

How To...

General Guide to 3D Printing my RC Airplanes. Please read before printing. Individual informations on a specific plane can be found in the individual build instructions. I hope these instructions answer all your questions, but if you have more, please feel free to contact me: emde.modeldevelopment@gmail.com

Why you should fly 3D printed Airplanes

Better Performance.

3D Printed planes can give you a taste of how it's like to fly carbon fiber planes for just a fraction of the cost. Because of the stiffness of PLA and the relatively high wing loading, combined with low drag they fly as if they were on rails.

More Versatility.

By choosing standard or lightweight PLA, different electronics or different part options, you have direct influence on the properties and flight characteristics of your plane. You can print a light version with better slow flight characteristics or a heavier version with larger motors for higher speed. And of course you can print multiple different planes from the same file.

Lower Cost.

Once you bought the files, you can print an infinite amount of planes and spare parts. No matter how hard you crash, you can always print new parts. And considering the fact that you can buy an entire 3D printer for less money than an ARF RC plane, there's no reason not to start with 3D printing airplanes.

Material

3D Printing Filament

All my planes can be printed completely in PLA, which is the perfect material for printing RC planes due to it's high stiffness, low warping tendency, ease of printing and low cost. ABS may have better impact and temperature resistance, but it will very likely warp during printing and make parts like wings almost unusable. It can however be used to print motor mounts because of the higher temperature resistance. To get different properties, you can replace some PLA parts with lightweight PLA. This new filament type is not as rigid as standard PLA, but expands during printing, which means that you can reduce the flow up to 50% cutting the weight in half. Using lightweight PLA reduces the wing loading, resulting in better slow-flight characteristics.

Other Materials

I always try to reduce the amount of special materials to a minimum, which means that you won't need carbon fiber tubes, magnets or screws. In most cases, you only need something for the pushrods, for example 1mm steel wire. If carbon fiber reinforcements are absolutely needed for strength, it will ONLY be 1mm carbon fiber rods. To glue the parts together, I recommend medium CA glue with accelerator. Of course, you also need electronics to make it fly. The needed electronics will be listed in each individual build instruction.

Printer requirements

To print my airplanes, you need an FDM (Filament) 3D printer with a 0.4mm Nozzle. The minimum build volume changes from plane to plane, but if your printer has a build volume of at least 220mm x 220mm x 250mm (311mm x 250mm for delta printers), you will be safe. It doesn't matter if the extruder is bowden style or direct drive. As long as your printer fits the size requirements and can print a good Benchy, you are good to go.



Slicer

In order to get low weight parts, most files consist of many open surfaces. This allows me to control the internal structure very precisely. Unfortunately, Ultimaker Cura is the only slicer I know that can interpret these special files, so slicing will ONLY work in Cura, but in my opinion, it is a great slicer and it is free.

On the right, you can see how to activate this "Surface Mode". The parts that require "Surface Mode" are stated in each individual instruction. Make sure that "Spiralize Outer Contour" is unchecked, otherwise you might have build plate adhesion issues. All parts are already oriented the right way on the build plate, but they might not be in the center, especially on larger printers because of the .3MF file format. I recommend to print each part individually to get the best results.

Print settings

Nozzle: 0.4mm
Layer height: 0.2mm
Every other setting depends on the printer and material. If your settings produce a good Benchy, they will also print a good airplane. Temperature should be as high as possible without deformation.

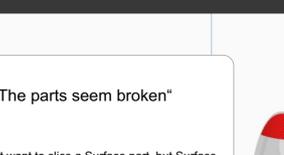


"I only see a shadow, but no preview of the part"

The part is either located very far from the build plate or very small. To fix this, select the part in the Object list on the bottom left, then go to the "Move" section and type in "0" for all coordinates. If that doesn't help, go to the "Scale" section and set everything to 100%.

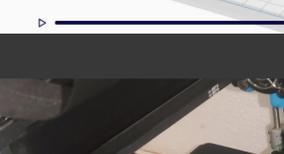
"I can not slice the part despite my printer being large enough"

Check if you have a Skirt or Brim activated. If the part barely fits on the build plate, the extra space needed for the Skirt might be too much. Deactivate the Skirt or, if you use a Brim, play around with the settings to make it fit. If it still does not fit, you can scale it down by about 10%, but if you do this, scale ALL the other parts by the same measure.



"The parts seem broken"

You might want to slice a Surface part, but Surface Mode is not activated. Surface Mode is the most important setting. The parts that require Surface Mode are stated in every individual build instruction.



"The part does not stick to the build plate"

For a successful print, the first layer is very important. Make sure that your print bed is perfectly levelled, if that does not help, use a Brim, especially on tall thin parts like wings.

"My parts suffer from bad layer adhesion"

Increase the temperature in 5 degree steps until you are happy or reduce the cooling fan speed by 25%.

"My parts suffer from warping"

Decrease the temperature in 5 degree steps until you are happy or increase the cooling fan speed by 25%.

Assembly

Before starting the assembly

Make sure that all parts printed well and you are happy with them. Remove Brims, stringing and clean the parts with a knife, scissors or sandpaper. This is very important with lightweight PLA, because stringing is inevitable with this material.

Control Surfaces

Some control surfaces are hinged with a single printed layer, similar to the "elastic flaps" seen on high performance composite gliders. This method is not only more efficient, but also reduces the number of individual parts. When it comes off the printer, it is very stiff. Run a knife through the gap with very light pressure, then carefully bend the hinge until it moves easily. This can take a minute, and should not be rushed. Never bend more than 90°.

Prepare the electronics

Before gluing anything, prepare your electronics. Center all the servos, program the transmitter, check servo and motor direction and make sure all the cables are long enough. Only then proceed with the build. Whenever you glue servos in, pay close attention to prevent glue from creeping in and locking the gears, especially when using thin CA glue.

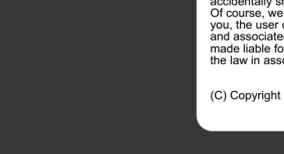
Gluing the parts together

Follow the individual build instructions in the correct order. Always test fit the parts before applying any glue. Guide the cables through the parts first, this will save you a lot of trouble later. Whenever you work with CA glue, be aware that it really likes to stick to fingers. To glue the parts together, add CA glue to one side and connect the parts. If there are drops of glue, wipe them off with a paper towel, then spray the accelerator on the connection. Keep in mind that CA glue cures very fast, so be quick and make sure that everything is connected nice and straight.



After completing the build

If you want, you can paint your model. Test all the RC functions and confirm that everything is moving in the right direction, set your center of gravity, charge your batteries and GO FLYING!



Disclosure

Caution! This is not a toy, but a remote-controlled flight model, which requires responsible thinking and acting by the pilot. Be sure to check the safety regulations for the necessary RC components and be aware of the dangers of rotating propellers or accidentally short-circuited batteries. Of course, we do not have any influence over what you, the user of this product, do with the product and associated RC components and can not be made liable for damages, injuries or violations of the law in association with our product.