





Fully 3d printable

# **Stearman PT-17 Kaydet**

scale 1:8, wingspan 1217mm (47.9in)





## Stearman PT-17 Kaydet fully printable R/C plane for your desktop 3Dprinter

#### Future of flying - Print your own plane

Although this first printable bi-plane model has been published back in 2017, introduction of new LW filament option allows for some serious weight reduction and improved , more scale flying characteristics. Furthermore the motor mount has been redesigned to allow better cooling and more reliable operation.

We brought you the first fully printable airplanes with 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 \$20 per 1kg

**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 precise 3d structure is only possible thanks to additive 3dprinting technology. So welcome to the 21st century of model flying and be the pioneer at your airfield.

**Easy to assemble**, you don't need any extra tool or hardware, just glue printed parts together and make pushrods for control. The rest of the assembly is very easy. Simply mount the brushless motor, ESC, servos and set the radio system. Don't be afraid, detailed step by step PDF/VIDEO is included.

With the new LW option you will get a scale speed flying stable airplane for fun and relax flying suitable for slightly experienced pilots. Stearman PT-17 Kaydet is significant for low stall speed and therefore is easy to land.





## General specifications:

Lenght:
Wingspan:
Height:
Wing area:
Wing loading:
Center of gravity:

Airfoil: Print weight: Empty weight (w/o battery): Takeoff weight standard: Takeoff weight hybrid LW: Max takeoff weight: Never exceed speed, VNE: Design maneuvering speed, VA: Stall speed, VS:

Powerplant

Propeller: Motor: ESC:

Battery:

APC 11x5,5 <u>Turnigy 3542/5 1000-1250KV</u> or similar <u>40A Electronic Speed Controller</u> or similar 40Amps <u>Li-Pol 3000mAh/3s/4s (11.1V)</u>, 300g/8.39oz, 25C

946 mm / 37,2 inch 1217 mm / 47.9 inch 356 mm / 14.0 inch 44 dm2 / 4,7 sq foot

0 mm (0 in)

1500 g / 52.9 oz

2120 g / 74.9 oz

2420 g / 85,3 oz 1700 g / 59.9 oz

2800 g / 98.7 oz

100 km/h / 62.14 mph

70 km/h / 43.49 mph

24 km/h / 14.9 mph

Stearman

56 g/dm2 / 18.14 oz at sg foot

at leading edge of bottom wing





## Performance measurement

 $Max\,speed\,VH\,(level\,flight):\quad 105\,km/h-56.7kn-65.2mph\,with\,APC\,11x6$ 

Rate of climb:

20 m/s (5 373 ft/min) with APC 11x6

Flight time (3s 3000mAh/full):

7:40 with APC 11x5,5 5:50 with APC 11x6







## Stearman PT - 17 Kaydet, History

The Stearman (Boeing) is a biplane used as a military trainer aircraft, of which at least 10,626 were built in the United States during the 1930s and 1940s. Stearman Aircraft became a subsidiary of Boeing in 1934. Widely known as the Stearman, Boeing Stearman or Kaydet, it served as a primary trainer for the United States Army Air Forces, the United States Navy, and with the Royal Canadian Air Force as the Kaydet throughout World War II. After the conflict was over, thousands of surplus aircraft were sold on the civilian market. In the immediate postwar years they became popular as crop dusters, sports planes, and for aerobatic and wing walking use in air shows.

The Kaydet was a conventional biplane of rugged construction with large, fixed tailwheel undercarriage, and accommodation for the student and instructor in open cockpits in tan-





page 4



#### dem.

## Included:

#### 1. STL 3d files

Universal STL files designed for use with desktop FDM 3D printers and slicer software such as Simplify3D (recommended) CURA or MatterControl (these STLs are not compatible with



Slic3r/PrusaSlicer or Makerware slicers).

## 2. Factory files for Simplify3D slicer

with all our setting, these Factory files include all for a good starting point. Note: we use PRU-SA i3 ORIGINAL printers so you may need adjust the basic printing parameters to match your printer, please see <u>Simplify3D for more details</u>.

### 3. Step By Step PDF/VIDEO userguides

Please use this user guide along with the website Help section where you can find Tips and Advice for thin wall airplane printing, material guide, slicing info and more.

#### 4. Gcodes

Basic Gcodes prepared for direct use. We made it as universal as possible, 100% compatible with PRUSA i3 ORIGINAL and most direct drive i3 style printers. Feel free to try it out, but we're not able to guarantee it's gonna work with your printer.



## 5. Prepared settings for CURA and Mattercontrol

If you can't use the recommended Simplify3D for any reason, please check the Help section for the latest basic CURA profile and instructions on how to proceed. Mattercontrol configuration is also included.





#### 6. Scale markings PDF

Print this PDF in 100% ratio at a thin self-adhesive advertisement foil and place it on the model as needed, violet cut lines included.





Wing area: 44 dm2 / 4,7 sq foot



Lenght: 946 mm / 37,2 inch





Wing span: 1217 mm / 47.9 inch





## Step By Step PDF/VIDEO userguide

1. Choose airplane at <u>www.3Dlabprint.com</u>. Our <u>Facebook</u> with current info.



Basic requirments for Stearman PT-17 are: at least 195/195/150mm build volume or equivalent. Nozzle 0.4mm recommended. Heated bed highly recommended. PLA filament as a standard, LW-PLA for tail parts and wings recommended (see charts for more info) and some flex for tires... If unsure your printer is up to the job, you can download a test part from Thingiverse.

### 2. Create account, download



You'll get the download link for all zipped files to your email, or log in to your account and download directly from our website If you don't receive the link right on checkout, please check your mailbox spam folder. Contact us on support@3dlabprint. com mentioning the order number (WC-XXXXX on a PayPal receipt.

## 3. Gcodes preparing

#### options A Gcodes:

If your printer is i3 comptatible you can use prepared gcodes directly. Simply save each to an SD card and let the 3d printer do its job, The HE temperature is set to 230°C for the best layer bonding, you can amend speed and temperature only through your printer LCD. If prepared Gcodes doesn't work for you, please proceed to next options...





#### options B Factory files Simplify3D (recommended)

We prepared all the basic setup in our factory files - FFF profiles and parts arranged on the bed. Use them as a starting point and amend the settings you need to adapt it to your printer. You can also select parts you need printed... The basic profile is set for most direct drive printers, we are not liable for any damage resulting from using our settings. If you need more control about the process, please proceed to the next option.



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

Please read through our Simplify3D article in our Help section to find out, how to set-up the SImplify3D processes. This is a great option to learn about how things work. For simplification we explain only the basic settings for wings and fuselage, please consult our prepared factory files to find out if a part needs some additional features like top/bottom layers and where to put the seam on a part.



#### AND... please watch our VideoGuides:

#### video 2 Simplify3D setting



#### video about Thin Wall Printing





options D CURA or MatterControl (considered as a last resort, we recommend Simplify3D) MatterControl and CURA are free and provide staisfactory results. The airframe is still strong enough, but some key features are not available, such as multiple process settings according to Z height, retraction options, fixed layer start, etc... Please try to find the right extrusion multiplier and temperature for good weight and best possible layer bonding. Check the suggested parts weight list for proper multiplier settings.

Please check the updated <u>Cura setup guide</u> in the Help section.

As a starting point you can use our predefined basic CURA profile. Always adapt the settings for your printer, change build volume, filament diameter, etc. according to your printer. Please be aware some parts require different settings of perimeters, top/bottom layers and infill. For some thick part you'll need to use support structure. Check our gcodes in printing simulation for more details about how the result should look like. NOTE: some parts (nose, canopies, engine covers,...) require top layers to cover the steeper overhangs, but only for a certain spot. This is not possible to be set in Cura, however you can use the text editor gcode merge procedure described in the Cura setup guide article.



### **LW-PLA option**

For significant weight reduction you can print some parts using foaming LW-PLA filament. This not only makes the parts lighter, but also allows using lighter and less powerfull setup without the need to add additional weight to balance the plane.

Note: the LW part is typically half the weight of a regular part, but it's softer. Please print only parts that are not critical for structural integrity. You can use it to print tail parts, wings except the center part and some scale additions, such as seats, instrument panels, pilot, etc.. Parts that can be printed from LW are marked by a red description in the assembly guide.

Please see the <u>material guide</u> for more information about how to set the printing process for LW-PLA filament.





## 4. Print it

Save generated Gcodes to an SD card and insert it to your printer. Prepare your printer, especially take care about heatbed surface and the first layer. We prefer to use the SD card than direct connection via USB.

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

Video guide about printing

you will need: PLA filament - good quality and strong PLA (we need good layer bonding) Strong hair spray (or your favorite adhesive bed surface) Razor blade

AND... please give a look to VideoGuides:

video printing guide



## Main parts weight list:

Note: LW-PLA parts are typically half the standard part weight





## **Basic Tips and Advice**

Please see the Help section for latest information about printing.

#### FAQ, Material guide, Simplify3D and Cura setup

Extrusion multiplier is important for proper amount of deposited material. We need to balance the weight and strenght. Suggested weights are part of this manual.

Very important is hot end temperature. We're printing PLA at 230°C, it may seem too high, but it's vital for proper layer adhesion. The part cooling fan is turned off, we want the part to be cooled by ambient temperature only. (Hotend fan has to be on).

Heated bed is very recommended, 55-60°C works for proper heatbed adhesion without warping.

### Please check our Help:





## 5. Assembly of printed parts

#### 5.1 Wing assembly

Glue wing parts together with CA glue. Pay attention to the order of parts. Each part has a small mark on the inner side with dots determining the order. Glue strut fix joints to wing at correct possition. Install ailerons by hinges. We recommend CA Hinge sheet. For LW-PLA upper wing glue in a wooden or carbon fiber spar. Rectangular works the best.

#### See video guide #4





### 5.2 Fuselage assembly

Start with glueing 7x M3 nuts to the fuselage part 7 using small amount of epoxy glue. Clean the threads and try it with screws for motor mount. Glue 3x M4 nuts using epoxy glue used to attach wing/gear to the fuselage part 6. Clean the threads and try screwing suitable M4x30 nylon screws in. Fine tune parts shape with a snap knife or sandpaper. Glue fuselage parts F0 - F5 using CA glue together. Glue fuselage parts F6 and F7. Keep front and back part of fuse-lage separate for easy pushrods and servo installation. Carefully glue the horizontal stabiliser to fuselage, so it's perpendicular with the vertical stabilizer. Insert pen spring into the F9 part, insert canopy lock, glue F9 and F8 together. Glue wing strut fix joints to the fuselage, short piece marked F5 belongs to part F5!.

#### See video guide #5

#### you will need:

<u>CA Glue - medium or similar medium viscosity CA glue</u> 7x M3 blind nuts <u>MP-Jet 1035</u> or Hobbyking M3 nuts or similar 3x M4 blind nuts <u>MP-Jet 1007 AL</u> or Hobbyking M4 nuts or similar 1x ballpoint pen spring (a spring from old ballpoint pen will work fine) Scissors, Snap knife or Sandpaper, Soldering Iron or any hot tool







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

Now is a good time to install tail servos, pushrods, elevator and rudder. Simply push 1 mm pushrods wires through the printed bowdens. Mount 2x Hitec HS-81/82 or similar servos to the fuselage. Make Z bend or use your preferred pushrods mounting method (clevis, ball link) on one side and adjust the length of wires. With correct lenght of the pushrod attach them to the control surfaces and glue them in using CA hinges in position. Make another Z bend on the servo side and attach servo horns. Do not forget to use screws at servos during final assembly. Now glue fuselage front and rear parts together. With a LW printed tail you may want to add 1mm carbon fibre struts to support the horizontal stabilizer against fuselage.

#### See video guide #6

you will need:

<u>CA Glue - medium or thin viscosity CA glue</u> <u>CA Hinge Sheet</u> or similar 2x 1 mm / 18-20 AWG pushrod wires 2x Hitec HS-81/82 or similar servos Wire cutter, Z bend pliers or pliers.





## 7.1 Landing gear

Wow, printed springs! Yes it works! If you have doubts, you can use conventional metal springs of appropriate size. Glue both halves of landing gear and legs together. Sand the legs smooth, so it moves freely inside. Push pins to holes and check correct legs functionality. Use 80mm wheels or print them! Print tyres using ninjaflex or do experiment with any new rubber fillaments. Use M3 screw as wheel axle. Insert printed springs into the legs and don't forget to glue the upper part of the springs to the LG body, otherwise it may break in to the fuselage.

#### See video guide #7

you will need:

<u>CA Glue - medium or thin viscosity CA glue</u> 2x M3x35mm screws 4x M3 nuts 8x M3 washers snap knife or sandpaper





## 7.2 Motor and fuselage small parts

Glue the cylinders to the engine body. Glue the exhaust ring to the back side of cylinders. Be precise for a good looking radial engine. Mount prepared motor setup with ESC to the engine body. You can also print a rear mount motor option with open front side of the engine body and a back-mount adaptor. There are several mounts for different motors. Add a 2 degree shim to add some right-down thrust between fuselage and motor mount. Use hot wire or dremel to cut cockpit holes. Glue the scale cockpit addition, such as seats,

Use hot wire or dremel to cut cockpit holes. Glue the scale cockpit addition, such as seats, instrument panels, sticks and windsheelds.

#### See video guide #7

you will need:

Snap knife <u>CA Glue</u> - medium <u>Activator for CA Glue</u> or similar, but not mechanical is better 7x M3 Screws on motor mount Small screwdriver Your earlier prepared R/C equipment - motor setup with ESC





## 8. Servos and Final assembly

Use servo wire extenders for aileron servos. Install a pair of Hitec HS-81/82 servos with Z bend pushrods for ailerons using hot melt glue or CA glue. Mount the complete upper wing, fuse-lage and landing gear. Clean wing struts by pliers, knife or sandpaper. Adjust the office pins (1 mm / 18-20AWG wire) to attach wing struts. Mount wing struts to the upper wing using pins, front side marked at each strut. You can clean holes for pins with a 1mm drill for easy assembly. Simply mount upper wing with struts to the bottom one. Use and lock all pins at correct positions. Instead of pins you can use screws and nuts according to your preference.







## 9.1 Final completion and setting

Install your reciever, connect batery, setup servos and etc. with your trasmitter, check servo throws, then install the propeller. Check the CG point 0mm at leading edge of bottom wing. Make sure that the battery is placed properly and secured, if battery moves during flight it can shift the center of gravity backwards and the model will become uncontrollable! Never set the ESC with instaled propeller, serious injury may occur!

you will need: Your own Rx/Tx system Battery for your setup... Foam strip for Li-Pol battery Propeller 11x5,5 Scale markings printed to adhesive foil

#### See video guide #6

#### 9.2 Recommended motor setups

or use your own with sufficient thrust and weight according to your target all-up-weight and desired performance and balance. See the shopping tips on the last page.

#### LW setup

3536 class 1200KV motor 40A brushless ESC with BEC 3S 2300–3000mAh 40C Li-Pol battery propeller two blade APC 11x5,5

#### Performance setup

3542 class 1000KV motor 40A brushless ESC with BEC 4S 3000mAh 40C Li-Pol battery propeller two blade APC 11x5,5





## 10. Pilots Please Attention!

For the first flights we recommend balancing the airplane about 5-10 mm forward from the CG tag - nose heavy, this increases the stability (you can use a heavier battery). Also, you can increase expo settings for elevator and ailerons to 60% on your transmitter (this calms the response to your stick inputs). For slow flights you can use full throws the construction allows. Make sure the battery is well fixed in proper possition. Shifting CG backwards will lead to uncontrolable flight behavior.

Increase throttle smoothly and work the elevator to raise the tail first. Make sure to compensate thrust with rudder until lift-off. Use rudder on turns to compensate side-slipping, trim the plane for level flight. The landing is easy especially with hybrid LW plane as the stall speed is significantly reduced.

To restore maneuverability when you feel confident, set the CG to the mark and set expos to 30-50%.

Never fly rear positioned Center of gravity.

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





## Shopping tips

#### Motor

A motor of 35 mm diameter and 42mm length is suitable for standard PLA plane, LW variant can use a shorter 36mm length motor. For 3S battery use motor with 1150-1250KV, for 4S battery use 900-1000KV. Use the appropriate motor mount option

#### LW 3S

Racerstar BR3536 1200KV 2-4S @ <u>Banggood</u> Turnigy Aerodrive SK3 - 3536-1200kv @ <u>Hobbyking</u> (back mount only) LEOPARD LC3536-6T 1270KV (back mount only)

#### High performance 4S

Turnigy Aerodrive SK3 - 3542-1000kv Brushless Outrunner Motor @ <u>Hobbyking</u> LEOPARD LC3542-6T 920KV

#### Servos

Hitec HS81/82 sized mini servos - exact fit Turnigy TR-1160A @ <u>Hobbyking</u> - needs slight adjustment of fuselage compartment Corona CS/DS-238 - needs slight adjustment of fuselage compartment

#### ESC

Any 40A Brushless ESC with at least 3A BEC for 3-4S battery YEP ESC 40A (2~6S) SBEC @ <u>Hobbyking</u>

#### **Propeller**

2-blade APC propeller 11x5.5"E or similar

#### Third party links

Since the original Stearman has been published, the community, you, made a couple of updates and improvements, we find very useful for this model. We think it would be nice if you tip the designers on the Thingiverse page:

Scale Pilot, FPV mount, Rear motor mount, Windscreen frame, etc...