SOPWITH'S GORDON BEN

Mike Roach's electric powered version of this 'so nearly famous aircraft'

I bought an old copy of 'Sopwith, the Man and his Aircraft' for Christmas last year and took it (and 20 sheets of A4) to Spain to have something to do when it was raining. However, an hour in the sun quickly becomes two or even three after a glass of wine; browsing sleepily through the Sopwith photos, drawings and words was as near to heaven as I expect to get. I settled two things fairly quickly - firstly, to restart work on my SP 600 Sopwith Churchill and, secondly, to build the Sopwith Gordon Bennett Racer as an essay in SP 300 lightness.

When Harry Hawker got back from his Australian adventure in early 1914 he had three months of flying experience in the Tabloid, followed by a long sea voyage back to England. Impatient to put his experience to good use, he went straight to the works and persuaded Tom Sopwith to make two racers for the Gordon Bennett Trophy to be held later that year in America. The first was a relatively standard Tabloid that eventually surfaced as RNAS Serial 1214. His second was a more ambitious aeroplane, based on Tabloid wings but with a slim-line fuselage, a radial cowling for the 80 hp engine and a very different tail unit. Of course, they never competed in the race: the Admiralty impressed both as unarmed scouts for the RNAS and 'Slim Line' became 1215, the subject of this article. Together with 1213, a Tabloid built for an Italian firm, but completed for the RNAS, they became the 'Fast Flight', on Home Defence duties at Hendon. 1214 eventually went to France and was fitted with a Lewis gun on its starboard side.

The wings

It seems likely that the wings are of production Tabloid plan-form, but the struts (which are oval-section steel) are spaced much closer together than normal and there is only a very small amount of stagger. The wings are further apart than the Tabloid but dihedral is evident and lateral control is by warping: the warp pulley can be seen above the wing in the side-view. Most unusually, there is an obvious fairing between the fuselage and the top of the lower wing. In the front-view it

Completed model all set to fly. Mike produced his drawings for the Racer from photos in 'Sopwith, the Man and his Aircraft' and various internet sources. Note big Union flag marking on lower wing underside; complex mixture of line thicknesses - plan has details.

FULL SIZE PLAN FEATURE

NETT RACER

appears that the lower centre-section leading edge curves up to meet the fuselage, but this may be a trick of the light. The trailing-edge is definitely not a straight line, but it is just possible that there is a cut-out similar to the upper centre-section, rather than a curved edge. There is an obvious gap between the end ribs on the centre sections and the outer wings, where they are joined together.

Fuselage

If the wing is ordinary, the fuselage is utterly extraordinary. Nothing like it comes out of the Works until the Snipe and the Dragon, four years later, and they are ugly in comparison. There is a large radial cowl, tapering down to a slim and elegant tail and rudder. The cowl must be the same diameter as the Tabloid's, because the same 75 hp le Rhone engine is used, but the side taper is straight from cowl to fin. The top longeron is level with the centre line as far back as the front of the cockpit, but then top and bottom longerons taper equally. The top fairing rises slightly to the cockpit opening and its generous windscreen. The tailskid is a complicated affair with an inverted pyramid supporting both the skid and its bungee. A similar device is found on the SS3 Tabloid, as well as earlier Sopwiths. The undercarriage is more upright than normal and the wheels have larger fairings.

The tail

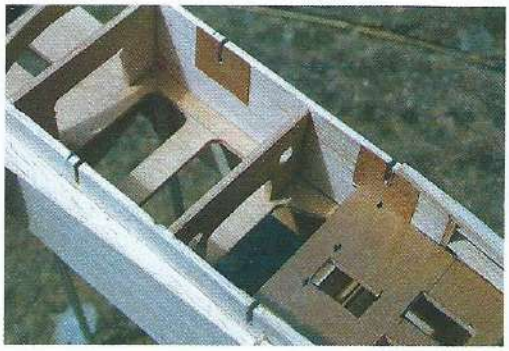
The tiny fins and rudder come straight off the photograph, but, although hard to make out, it seems that the tailplane was slightly larger than the semi-circular one fitted to the Tabloid. Sopwith's two-seater scout had a similar layout and may have been used as a pattern. Hawker clearly believed that a small fin and rudder was adequate: the other Racer also had a much smaller rudder and fin than the standard Tabloid, though of a very similar shape.

Markings

I suspect that Hawker and Sopwith planned to make the Gordon Bennett as distinctive as the Schneider Trophy winner. The cowl would have been polished alloy, the front panels red and the rear of the fuselage blue, with a white cheat line between the two. His signwriter would then have added the magic word 'SOPWITH' to the sides. But as photographed and sold to the Admiralty, it seems that only the cheat line remains. It is possible that the forward fuselage is red or very dark stained and varnished ply. The serial on the fin (in the distinctive typeface of all the 1201 - 1215 Tabloids) and the trademark below it must be in black. The trademark is slightly different from usual, more extended, with the letters more widely spaced. The front-view shows that

Below: motor bay showing the ply plate motor installation bearer and the balsa rings at the "firewall" that create the shape of the fuselage front end.

Below: fuselage centre section viewed from top shewing the servo installation try. Bottom: detail showing motor cowl installaed and main undercarriage.



under the lower wings, Union Jacks had been painted to provide a recognition feature. Otherwise the aircraft seems to have been covered in plain varnished fabric, through which every detail of the fuselage structure is clearly visible. The rib tapes are very obvious.

Conclusions

I doubt very much whether the Works realised the extent of Hawker's vision in this aircraft, since it is so unlike anything that had gone before and is not really reflected in later Sopwiths. It was a pure racer. Had the Schneider's 100 hp engine been installed (it was lost when Hawker crashed the landplane conversion at Weybridge) it might have been a winner, but was eventually written off in 1915 after some months of Home Defence scouting. So very nearly a famous aircraft!

The model - planning

I drew up a plan of 1215 based on the photos in the Sopwith book and a bit of pictorial detective work and a spell on the Internet at 'the Sopwith Cook-Up' and other sites. The Cook-Up has pictures of a scatchbuilt plastic model and a three-view of 1215, also based on the photos in the book. There were a number of things wrong with the accompanying drawing and the model but there is some useful information, which I had managed to miss, such as the clear outline of a Union Jack under the lower wings.

Transferring the photos to a plan probably took me as much time as it did Hawker, Sigrist and the Works to draw the original. It brought home to me what Hawker knew at the outset but Sopwith and Sigrist probably did not - that the only Tabloid components used in the Racer were the wings, and even they were drastically modified! The scale rudder is tiny, smaller even than the Tabloid's, and it looked to me far too small for adequate control. So I had to have a scale wing warping system to provide control in the rolling plane. This fell in nicely with my feeling that a thinner wing section would be more realistic and, in any case, little servos cannot warp a thick wing that has been covered with heat-shrink film!

So undercamber it was, but as the plan shows, the rest of the structure is conventional balsa-bashing. It is covered with my favourite white Litespan, stained and dirtied with various paints and dyes and decorated with permanent marker to represent a tired, scruffy and war-weary aircraft, about to be replaced by a faster, stronger and better-armed Bristol Scout. But in late 1914 it was the fastest, most glamorous Sopwith around, with a mean-looking radial cowl: almost a famous aircraft.

Careful study of the plan and the model will show that I have made a small number of weight-saving changes, brought about by seeing the

great strength given to the structure by the wire bracing. I used Drennan's 15 1b Pike Wire, secured by Drennan's slim crimps, both readily available from any fishing tackle shop. The wire is also available in 12 lb weight, which I am sure would be more than strong enough for this size of model - and would make using the crimps a lot easier! My model weighs only 16 ounces ready-to-fly, but I am sure that you could make 14 ounces just by some simple reductions in component weight. Less than this, and I am not sure that it would have the strength to land! Gaymer's Cider do a three-litre bottle of their 'Old English', which, especially after you have drunk most of it, makes a very scale-looking cowling for a mere £3.50, including the hangover. It's also very light!

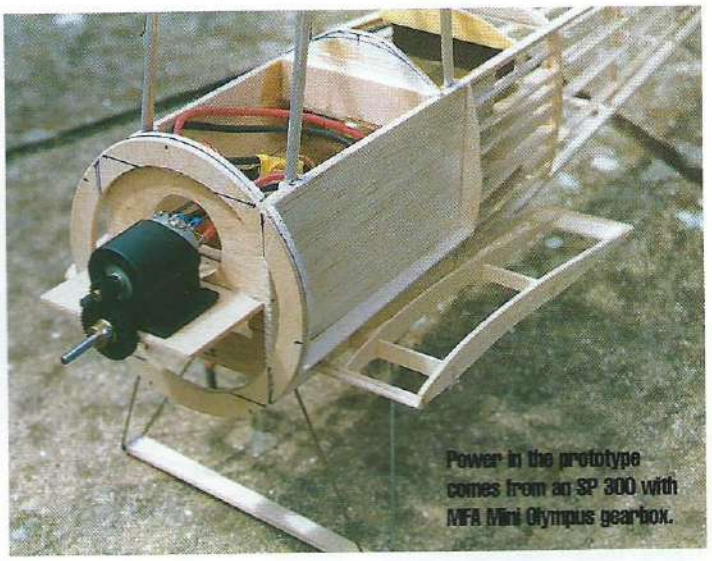
The first flight was on a cold and dull November day. A gentle push and away she went, perfectly balanced and very controllable, even on that tiny rudder. After a few circuits she had climbed to about 50 feet and safe territory. I tried a gentle turn on warp and elevator and, much to my surprise, she banked over and pulled round with no problem. After my usual landing, the subsequent checks and a fresh battery, she went off again. My 'thin braced wing' policy had paid off perfectly. The Gordon Bennett is actually easier to fly than my Tabloid and the rigging absorbs the odd bounce that rough-cut grass gives it. This is a rewarding model to build and fly - I hope you enjoy it as much as I do!

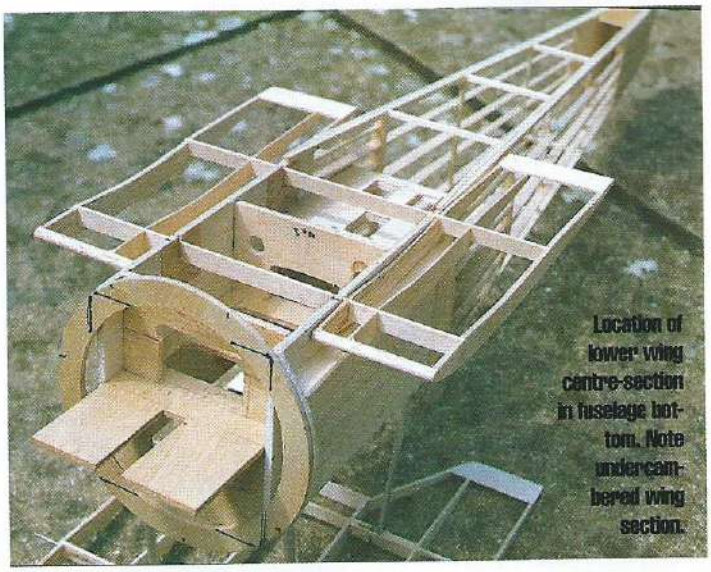
Building

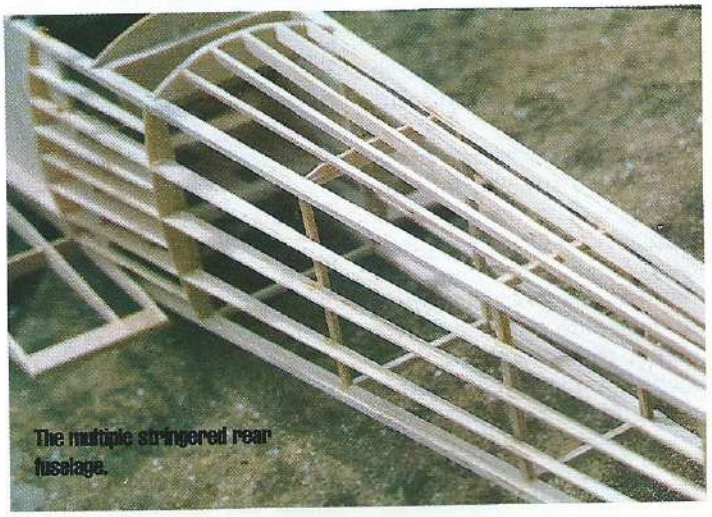
Please try to think 'SP 300' all the time during building, rather than 'SP 400'. The latter will pull 22 or 23 ounces of biplane round the sky, but even with eight cells, the former struggles at much over 16 ounces. I tested all this out on an Aeromodeller 1953 design Luton Minor that eventually had five motor changes in the interests of research! Of course, you could just build for a 400 from the start and save a lot of effort, as the structure will take the power and weight without complaining. The MFA Mini Olympus gearbox fits directly to the SP 300 mounting plate, but the Graupner gearbox has a different mounting axis. Both are shown on the plan.

I used 2 mm (3/32") balsa for all the fuselage except the formers and motor plate, which were 2 mm liteply. The longerons must be laminated from two strips of 2 x 2 mm balsa to add strength. This method also allows the side stringers to be taken down to nothing at the tail end without compromising the overall integrity of the structure, as they sit inside the basic frame. It is also lighter than the usual 3 mm balsa structure. All stringers, panels and minor formers were made from 1 mm balsa

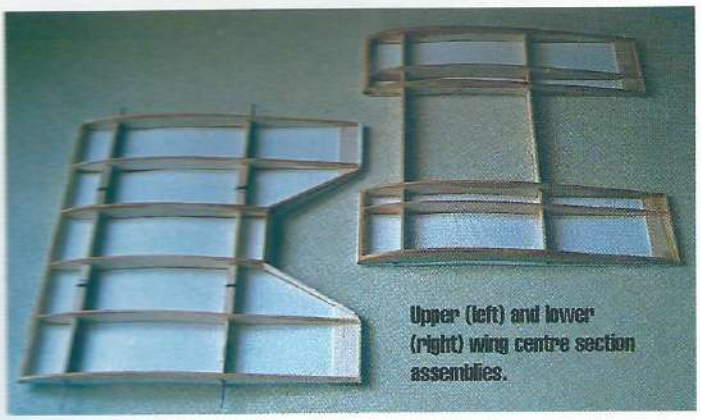
Build the front fuselage box from 2 mm balsa, with all the little doublers, control wire grommets and 3 x 3 supports in place, then join together squarely, using the motor plate and formers. Make up the cabane struts from thin wire, faired with squashed alloy tube secured with a dab of epoxy or superglue. I squashed the tubes between two lengths of wood in a hand vice. Just be very gentle, take it a bit at a time and stop when they are nicely oval. Sew the cabanes onto the motor plate and fix them at the right rigging angle using


Power in the prototype comes from an SP 300 with MFA Mini Olympus gearbox.


Location of lower wing centre-section in fuselage bottom. Note undercambered wing section.


The multiple stringered rear fuselage.


Close-up of the cockpit area prior to addition of top-deck sheeting. Simple instrument panel heightens realism.



Upper (left) and lower (right) wing centre section assemblies.

pieces of grooved liteply epoxied to the fuselage sides. Then build the rear fuselage, taking great care over the tricky bit of joining at the back end, where the fin and tailplane are located. Eventually the tailplane will slide into position, with little need for glue or reinforcement. Then join both sections together, upside down, over the plan. This will ensure a true fuselage.

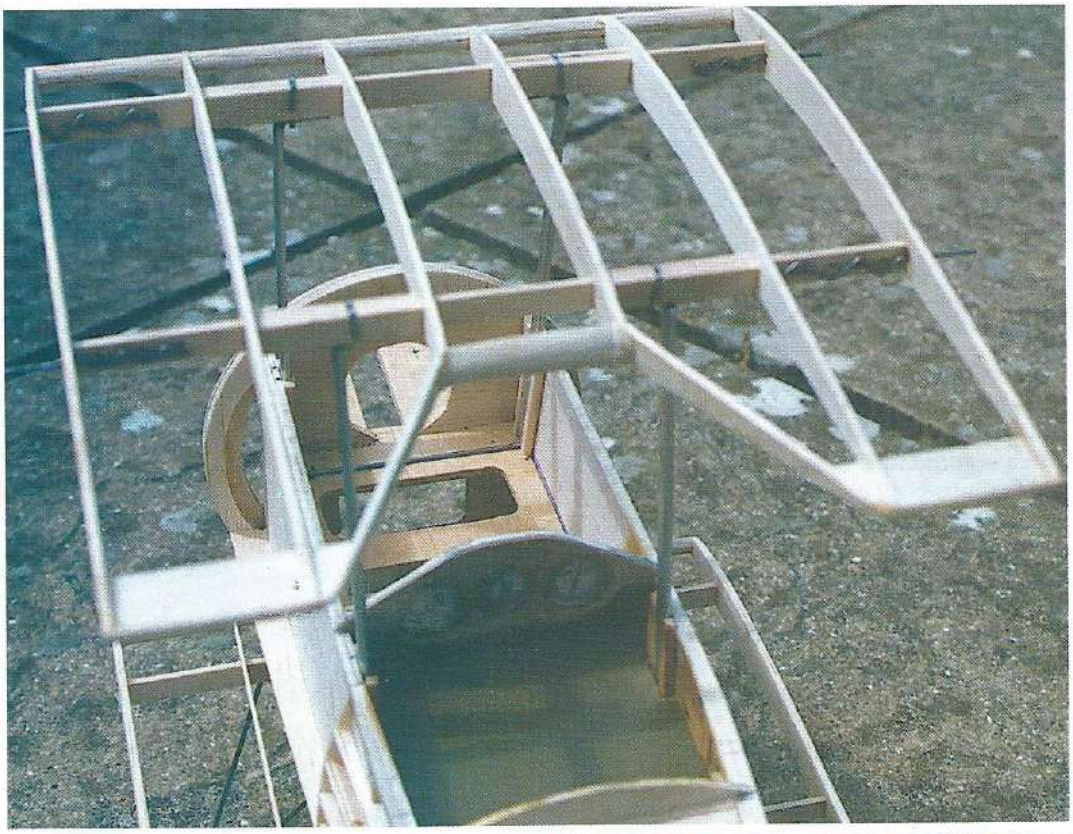
Now you can start to make the basic box into a sleek, streamlined form, by adding side and top formers and stringers from 1 mm balsa. I covered the rear of the fuselage at this stage and added the balsa top and side panels later. This allows the edges of the Litespan to be sealed tight under the balsa. Then, glue on the cowling locators (weight could be saved by gluing the cowling straight to the fuselage - it does not need to be removable).

The fins are simply sheet balsa glued straight onto the fuselage. The rudder and tailplane outlines are made from laminated 1 mm strip, formed round a pinned curve, straight onto the plan. Don't bother with complicated formers, but make this easy and strong structure in just a few minutes. Finish off with strip wood and keep the whole tail assembly as light as possible - it hardly takes any stresses and there is scale bracing from the fins to the tailplane, if you are feeling really keen.

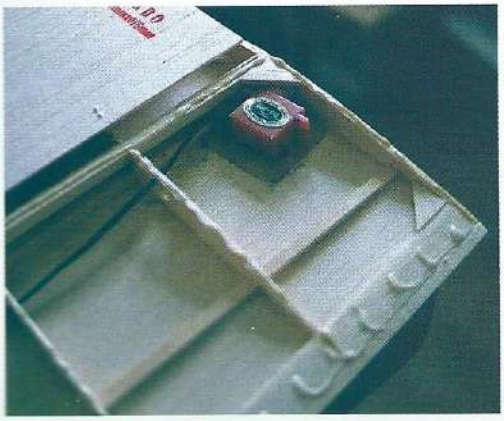
The wings

The wings are a little more complicated than my previous Pup, Tabloid or DH2, but are still easy to make. About 90% of the flight stresses are taken by the rigging, so heavy dihedral braces are not needed. I made the spars from basswood, which is stronger than balsa but light and close-grained. I expect hard balsa would be fine. I used the Option 1 method of sewing wire pegs to the spars, which, on assembly, simply fit into holes drilled in the ribs and fuselage sides. This method of construction will be familiar to free-flighters, and makes a strong but very crash-resistant structure. A one-piece wing is shown and described on the plan as Option 2.

For Option 1, cut front and rear spars from a sheet of basswood and sew the wire pegs to them using button thread and a spot of superglue. Pin them down to the plan, together with the 1.5 x 15 trailing-edge. Fit and glue each rib in turn, including the 2.0 root rib, then glue the balsa dowel leading-edge and finally the thin strip along the edge of the trailing-edge in place. This strip makes a very neat-looking trailing-edge when it is sanded nearly flush and the covering is added. Trim the ends of the leading-



Above: Upper wing centre-section on cabane struts; Mike forms these from thin wire faired with carefully squashed alloy tube. Right: Cabane struts in close-up showing split-pin fixing method.



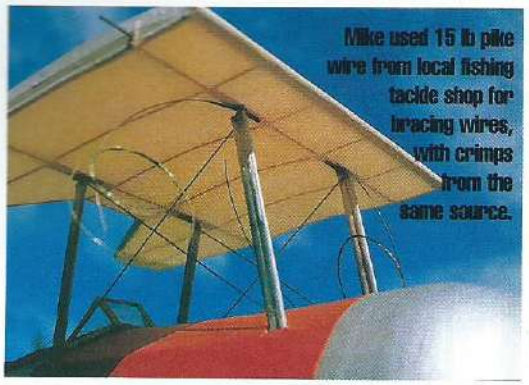
Left: installation of aileron servo.

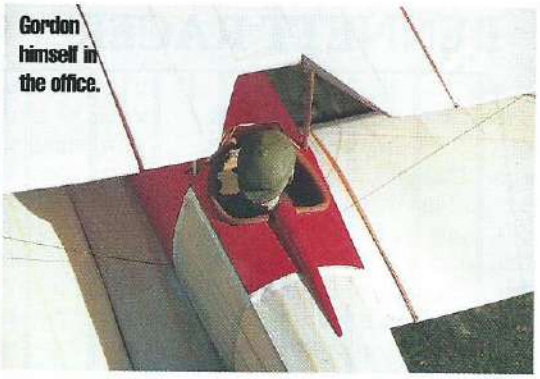
Right: Servo tray in fuselage, with three micro-servos - for rudder, elevator and wing warping controls.

and trailing-edges to the correct angle and tap in a row of pins to the inside line of the laminated wingtip. Wet and glue the three strips of 1.0 x 3.0 and press them firmly together round the pin outline and to the leading- and trailing-edges, keeping the shape with more pins, using scrap balsa packing to get the correct undercamber. When completely dry (at least overnight), remove the wing from the plan and use a razor plane and carve the tip to section. Try to get down to a 1 mm thin edge to the tip as this will look very realistic. Now add the reinforcing basswood strips and drill the spar for the split pins, which hold on both the struts and the functional rigging.

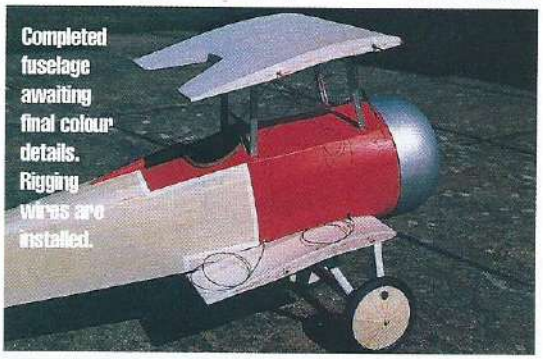
The top and bottom centre-sections are made in the same way. It might be prudent to build them with the outer panels jigged in place, so as to get everything square and built to the same standard. After reinforcing the spars, drill the top centre-section rear spar for the four split pins, which are used by the cabane, struts and warp wires. The front spar only needs the one pair of split pins. Test fit the cabanes and check for squareness and incidence then make up the interplane struts from squashed alloy tube, plug the ends with ply or hard balsa and drill for the split pins, which are not glued in until final assembly.

With the woodwork complete, I always fit the hardware and test the servos and motor for correct operation, then I stain all the edges of the structure with Coloron antique pine wood dye. After the framework is covered with Litespan, a wipe of thinners over this staining brings the dye through the material in what I like to think is a very realistic way. I painted the Union Jacks onto pre-stained white Litespan, after masking out the 'white' area first. Just rub a soft rag, damped in a 50/50 mixture of thinners and the wood dye, over the surface. I suppose you could use the cream Litespan and have done with it! The Union flag is a very complex mixture of straight lines and is drawn correctly on the plan for the wing undersurface. Whether the RNAS ground crews who had to do the job lying on their backs in the mud were as accurate is anyone's guess!


Mike used 15 lb pike wire from local fishing tackle shop for bracing wires, with crimps from the same source.


Gordon himself in the office.

Engine cowl came courtesy of Gaymer's Cider! Their three litre bottle is exactly the right diameter


Completed fuselage awaiting final colour details. Rigging wires are installed.

You should now have an ARTF kit, less the undercarriage. Fit some of the wires now, threading the front flying wires through the fuselage split pins and crimping them off, sealing with a dot of superglue for luck. Secure the warp power wires to the servo arm in the same way, leading them out through the metal grommets. Leave the warp idler wire until later.

Assembly and rigging

Securely glue on the lower centre-section, then weight down the fuselage on a flat surface and add the lower wings, jigging to the correct dihedral angle (and add a little washout if you like). Add the interplane struts, gluing the split pins into the predrilled end plugs. Spring the top centre-section into place on the cabanes and crimp on the front landing wires to the centre-section split pins, then take them down to the interplane struts, loop them through the split pins and back through the crimp, and leave loosely secured. Slide on the top wings and fit the interplane struts to their split pins. Now fit the front flying wires to the split pin at the top of the front struts and secure as before. Do the same with the warp power wires, then secure the warp idler wire firmly to one rear strut, take it up through the split pins on the rear of the top centre-section and down to the other side. It should look like a WW1 wing now, but a bit on the loose side. Keep everything weighted down and tighten the 'open' crimps until all the wires are tight but not excessively so. Crimp the crimps, dots of superglue, cup of coffee and try out the wing warping. It works! Wire up the elevator and rudder in the same way and check them out too.

If you've read all this and thought "come back Peter Rake, this Roach fellow is just too complicated", then simply make up the wings in the same way as for my Tabloid in FSM for Sept./Oct. 2001 and forget the wing warping. Despite the apparently small rudder, the model flies excellently on rudder/elevator, even with scale dihedral of a mere 10 mm at each tip. I just thought I'd tell you now you've got this far! I needed very little elevator movement (perhaps 5 mm each way). The rudder needs all its travel and the warp sorts itself out if you build it to the plan.

Finally, sew on the undercarriage, charge up the battery and hand-launch into the sky. It's a really great little flyer with either a 280 or 400 motor and just looks like... 'Gordon Bennett!'

As usual, I welcome comments and suggestions to roachfoxwood@aol.com or to 5 Foxwood Ave, Christchurch, Dorset, BH23 3JZ.

FLYING SCALE MODELS

SPECIFICATIONS.....

Sopwith Gordon Bennett Racer.....

Name:	Sopwith Gordon Bennett Racer
Type:	Electric R/C Scale
Designer:	Mike Roach
Wing span:	896mm (35.25 ins.)
Motor:	Geared SP 300
Control functions:	Wing warping, rudder, elevator electronic speed control
Construction:	Built up balsa/ply
Covering:	Litespan
All-up weight:	16 ounces

THE SOPWITH "GORDON BENNETT" RACER

When Harry Hawker got back from his Australian adventure in early 1914 he had three months of flying experience in the Tabloid followed by a long sea voyage back to England. Impatient to put his experience to good use, he went straight to the works and persuaded Tom Sopwith to make 2 racers for the Gordon Bennett trophy to be held later that year in America.

This one-off aircraft was built at Harry Hawker's request, to win the 1914 Gordon Bennett Trophy and it was supposedly based on the Tabloid that Hawker had taken to Australia at the end of the previous year. However, it was in effect a completely new type that resembled the design of the SE2 and SE4 from the Royal Aircraft Factory, rather than anything from the Sopwith Works at Kingston. A second racer based much more closely on the production Tabloid was also built, but the declaration of war prevented either being used for the competition. In late 1914 they were impressed by the Admiralty for service with the RNAS and Hawker delivered the Gordon Bennett machine, now Serial 1215, to Hendon, with the conventional racer as Serial 1214. Together with 1213 (a Tabloid made for an Italian firm, but taken by the RNAS) they formed the "Fast Flight".

The sources for the drawing are photographic side and frontal views published in "Sopwith, the Man and His Aircraft" in 1970. The RAeS also holds a photograph in its archive and "Great Sopwith Cookup" website has details of a scratch-built plastic model and a rather dated 3-view.

THE WINGS

It seems likely that the wings are of production Tabloid plan form, but the struts (which are oval-section steel) are spaced much more closely together than normal and there is only a very small amount of stagger. The wings are further apart than the Tabloid but dihedral is evident and lateral control is by warping: the warp pulley can be seen above the wing in the side view. Most unusually, there is an obvious fairing between the fuselage and the top of the lower wing. In the front view it appears that the lower centre section leading edge curves up to meet the fuselage, but this may be a trick of the light. The trailing edge is definitely not a straight line, but it is just possible that there is a cut-out similar to the upper centre section, rather than a curved edge. There is an obvious gap between the end ribs on the centre sections and the outer wings, where they are joined together.

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CONCLUSIONS

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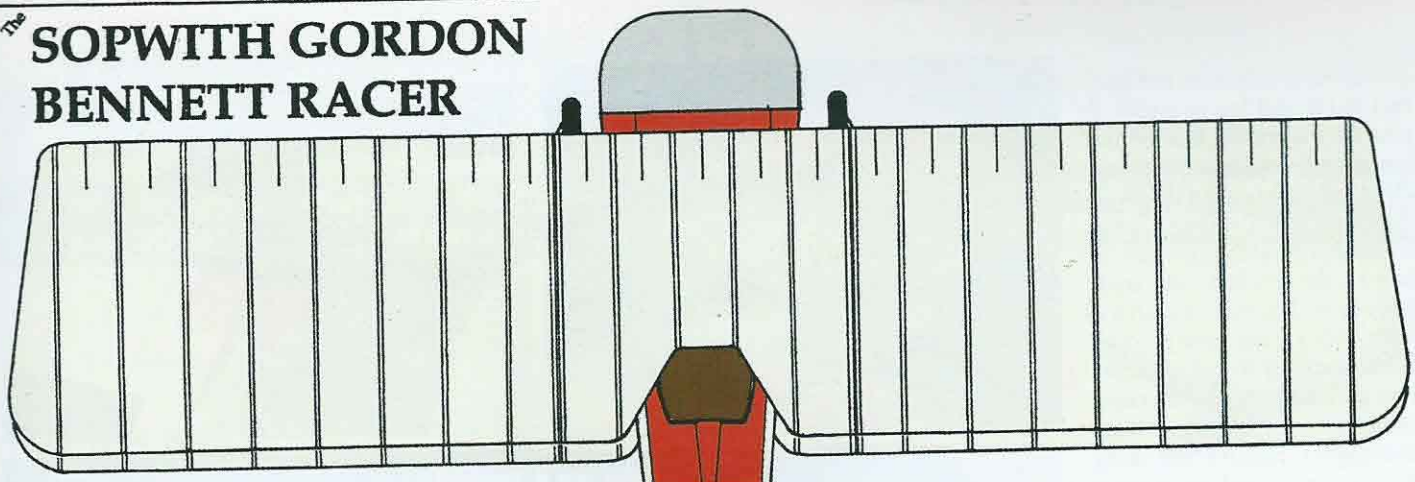

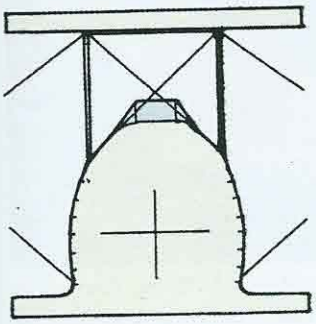

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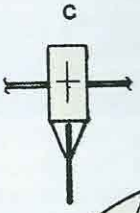

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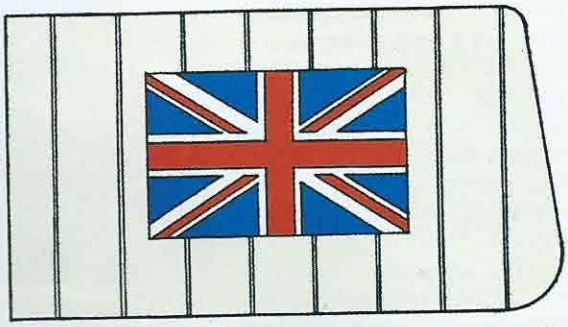
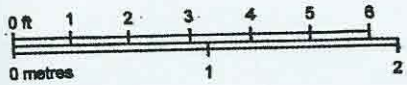
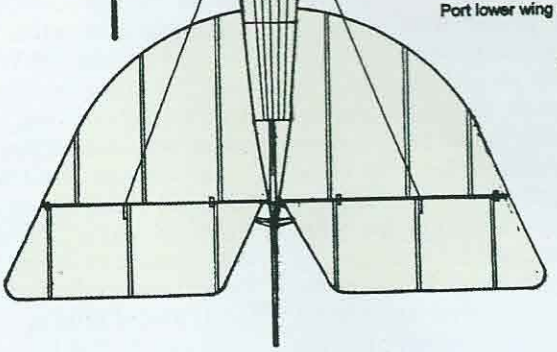
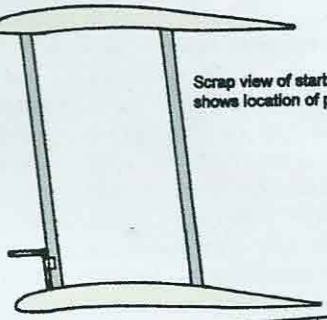


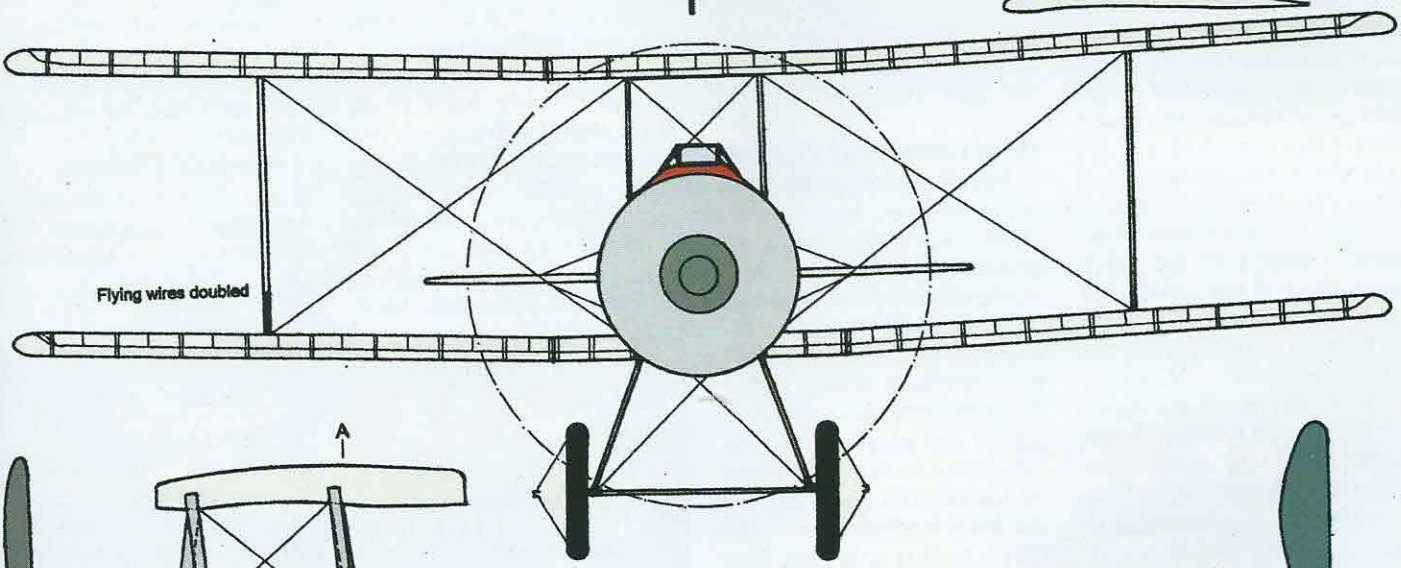
Port lower wing undersurface showing Union Jack marking (both wings)



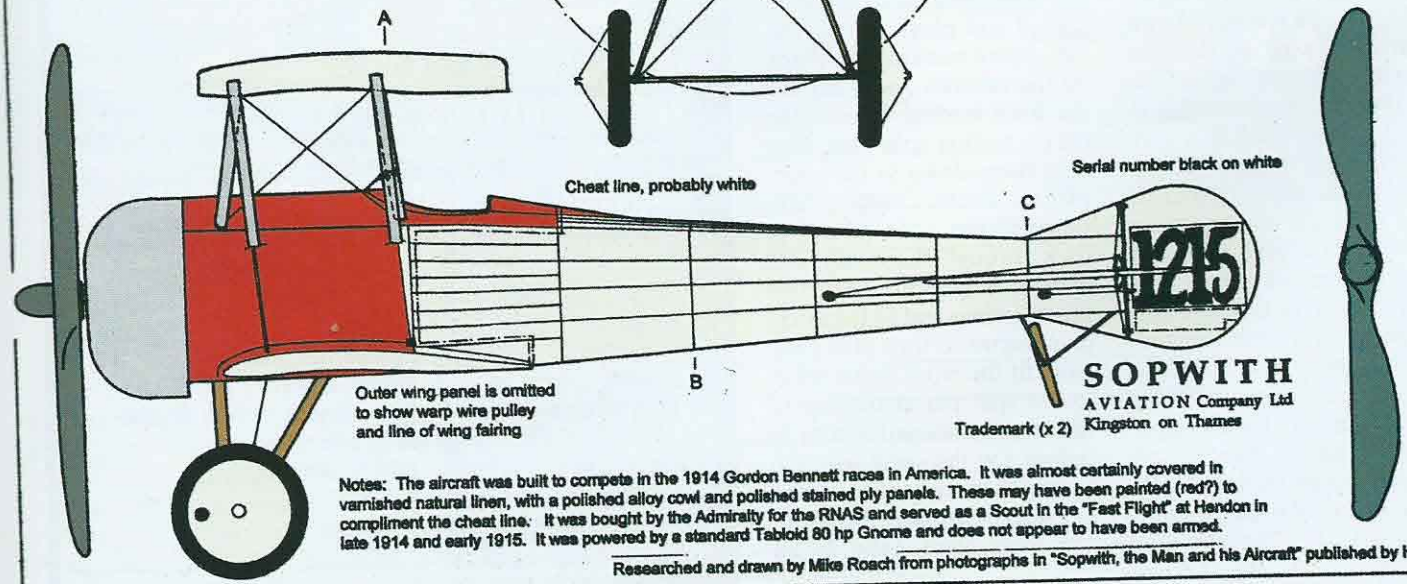




Scrap view of starboard struts shows location of pitot tube



Flying wires doubled



Outer wing panel is omitted to show warp wire pulley and line of wing fairing

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Notes: The aircraft was built to compete in the 1914 Gordon Bennett races in America. It was almost certainly covered in varnished natural linen, with a polished alloy cowl and polished stained ply panels. These may have been painted (red?) to compliment the cheat line. It was bought by the Admiralty for the RNAS and served as a Scout in the "Fast Flight" at Hendon in late 1914 and early 1915. It was powered by a standard Tabloid 80 hp Gnome and does not appear to have been armed.

Researched and drawn by Mike Roach from photographs in "Sopwith, the Man and his Aircraft" published by Harleyford.