Full-size plan feature *by Mike Roach*

Sopwith Tabloid SS3

Indoors or out? Try this delightful little 80 gram (3 oz.) World War I scout for micro R/C and electric-power, designed by Mike Roach

I first came across the SS3 while researching the more familiar Tabloid family. There are some excellent photographs in the *Albatros Minidatafile No. 6* which allowed me to prepare a working drawing from which I built my first 'foamie', a 35" span version for the GWS gear I stripped out of my Pico Stick. This model weighed about 8 oz. and was just a little too large for the power available, although it performed very well indeed when I fitted one of the twin 150 motors, an 1147 prop and a two-cell Li-Ion battery. By that time the model was fairly war-weary and it has been retired, to hang, hardware stripped out, in the ceiling of my model room until I can bear to scrap it. Not a process I enjoy!

This 24" version was built in response to the capabilities of the *Falcon* range of ultra-light radio equipment. While I was working on the new drawings, I came across Jef Raskin's website (Jef is the inventor of the Click and Drag interface, as well as a host of other innovations, both scientific and aero-modelling) where he too had found the SS3 and had prepared a set of drawings, which differ in a number of respects from mine. I think we will agree to share the honour of 'first past the post' but it was close!

The real thing

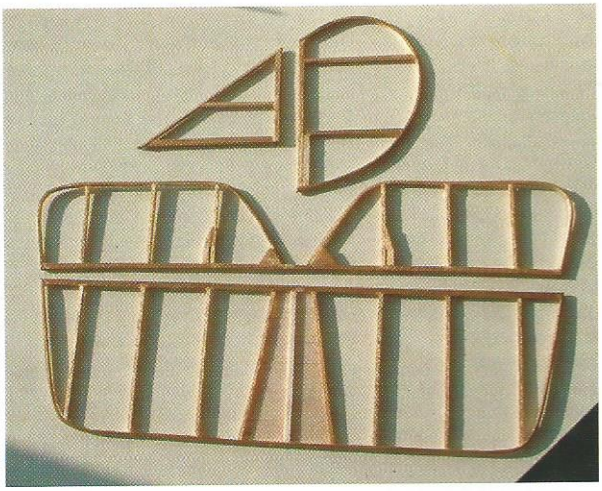
At some point in late 1914, Sopwiths made a number of changes to the design of the Tabloid to meet a Royal Navy requirements. The resulting aircraft had quite a different appearance from the earlier versions: the wings were unstaggered, being orientated about the same c. of g. as the earlier Tabloids and the upper wing was higher above the fuselage - higher even than the protoype. Ailerons were fitted to both wings; steel interplane and cabane section struts replaced the earlier wooden ones. The fuselage alloy side panels ended between the strut locations with a vertical cut-off and a ply panel aft of this line. There was a very obvious dark-coloured circular cut-out in the alloy panel above the front wing spar, possibly an access hatch.

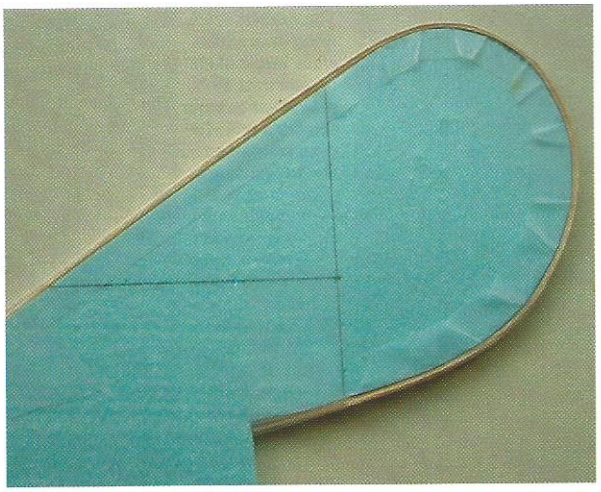
Finally, the fin and rudder were larger, by about 25%, the tail skid was supported by a nest of struts, to give a degree of steering on the ground and the tailplane was redesigned with a straight leading edge. It sounds like a typical Royal Navy response to an existing specification! These aircraft, numbered 1201 - 1212 were delivered to the RNAS during 1915 and served as scouts on Home Defence and in the Mediterranean until the middle of 1916. My drawings are as accurate as I can make them, taking details from the photographs in the Datafile, except that the wing section is more cambered than the original, to give a better flight performance at slow speeds.

Model design

The design of the model follows conventional free-flight practice, heavily influenced by the Albatros CIII of John Watters and recent mod-

This 35" span version of the SS3 was my first 'foamie' and was really just a bit too big and heavy for a GWS A series IPS and seven little NiCads, but when re-motored with a GWS twin IPS and an 1147 prop it flew really well.





FAR LEFT: The tail is a good place to start adding lightness! This has been stained but not sanded.

LEFT: I used blue foam as a former for laminating the tail outlines from two strips of 0.8 light balsa. This technique is very quick, very easy and makes a strong, light structure.

els by Ken Shepherd and is suitable for indoor or calm outdoor flying. My philosophy is that indoor R/C models may be built at least as lightly as free-flight ones, since they will only fly under controlled conditions and will be landed carefully and gently, whereas every free flight is, by definition, a crash landing waiting to happen. So, if 1/16" square longerons and 1/32" ribs seem fragile to you, don't worry. The SS3 and its sister model the three-seater are much tougher than foam models and stand up to the gentle stresses of hangars and gymnasiums very well, but it is important to note that much of the strength comes from working rigging, without which they would weigh more, fly faster and break more easily!

This weight business is important. The model has a wing area of just under 2 sq. ft., so the bare airframe had to weigh about 3 oz. to get within the magic 2 oz/sq. ft. that indoor flying really needs. Since the GWS hardware I used in the past weighs 3.5 oz. that was a non-starter, so I ordered a PU01 motor, HF9 speed controller, two of the 1.7 gram servos and one of the new Li-Poly cells from Falcon Models, which brought the hardware weight down to an amazingly low figure - less than 1 oz. including the two-cell 145 mAh Li-Poly battery. Unfortunately, Falcon's new Rx was not ready when I made my order, but has appeared now, in normal form, or with two servos attached in an integral 'breeze block'. I was offered a Multipex Rx for an extended trial and, although it weighed more than all the other electric bits put together, the model hasn't complained!

You may think that the structure is too lightweight, but I assure you that it flies well and, provided you don't crash, is strong enough for all the loads it is likely to meet. Just look at the free-flight scale models in Mike's Models and bear in mind that they are designed to survive every time they land. Your landings in the Sports Centre are going to be smooth three-pointers, aren't they, so you can build accordingly?

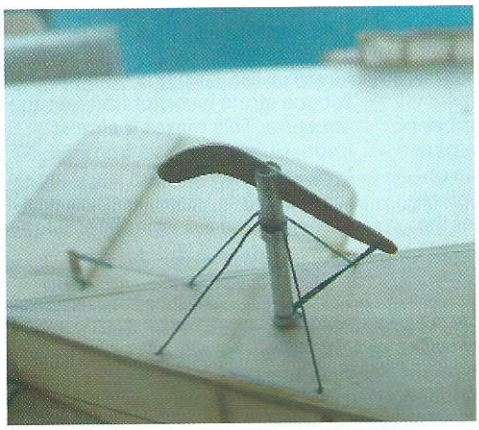
All of my recent indoor scale models have been made from Depron or pink foam and, while I like using these materials, I wanted to do something a little less 'industrial'. Also, the natural finish of the aircraft lent itself to my favourite method of staining the structure as well as the Litespan covering with thinned wood dye, which is cheap, looks perfect and is as near weightless as you can get. The balsa and carbon fibre structure has proved to be remarkably resilient; far stronger than my foam or Depron models and with a very definite 'real modelling' feel. If you wanted to you could reduce the weight by 10 grams fairly easily by using a Falcon Rx (at least 5 grams) and by covering in tissue or one of the very lightweight Mylar films.

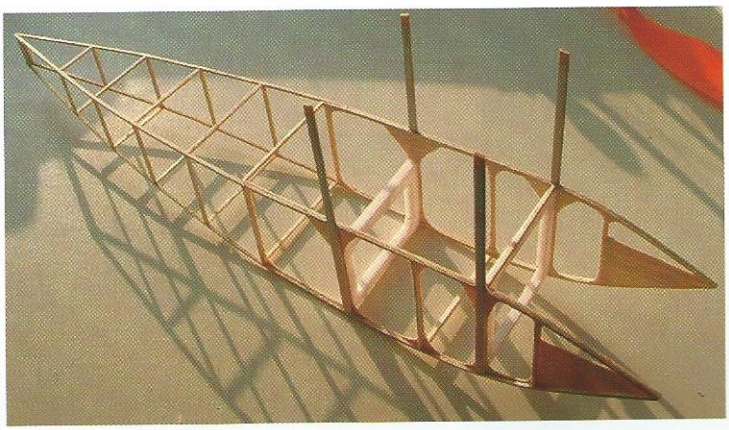
ABOVE: Assembly is straightforward and I used thread for a closed-loop control system - so much more elegant than pushrods. The Sopwith trademark is just drawn on using a pen - I would use Lazertran transfers generated on Microsoft Word now to get a much sharper result, or even print direct onto the Litespan before covering.

Building

I had a set of ribs CNC-cut by Chris Stewart at Falcon Models for a very reasonable £8.00 and drew up the plan so that the span was just under 24" to 1/13th scale. While waiting for the ribs to arrive I built and covered the tailplane, fin and rudder, which weighed 4 grams. As a comparison, a 3.0 mm pink foam set of tail feathers, painted, reinforced and edged for hinging also weighed 4 grams. The foam took about an hour to make, the balsa and Litespan set took at least three, so there's a message there somewhere!

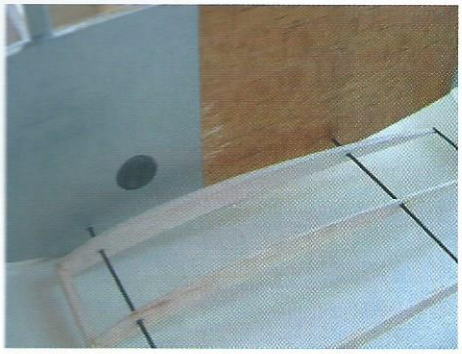
I used 1 mm carbon fibre rod for front and rear spars and the TE of the wings, and a strip of 2.0 sq. balsa for the LE, with 1.5 mm ribs for the top wings and 0.8 ribs for the lower set. I was concerned that the carbon rods would be far too flexible, but when I took the wing panels off the board they twisted, but hardly bent at all. Once covered (bare weight 4 grams per panel, covered, 8 grams per panel) they were as stiff as any conventionally built wing.



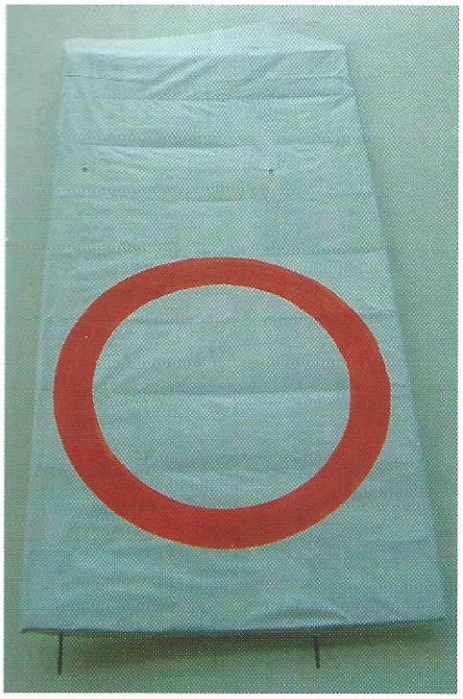


FAR LEFT: The tailskid is so distinctive that it needs a bit of care. Alloy tube, ply, thread and shirring elastic are all that is needed (but it does look a bit furry close up!).

LEFT: This shows the use of light foam reinforcement where you might be tempted to use balsa formers, and also the importance of the 0.8 balsa internal doubler in providing strength to the strut/longeron joints. Fretting it out afterwards is optional but does save a gram or two.

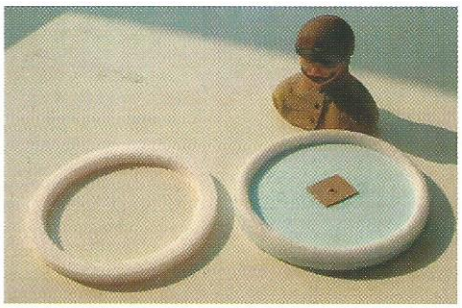


The carbon fibre wing spars just slide into holes drilled in the extended cabane struts. Scale rigging holds the aircraft together.

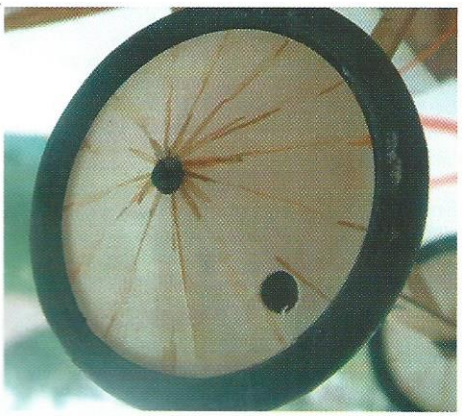


Another good opportunity to use Lazertan or direct printing, but a year ago I drew the markings onto the Litespan using a pen and compass.

A 'rigger's-eye view' up the fuselage shows the carbon-fibre stringers and the route of the closed-loop control threadsI must admit that threading them through the covered fuselage and avoiding getting them tangled up on the way is not a job to be rushed!



The wheels (and Sub-Lt. Smallhead RN) are made from foam.



A paper cone with a bit of artistic licence completes the illusion of spokes and fabric covering.

The building and covering techniques are slightly different from conventional structures. If you want to stain the wood so that it shows though the covering, do so before you start gluing, or it will look patchy. I recommend Coloron wood dye for this job and Antique Pine is just right, applied with a brush. Then, cut out all the ribs and drill the spar holes to match the CF rod size. Cut the spars 10 mm overlength at the root end (the ends of the spars act as incidence pegs, and the protruding tip ends support and shape the tip section) and thread all the ribs onto the rods and shuffle them into the right positions, but set off to one side.

Cover the plan with clear polythene (the backing from Litespan is perfect, but don't use Clingfilm, the glue sticks to it). Then pin down the loaded spars over the plan, blocking the ends so they can't move. Now, one rib at a time, put a dot of cyano on each spar over the rib position and slide the rib into the correct position. I use odourless cyano, which has about ten seconds of grab time, which is enough to make minor alterations before it seizes up. When the full rib set is glued, add the TE and LE, pinning them into position first, then adding a small drop of glue at each joint. I used 0.8 balsa sheet to make the wingtips, but this is too thin for scale and needs an outline of 1.5 to make a scale tip thickness and the task of covering these tricky bits a lot easier.

As soon as the glue dries, the panels can be taken from the plan and covered. You can print the RNAS roundel onto Litespan or tissue using an Inkjet printer, make transfers using Microsoft Word, or paint or draw them on using compass and pen or brush. But I do recommend that you do the latter before covering rather than after, as it is so much easier! Some of the SS3s had Union Jacks under the wings and there are full details of this and all other markings on the plan.

It's best to cover the underside of each wing first. Cut some Litespan (from the long side of the sheet) about 20 mm oversize and paint with Balsaloc where it is going to touch the LE, TE and end ribs. Then Balsaloc the undercamber of the ribs themselves. Wipe a gluestick, such as Pritt, round the outline to hold the Litespan in place, tape down the covering over the wing and remove all the wrinkles, then iron down the edges onto the structure and trim off the excess to within about 3 mm of the wing, then remove from the building board. Fold over the edges using the flat of your iron and seal them tight.

Repeat for the upper surfaces, and then gently shrink each panel a rib bay at a time. This should ensure a warp-free wing. The undercamber can now be ironed onto the ribs, taking care not to crease the covering. Finally, white Litespan can be stained with the same Coloron dye to represent any stage of real weathering, from 'just out of the factory' ivory to 'just about to be written off' pale primrose. Just thin the dye 75% with cellulose thinners and use a kitchen paper pad to scrub colour into the covering. In the immortal words of builders everywhere:- *test on a scrap of Litespan first.*

At 8 grams, each covered and stained wing panel weighed 0.017 grams/sq. cm., this is a significant improvement over a pink foam panel from my Sopwith Sparrow, which weighed 0.027 grams/sq. cm. The figures aren't very important, but the difference showed that I was on the right side of the weight curve.

On the real thing, the struts were steel tubing: those on the model are two laminations of 0.8mm hard balsa, sanded to an oval section, with headless pins inserted in the ends, in order to locate the struts in the wings. Using a card template, I glued each set of interplane struts into the upper wing and when set (two minutes using odourless cyano) I dry-fitted each set into the lower wings.

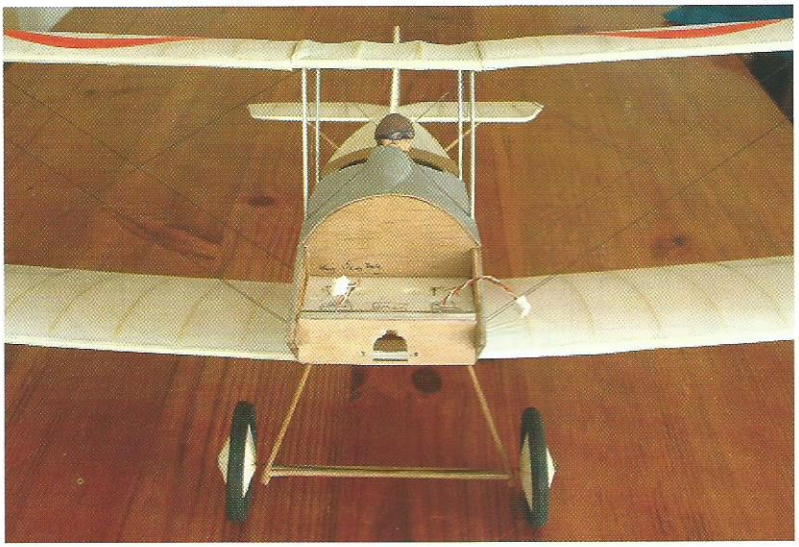
The results were very encouraging and, as soon as the motor and battery arrived from Falcon, I moved on to the fuselage. I do recommend that you have the hardware to hand and build it into the fuselage as you progress: I did it the other way round and got a bit frustrated by the size of my thumbs compared with the components!

Fuselage

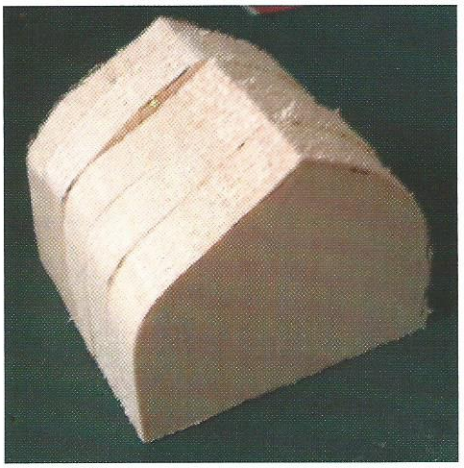
The fuselage is simply a 1.5 mm square balsa strip box with the cabane struts incorporated into the structure. This makes it almost impossible to remove from the building board without breaking the butt joints between struts and longerons, so a 0.8mm internal

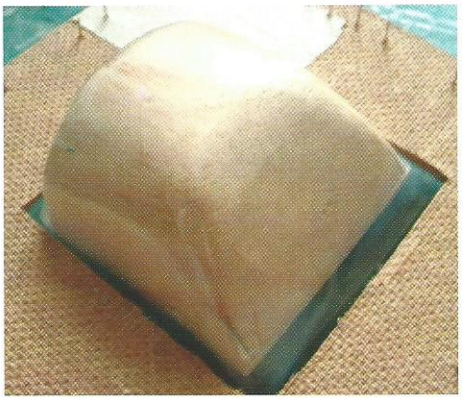
Specification

Model:	Sopwith Tabloid SS3
Type:	Lightweight R/C Scale
Designed by:	Mike Roach
Scale:	1/13th
Wing span:	24" (609 mm)
Motor:	Falcon Models PU01
No of channels:	Three - rud./elev./throt.
R/C gear:	Multiplex Micro Rx Falcon Models HF9 speed controller Two FM 1.7 gm. servos.
Battery pack:	Two-cell 145 mAh LiPoly
Construction:	Balsa/ply/carbon-fibre
Covering:	Litespan (stained)
All-up weight:	3 ounces (80 gm)



LEFT: Coming along nicely; the Falcon PU01 motor just screws to F1. You can add side-thrust with a bit of packing. Spot the mistake on the centre-section covering - it should be cut across the grain like the wings, then it would not sag so much between the ribs.





doubler is glued over the front portion. Now the side can be removed from the building board and the doubler trimmed out to the lines shown on the plan. When both sides are complete they can be joined with the F formers and strip balsa (reinforced with Depron, perhaps - see the photos) and the rear part covered. Only then can the outer doublers and top coamings be glued in place, so that they trap the covering neatly underneath them. I strongly recommend staining raw balsa to represent ply and I sprayed Tamiya flat aluminium (XF16) over the rest.

The upper and lower cowlings were moulded from thin acetate and most of the radio gear fitted neatly under the upper cowl, which should be hinged on its front edge for easy access. The servos live under the lower cowl and are linked to the control surfaces with thread. I might use 0.5 mm CF rod next time, as I found it difficult to get the surfaces properly centred using the closed-loop system. Once the model has flown and you are happy with the servo operation, fix the lower cowl in position.

Flying

Once again, I found myself in a small sports centre without having test-flown the model out of doors, but the winds along the South Coast in September were just too strong for me. At take-off, the SS3 needed some right rudder and after a couple of hops, I 'committed aviation' for a couple of circuits. Apart from falling into the left-hand turns, she performed well. The balance point seemed about right (no ballast needed - amazing!), but I wanted open spaces to get her properly trimmed out. After putting in about three degrees of side-thrust I waited until the next calm evening, when to my delight she met all my expectations. The motor just hummed away and the plastic prop provided by Falcon gave enough thrust to climb to 50 feet or more for a very enjoyable 15 minutes.

The whole point of the exercise - flying qualities are excellent and in the big outdoors on this grey October afternoon I had 15 minutes of relaxed circuits and bumps.

Size matters

Could I build something smaller? To be honest, I was disappointed with some aspects of this model, particularly the covering, which I found very difficult to apply evenly. However, some time ago I committed myself to building a Peanut Sopwith Bee and the very pleasing results and the superb flying qualities of this little 3 oz. model has given me fresh impetus. A twin for two PU01 motors is also on the cards - I've just drawn up a DH10 with a 40" wingspan (5 oz.?), but I shall need to go back to Falcon Models and let my credit card discover the joys of flight!

But first, I'm building a larger SP600-size Sopwith 'on the Net'. If you look up *RC Groups/showthreads* and search for (wait for it) *Mike Roach's Sopwith Aviation Limited* you'll see what I'm getting at.

As always, please get in touch with me at *roachfoxwood@aol.com* or on 01202 477553.

Falcon radio control equipment is available from: *www.falconmodels.uk.com* 0207 267 9049.

TOP: I tried to mould the cowling in one piece but the sharp edges kept tearing the acetate. Eventually I cut the mould in half and 'push-moulded' the top and bottom separately. This is the balsa before getting out the razor plane.

ABOVE: And here is the push-moulding for the upper cowl.

FAR LEFT: I really like the way the stained balsa contrasts with the sprayed aluminium paint. I suppose some clear varnish on the ply would be appropriate.

LEFT: With the hardware as shown I had no need for ballast. The HF9 SC fixes to F1, the battery to the fuselage plate and the Rx to F3. The servos are underneath, between F1 and F2.

Jef Raskin's website can be found at *http://humane.sourceforge.net/home/* where there are a number of very interesting aeromodelling articles, as well as a host of assorted diamond chips and gold nuggets.

Mike Stuart has a brilliant free-flight website at *http://www.thestuarts.freeserve.co.uk/index.htm* which is packed full of pictures, information and mouth-watering plans, all of which could be converted to R/C or just enjoyed for what they are. ■

Complete, ready to fly. The wingtips are from 0.8 balsa and are just too thin for scale and too difficult to cover neatly. A laminated tip would have been better, but I think the overall effect isn't too bad.