SPITFIRE MK5

Ok so those of you who bought the RCM&E Special back in October 2006 and the April / May editions of RCM&E in 2007 might get a sense of dajavoue when opening this edition of the RCM&E special, and quite rightly so. Indeed what you see before you is yet another scaled up version of the very successful 45" Spitfire produced for the October 2006 RCM&E Special Edition.

So why go larger yet again I hear some of you say. Well it appears you just can't satisfy all the people all of the time, but you can listen and if practical, make amends. The 45" Spitfire filled a niche and satisfied the modellers who wanted a small size Spitfire suitable for having fully rigged in the boot of their car, waiting for the opportunity to just pop out to local flying patch for a 15 minute 'fix'. The 62" satisfied the modellers who wanted to go with 4 stroke motors and retracts for that added authenticity. By all accounts it filled the brief perfectly and both are still selling in large numbers today. However if you ask modellers what would be the ideal size for a Spitfire, more and more will be asking for a 70" plus span model and for engine sizes up to 1.20 size. The 1.20 size engine is becoming more common place now while the 25 size engines, once the main stay of engine sales, is dwindling to a trickle…give it a few years and I reckon the smaller engine will become obsolete in favour of electric power. In the world of scale competition, you tend to see a certain scale appearing and for Spitfires this is any where between 1:5 to 1:7. (from 70" to 90") where the model is still considered a manageable size, suitable for the average club field but at this size the flying characteristics becomes become smoother and far less twitchy. The speed of the model approaches a more scale appearance, the scale detail can be better applied at a much clearer level (you can see what you are doing in other words). Finally the all up flying weight is more resilient; if add a few extra pounds in weight during the build, then a model of this size will absorb it comfortably.

Now fitting undercarriage to a Spitfire can be problematic but once again as the model becomes larger, the wheels increase in size to deal with rougher terrain so the quality of your flying strip becomes less important. The 2007 62" spitfire had good ground handling and the 2010 72" version has even better, mainly due to a little 'designers' licence' employed by cranking the U/C legs forward slightly and making sure the wheels were a good couple of inches forward of the Cof G. This mean the model will only tip on to its nose at a point well after prop ground clearance was lost. So during take off and landing the Spitfire will be less incline to nose over. The model will still have to be balanced with up elevator to avoid the prop catching the ground, but during initial taxing trials on quite long grass, the Spitfire was very well mannered.

So what about the design? Well, I could say the model was a complete redesign but that would be telling 'pork pies'. I have a very simple philosophy when scaling up a smaller design and that is to select a scale where the wood sizes jump a size too. For example 1/16" becomes 3/32", 3/16" becomes ¼" and so on. This means the plan effectively remains in-tack apart from the notes of course. Having said all that, as the model gets bigger it demands to be more scale in appearance. The 62" version employed a simple sheet fin and tailplane which to the purists did let the model down. So with this new bigger version I have now gone for a scale built-up tailplane and the open frame rudder and elevator. Flaps have now also been included which at an AUW of 15lbs do become a necessity especially on small club air strips.

Now from the photos you may notice a difference here from the run of the mill glow 4-strokes currently available. Installed is an ASP 1.20 glow 4 stroke engine converted to petrol operation. Now the reason behind this is one of cleanliness and protecting the paint finish. From years of glow engines and having religiously applied fuel proofer but I'm always disappointed by the ruination of the finish by the glow fuel. So this petrol conversion dose seem the ideal solution.

The conversion kit was supplied by Just Engines and for around the £50 mark, this is a relative cheap way of converting 2 and 4-strokes glow engines to petrol. Just a word of caution with these types of conversion, once you convert your engine, any warranty you may have with you engine is lost, so the suggestion here is to use and old engine to convert. The petrol conversion will cause the engine to run hotter so a well run in engine will work better anyway. Check out the Just Engines web site, for more on conversion information.

As the ASP 1.20 I had was new I decided to run the engine in on glow fuel before running on petrol. Switching between the two fuel is simple and no change to carburettor is required (other than the needle valve setting). The spark plug is the same size as standard glow plug. The only modification you do have to make is to fit a small magnet into the prop boss and then mounting and positioning the 'hall effect' sensor (the pick-up that senses the magnet passing to fire the spark) to the crankcase.

The first flight was made in petrol mode and I have to say the engine and ignition unit performed faultlessly. Because the spark is positive irrespective of speed starting is so easy and the tick over is amazingly slow (far slower than when operating on glow fuel). The other surprising thing is the amount of fuel the engine uses, barely half the amount! This was borne out by the needle valve setting being only ½ a turn open. Take note of this as the engine will flood on the glow fuel recommended 2 ½ turns open and won' t start.

The fuel to oil mix is around the 20:1 mark using a good quality 2-stroke oil. The only slight down side to a petrol conversion apart from the motor running hotter is the power from petrol as opposed to using 10% glow fuel is a reduction in power by about 10%. You will notice the engine will not peak as high as it does with glow but this is a small price to pay.

So let's get on with the build. As with most of my plans, a CNC pack, canopy, lower cowl and exhaust stacks, will be available so order yourself one and lets crack on.

WINGS

The wings are traditionally made over the plan. Cut and pin the main wing spar (centre spar) on to plan and notch the spar at the tip to accept the tip rib W11. Now fit all of the wing ribs remembering to angle W1 to take account of the wing dihedral. Note that the wing ribs have jig tab fitted to the ribs to help you build a twist free wing. As with all the other Spitfires I have designed, no washout was installed in this model.
Now trim and fit all the top spars. Fit the inner leading edge and the trailing edge where the aileron sits. Now sand the top leading edge, spars and trailing edges flush with the ribs, so the wing skin sits flush on the ribs and begin to sheet the top of the wing with 2.5mm medium/ grade sheet balsa. When done, remove the wing panel from the

building board and fit the remaining spars to the underside and trim off the jig tabs. Now trim the wing trailing edge to the exact profile as shown on the plan.

Now construct the other wing panel to the same point but add the wing braces B1 & B2 (using epoxy)

The aileron and flap servo mounting bearers should now be recessed into wing ribs W4 & W5 and W7 & W8. At this point either install the aileron extension lead or install a 'draw' string for this to be done later. Now apply the shear webbing between the main spars as shown on the plan.
Install the retract mounts. The retract mount have been spaced and sized to accept the small air retracts supplied by Unitracts International. Custom made oleo legs are also available to suit the Spitfire and is available as a package upon request.

Now sand the bottom leading edge, spars and trailing edges flush with the ribs.
The wings should now be joined making sure the wing braces are secured with 30min epoxy.

Now fit the wing dowel plates DP1 and the wing bolt plates at the trailing edge.

Begin to sheet the underside of the wing with 2.5mm medium sheet balsa. Be careful not to induce any 'twists' when enclosing the wing with the underside sheeting. Might be an idea to make a wing 'cradle' to support the wing during the sheeting process

Now trim the top and bottom wing skins flush with the edges. Now fit the outer leading edge and shape this to the profile as shown on the plan. As this is made from 12mm sheet it may require a little wetting to aid bending towards the tip of the wing.
Now cut out the wing tips from block balsa or sandwich sheets of balsa and glue the tips on to W11. Roughly shape the tips to shape then finally sand to a smooth flowing profile to match the wing.

Make up each individual aileron as shown on the plan by cutting to shape the bottom skin first. Now trim and fit the leading edge. Now fit the aileron ribs and the aileron horn support block. Finally enclose with the top skin and trim to shape

Make up the individual flaps from a laminate of 1.5mm birch ply and 0.8mm balsa, as detailed on the plan.
Finally a 3" (75mm) wide strengthening glass fibre bandage should be applied around the joint and bonded with epoxy.

FUSELAGE

Each fuselage side comes in seven pieces as depicted on the plan. Note that the pieces that go to make up each fuselage side, are different. This is done because the right hand fuselage side (look towards the front) is shorter to take account of engine side thrust. Note also that the top edges are extended which takes account of the fuselage curvature.

Glue the parts together to make a left and right hand panel and mark all the positions of the fuselage formers. Now begin to apply 25mm triangle to the edges as indicated on the

plan. Now glue into position the wing seat doubler and the forward doublers making sure the thickness of the fuselage formers F1 & F2 are taken into account. Now glue into position formers F1, taking note of the side thrust angle, F2, F3 and F4. Note the curved upper sides of F3 and F4 should not be glued yet. Now chamfer the 25mm triangle on each fuselage side at the tail so the fuselage sides come together at the rear (taking into account the tail post).
Now fit the other fuselage side and check for alignment. It may be easier at this point to use a SLEC building jig for greater accuracy.

Now cut a piece of 9mm x 14mm from sheet and shape as shown on the plan to form the tail post. Pull the tail together and fit the tail post. Now fit formers F5 & F6.

Now curve the top fuselage side and glue these to the upper edges of F3, F4 and F5. You **WILL** need to wet the outside surface of the fuselage to aid bending especially around F3. Be patient bending the wood and only apply gently pressure. You will also need to clamp the tops of F3, F4, F5 & F6 to stop these from springing apart. Masking tape can prove very useful for this job.

Now add the formers F4A and F5A.

You will notice that the fuselage top edges between F1 & F3 overhangs the formers slightly so use a razor plane to bring the fuselage sides down flush with the tops of the formers. When happy with this, apply the top front decking using soft 12mm sheet balsa Now fit the front lower decking using 12mm sheet balsa and trim any overhang flush with F1.

Trim the top rear fuselage sides, flush with the tops of formers F4, F5A, F5, F5A & F6. When happy, fit the top rear decking using laminates of 9mm balsa one after the other

Mark the position of the engine mount and drill the mounting hole into F1. Fix the engine to the mount (without silencer fitted) and fix the mount into position The top cowl sides can now be cut out from 12mm balsa, trimmed and fitted. Now fit the top of the cowl from 12mm balsa. Now trim the front edges so the nose ring sits square to the engine. Use a 94mm (3.75“) spinner backing plate to centralise the ply nose ring before marking its position with a pen and gluing into position. Remove the engine and trim and fit two lengths of 25mm triangle flush with the inside top edges of the cowl cheeks..

The rear lower fuselage decking can now be cut and glued into position. Use the wings to position this correctly.

The fuselage can now be shaped using a razor plane and sand paper, taking note (detailed on plan) of feathering in the lower 6mm fuselage into the upper 4.5mm. Take your time over this and don’t be concerned about trimming well into the 25mm triangle edging, that’s what its there for. Before the rocker box bulges are fitted, the top cowl should be shaped to a smooth flowing finish. The bulges can now be cut to shape from 3mm sheet. Three laminates are applied to each side and then shaped using a knife, razor plane and a sanding block. Use lightweight filler to blend the bulges into the fuselage.

The wing ‘T’ nut mounting bracket can now be installed along with the wing retaining dowel into the wing. Drill the corresponding dowel holes in F2 and adjust to give a snug

fit. Now cut out the ply wing fairings pieces from 0.8mm birch ply. Now fit the wing and slide the 0.8mm birch ply fairing piece into position between the fuselage and wing. When happy with the positioning, glue them along the fuselage edge only. Now cut and fit the 3mm rear fairings linking the fuselage and the back edge of the wing fairing. When the glue is dry, the wings can be removed. The fairing should now stay in position at the correct angle.

Using soft wetted 1.5mm balsa, cut out to the profile as shown on the fuselage side view The piece is rolled in one piece and firstly glued against the fuselage before gluing to birch and lite ply fairings. The forward piece of the fairing from F3 forward, is made from solid balsa and shaped to blend in with the rolled sheeting.

The rear under fairings can now be cut and fitted from sheet 2.4mm balsa.

The under wing radiator housings chin scoops can now be constructed as detailed on the plan. These can be fitted after covering.

TAILPLANE & FIN

The tailplane is made over the plan and up-side down. Pin down the main spar and the trailing edge. Now fit all the tail ribs. The enclosing spar can now be fitted. Because there is a small amount of dihedral, the spar should be slightly kinked in the centre. This can be done by steaming over a kettle for a few seconds.

The leading edge is made from a laminate of three 3mm strips of balsa wood. The first 3mm inner leading edge strip can now be applied. The structure can now be removed from the plan and the 1.5mm sheeting can now be applied. The final two leading edge laminates can now be fitted and the solid tips cut out and added.

The fin is made from solid balsa (two laminated sheet of 12mm balsa) and shaped

The elevators and rudder are made in a similar fashion. First cut the centre from 3mm balsa cut to the profile on the plan. Now cut and fix the leading edges centrally to the edge of the core. Now cut and fit the 3mm riblets. The easiest way to make these is to cut strips of balsa and cut these to length. Mark the positions of the riblets using a pen on the core before fitting the strips of balsa. To tapper the strips to a triangular riblets, use a razor plane and sanding block and carefully ‘feather’ the ribs to the trailing edge.

The rudder and elevator tips are made from solid balsa and these are cut to shape before fitting and profiling. The solid inserts at the base of the rudder and elevator should now be fitted.

The rudder when finished with lock into the tailplane, so check to make sure this occurs.

Glue the tailplane into position remembering to make up and fit the elevator torque rod at the same time. Trim the top rear sheeting to allow the the fin to fit through and located into the tailplane. When happy glue the fin into position and infill with scrap balsa, the gap at the top of the tailplane.

COVERING

It's up to you when you fit the canopy, but cockpit detailing and fitting could be done before cover. The Spitfire is approximately 1/6th scale so there are a number of WW2 pilots available. The type I used was rubber type available from J Perkins stockists which is bought ready to paint.

The prototype was covered using 25g/sqm glass cloth and epoxy supplied by Fibretech UK. With a model of this size and quality I think it pays to cover the model in a finish that is durable.

The open structure of the rudder and elevator was covered with natural Solartex.

The alternative to glass cloth covering would be to use silver Solarfilm.

Fit all the control surfaces with proprietary hinges and secured with glue and pins. Fit all the servos and the all the control horns. For the elevator and rudder pushrod control rods I used on the prototype12mm dowel and 3mm x 200m pushrod ends. Making the complete pushrod may result in difficulties fitting it into the fuselage so F3 may have to be cut to allow the rod to slide through into the centre of the fuselage.

The lower vac formed cowl can now be trimmed and test fitted. Ten hard wood blocks made from 9mmx9mm obechi should be cut and glued into position. Reposition the cowl, drill the ten retaining holes using a 1.5mm drill and securing with M2 self tapping screws

FINISHING

The prototype mark and type was based on current flying full size Spitfire presently own by Guy Black. I met Guy through a mutual friend and when he heard I was building a scale version of his spitfire, he was enthralled and keen to keep track of progress. It seems even the owner of a real Spitfire can have a soft spot for even a model. I decided to be as authentic as possible so I decided to use the exact colours Guy had used when his Spitfire was repainted. Now there is a curious issue with paint in the fact they are 'scaled'. This concept is apparently adopted by Humbrol where by the shading is changed slightly to replicate a scale appearance at distance. So although the colours to my spitfire are authentic Dark green and Dark Earth, they do look different when compared directly to the full size.

As an alternative Spectrum Paints could be used.

The main colours are Dark Earth and Dark Green for the top camouflage and Sky for the under surface.

For the decals either paint the roundels on by firstly marking them out and then painting by hand or use coloured Solartrim. The alternative is to go to pyramidmodels.com and get them to sort you out.
For the squadron markings I painted these on, but again Pyramid Models should be able to help.
To add a touch more detail, some vac formed exhaust stacks are also part of the VAC form package. These are made in two halves and glued together. The join is butt glued so you may need to run a bead of car filler over the joint line, just to lose the edge.

To fix the exhaust stacks to the model, simply use Cyano glue. You will have to trim the back of the exhaust stacks to a slight curve to match the curve of the cowl.

I can almost guarantee that ballast in the form of lead will be required in the nose area to achieve the C of G position. The prototype needed almost a pound of lead in the cowl screwed to the fire wall.

FLYING

Now there's an old saying that if its looks right it will fly right and with a Spitfire you can pretty well guarantee its going to be good; but just how good? Well as this model is based on the smaller 62" Spitfire plan, all the important parameters such as the Cof G and the control throws were pretty well know so test flying the model for the first time did not give the usual in trepidation!

Even the ground handling was a known quantity. If the grass is long she will tip onto her nose from a standing start, but once rolling and with up elevator applied she will taxi. So without further a do the throttle was open and the Spitfire gently gathered speed into gentle 5knott wind at the Hastings MFC club field.
As ground speed increased, up elevator was backed off to a point she balance perfectly on the main wheel at takeoff speed. Then she gently rose of the ground and began climbing with gusto. The undercarriage was retracted and the model just came to life. By the first turn everything felt right about this model, the power, the stability; a real pussy cat. Two clicks of right trim for the aileron and no change to the elevator or rudder and she was flying 'hands free'. Being that little bit bigger than the 62", she felt rock solid and pretty darn perfect

The model I have to say installs great confidence and the feeling that one can pretty well do anything with this model.

The 1.20 four stroke is the ideal engine for the model but as the petrol conversion delivers less power so your throttle stick may always be at the top of the transmitter.

Anyone building this Spitfire will not be disappointed with the flying performance, but as this is a scale model, producing a scale flying performance is the order of the day.
The model will perform most manoeuvres expected by a Spitfire. Barrel rolls and loops are a delight, but the model excels at a low fast past, pull up into a half roll and reversal……brilliant. Landing the model feels very smooth and predicable. With the flap deployed there is very little pitch change, so much so I had to do a low pass to check the flaps had deployed! (they had). Once on the ground and rolling out, keep a little up elevator fed in and she will stay on her wheels.

There are no real vices with this model…it goes where you point it and does what you ask of it…you real couldn't ask for more.