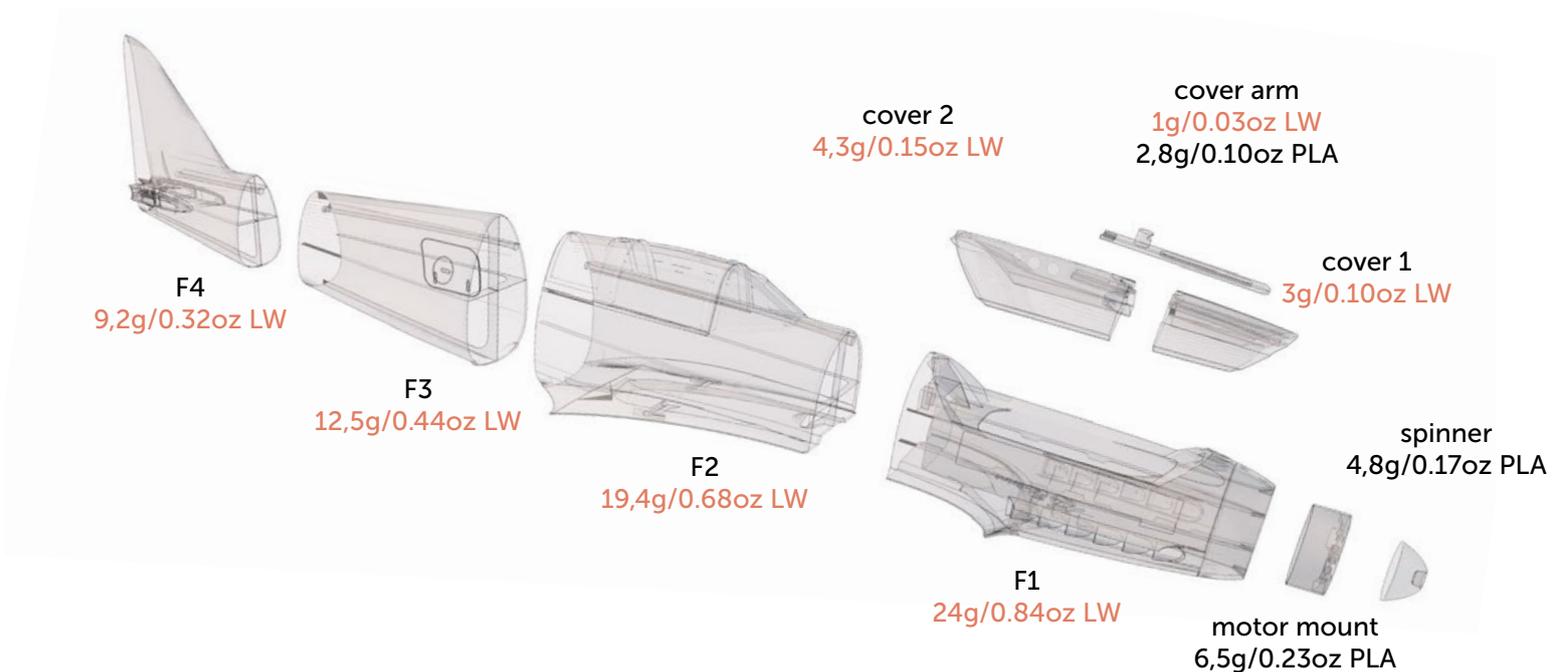
Insert two 90 mm long 3 mm diameter carbon rods making a rubber band wing holders. No need to glue it for easy replacement.

For fuselage cover arm use a ball pen spring. Put it to the part 2 and glue with part 1 together.

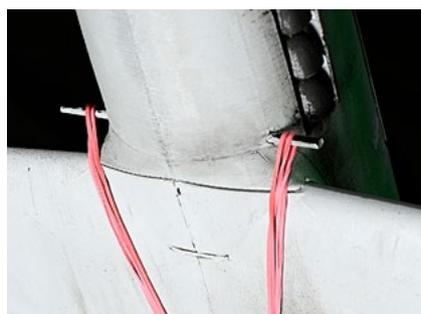
NOTE: Don't glue the rudder tailpart yet !!! (proceed to the next step for elevator and stabilizer assembly)

[See video guide #4.3](#)

you will need: [CA Glue medium viscosity + activator](#)
 Snap knife or Sandpaper, Soldering Iron or any hot tool + hot glue
 2x 90mm of 3mm carbon or fiberglass rod



ball pen spring

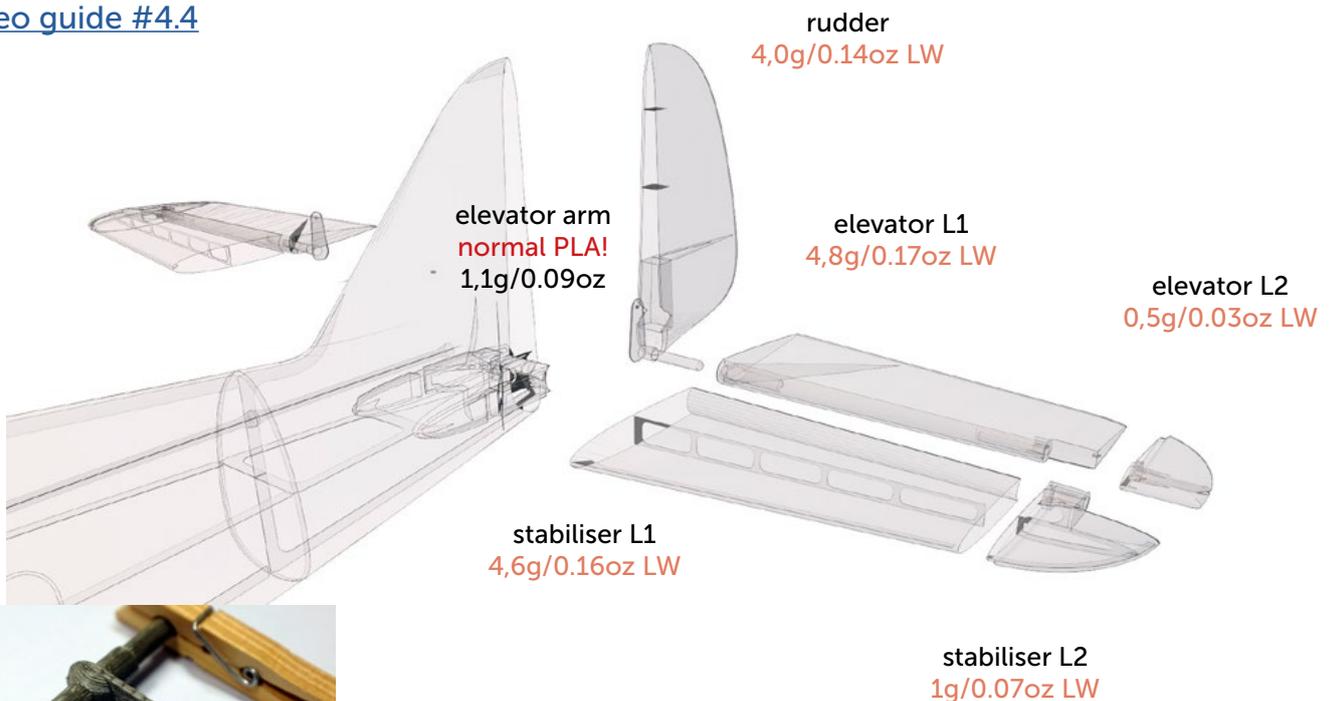


5.2.2 Fuselage tail - elevator pushrods and servos

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 control lever on a flat surface. Make a Z bend on the elevator 0,8 mm pushrod wire. Using hot tool cut loose the hinge of the elevator on the F4 part of the fuselage and mount the elevator assembly to the stabilizer using the 0,8 - 1,2 mm carbon rod or steel wire. Elevator should move freely controlled by the pushrod and servo. Check the functionality of the elevator assembly carefully and finally glue in the rear rudder part.

you will need: [CA Glue medium viscosity+ activator](#)
 0,8 - 1 mm steel wire for elevator pushrod
 0,8 - 1 mm carbon or steel wire for aileron hinge
 Snap knife, Soldering Iron or any hot tool

[See video guide #4.4](#)



elevator arm
 normal PLA!

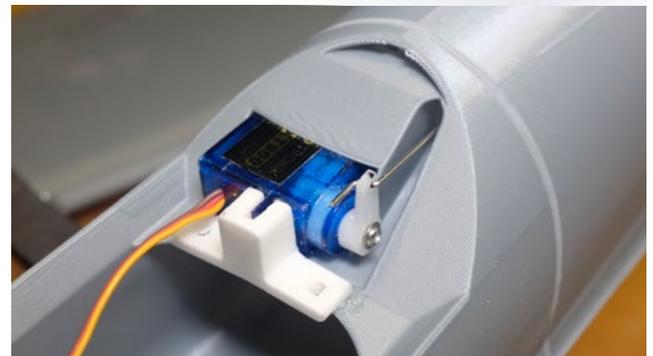
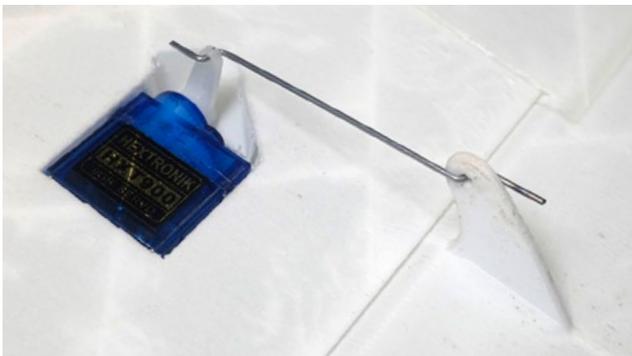


6. Servo installation

Cut loose 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 #5](#)

you will need: 3x [HXT900](#), or [opt1](#), [opt2](#), [opt3](#)
 or any similar sized servos
 23x12x26 mm / 0.74x0.42x0.78 inches
 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 #6](#)

you will need:
 4x M3 screws and nuts



LW planes setup (230W)

Motor: any 2830 1000KV, [opt1](#), [opt2](#), [opt3](#), [opt4](#)... or similar
 ESC: any 20A/3s, [opt1](#), [opt2](#), [opt3](#), [opt4](#)... or similar
 Propeller: two blade GWS 9 x 7,5 (ugly orange) or [opt1](#), [opt2](#), [opt3](#)
 Battery: 1300mAh/3s, [opt1](#), [opt2](#), [opt3](#), [opt4](#), [opt5](#)
 Batt. connector: [XT60](#) or [Gold Conn](#)
 printed PLA mount 16 x 19 mm



8. Painting/marketing and Final assembly/setting

[See video guide #7](#)

Refer to your R/C system userguide for setup information.

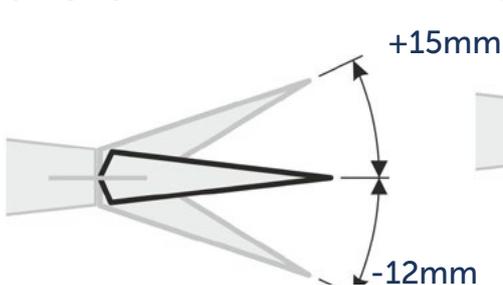
[See video guide #8](#)

you will need: Your own Rx/Tx system

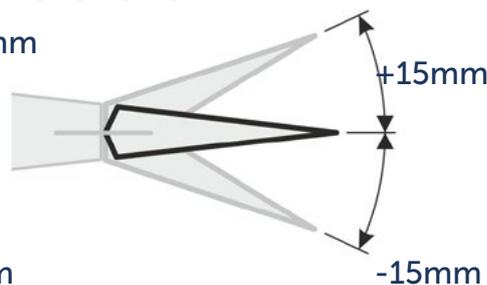
Install your receiver, connect battery, setup servos and etc. with your transmitter, check servo position, then install propeller, the **supplied spinner** guarantees proper cooling of the motor and mount.

Make sure the battery is positioned properly and secured with wing 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



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 ...

[Flyght video of VL Pyörremyrsky](#)



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 and ailerons deflection to calm down the plane. Make sure the battery is well fixed in proper position. If it moves during flight it will cause shifting of CoG aft and will result in uncontrollable 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.



Shopping list

Printing material:	0,25 kg of LW-PLA by ColorFabb a few of PLA or PETG (elevator arm, motor mount, spinner)
RC:	R/C system, Tx (EU) (GLOBAL) + compatible Rx 4ch, or opt1 we use JETI
Motor:	any motor 2830 size for 3S Li-Pol with weight up to 50g opt1 , opt2 , opt3 , opt4 ... or similar Leopard LC2830 980KV (for 3S setup)
ESC:	20A/3s, opt1 , opt2 , opt3 , opt4 ... or similar
Battery:	1300mAh/3s, opt1 , opt2 , opt3 , opt4 , opt5
Servos:	3x HXT900 , or opt1 , opt2 , opt3 or any similar sized servos 23x12x26 mm / 0.82x0.47x0.86 inches
Glue:	CA Glue - medium Activator for CA Glue
Other:	1x 1m of 1 - 1,2 mm / 14 AWG pushrod wire or carbon rod 1x 0,2m of 3 mm carbon or fiberglass rod 1x 1m of 0,8 mm pushrod wire 4x M3 screws and nuts