

1

Causemann

Model aircraft construction

RC models 1a Quality "made in Germany

designed by

Julian Path

made by

RC scale model kit in Depron/wood/CFK mixed construction

Eurofighter Typhoon XL

For a better overview of which frame and which strip must sit where, use the following plan. The battens can already be cut to their appropriate length. Please do not throw away the remaining pieces! Some of them can still be used in other places.

Required tools:

Sharp cutter knife/scalpel

Ruler/ Folding rule

Sanding block

Sandpaper (various grit sizes 80-320)

Scissors

Permanent markers

Balance

Required materials:

Depron superglue

Activator for Depron superglue

UHU Por

Lightweight putty (e.g. Molto Modellier)

Glass fibre adhesive tape

Required RC components:

50mm impeller (e.g. WeMoTec Microfan or ChangeSun CS11/50) with approx. 6N thrust

Controller 30-45A

2 pieces Miniservo 9g, also available with metal gearbox

linkages for rudders

LiPo battery 3S 1000-1600mAh with sufficient C-value (e.g. 40/80)

Some time ago, when I was at an air show and the Eurofighter in its solo display, rumbling and hissing, conjured up breathtaking flight manoeuvres in the sky, it was clear to me that I would have to have such an aircraft as a model.

A small, handy park flyer made of Depron with a 50mm impeller should be it. Easy and fast to build, inexpensive and with the great flight characteristics of the original. So I set out to develop a pattern, build deep-drawing moulds and build test models.

About two to three months after the start of the planning, the day of truth had come and I was standing on the meadow with the ready to fly prototype and soft knees. So full throttle in, a little push and the Eurofighter was in its element. And it flies perfectly! The calculated centre of gravity is correct, the rudder deflections are correct, the roll rate is great and the plane goes straight ahead as if it were on rails. The speed, the impeller sound and the absolutely realistic flight image fascinate me and I feel like I was at the air show...

The construction effort for this model is kept manageable, so that it can be built comfortably on a rainy day or weekend. Some experience in building Depron models can't hurt. Due to the agility and the high flying speed, you should already have experience with fast motor planes or impeller models. But the flight behaviour of this Eurofighter is very good-natured, predictable and forgiving. So it has everything that a park jet needs for a relaxed after-work flight.

General plan of frames and battens

(schematic representation, proportions can deviate, without scale)

For frame 1, the larger half must point downwards

Motor bracket

CFK flat bar 5x0,5mm 200mm long as reinforcement

The frames 8 to the front of frame 4 all have the same distance to each other. The distance between 4 and 3 is slightly smaller. This leaves about 93mm, as frame 3 should be flush with the front end of the wooden strips.

The construction of frames and wooden strips is now glued to the bottom of the fuselage. Frame 8 is now flush with the rear edge of the fuselage floor.

Now the frame 2 is glued opaque to frame 3.

These instructions should be read and fully understood before starting construction. Then you will not make mistakes later on which you might get annoyed. When viewed on a computer or tablet, the photos can be zoomed in large if questions arise. The kit should also be checked for completeness. A list of all parts can be found on the previous page.

In the first "correct" work step the four wooden strips are cut to size. The measurements for this, and the arrangement of the frames, can be found in the "Overview plan frames and battens" further ahead. We start with the rearmost frame and work our way forward. For the correct distance between the frames, the distance template with the 1 can be used. (Do not be irritated, there is no template 2)

Let us now turn our attention to the current channel. First of all, the cuts in the main part for the flow channel must be cut through to the end with a knife, so that three parts are created.

The middle section is bent forward a little at the end...

The two 285mm long wooden strips are now glued in, so that they end flush with frame 4 at the back and pass through frames 2 and 3.

...before it is carefully pushed through the bulkheads from the front...

Frame 1 is now glued to the front end of these two strips. Attention! The cut-outs for the ledges are not in the middle! The frame must be glued in such a way that the larger half is at the bottom!

The slight overhang at frame 6 can now be cut off flush with a sharp knife.

This is how the hull should look now.

...until it is flush with frame 3 at the front.

For a better stability the area of the air intake with the fuselage bottom can now be reinforced with glassfibre tape.

Then the two side parts are also pushed in and fixed with glue. If there should be small gaps at the transitions of the parts, these can be closed from the outside with glass fibre adhesive tape.

I recommend to start with the coat in the back area. All formers and the edge of the fuselage floor should be carefully painted with glue. Some flash-off time should be allowed for the glue...

Before you press the fuselage shell as shown in the middle first and then work your way forward and backward.

Before we now begin to plank the fuselage, the area BETWEEN frame 6 and frame 7 should be marked by four small incisions with a sharp knife. This is where the maintenance hatch will come later. The markings will also help you to fit the wing spars later.

That still leaves the forward hull section. Once again, carefully coat everything with glue (on both sides) and let it air out a little. Now place the Depron around the bulkheads. Be careful, it can easily tear at the incisions.

For the correct positioning of the fuselage shell it is helpful to mark the center before gluing. You can also mark the line between the incisions in the front area with a pencil as shown on the right. This incision must be placed exactly between frames 3 and 2. The Depron should be bent a little before you start to glue.

Cuts

Now we can get on the wings. These consist of two layers of Depron. The bottom layer is 3mm thick and the top layer is 6mm thick. To make the wing, and thus the whole plane, a bit more robust, we cut two pieces of 450mm each from the 3x 0.5mm CFK flat bar. One is glued flat to the leading edge of the 3mm layer of the wing.

Afterwards the whole surface is carefully coated with glue. It is very important to also coat the surface of the CFRP rod.

Care should be taken to distribute the adhesive very thoroughly. The surface should also lie on an absolutely flat surface, otherwise warping can quickly occur.

The seam can be fixed with tape or paint masking until it is completely dry.

After some flash-off time the 6mm layer is placed on top and carefully pressed. After sufficient drying, the nose and end strips can be sanded thinner. The CFRP rod helps with the leading edge as a guide. For the end strip, the same amount should be sanded away from the top and bottom.

Let's put the fuselage aside to dry off and devote ourselves to the fin. This can be sanded slightly thinner at the edges to please the eye. To give it a little more stiffness you can make a cut as shown in the picture, and glue a 200mm long piece of 5x0.5mm CFRP flat rod into it. Now we are already finished with the tail unit.

...so that the spar protrudes 30mm at the inside of the wing root.

The spars should now both be glued in carefully. It is essential to ensure a flat surface to avoid distortion!

Let's get to the wing spars. These consist of a 320mm long 10x0.5mm CFK flat bar each.

Unfortunately, since the wings are only 9mm thick, this must be sanded to a width of 9mm after cutting to length. Next, the surfaces must be aligned on the table as shown on the right and ideally also fixed. The distances correspond to the widths of the fuselage bottom at these points.

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In the next step we cut two slits for the spar ends into the fuselage shell.

The spars should enter the fuselage just in front of frame 7. Here we can now use our previous incision in the fuselage floor as a reference point, or measure 122 mm from the rear edge of the fuselage. The incision starts about 25 mm above the bottom edge of the fuselage, and measures 10 mm in height.

Now first make a line with a pencil. This is 122mm in front of the rearmost edge of the wing. A bar or a flat bar will help you to align it straight. Once the line is in place, the wing can be cut with a sharp knife. The cut extends 290mm into the wing...

The next step is to set up the assembly slipway. The parts can easily be plugged together. The narrowest strip comes to the back, the middle one to the middle and the big part with the sloping ones to the front.

The fuselage fits exactly into this mounting bracket. The steps mark the front points of canards and wings. The angle of attack of the wing and canards is also correct. The negative V-shape of the canards is also specified.

If you hold the hull against the light you can see the frames well and check before cutting if you really come out BEFORE the frame.

In order to be able to glue the canards well to the fuselage, the adhesive surface must first be adapted to the fuselage using sandpaper.

I recommend cutting out the ailerons before gluing the wings to the fuselage. A depron template is supplied with the kit for this purpose. This is applied to the wing root with the corner at the wing root, as shown on the right. Further machining of the ailerons will follow later.

Now the wings can be glued on with UHUPor.

Followed by the Carnards.

If you like, you can now or after gluing the surfaces you can apply the 3mm thick doublings in the wingtips. These are then ground round for a more beautiful look.

Note: The wing with the "cut off" part at the back comes on the right side.

Next, glue the vertical tail unit butt to the fuselage. The step is located at the trailing edge of the fuselage. Make absolutely sure that the step is aligned straight!

In the next step we cut the hatch for the "technical compartment" into the hull. For this we connect the small incisions which we made before at the hull bottom with straight incisions. If we have done everything correctly, our hatch will extend exactly from frame 6 to frame 7.

These can be pinned to the mounting light with pins for drying. So nothing can warp.

Now the short protruding ends of the wing spars are visible, and we can glue them to frame 7 with styrofoam adhesive. Look out! It is essential to check that the wings are aligned straight. It is very difficult to correct any distortion later on.

To reinforce the wing bonding I still apply a small "throat seam" of Pattex Extreme Repair. This can be smoothed out with a finger immediately after application. This creates a stable and visually appealing transition.

Time to prepare the ailerons. Cut a strip at an angle of about 30 degrees at the front. Then glue glass-fibre adhesive tape to the underside of the aileron as a hinge. Now the ailerons are ready and can be glued to the wings from below.

Now the underwing stations can be glued on as shown. The distances from the fuselage at spar level are 50, 180 and 230mm. Note! Glue the parts at right angles to the wing spar, not parallel to the fuselage! The fuselage tapers narrower towards the front, so the stations would not be straight in the direction of flight.

From the aileron template we can now cut two narrow 45 degree angled strips...

In the next step the two Depron parts for the air intake are glued together as shown. A piece of 3mm CFRP rod protects the spoiling edge during landings.

We glue this to the left and right side of the rudder for reinforcement. The reinforcement is later covered by the PET back bead. So don't worry about the optics.

And glued the servos in. The cables can be led into the fuselage in a short way.

In front of the fin you can now cut a small hole for the battery cables. There are two possibilities to place the controller. Above the impeller in the "Engineering Compartment", or in the back of the fuselage for better weight distribution when using very light batteries (see page 20).

Now the air intake parts can be glued to the fuselage. A further CFRP rod reinforces the sensitive depron edge here as well. I also recommend the application of glass fibre tape in the front area of the air intake, as this can otherwise be bent in the event of a somewhat rougher landing.

Now we adjust the bulkhead for the impeller. In most cases it is sufficient to round off the edge a little bit, so that the inlet ring lies well on the Depron...

Now the servos are mounted. First mark out the positions for the servos as close as possible to the fuselage, cut them out...

Attaching the self-adhesive hooklet to frame 6.

Time to prepare the foil nozzle. The print template is located further back in the manual. It should be printed on an A4 overhead transparency and cut out. Attention! Only glue the grey marked area, otherwise you will not get the impeller threaded. The free part of the adhesive edge can then be sealed with tape or fibreglass tape after assembly.

...and then glue the impeller to the bulkhead as shown.

Installation position of the controller if it is to be installed in the "technical compartment". It is then located above the impeller. The receiver can be mounted to the left or right of the impeller.

Now we provide the motor bulkhead with self-adhesive velcro. This allows the impeller to be removed again later and at the same time it is mechanically decoupled from the fuselage. This makes the model quieter in flight.

The position of the spar in the fuselage. Due to the offset in the spar, the cross-section of the nozzle remains unrestricted. To achieve a proper stability the CFRP parts have to be joined together now. For this purpose we cut two more pieces of the CFRP flat bar, each about 40mm long.

We then glue these with styrofoam glue, overlapping the flat bars in the fuselage. I recommend roughening and degreasing the flat bars on the glued surfaces with sandpaper before gluing. This gives a more stable bond.

Now the foil nozzle and impeller can be mounted as shown on the right. To connect the two wing spar stubs in the fuselage we cut a 124mm long piece from the 10x0.5mm CFRP flat bar, which we then cut off the wing.

As a support surface for the lid of the technical compartment, another support surface can be cut from pieces of the aileron template. The builder can decide whether to close the hatch with magnets or just tape.

... directly ÜBER Glue the stubs of the wing spars flat to frame 7.

Now we can start to build the nose out of Depron discs. The discs are "coded" with grooves on the fuselage side. You start with the two discs with one groove and then work your way out. The outermost small disks have no more groove, because this would be visible later after grinding.

When the glue has dried, we sand carefully with sandpaper with 80 grain size until the edges between the discs have disappeared and a smooth surface is created. The nose can then be fitted to the fuselage and glued in place.

In the next step the rudder linkages can be attached. Probably everyone has his own preferences when it comes to the design of these linkages. From ordinary, bought linkages to self-built linkages made of plywood (see right) everything is possible. For reinforcement you can glue a small piece of CFRP rod underneath, this minimizes the twisting of the rudder.

Now the Eurofighter still lacks its characteristic "Nozzles". These are also printed on overhead foil, just like the nozzles before. The print template is also located further back. But before the parts are cut out, the foil should be painted first silver and then black from the printed side. If you don't want to varnish, you can also stick silver and black plot foil.

With small remnants of Depron you can now close the open triangles at the air intake. The edges at the air intake should be rounded inwards for higher efficiency.

The two nozzles can now be glued to the fuselage with the glue tubes and UHUPor. They are shaped in such a way that they bring practically no additional resistance into the air stream of the impeller. The surfaces in the "nozzles" can still be painted black.

This is what the finished nozzles should look like then.

Afterwards the foil parts can be cut out and glued together. First each one separately...

For the completion the back bead and the cockpit are still missing. These have to be cut to size first. ...and then at the glue line, the two together. UHUPor is very well suited for this purpose as it remains elastic. The small adhesive tubes are folded inwards.

Now follows the cut for the vertical tail in the dorsal bead. This must be 6mm wide. The best way to determine the length is to lay it next to the bead and mark it out. The bead should be flush with the rudder at the rear. On this picture you can see the alternative position of the rudder.

When making the incision for the fin you have to make sure that the incision runs neatly in line with the fuselage.

For a straight cut at the angle of the back bead, either a scraper blade (for ceramic field scrapers) or ordinary scissors can be used.

Of course, the cockpit still has to be attached detachably. For this I use three pairs of small neodymium magnets. In the front third I have glued two small depron cubes to which the magnets are attached.

For the cockpit, first only the edges are cut away. Then you put it on the fuselage and mark the next cuts with a pencil. Here you should rather slowly feel your way to the optimal fit! It is better to cut off a little bit more than once too much.

In front of the back bulge I built a small "bridge" made of Depron, on which a magnet is sitting. The bridge also ensures that the cockpit does not slip to the left or right and is nicely aligned with the back bead.

In the cockpit cockpit I glued the magnets with styrofoam glue. This glue emits much less gas than normal superglue. In the front area I cut a slot for the battery. Two depron strips lead the battery to the bottom of the fuselage. So it can be changed more easily. On the bottom is a velcro to hold the battery.

Before the first flight can take place the C.G. must be adjusted correctly. If possible this should be done by moving the battery.

By adding the centre of gravity scale depron part to the building slipway (see photo right) an ideal centre of gravity scale can be built. The edge can be used as a reference point for the wing leading edge.

For the first flight the C.G. should be 180mm behind the leading edge of the wing (measured at the root)!

Setting values for the maiden flight:

Querruderausschläge (an der Rumpfseite gemessen): +17mm, -17mm, 45% Expo

Höhenruderausschläge (an der Rumpfseite gemessen): +17mm, -17mm, 35% Expo

C.G.: 180mm behind leading edge of wing measured at the fuselage

I recommend a battery life test and a range test before the first flight. If both are passed, you can finally start, the first flight is imminent!

When all the work is completed, the day of truth comes, the maiden flight is imminent. You shouldn't be too afraid of this, the Eurofighter is a very good-natured and, for a small park jet, quite easy to fly. Before taking off for the airfield, all values such as rudder deflection and centre of gravity should be correctly adjusted and controlled.

For the start I recommend a normal hand launch. The Eurofighter can be grasped very well on the underside through the box-shaped fuselage. So full throttle in and with a light to moderate push the plane with the nose pointing slightly (!) upwards into its element. You do not need to be a javelin thrower for this model. The model can be flown quickly but also very slowly, with a high angle of attack. The lower limit should be approached during the first flight with a few fly-bys for later landing. If you fly too slowly, the Eurofighter will slowly take its nose down to pick up speed again. If you overdo it, it will try to make a turn in one direction. A critical stall usually does not occur. Vertical climbs, large loops and fast rolls are no problem. If the model is roughly trimmed and has done a few laps, the moment when you should land will come. For this you choose a long straight approach and turn off the throttle or use very little towing gas. By slightly pulling the elevator you can now start the model and brake it. The ideal way to bring the model to almost zero in a light headwind and simply "set it down" from a low altitude. Landings which involve a lot of speed and therefore longer slipping sections should be avoided, as otherwise you will quickly damage the air intake. In addition, the impeller should always be off when the model touches the ground, otherwise grass and dirt will be quickly sucked in through the air intake at the bottom.

I hope you enjoy building and flying your Eurofighter, and always have a handful of air under your wings!

one-o-four

Julian Path

First flight

Right after takeoff.

Eurofighter in slow flyby with angle of attack.

Print template "Nozzles" for Eurofighter XL

one-o-four

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Print the artwork on overhead transparency in A4 format. Overpaint the foil thinly with acrylic or special lexan paint for RC car bodies) silver, from this printed side, then cut out.

Fold the adhesive tubes INSIDE and stick them to the fuselage

The patterned surfaces are adhesive surfaces

Cable cutout

First glue only the grey marked area! The rest of the glued area is sealed in the model after the impeller has been mounted.

Print template for film nozzle XL Eurofighter

Rear side