Spitfire

Created by: Martin Elmberg (C) 1997 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)

You have downloaded this plan+instructions+articles as a kind of freeware. To use it, you must accept the following:

You may:

* Build how many models according to the shipped plan as you wish! :)

* Copy the plan and give it to other pilots.

* Copy the complete Spitfire -file kit, and distribute to others.

* Reproduce the plan in any sort of magazine, as long as you don't take money for it. If you publish the plan+articles, you must mention who originally wrote them, and also send me a copy of the magazine, whatever language it is published in.

* You may translate the building-instructions+articles into another language.

You may not:

* Alter the plan, instructions or articles contained in this kit.

* Publish or sell anything contained in this package, for money.

* Make kits of this design, and sell.

January 1997 (Updated February 2010 and February 2013)

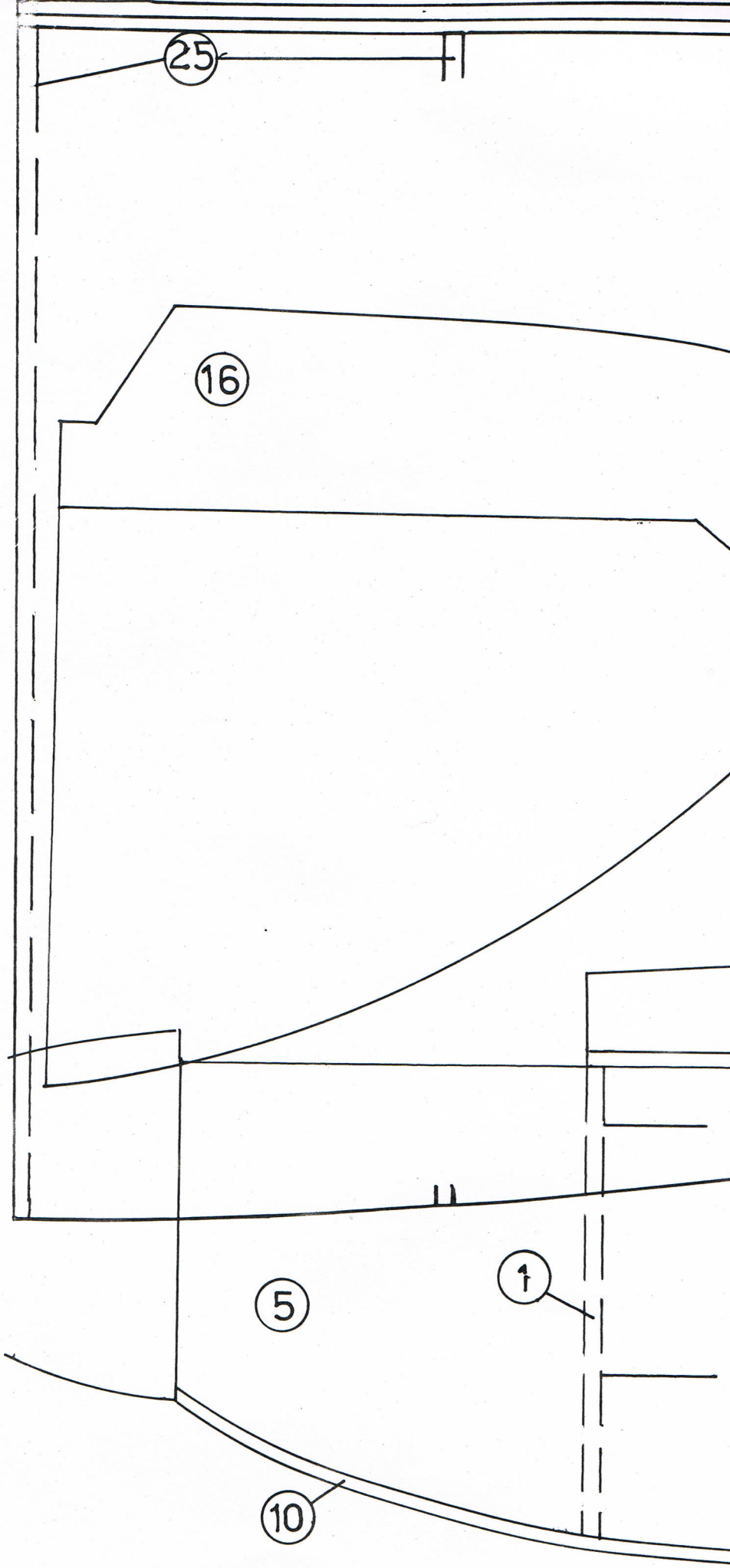
Martin Elmberg

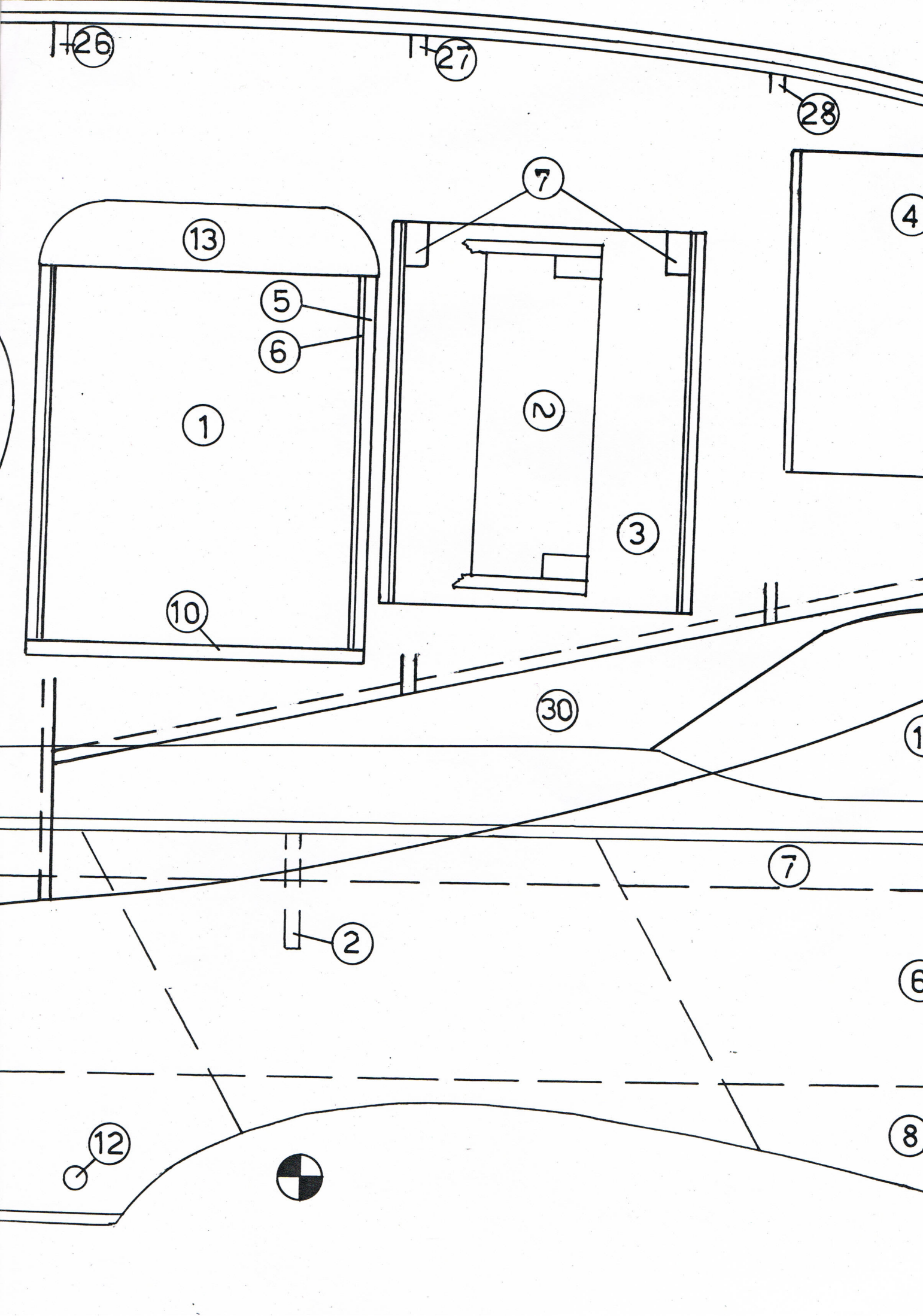
Bergmov. 6A

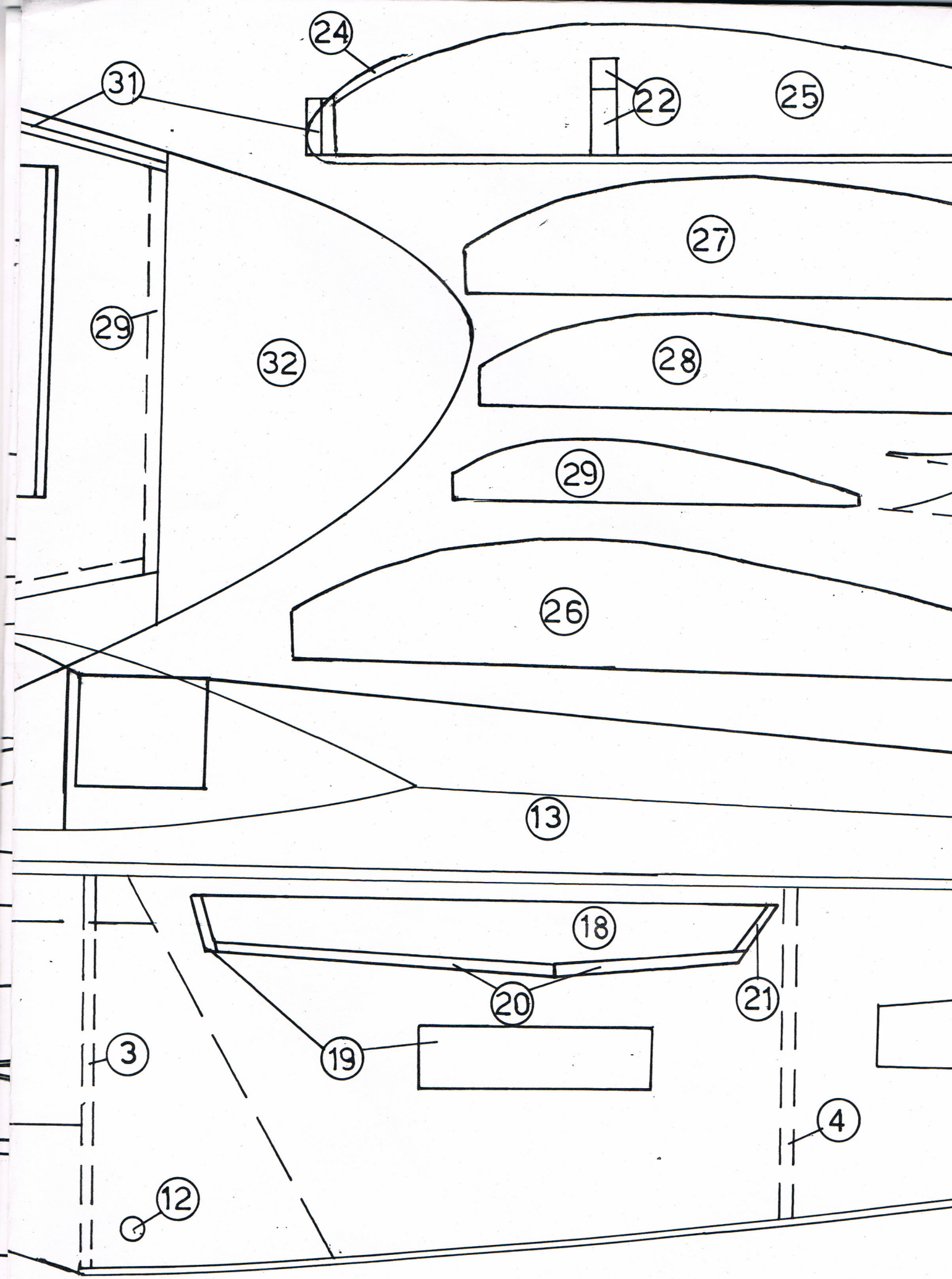
146 37 Tullinge

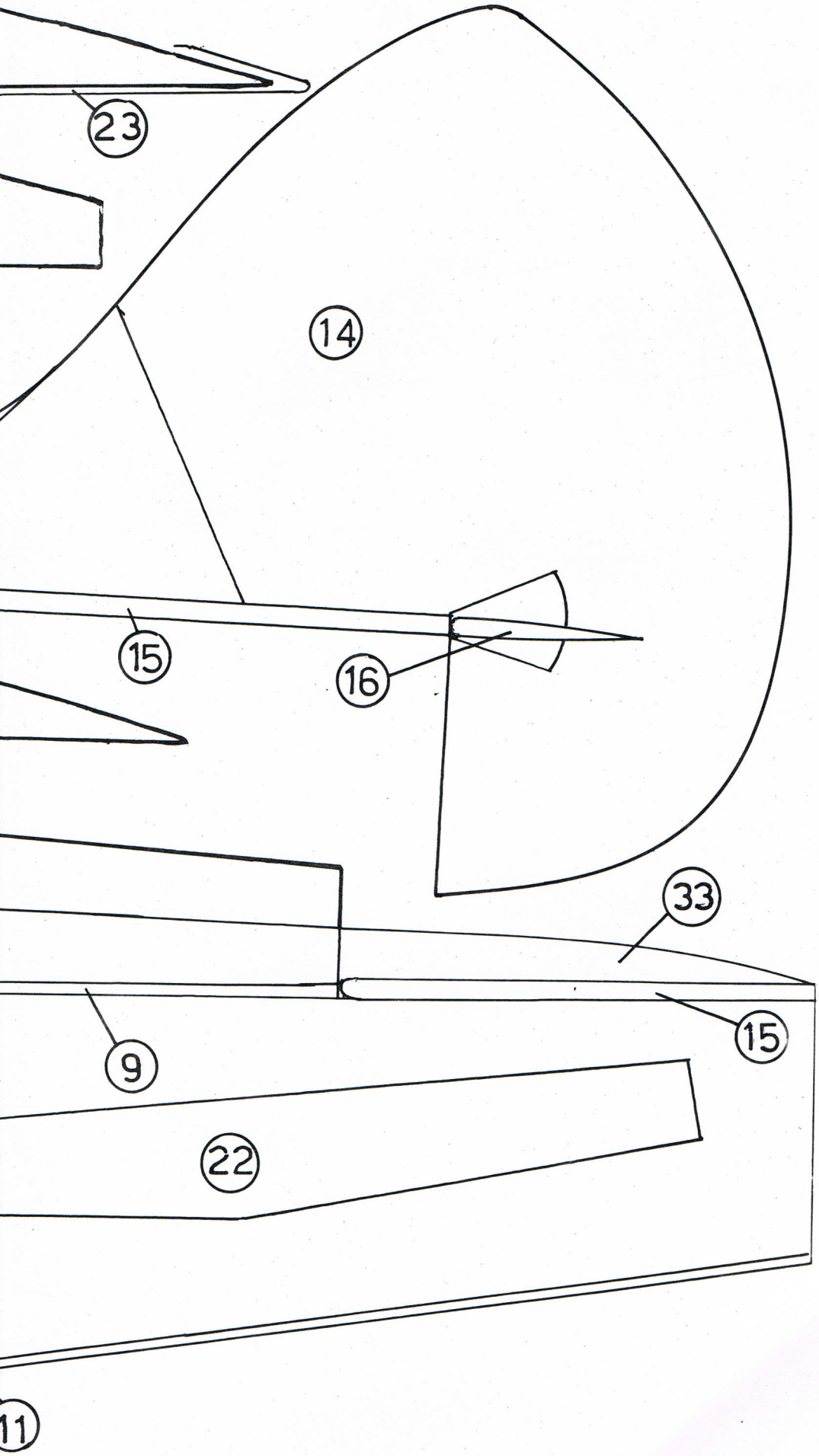
Sweden

martin.elmberg@gmail.com


25
16
5
1
10


26
27
28
7
13
4
5
6
1
2
3
10
30
1
7
2
6
12
8


24
31
22
25
27
29
32
28
29
26
13
18
20
21
19
3
4
12


23
14
15
16
33
15
9
22
11

1/12 scale Spitfire!

The Spitfire is probably the most wellknown fighter of WWII. This design is meant to recreate the outlines of this classic warbird, and give you as a R/C pilot the opportunity to fly it!

The plans

The plans of this fighter are not in fullscale, but you may easily use a copying-machine, to scale them up to full-size. The percentage needed is 141% of the original ones. On the plans, you find rulers that measure both centimeters and inches, to give you a chance of knowing when you "hit the spot".

The plan is separated in two halves, you have to make them fit, when you put them together. This should not be any problems. Also, some of the parts of the drawing are overlapped. At a first glance, this may seem confusing, but I think you soon will find out which lines belong to which part.

The Spitfire

The original aircraft is a beatiful thing, with it's curves and elliptical wings. In model though, these curves may cause some problems. I think I have solved these problems in this design. The main goals of a 1/12th scale fighter, are simplicity, easy and quick to build, cheapness, easy to fly and easy to repair. Keep this in mind when you build your own "Spit".

The version used as original to this design, is the Spitfire Mk.XIV, which may be built with "razorback" or bubble-canopy. Also, you may choose not to have the outer wingtips, thus building a "clipped" version (low-level flying...!). The Mk.XIV is a later version, using the bigger Rolls Royce Griffon engine. You may of course easily change this design into an earlier Spitfire, by changing the fin, and maybe also the parts around the engine-compartment, as the earlier Merlin-engined versions have a somewhat different layuot at the front. Keep in maind though, that the earlier fin is smaller, and may give rise to a more instabile fighter.

General buildup

The design is, as I mentioned previously, made to be very fast and easy to build. The body is built up-side-down, using a flat top. In this way it is easy to assemble the fuselage in a straight manner. To give the Spitfire its rounded upper-parts, a foam-top is added. This top is shaped after the version you want to build - either the razorback or the bubble-canopy.

The middle parts of the fuselage is doubled with plywood, to increase strength. Also, the firewall is made out of plywood, to be able to cope with crashes. At a crash, the firewall is meant to break loose, thus saving the rest of the fuselage from the impact of the crash. The most forward parts will in this case act as a deformation-zone, and will be totally broken. The thought behind it, is that you after a major crash should only have to reassemble the firewall plus engine, and the servos, and maybe some other parts, to get your fighter into "service" again.

The wing is an all balsa Clark-Y variant. The design of the wing may seem fragile, but I can reassure you that it is very sturdy, and able to take a lot of damage. If you do not want the Clark-Y airfoil, you may instead choose another airfoil, and cut the wing out of foam. This is done by having too large airfoil-formers (especially at the wingtip) when cutting the wing, and having the foam-block elliptical shaped. Use a good airfoil, for instance the Ritz-2, or something similar.

If you want a better looking nose (the design is kind of very square), you may either use more balsa-blocks, and sand it into a round shape, or you may mould your own cowling using proper materials.

Start building!

Start with cutting out the necessary parts, as formers and fuselage-sides. We start with the body: Mark up a centre-line on a 2mm balsa-sheet. This will be the fuselage-top (9). Take all of the formers (1, 2, 3 and 4), and mark their respective centers. Prepare the firewall (1) for you engine-mount and throttle-push-rod. Also make holes for the fuel-lines. In the prototype I used a Radio-active 10/15 size nylon engine-mount. Glue the formers to the top. Be sure to put the firewall (1) pointing a little (about 2 degrees) to the left and upwards. This is to point the engine to the right and downwards (remember - you are building up-side-down!).

Adjust the two fuselage-rods (7), and glue them to place. Cut out the fuselage-sides, and sand their rearward edge to make them fit together nicely. Cut out the plywood doublers, and glue them to the fuselage-sides. Be sure to make one left- and a right-hand side! Please note that the plywood-doubler runs in some angle to the fuselage-sides. If you want to make the building easier, you can skip the plywood-doubler, and use 3mm balsa-sheets for the fuselage-sides instead. You can also exchange the plywood-doubler to 1.5mm balsa, thus saving weight. In both cases, you will loose strenght, though. Glue the fuselage-sides to place.

Prepare installation

While you still may access all of the fuselage, you should prepare for radio-installation by assembling the elevator- and throttle- push-rods. After that, attach the wing-saddle (8), and the bottom fuselage-covers (10 and 11). Please note the fibre-direction of the bottom-cover - it should be directed in 90 degrees angle to the fuselage. Now you can drill holes for the rubber-band rods (12), and attach them. They should stick out some 1-2cm from the fuselage-sides, to be able to draw rubber-bands around them, to mount the wing.

The next step is to attach stabilizer and fin. Attach the stabilizer (15) to the fuselage. Cover the elevator (16) with the covering you wish to use for the model, i.e. some iron-on tex, and put it in place in the hatch in the fin (14). Now, glue the fin to its place, be sure not to forget the elevator!

To get the rounded Spitfire-look, you must add the foam-top (13) to the fuselage. First you must choose what version of the Spitfire you are building: An "ordinary" or a "bubble". Then cut out one (or several, it does not matter) piece(s) of foam that fit in to the fuselage top-view. The foam can be a bit too wide, as it is easy to sand it to proper shape later on. Then shape up the foam according to the side-view you find on the plan (and of the version you are building). Then glue the foam-top to its place. When the glue has dried, you can sand the foam-top to proper, round shape. If you do not want to make a transparent canopy, you can use the foam-top to shape the canopy too.

The wing

You start by adding the sheets of balsa that makes the wing-covering. You do this by using tape to fit the sheets together, and then dipping glue into the gap between the sheets. Let the sheets dry under pressure, to keep them straight. After having cut out the wing top and bottom covering, you may start assembling the wing. Please note that the top-covering must be made a little bit wider, as the top of the wing is curved. You start by attaching 25, 26, 27, 28 and 29 to the bottom

covering (23) of the wing. Do the same to both wing-halves. Please note that spar 25 are in two versions, with different hatches. The one with biggest hatch is to be placed at the wing-root. This spar can be aded later on, when asembling the two winghalves together. Also attach the pieces of balsa that are to be placed between 26, 27, 28 and 29, where the ailerons are to be attached.

Now, attach the winghalves to each other, using 22 to get the proper dihedral. Be sure that 22 is properly attached to all of the spars nbr 25! This is vital to the strength of the wing. Now you can start installing an aileron-linkage of some sort. After that, you may cover the top of the wing. Before you do this, you must put wash-out to the wing. You do this by pinning down the leading edge of the wingtip, and having an 8mm piece of balsa under the rear edge of the wingtip. Then you glue the top covering to its place. Be sure to use a lot of needles to secure the covering while the glue dries up. This is to keep the balse down on all the spars of the wing. Do the same to the other wing-half, and be sure to give the same wash-out to both of them.

Sanding

Now, you should sand the leading- and rear edges of the wing. Sand away all unecessary balsa, and give the leading edge its characteristic rounded shape. The rear edge, where the ailerons are to be attached, you should sand as straight as you can. The leading-edge (31) is attached in two layers of 3mm balsa. The reason for this, is the sharp bend of the leading edge. If you want to have a very strong leading edge, you could always put a 1mm plywood string in-between the two 3mm balsa layers.

Sand the wingtips (32) into reasonable shape, and glue them to their places. When the glue is dry, you should sand them to proper shape. Meanwhile you could sand the ailerons to proper shape. Be sure to let them follow the shape of the wing, which is pointing more upward the further to the wingtip you get (due to the wash-out).

To be able to hand-launch your fighter in a safe manner, you should add a scoop to the middle of the wing-bottom. The scoop is built up by parts 18-21, and it should be placed about 1cm from the leading edge of the wing. After that you have covered the wing with iron on material, you should glue some sanding-paper to the sides of the scoop, to give you a good hold even when the model is slippery of oil.

Finish

Preferrably you cover your model with iron-on covering, that should be in some scale-like colour. By using iron-on tex, your model gets tougher to break, and you save weight in comparison to painting the model straight on the balsa. The foam-top is sensitive to iron-on tex, as it melts by heat. It is no problem, though, if you are careful.

If you want to be sure not melting your foam-top, you could cover it with "brown-paper", that is, the kind of paper used to cover mailed parcels. Wet-room wall-paper glue has proven to be a good glue to attach this kind of paper to foam. Use long and narrow pieces of paper to cover with. Drench both paper and foam in the glue, and attach the paper with your hand, drying off any excess glue with a piece of paper (not brown-paper...). Repeat this until all of the top is covered.

Fuselage and wing are then painted in some sort of camouflage. The Spitfire was used in several air-forces, and in several theatres of war, so you have lots of painting-schemes to choose from. Try to paint the bottom of the model in a light colour, so that top and bottom differs. It gets easier to see in the air in this way. At the same time you should have som darker paintings on the bottom of the wing, so that the model

can not "disappear" against a light-blue summer sky. D-day stripes may come handy in this.

Installation

Aileron and elevator are attached with hinges. Use two for each of the ailerons, and three for the elevator. You may use thin plastic hinges instead of ordinary nylon-ones, as the stabilizer and elevator are quite thin.

Now we may begin with the radio-installation. The aileron-servo is placed in the wing, at a proper distance from the aileron-linkage. Throttle- and elevator-servos are placed just behind former 2. Note that you can lower these two servos into the foam-top, to save space for the aileron-servo.

On the prototype, the engine is placed straight up. You may of course mount your engine in any direction you want, but I do not reccommend you to have it up-side-down, as you in this case may get a lot of dust and other stuff into the carburettor, thus ruining your engine. The accumulator should be placed underneath the tank, that is placed right behind the firewall. The receiver is placed as far back as possible in the radio-compartment, to keep it safe in a crash.

Be careful to get the CG right! A fighter like this one, needs to have the CG further to the front than most other model-airplanes. The prototype used a Fox 15. This engine-type is about 50g heavier than most other engines of the same size, so it automatically gives you a proper CG. If you have a lighter engine, you may have to put some lead under the tank to get the CG right. Don't cheat on this!

Test-flight!

First of all, the radio and engine must run perfect before you even think about testing this fighter! If you cheat on this one, the test-flight will probably not turn out good. Then, pick a nice day, with not too strong winds, for your test-flight. Then comes the first test: Can you handle such a small fighter? If you have ANY doubts about this, you should ask a more experienced pilot at your club to perform the initial test-flight(s).

Be sure that the engine runs ok. Then throw the fighter straight against the wind, in a good, slightly upward-pointed throw. If you have built everything straight, your fighter will fly away at a straight climb. If not, you must correct the errors with your sticks, take it up to some height, and trim it into level flight. Then, take a few turns, "feel" how it is to fly this kind of fighter. If you are not used to fly small and fast airplanes, you should decrease throttle when you have gained some altitude, to reduce speed.

Landing the Spitfire is quite easy, as it has a big wing that keeps it "floating". Even so, you should keep up speed, and keep the wings level as you belly-land the fighter. Do not be afraid of landing the fighter in higher speeds than you are used to. The Spitfire can take it, as long as you keep the wings level, and takes her down smoothly.

Further adventures!

After the initial test-flights, you may learn to master this little fighter. Increase throttle, do more advanced manoeuvres, fly a low-level by-pass... Then build a few other fighters, fly against your friends, and why not participate in a combat-contest? Isn't it great to be a fighter-pilot?!!

/Martin Elmberg

Numbered parts:
1. Former 1, 3mm plywood
2. Former 2, 3mm balsa
3. Former 3, 3mm balsa
4. Former 4, 3mm balsa
5. Fueslage-sides, 2mm balsa
6. Doubler, 1mm plywwod
7. Fueslage-spar, 5x10 balsa
8. Wing-saddle, 3mm balsa
9. Fuselage-top, 2mm balsa
10. Fuselage bottom-cover, forward, 3mm balsa
11. Fuselage bottom-cover, rear, 2mm balsa
12. Rubberband-rod, 5mm rod
13. Foam-top
14. Fin, 3mm balsa
15. Stabilizer, 3mm balsa
16. Elevator, 3mm balsa
17. Canopy
18. Scoop, sides, 3mm balsa
19. Scoop, front, 3mm balsa
20. Scoop, bottom, 3mm balsa
21. Scoop, rear, 3mm balsa
22. Wing-spar, 5mm balsa
23. Wing-cover, bottom, 2mm balsa
24. Wing-cover, top, 1,5mm balsa
25. Wing-former 1 and 2, 3mm balsa
26. Wing-former 3, 3mm balsa
27. Wing-former 4, 3mm balsa
28. Wing-former 5, 3mm balsa
29. Wing-former 6, 3mm balsa
30. Aileron, 15mm balsa (3*5mm)
31. Wing leading edge, 3x15 balsa
32. Wingtip, 15mm balsa (3*5mm)
33. Fin fill-out, scrap-balsa

Material-lista:
2st 3x15mm balsa-spar
1st 5x10mm balsa-spar
2st 1,5mm balsa-sheet
5st 2mm balsa-sheet
2st 3mm balsa-sheet
1st 5mm balsa-sheet
1st 1mm plywood
1st 3mm plywood
1st 5mm rod
1st foam-piece (60x10x5cm)

Photo-texts (not included in the zip-file):

1. The fuselage parts ready to assemble.
2. This is how the fuselage is built - up-side-down on the table!
3. The fuselage top doesn't look much when the foam is still in raw shape.
4. The assembled wing-halves. Notice the ailerin-linkage having extra support at the wing-middle, and the well-glued wing-spar...

5. The top of the wing-halves are covered. 8mm of wash-out is built into the wing, by having an 8mm spar pulling the rear wingtip up.
6. The wing leading-edge is attached to the wing. Notice the now sanded fuselage foam-top.
7. The foam-top is covered with "brown-paper".
8. The classic outline of the Spitfire is mostly characterized by its elliptical wings.
9. Ready for the first test-flight, in winter-cold. I wonder if the pilot is freezing under the canopy...?!!