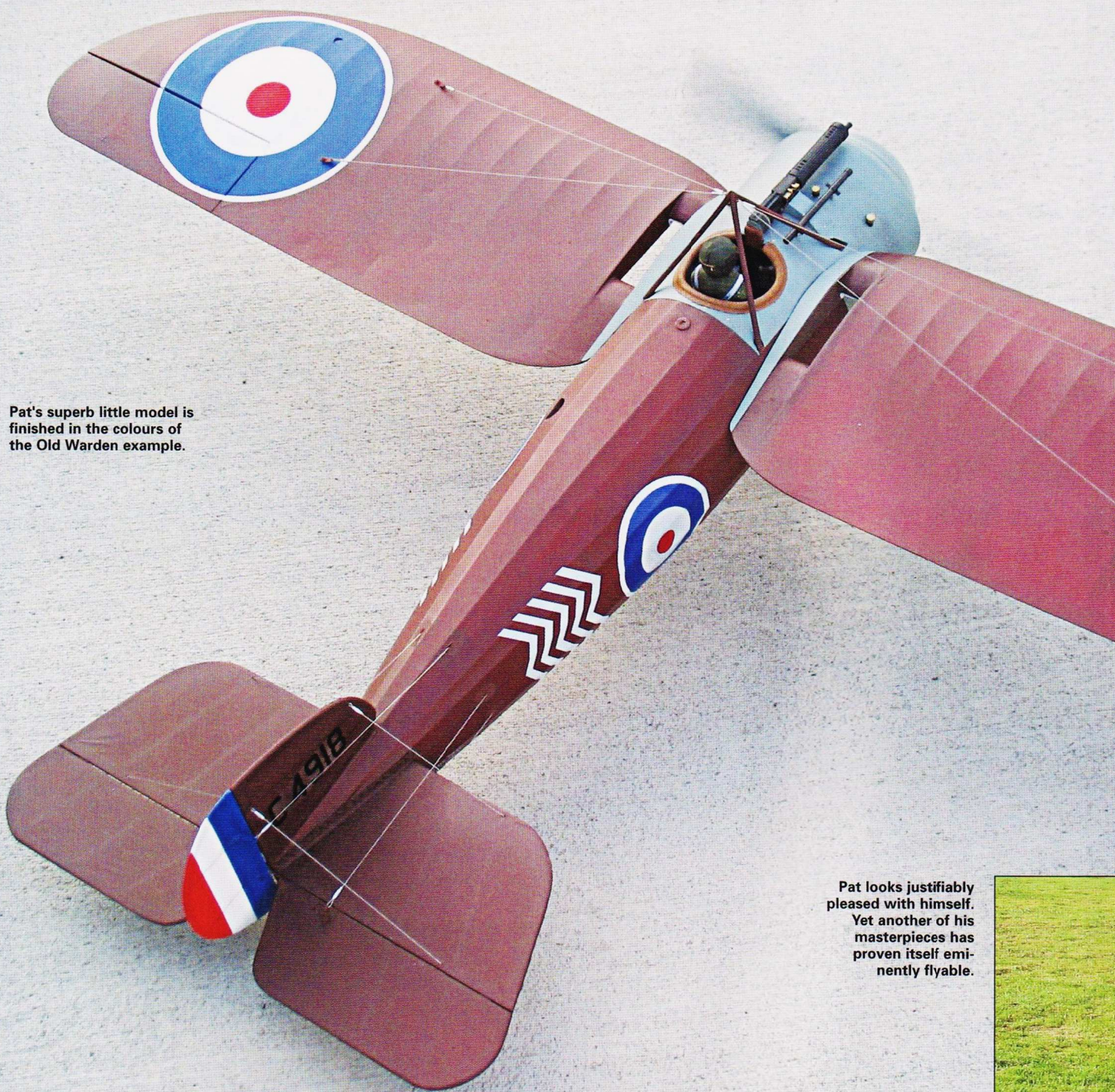


**Full-size FREE
Plan feature**

Designed by Peter Rake and builot by Pat Lynch



Pat's superb little model is finished in the colours of the Old Warden example.

Pat looks justifiably pleased with himself. Yet another of his masterpieces has proven itself eminently flyable.

Bristol M1c

A 1/8th scale electric-powered model, designed by Peter Rake with prototype model built and described by Pat Lynch

During a telephone conversation with our publisher, he just happened to mention that he had a disc full of photographs of the Old Warden-based Bristol M1c Monoplane ... would I 'be interested'? Not too surprisingly, I

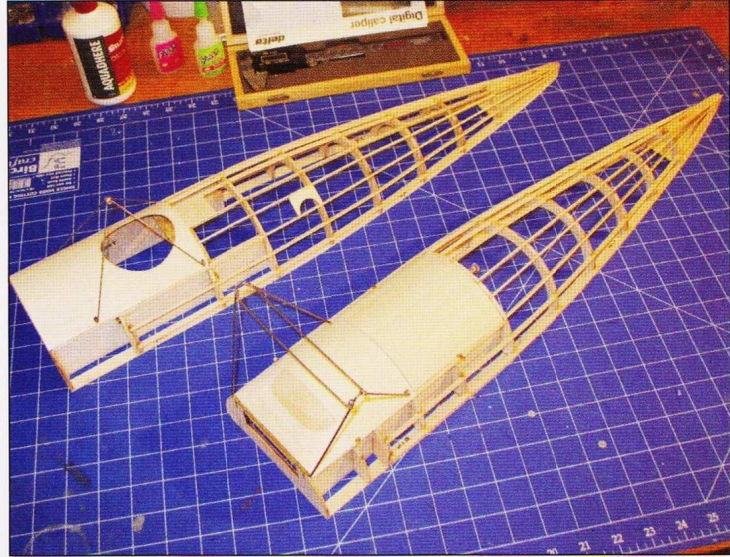
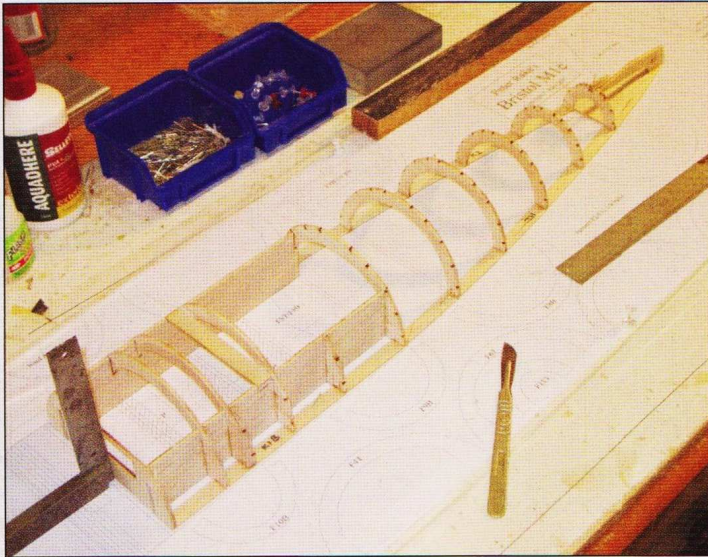
said I was very interested, and waited for the disc to arrive.

Once it had, supported by a set of three-view drawings (obviously the publisher is learning how to motivate me), a plan was started and Pat Lynch approached about a prototype build

from a set of laser-cut parts. The rest is now history, so I'll hand you over to Pat for all the details - P.R.

Some months ago, Peter Rake asked, would I be interested in doing a prototype build of a





ABOVE LEFT: Centre keels with formers and forward 'box' sections glued in place provides a good, solid basis for sheeting and stringers. **ABOVE RIGHT:** The two half fuselages ready to be joined and have remaining nose sheet added.

Bristol M.1c in a size that he knew I liked - around 46 - 48". Naturally I said yes please, without having the faintest idea what an M1c Scout was!

A bit of research told me that very few M1cs were built (a hundred or so) because the RFC preferred biplanes, although the type did see limited service in the mid-to-late part of the Great War.

I do not think any originals survive to fly today, but several Collections have authentic replicas - complete with original rotary engines, so reference material is in abundance. The Bristol is quite an elegant machine with a round-section fuselage and curved wing leading edge (L.E.), both of which make the design just a little more challenging plus, of course, there's that spinner.

A few photos of the real aircraft were gathered (mostly of the *Shuttleworth* replica) and one of *Manzano Laser's* excellent wooden propeller kits was ordered to go with Charlie's short kit. This was an inch or so too large, but was of the right shape. A few preliminary calculations showed that, if a scaled prop of 12.5" was used, the motor would need to be a low kV outrunner of about 120-150 watts input. A 'bell' motor of 750 kV was purchased to run from 3S LiPo at around 15 amps.

Fuselage

This design, a new departure for Peter. The fuselage is built in two half-round parts split horizontally, making it easy to build over the plan without jigs. Extra structural rigidity around the firewall/undercarriage/wing mounting areas is created by use of an internal box and ply cross-members.

The crutch elements were glued and pinned over the plan, then the main half-formers fixed and the two 1/8" balsa 'box' sides, slipped into the frame assembly and glued. Finally, the 1/8" ply firewall half was secured with PVA as was the rear undercarriage (U/C) mounting plate. After gluing the tailskid support plate, the 1/8" x 1/16" stringers were added. These had been cut slightly over-width to allow some light sanding later.

Brass tubes anchoring the undercarriage (U/C) wire were bound to the lower firewall and U/C plate with fuse wire and epoxy then four small brass brackets were fixed to the fuselage for the flying wires under the wings. With the lower half still pinned to the board, the hatch, underside sheeting, and U/C wire were fitted. The U/C legs were made in a V-shape for each side, then bound and soldered to two cross-members as per full-size. The axle is suspended in the V with hat elastic.

The upper fuselage half is similar in the method of building, just detail differences - sheeting, mounting tubes for the pylon, wings etc.

The pylon fits into lengths of tube, bound epoxied or both, to ply cross-pieces. The wings will have short lengths of piano-wire inserting into brass tubes running through the fuselage. Minor detail items are some 1/16" sheet inserts to reinforce the areas around fuel tank filler and foot steps.

The tailplane is located in a 1/8" wide slot cut into the sheeted area in the upper half of the rear fuselage. This is done while the upper half is attached to the board, cutting the slot parallel to the centre-line is easier.

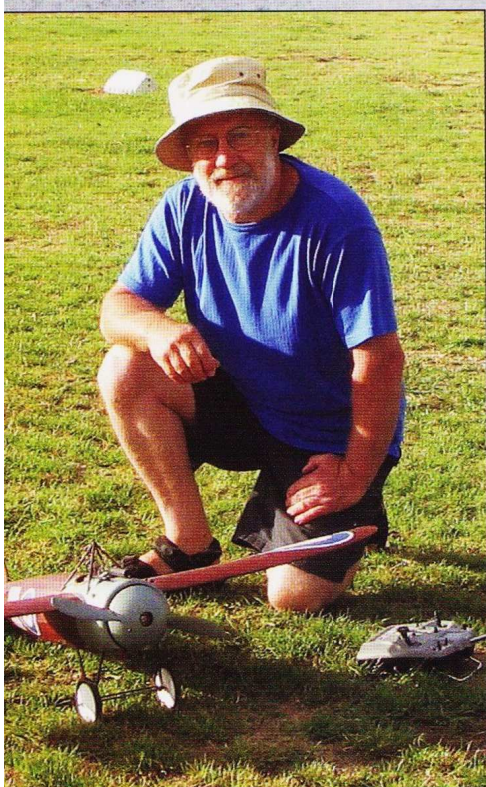
The servo mounting and control cables/guides were installed before joining fuselage halves together. A 1/32" ply guide ensured all the cables leave the fuselage in the correct place. The cables were fitted, labelled and coiled up in the rear fuselage. After adding a battery box and painting the visible interior grey, the two fuselage halves were carefully aligned and clamped. When satisfied that all was aligned, CA was run into the join and allowed to set. The remaining sections of the nose were sheeted, and some basic dummy interior framing added to the cockpit area. The M.1c had a rather sparse cockpit and did not warrant a huge effort.

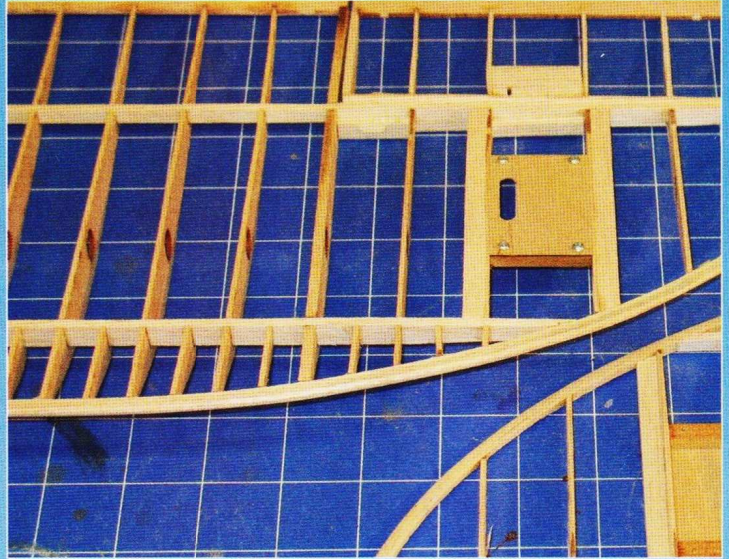
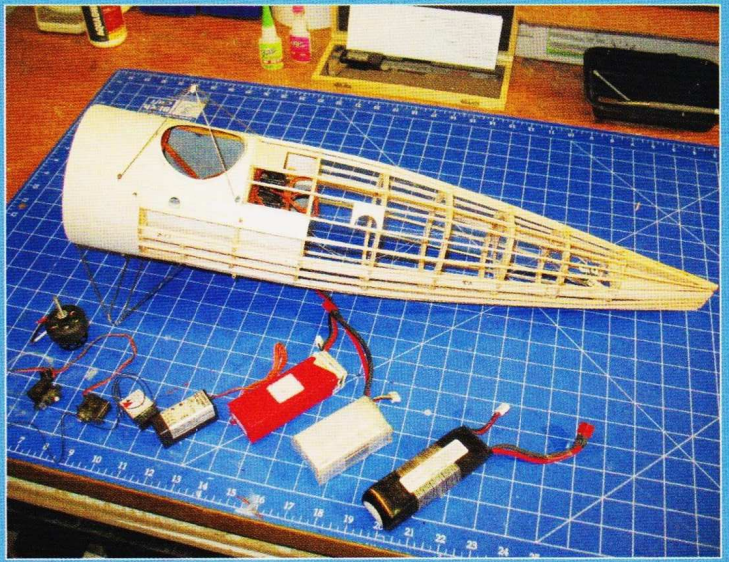
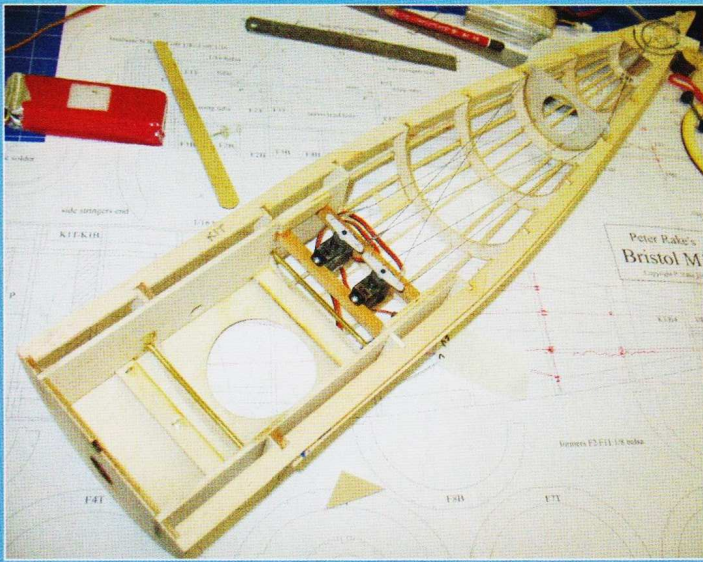
The cowl is fairly straightforward - two lite-ply rings with 1/32" ply wrapped around, and some balsa laminations glued on the front and sanded to shape. The cowl is secured to the firewall with three screws. The front of the cowl is sanded at an angle to match the rear of the spinner which has a small amount of down and right thrust. The motor is fastened to the firewall on a ply disc sanded to give two degrees right and down thrust.

Wings

The wing is fairly straightforward. The two spars are straight-grained and moderately hard balsa. The trailing edge (T.E.) is 3/32" bass - it is fairly thin and the bass is less fragile than balsa would be. The wings are aligned with the fuselage with piano wire pegs in brass tubes glued into the 1/8" ply root ribs. The rigging should pull the wings into the fuselage. Because of the round section fuselage, a lamination of balsa ribs is shaped to fit the gap between wing root and fuselage.

The leading edge (L.E.) is laminated from three strips of 3/8" x 1/16" balsa. The ply and bass parts plus the balsa spars were glued together (PVA) and allowed to dry. Then the various ribs were fixed in place, bevelling





TOP LEFT: An added bonus of this style of construction is that servos can be fitted while there is still easy access. **TOP RIGHT:** Fuselage sections joined and the selection of batteries Pat had to choose from. Along with the remaining hardware. **ABOVE LEFT:** Lots of clamps used to assist with laminating the wing leading edges. **ABOVE RIGHT:** Scale rib/sub-rib count makes for a 'busy' looking wing. Ply plates are for aileron servo attachment.

where required. The laminated L.E. is 3/8" high, but tapers down at the tip to about 1/4" - as does the whole end third of the wing panel so a lot of sanding was needed to trim it to the same level and angle as the ribs.

The various 'add-ons' to the wings were next. The rear spar needs to be built up to the wing upper surface level and reinforcing blocks added in the three hinge areas. The servo hatch has two spruce screw-blocks epoxied in place plus the rib each side is reinforced with hard balsa strip. Hard balsa rigging points and the optional 'windows' were added. The front and rear edges of the 'window' openings are rounded so I used small lengths of L.E. stock plus some soft 1/16" sheet to give the required shape.

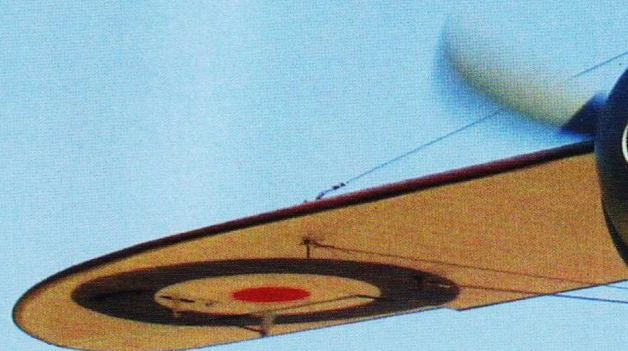
At the root end of the wing, the 3/8" thick sandwich of ribs was cut down to match the angle of the fuselage. Two 1/8" brass tubes are glued into each pair of root ribs to support the wire dowels holding the wings in place. (*Fitting these after the root rib has been shaped makes life a whole lot simpler. PR*) The rigging will be very functional as it maintains the dihedral and holds the wings tight against the fuselage.

The servo lead extensions were installed and the antenna was run down a series of small holes drilled through the bottom of the fuselage formers before covering.

Tail parts

The elevator/tailplane is about as simple as it can get. A few strips of 1/4" x 1/8" medium hard balsa plus some 1/16" x 1/8" for the 'ribs'. A few laser-cut parts are provided for the corners and horn-blocks etc. I left the elevator in one piece until the wire link is epoxied in place and set, then cut the rudder gap piece away.

The fin and rudder use a laminated balsa outline. Three strips of 1/8" x 1/16" balsa were given a spray of ammonia-based window-cleaner. After a soaking of about ten minutes, the three strips were slowly eased around a row of pins over the plan. After the wood had dried, the strips were glued together with PVA and re-formed around the pins. The internal balsa parts were CAed in place and the assemblies removed, sanded, edges rounded and hinged.



Spinner and propeller

The 12.5" propeller was adapted from a 13.5" x 11" kit from *Manzano Laser*. Only four of the laminations were used to give the appropriate thickness. After gluing together with PVA, the blades were carefully shaped using *Exacto* gouges, a large round file and a craft knife. The back side is slightly hollowed and just pared out tiny chips at a time. After final sanding and balancing (essential), a coat of alcohol-thinned epoxy was brushed all over the prop.

The spinner was always going to be a bit of a problem. The challenge was to get the shape, but but also to mount it reliably, to be able to change the prop and also be able to see the prop through the front of the spinner, whilst not being too heavy or difficult to balance.

A slice was cut off a 5.5" foam ball a little larger than the final diameter needed, and then the back sanded over a flat surface on a piece of coarse sandpaper to achieve exactly the diameter needed. I was aiming for a small gap between spinner and cowl rather than an exact scale size - about 105mm diameter is what I finished with. This was glued to a ply ring - cut from 1/8" ply birch ply - using PVA glue. Slots were cut through the ply ring and foam to fit the carved prop. A 1/16" ply disc was cut as a spinner back plate and fastened to the spinner with six self-tapping screws.

The hole through the spinner was cut with a sharpened metal tube, then the whole spinner had two layers of 3/4 oz glass cloth applied with water-based Polyurethane and sanded smooth. The hub of the prop is visible through the hole in the spinner so after staining, I added a metal washer and eight bolt heads.

Cabane and undercarriage

The pylon and undercarriage wire was clad in wood to give a more scale appearance. For the pylon, two pieces of 3/16" x 1/16" spruce

were grooved on one edge to encase the 18 swg wire and glued around it. Some shaping was needed at the top to make a point and leave the rigging lugs exposed.

A piece of 5/16" x 1/8" spruce was grooved along one edge with the *Dremel* and sanded to a rough airfoil section. The four leg fairings were cut to shape and epoxied to the roughened wire legs. The legs were wrapped in a spiral 'bandage' of *Litespan* before painting.

Metalwork

The upper deck and fuselage immediately behind the firewall is metal. In this machine, it is painted a light or metallic grey. A card template for these metal areas was made before cutting a lithoplate panel. Lithoplate has long been a favourite with modellers - thin, slightly tempered aluminium sheet, fairly easily cut, and it looks like metal as nothing else can because it is what it's supposed to be!

The inspection panels were outlined from the front to make a groove, and the hinge pins were marked from the back. (*Pat forgot to mention that lithoplate can be embossed with false detail. PR*) Rivets were added with a dress-makers' tracing wheel - I've got a few with different pitches. Panel lines were scored from the top side with a ball-point pen.

Covering and painting

The aircraft chosen as a prototype is the *Shuttleworth Collection's* replica as many colour photographs were available. The colour looked a bit elusive - I'd been going to use *Tamiya Flat Brown* but the first applications looked a bit 'brown' so about 25% gloss red was added.

The undersurfaces are white *Litespan* and the top surfaces of red *Litespan* which serve as a base for the brown - it covered very well. I don't think the colour is perfect but since I had no references for PC12, the Shuttleworth photographs will have to do!

The fuselage was covered in seven front-to-rear strips. The compound curves were easier to do three-four stringer bays at a time. A small section was left open at the tail end to assist in rigging the control surfaces later. The red *Litespan* was given a thinned coat of clear dope to help bind any loose edges before painting.

The white parallel zig-zag stripes were masked and sprayed flat white as were the background discs for the roundels. After masking and spraying the roundel blue areas, the red parts were painted.

The 'Lift by tail skid only' annotation is a water-slide decal with a brown background and transparent letters using white decal paper. The black fin serial is a decal on transparent paper, sealed with matt acrylic before applying.

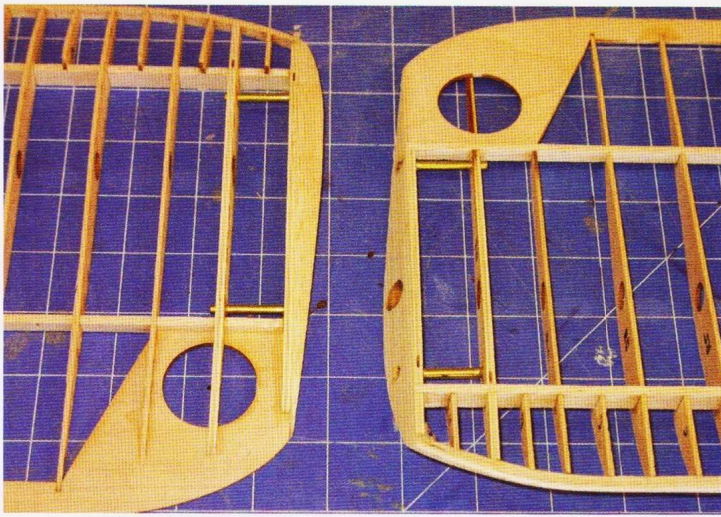
The tailplane was glued in place and the elevator and rudder hinged and assembled. The elevator cables were now connected and small oval patches of tissue were cut and slit, then stuck over the exit holes with canopy glue and painted brown. The cables were then run to the horns and crimped with 1/16" aluminium tubes. The aileron servos were wrapped in masking tape and CAed to the ply hatches - making sure the shaft was centred in the slot! A blob of hot glue at each end made sure they wouldn't move.

Wheels

The wheels consist of 1/32" ply discs and a 1/8" balsa core. 1/8" internal diameter (ID) brass tube serves as a bearing and the fabric cover over the spokes was simulated by a scored card cone. The card cone was made about 5mm smaller in diameter than the wheel disc, and the whole surface was covered in white *Litespan* to look more 'fabric'. After a coat of flat white acrylic, a dirty rag was rubbed over the white to give a weathered look and the foam cord tyre was secured with a bead of thin CA.



After a minor balance issue, the M.1c proved itself to be a gentle, stable flier that floats in to land.



LEFT: Brass wing mount tubes are best fitted AFTER the laminated root ribs have been shaped to match the fuselage curve.

BELOW: Bare framework shot reveals just how scale-like the structure will appear through the covering.

The wheels are held in place with 1/32" split pins through holes drilled in the axle ends. The axle is held in place by a few turns of black hat-elastic.

Getting it together

The tail bracing wires were fitted with small brass loops, epoxied into holes in the fin to anchor them. The simple spruce and balsa skid was stained and painted then glued in place.

The cowl and other metalwork was painted as close a colour as I could to the Shuttleworth replica - *Tamiya* light grey with some metallic grey added. The lithoplate skin was fastened to the balsa with contact adhesive. I've found this to be the most reliable - just a thin smear around the edges on both parts and then very carefully put it in place and start pressing down from the centre out. It has to be very accurately placed as later movement is impossible without destroying something.

Because I wanted to have dual flying wires (the ones under the wing that carry the flight loads), a small plate to hold the two wires was needed at the wing anchor point. A length of aluminium tube big enough for a 12 b.a. bolt was CAed into the rigging block and small pieces of drilled brass were fastened each side of the wing. These provided the termination points for the rigging wires of 'Tiger Tail' stainless beading thread, available from craft stores. 1/16" aluminium tube was used for crimping the wires. The small bolts can be removed and the wings taken off if desired.

The servos were all installed, centred and given about 1/2" travel up and down with -50% expo.

Details

The leather coaming was made from thin leather glued around some 5mm foam cord and fastened around the opening with contact adhesive.

The M.1c had aluminium riveted to the wing roots as walk ways. For the model, these were made from lithoplate with rivets embossed from the rear. They were stuck to the wing with contact adhesive.

At 1/8th scale, the Vickers gun is quite large - about 110mm long and it was built from balsa, corrugated aluminium, plastic sheet, rod and tube, a round-head pin and 1/64" and 1/32" ply. Small lengths of 1/8" dowel were glued into holes in the top deck and the gun CAed onto those dowels. The gun had been painted flat black and given a light rub over with graphite powder. A thin aluminium sheet ammunition chute was mounted on the side.

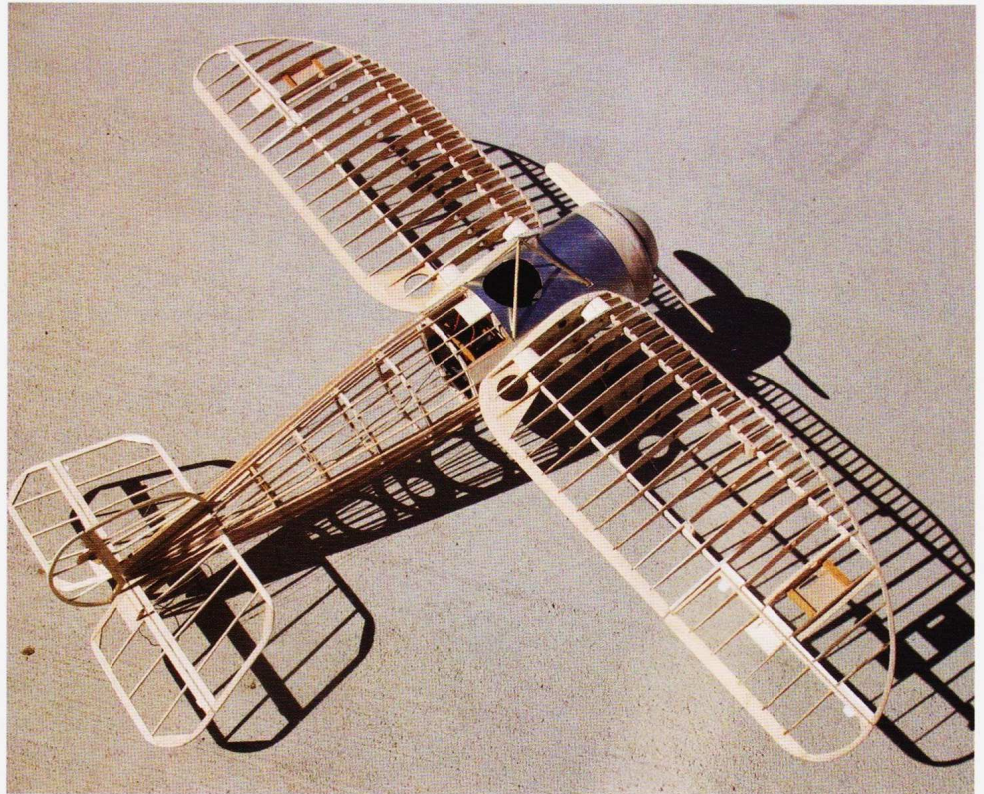
The Aldis sight was made from plastic tube and strip plus a couple of pieces of aluminium bent around as clamps.

The windscreen is thick-ish plastic sheet and the 'head buffer' is a piece of thin leather

camera, taxied the Bristol onto the strip. Easing the throttle open, the plane was kept on the ground until a good speed was obtained and it floated off on its own. I hadn't got much more than half throttle when airborne and throttled back to about one third after some height was achieved. A slow turn was started using rudder only - no problems, but I noticed that I was using a lot of back stick to keep it from losing height and despite full up trim, I had back stick pressure on the stick for the whole flight. The balance was where Pete and I had agreed to start with. This small problem was cured later by moving the balance back 1/2".

I did a few circuits and aileron response with 50% expo was perfect - tended to stay in a gentle turn until given a bit of opposite to pull it straight again.

I tried flying slower and did not notice any



glued to a square of balsa.

The remaining tiny details - air intakes, oil filler caps, etc. were added from plastic tube and painted. The pilot (Andy Sephton?) was carved from pink foam and painted. As with many scale models, the details could continue ad infinitum but I needed to prove this machine could fly before I overloaded it!

Flying

Flight time - around 6 am, the sky was cloudy and calm and a lot of dew on the 'paddock'. I flew my ancient *Telemaster* to get my fingers working and then, with my partner Liz on the

undue stalling tendencies.

The biggest surprise was the noise - the scale 12.5" prop was all that was heard! The wind and air noise almost completely masked the motor - certainly didn't sound like a popping rotary.

After becoming rather annoyed by the persistent flies (Australian summer!), it was time to land. The M.1c was slowly circled and height lost while lining up the strip. It was just floated in, the throttle cut, up elevator applied and she settled down among the grass clumps, cow-pats and pot-holes. No worries! Good one Peter!



A warm summer day at Old Warden? Well, almost - only a few thousand miles out in Oz!