Messerschmitt Bf109K

Created by: Martin Elmberg (C) 1998 and 2013

Scale 1/12th

Made for 1/12th scale combat - Aircombat

Engine: .15 IC or 200-400W electro

3-4 servos, 3 channel (aileron, elevator, engine)

April 1998 (Updated February 2010 and February 2013)

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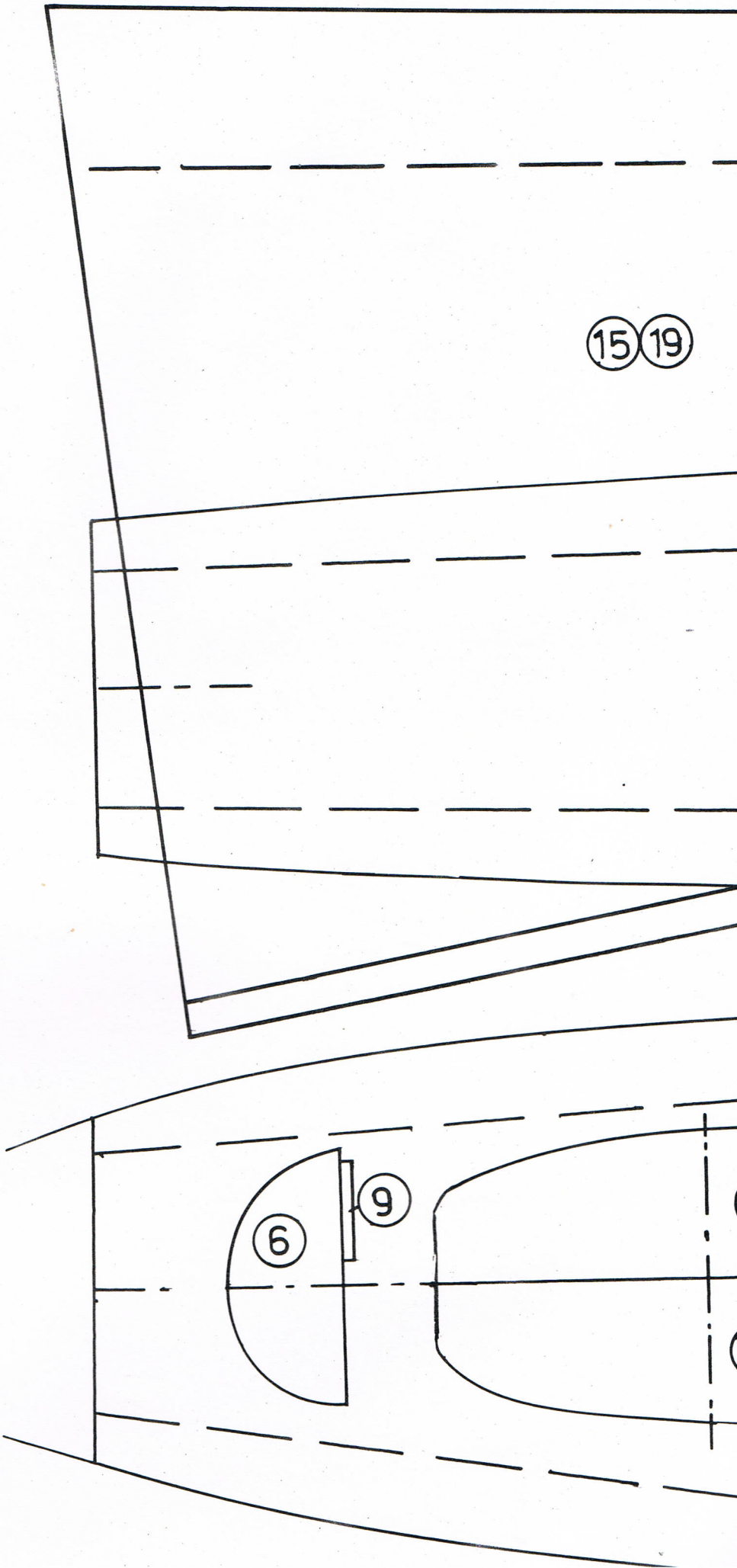
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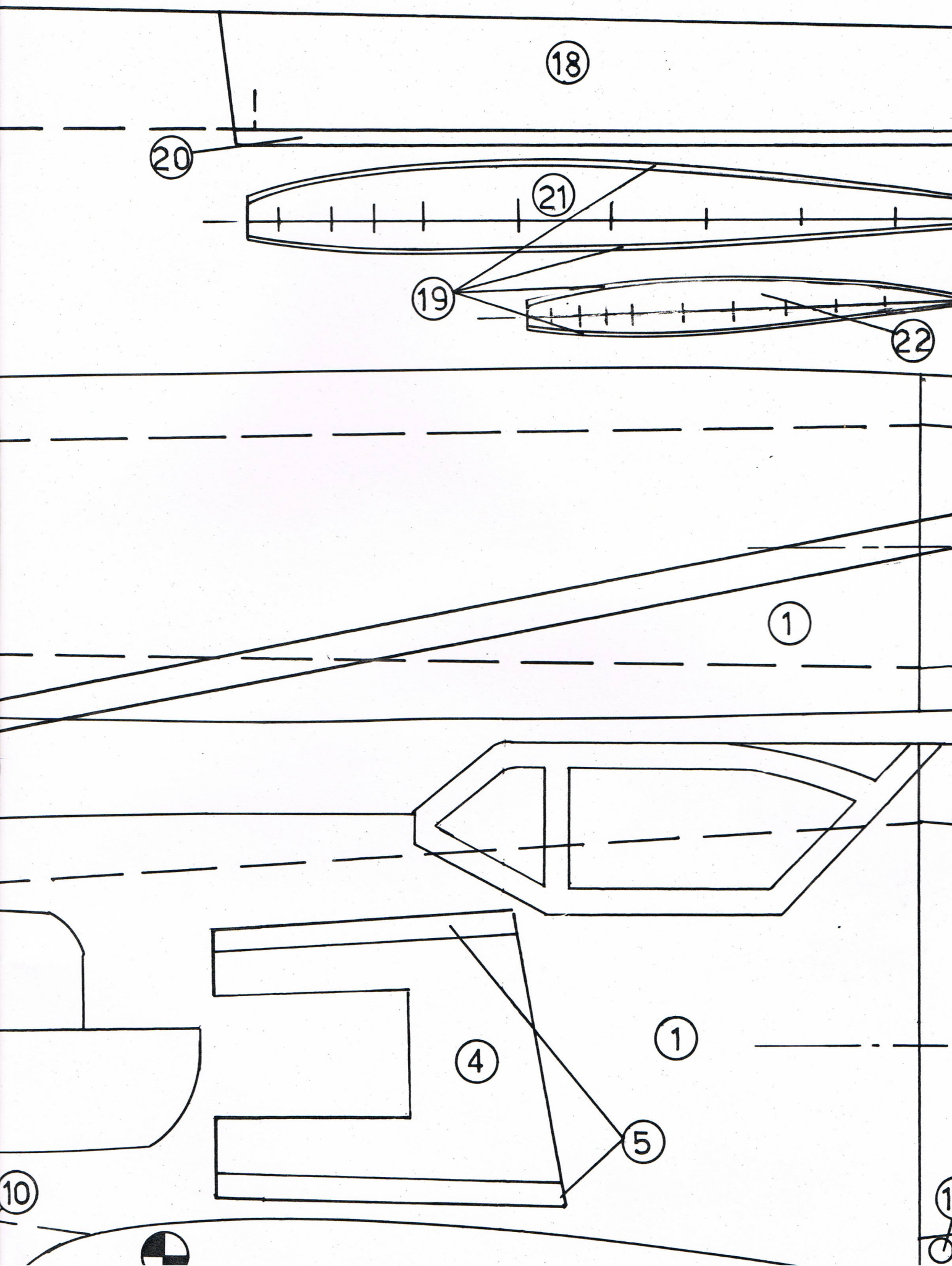
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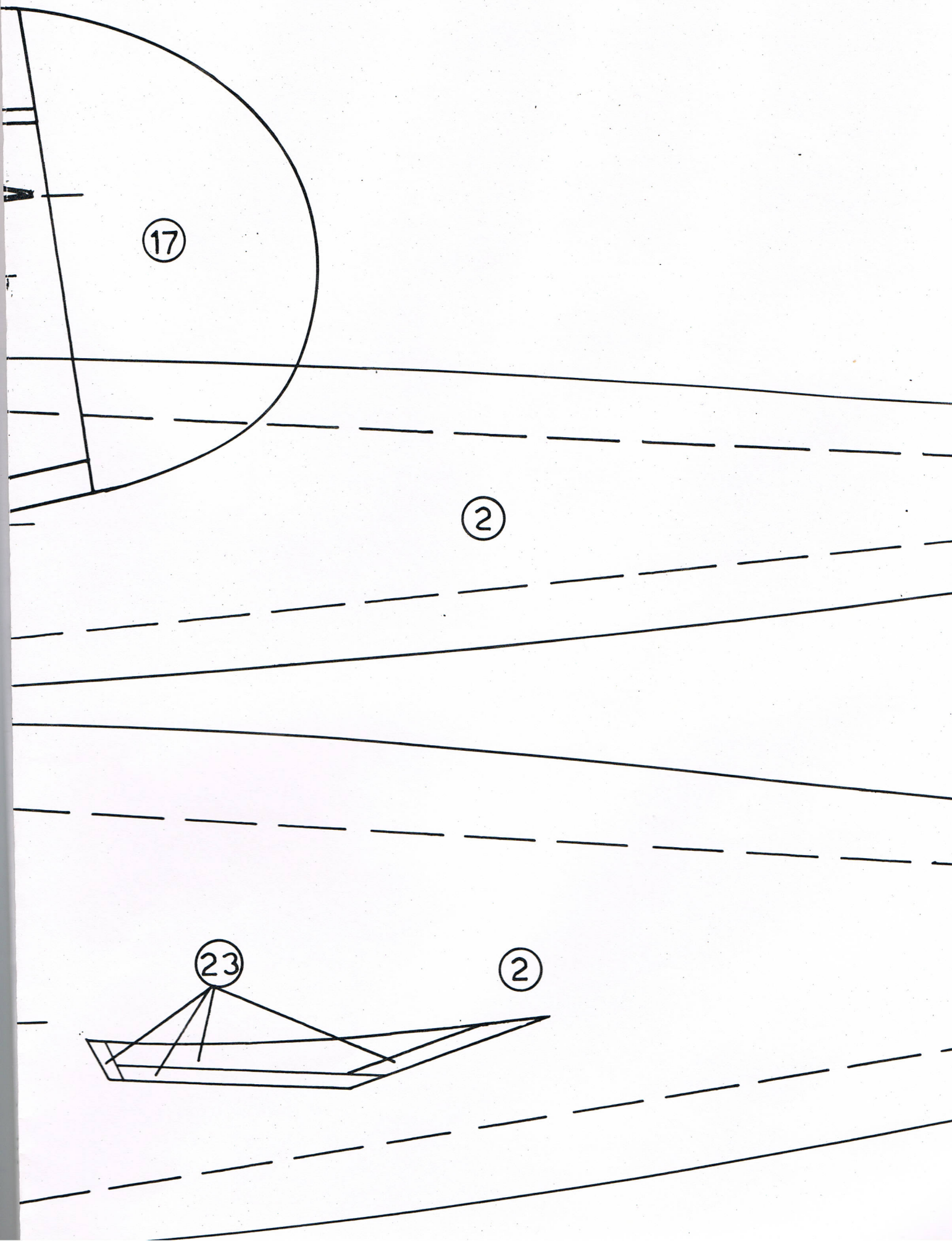
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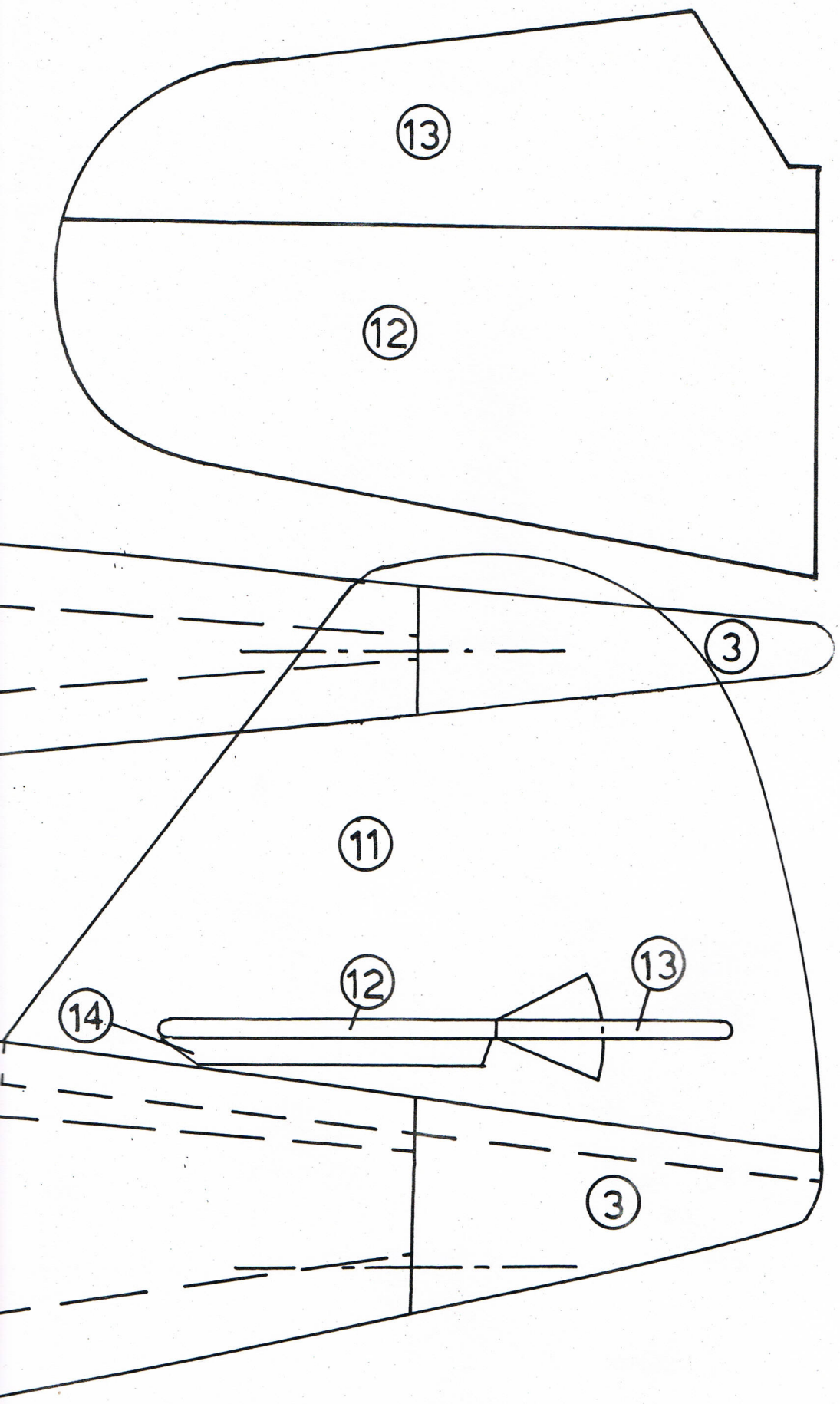
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A Messerschmitt out of foam!

The most well-known "bandit" of all times, the famous Messerschmitt Bf109. In original it was a very effective war-machine, which participated in action throughout all of the second world war. In model it is a funny little fighter, to roam the skies.

Enclosed with this article you will find the plans, ready to be enlarged into proper size. All you will need to build yourself a little Messerschmitt, is this article, some material and a few hours of construction-time. Be sure to use the on-plan rulers to enlarge your copy of the plan into proper size.

A classic!

Just as the Spitfire and the Mustang, the Messerschmitt Bf109 is one of the real classic fighters of WWII. The plan shows one of the latest versions, the Bf109K. It flew in 1944-45, but by that time the Messerschmitt was inferior to the allied fighters. The K-version had a "bigger" version of the Daimler-Benz 605 engine, with an emergency-power effect of over 2000hp - a lot of power for such a small aircraft!

In comparison to the previous versions of the 109, the K-version had a bigger fin, which by the way was made out of wood to ease manufacturing in the, by the last months of the war, more and more cut-off Germany. The canopy was also redesigned to a more "open" type, more commonly called the "Galland-hood". In reality the later versions of the 109 were hard to fly. The K-version was no exception to that rule, but the real ACE:s flew the 109 throughout the war. To the beginner-pilot it was enough having to fly the Messerschmitt. To also fight the enemy could be a very perilous task!

The fact is that we could say that it is the same case in model - you shouldn't try to fly a Messerschmitt unless you've already tried several other 1/12 scale fighters!

Build-up

The 109 is built up almost completely out of foam. Don't let this hesitate you from building a 109 though, as the technique is quite simple really, when you've got a hold of it. The wing is sawed out of white foam, and covered with thin balsa and film/tex. The fuselage is cut out of blue foam using side and top-views.

First you need a thermal-saw. You make it easily out of a few wooden-spars (approximately 1 inch square), and some bolts. To cut the foam you also need cutting-wire. Personally I use Kanthal-wire (0.5mm dia), but steel-wire should also work. Tighten up the wire in you "saw" you made out of the wooden spars, and connect cables for the power to each side of the cutting-wire. As power-source you may use an ordinary lead-battery charger, or the sort. Adjust the power running through the cutting-wire by adjusting the length of the connecting-cable from the power-source. Or use an electric engine speed control for brushed motors. If you use a speed control, connect it to a receiver and use a transmitter to control the power of the cutting wire (that is, the current running through the cutting wire). Or use a servo-tester and connect it to the speed control – it is simpler than using a transmitter and receiver.

Preparations

When having finished the thermal-saw, you should practice with it a little, to learn the technique. Use some scrap-foam and cut it into different pieces.

Then you should use a carpet-knife or an ordinary saw to cut out the foam-pieces needed for the fuselage and the wing. The foam-piece needed

for the fuselage is rather wide, so you may have to glue two pieces together, to form the one piece needed. The glue used to assemble foam-pieces is preferably the PolyUrethane-glue, or more commonly abbreviated PU-glue.

The PU-glue has the special trick of expanding while drying out, thus sometimes flowing way out of the place where it was intended to glue! Caution is needed, and masking-tape or the sort can be used to keep the glue in place...!

Templates

A very important part of the construction is making the templates. The templates are used to cut after, to shape up the wing and fuselage. The airfoil-templates are preferably made out of plywood or similar hard-wood. Be careful to mark up a centreline and positioning-marks on both sides of the templates. Also make a "tongue" in front of the leading edge of the airfoil-templates, to make it easier to start cutting the wing. Note, if you want to skip the balsa-covering of the wing you must add 1,5mm to each side (upper and lower) to the airfoil template.

Templates to cut out the fuselage are made out of cardboard. Be careful when making these templates, so that you make them correct according to the centrelines of the plan! If you cut out an erroneous body, it is hard to get it right again. Apply tape to the edges of the fuselage-templates, to make it easier for the wire to run over them. Be careful to mark up the centrelines correct on all of the templates.

Note that you now have the choice to make your Messerchmitt with a canopy of foam, or of transparent plastics. The original is designed to be hard to break, so the canopy is made as a part of the fuselage. You may of course put a transparent canopy onto it, but be aware of that you in this case create a place where the fuselage easily breaks. If you choose to make a transparent canopy, you must change the side-view templates, and also change the templates used to shape up the inside of the fuselage.

The fuselage

Mark up centrelines on the sides of the foam-piece you are to cut from. Apply the side-view templates according to the centrelines. Be careful to have both templates applied equally on both sides! Then take your thermal-saw and cut out a fuselage according to the templates. After having done this, you can take out the fuselage out of the foam-piece.

Now you have a fuselage that looks quite ok according to the side-views. Apply the top-view templates to the fuselage, and you should be very careful to get it right according to the centrelines! Then cut out the fuselage according to the top-view.

The inside

To be able to use your fuselage, you must remove some foam from the inside. This is done for two reasons: Basically to get some room for the flight-pack, but also to remove weight from the aircraft (this is most important for the rear-fuselage). You divide the fuselage into three parts, according to the vertical lines on the plan. Note that the line dividing the fuselage behind the wing is placed somewhat behind the wing rear edge. This is to be able to have rubber-bands to secure the wing to the fuselage, coming from inside the fuselage. If you do not want it this way, you should divide the fuselage at the rear edge of the wing instead, to eliminate the "drag hole".

To be able to form the inside you need another set of four templates (6-9). Note that the contours depicted on the plan are the inner-contours, that is how the foam you are to cut away looks like. The

templates should be "empty" according to what the plan shows, and have cardboard around the contours instead. Also note that even if the templates are only drawn in "half-circle", your templates should be "full-circle", to make it easy for you to cut the foam. Mark up centrelines (top and side), and as always be very careful in doing so!

Drilling

To be able to get the cutting-wire through your fuselage-part, we now must drill a hole through the two fuselage parts. As we are dealing with foam, no special equipment is needed. Simply use a 5-8mm rounded spar, of appropriate length. Sharpen up the edge of the spar, so that it cuts easily through the foam.

Now take the front fuselage-part, and apply template 6 to the nose, and template 7 to the "middle". Be careful to have the centrelines correct! Then loosen the cutting-wire, and run it through the hole you just drilled through the foam. Tighten up the cutting wire, and start cutting. As you will notice you will cut out a bit of the bottom fuselage too, but it doesn't matter as it is here the wing is situated later on.

Now do the same with the other part of the fuselage, using templates 8 and 9. Be careful in the rear part of the fuselage, as the cutting wire stays at the same place for quite a while, running the risk of overheating and melting through your template. This template is best made out of plywood, to make it cope with the heat.

When this is done, you may glue the three fuselage parts together again. Use PU-glue, and use tape to keep the glue in place (you save a lot of sanding in doing so).

Sanding

When the glue has dried (preferably over night), you have a first start of a fuselage. What remains now is sanding the fuselage to proper shape. You should study some pictures, or a 3-view, of the 109, to understand how it should look like. The original is pear-shaped in its cross-section, and it is important to get the model like that, or otherwise it will loose the real "Messerschmitt-look".

A tips: If you want to avoid much of the sanding, you could instead choose to use four top-view templates instead of two. The new pair is to be non-symmetric, that is the top-template is about one cm less wide, and the bottom-template is some cm wider. By using the ordinary templates first, and then the new non-symmetric ones, you'll have a god start of a pear-shaped fuselage, that don't have to be sanded as much as the ordinary fuselage!

Another tips is to wait with sanding the nose of the fuselage, until the engine and spinner is mounted. In this way, you can sand it to precise fitness.

Tail

The very few pieces of this model that is made out of wood, is the tail-planes. These are made out of 4mm balsa. Sand and adjust the elevator so that it runs light in the outlet of the fin. Cover the tail-planes before you glue them together. Use spars on the bottom side of the stabiliser, fit close to the fin, to strengthen the stabiliser. Don't forget that the elevator must be fitted before the stabiliser is glued to the fin, as it is impossible to assemble afterwards!

Then glue the fin + stabiliser to the fuselage. Make a notch in the top of the rear fuselage, to make the fin fit to place. Use PU-glue to secure the fin.

Engine

The engine is mounted in 3mm plywwod. To get more area for the glue to work on, you should attach four 5mm balsa-spars to both sides of the plywood. Mount the engine so that it points 1-2 degrees down- and rightwards. You may rotate your engine to any angle you prefer, my favourite is 90 degrees of angle having the silencer below the fuselage. The fuel-tank is situated right behind the engine.

The wing

For those who have made foam-wings before, the 109-wing is no problem. For the rest I'll give a brief description on how to do it:

Use a carpet-knife or an ordinary saw to cut out the foam-pieces needed. Mark up the centrelines on the short-sides of the foam-pieces. Apply the airfoil-templates with needles, according to the centre-lines. The outer template should be pointed about 3-5mm upwards at the rear-edge, to give the wing a proper wash-out. This is very important! Also be careful to have the washout equal on both sides.

Then use the thermal saw to cut the wing, backwards along the templates. Cut the top-surface first. Two persons are needed. You should have numbers per every vertical mark of the templates, to let you "count" your way over the template. This is to let you keep the same pace.

Balsa-covering

Save the foam left over when cutting the wings out. This is to be used when applying balsa to the foam-wing cores. Cut notches for aileron and aileron-spars (18 and 20) out of the foam-cores. Prepare for the aileron-installation by cutting a notch for the aileron-linkage from the core.

Prepare the balsa used to cover the wing, by putting two sheets of balsa together. Use tape at first, then dip glue in-between the sheets, and let it dry under pressure. When dry you may cut out the balsa-covering according to the plans.

Place the bottom-covering on the bottom foam-leftover. Put glue onto the covering. Personally I use "white-glue" for this. Then place the wing-core onto the balsa-covering, and apply glue on top of the core. Then place the top foam-leftover onto the top balsa-covering, and place a heavy weight onto the foam-leftover to keep the pressure up. Then you do the same to the other wing-half.

Note, you may skip the balsa-covering but then you must cover the wing with brown-paper and cut the wing core out of thicker foam, like blue or pink-foam.

Join the wing-halves

Now you should apply 16, 17 and 18 to the wing-halves. Before you do that, you should sand all edges of the wing. Then apply 16, 17 and 18, using PU-glue, and tape to fix the parts while drying.

When dry, you may glue the halves together. Sand the wing-root of each half, and then join them using PU-glue. One of the wingtips should be raised by 10cm to give the proper dihedral. When the wing has dried, you should sand it into proper shape, with rather sharp front and rear edges. Round the wingtip off, and adjust the aileron to fit.

Now it's time to attach the throwing-grip to the bottom of the wing. The throwing-grip that is drawn onto the plan is rather small, to eliminate drag. You may make it bigger at will, to make it easier and safer to launch your aircraft. The "grip" is glued to the bottom of the wing-root, at approximately 2-3cm from the front-edge. Then cover the wing with the covering you prefer. Attach the ailerons with two hinges each. See to that the aileron-linkage runs smoothly, and gives enough throw in each direction (at least 5mm each direction).

Paper-covering

When having come this far, you need a roll of brown-paper, to cover the fuselage. The brown-paper is cut by a pair of scissors into fuselage-length, wedge-shaped pieces. The brown-paper pieces are glued onto the fuselage using white-glue or the sort (some wallpaper glue is perfect). Put glue on both the paper and the place on the fuselage where you want to put the paper. Then attach the paper with your hand, using a piece of "white-paper" to dry excess glue off. Cover the whole fuselage (not the inside) in this way. Let it dry.

Painting and decoration

The 109 used several different painting-schemes. You just have to find your favourite in a book, or make up your own. My scheme was used by JagdGeschwader (Fighter Squadron) 54, III Gruppe (Fighter Group), the so called "Grünhertz-geschwader" (Green-hearts). The small symbols where scanned into the computer, and printed on a colour-laser printer to finally be attached to the model.

Be careful not to apply too much paint when painting your fighter. Especially do not put too much paint on the rear parts of the fuselage, to keep the CG right.

Installation

The 109 is a small aircraft, and flies better the lesser it weighs. It is good to use mini-equipment, even if you may use standard-equipment. If you have problems in getting it all into the little fuselage, remember that you can cut deeper into the foam to give the equipment extra space. As push-rod to the throttle, I used an ordinary Ny-rod. As push-rod for the elevator, I used a 5mm diameter wooden-spar.

The accumulator is best situated below or beside of the fuel-tank. The receiver is best placed behind the fuselage-servos. Be careful having the CG where the plan tells it should be! You should use lead to get it right, if it is placed behind the correct CG. It is more important to get the CG right, than to have a light-weight model!

Suitable throws on elevator and aileron is about 5mm on each side, or maybe a little less if you are not used to high-speed, highly manoeuvrable aircraft. The fuel-tank should be of 100cc size.

Flying

Properly constructed and trimmed, this fighter is no problem to fly. You should however be aware of that this is an extremely small and sensitive model. Keep up speed, and don't try too sharp manoeuvres without having enough height to correct any mistakes.

In a fight it may not turn as sharp as some other fighters, but with some nerve and clever flying, a good pilot can outmanoeuvre any opponent. Also, the 109 is a small fighter, that is hard to see and follow for the opponents in the sky.

Modifications

If you want to build another version of the 109, for instance the F or G-version, it is no problem. The main difference is a smaller and differently shaped fin. Just find a correct 3-view, and modify your fin. Also, the canopy looks a little different on the earlier versions, but as this is only painted onto you model, it is no real problem. The E-version is easily built by adding two tail-struts, and reshaping the nose a little.

To be more scale, you can add the special bulges that the later versions had, to the nose of your model. Also, notches for the cannons,

and other scale-details may easily be added. But remember - this is a fighter, not a display-model!

Dogfight!
Now when you have a fighter, why don't you get a friend to build a fighter too. Challenge him for a dogfight or two, and when you are ready, make a trip to the nearest 1/12th scale combat contest you can find. I mean, flying real dogfights must be the most thrilling you could do?!!

/Martin Elmberg (Updated February 2010, original from 1997)

Numbered parts:

1. Front fuselage-part, blue foam
2. Rear fuselage-part, blue foam
3. Tail, blue foam
4. Engine-mount, 3mm plywood
5. Engine-mount spar, 5x5mm balsa-spar
6. Fuselage-template 1
7. Fuselage-template 2
8. Fuselage-template 3
9. Fuselage-template 4
10. Wing-mount, 5mm round spar
11. Fin, 4mm balsa
12. Stabiliser, 4mmbalsa
13. Elevator, 4mm balsa
14. Stabiliser-reinforcement, 5x5 balsa-spar
15. Wing-core, white foam
16. Wing leading edge, 8x12mm balsa-spar
17. Wing-tip, 15mm (3x5) balsa
18. Aileron, 10mm (2x5) balsa
19. Wing covering, 1mm balsa
20. Aileron-spar, 3x15mm balsa
21. Airfoil-template 1
22. Airfoil-template 2
23. Throwing-grip, 3mm balsa

Materials:
1pc white foam
1pc blue foam
3mm plywood
1pc 3x15mm balsa-spar
1pc 5x5mm balsa-spar
1pc 8x12mm balsa-spar
4pcs 1mm balsa
1pc 3mm balsa
1pc 4mm balsa
1pc 5mm balsa
1pc 5mm round spar
Brown-paper