FIAT CR-32 (Chirri)

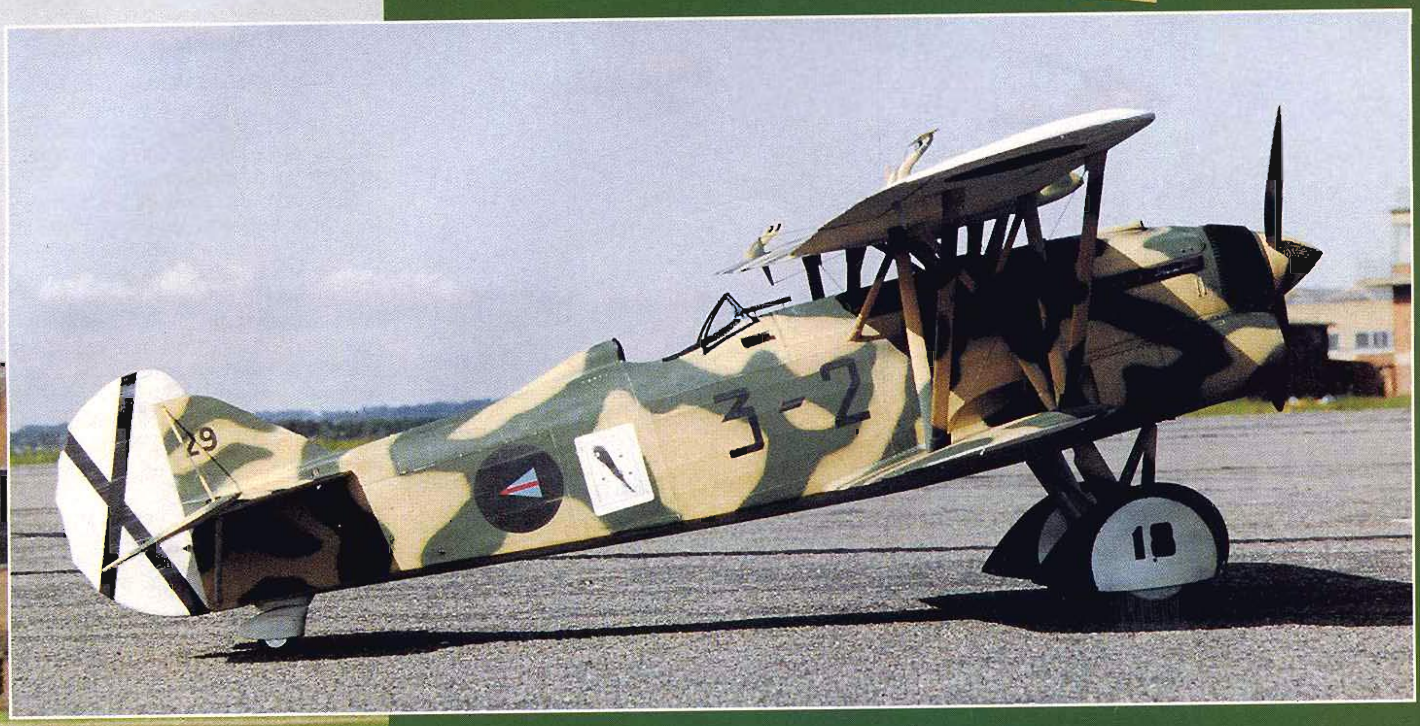
build from our full-size PLANS

Paul O. Blakeborough's 1/7th scale 54" span replica of this attractive Italian biplane fighter is suitable for .40 to .48 size four-stroke engines

Tecspecs

Name:	Fiat CR 32
Type:	Single engined fighter biplane
Scale:	1/7th
Wing span:	54"
Wing area:	4.6 sq. ft.
Wing section:	NACA 2410
Fuselage length:	1067 mm
Power:	.40 to .48 four-stroke or equivalent two-stroke
Radio:	Four function
Tank:	Medicine bottle (approx. 9 oz)
All-up weight:	6lb 13oz (dry)
C.G. position:	66 mm from l.e. of top wing
Control throws:	Elevator - 1/2" up, 3/8" down Aileron - 1/4" up, 1/8" down Rudder - 3/4" left, 1" right (couple aileron to rudder if possible)

Difficult to distinguish from the real thing, Paul Blakeborough's convincing 'Chirri' makes a worthwhile scale project for serious scale competitors yet is straightforward enough to construct to tempt scale beginners. construction is uncomplicated from traditional balsa and ply.



I first came across the Fiat CR 32 'Chirri' when a good friend of mine showed me an article about the aircraft in Aeromodeller about four years ago. The lines of the aircraft were an instant attraction to me, although the detailing daunted me some.

However, I had just settled down after another house move, when I remembered the Fiat. I then started looking into the possibilities of reasonable documentation, and eventually dug up enough - in fact more than enough - to make it a viable proposition for a scale subject. I have mainly Gordon Whitehead to thank for most of the documents and Dave Arnold of Scale Model Research for some fine photographs of a full-size version.

The Spanish Civil War was where the Chirri made an excellent name for itself; it became well favoured by both the Italian and Spanish pilots who flew for the Spanish Nationalists against Franco's Republican forces. Aircraft that it faced included the Russian I-15 and I-16s, and it was also reputed to be able to see off a Gladiator in some dog-fights. The appearance of German monoplanes like the Me l09 caused the demise of the 32 as a front-line fighter although they were still used in a training role, even into the beginning of the second world war. The aircraft that I modelled was flown in 1938 by Sergeant Pilot Giovanni Carmello who was the Squadron Leader of the Asso Di Bastoni squadron (Ace of Clubs).

The basic structure should be familiar to many and should not present too many problems, however some parts will require the knowledge of an experienced modeller to manufacture but many short-cuts can be taken and these I will leave to you. But, for the moment, let's motivate...

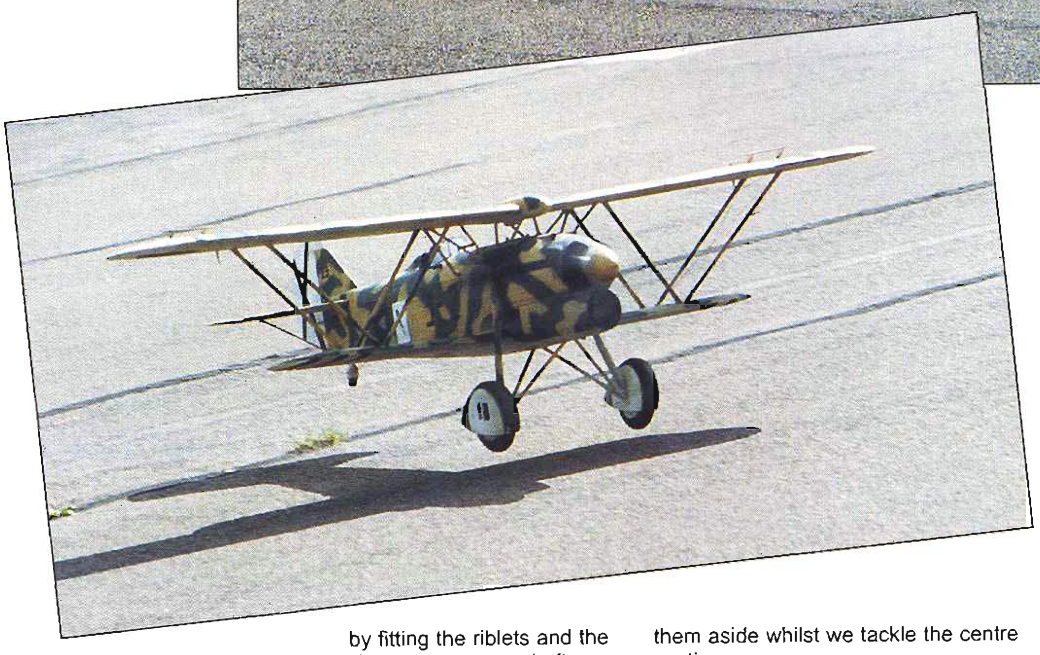
Lower wings

Because man has to start somewhere when building a model, let's start by getting to grips with the wings. I firmly believe that this is the best place to start, as building wings to fit a completed fuselage has got to be a harder job than 'tickling' a fuselage to fit a completed wing.

All the wing panels are made similarly, and the first job I completed was to manufacture the wing tips from laminations of 1/16" ply, in the well proven manner of wrapping the PVA soaked strips around the finished shape, the shape being panel pins tapped into a scrap of wood in the shape of the wing tips. These were left overnight and then released from the 'jig' to give a nice strong wing tip. (To combat the many doorways that the wings would pass through!)

Onwards... After all the spars and ribs were cut out (don't forget the support tabs which initially support the ribs) I set to with the lower wings. First of all, pack as necessary and set-up the leading edge (LE) in position followed by the two lower spars after thinning them towards their tips. Glue on the formed tip, packing as necessary, following this with all the ribs remembering the dihedral on the inboard one. Complete this first stage

Designer and prototype (right) and model about to touch down below. The photos in this feature are a mixture of `Paul's own and from the lens of scale columnist Gordon Whitehead.



by fitting the riblets and the thinned (tips) upper spars, and after a good cup of coffee (presuming you were using faster setting adhesives) lift the wing panel from the board.

The rib supports can now be dressed off and, when the trailing edge has been pinned to the board, the wing panel is glued to it, packing as necessary. After the wing panel has set properly, it can be lifted and the finishing touches added. Fill in the rib/spar cut outs with small offcuts and reinforce in the weaker positions as shown. This completes the panel basically; give it a good sanding and, after building the opposite one, put them aside whilst we tackle the centre section.

The centre section is built over the plan similarly to the outer panels. This unit is made and finish-doweled to the panels and then, at the right stage in the building of the fuselage, this centre section is fixed in place over the fuselage ply doublers. The secret to success here is to make sure you are accurate with the measurements of the middle centre section and the overall width of the fuselage doublers.

Make sure you have drilled the ribs to suit the dowel tubes and proceed as follows:- Set-up/pack the lower two spars and the L.E. on the plan, then glue the ribs in place, insert the dowel tubes and epoxy in place, topping the framework off with the upper spar. This unit has to slide on to the fuselage remember, so now sheet over the ribs flush with the inner 1/8" ribs! When dry, remove the unit from the board and sheet the other side, then face the outer ribs with 1/32" ply.

Finish the centre section off with a good sanding - keeping the unit nice and square will help with the setting-up later so don't go mad with the 60 grade glasspaper!

The wing panels can now be mated up to the centre section, so if you haven't already done so drill the wing panels to accept the dowel tubes and then set up each panel in turn, doweled to the centre section at the correct dihedral, then epoxy the tubes in place packing between the spars as necessary. For the interplane strut mountings I used a piece of beech epoxied to the spars and drilled as necessary. A final tickle with the glasspaper will ensure a good match at the joints after everything has set.

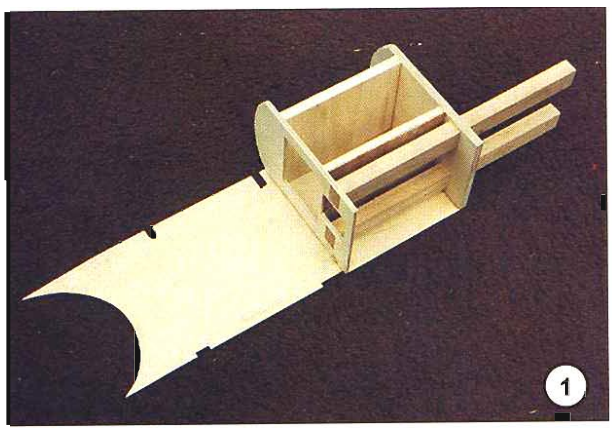
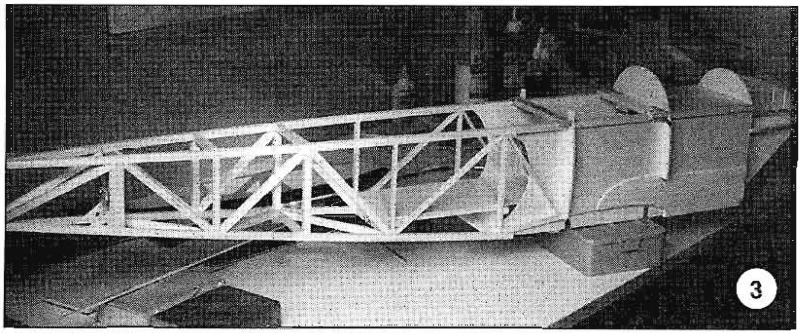
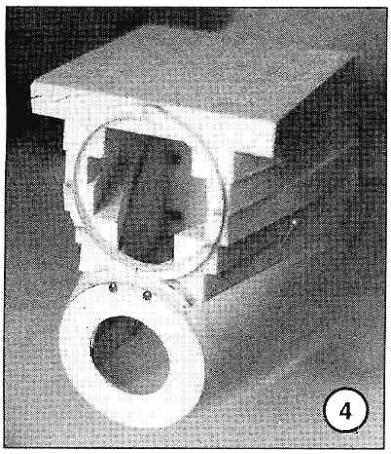


Photo 1. Early stages in fuselage construction showing details of engine bearers and firewall bulkhead layout on the 1/16" ply side. Photo 2. Fuselage construction progresses. around cockpit area. Note undercarriage and cabane block cross-members.

Upper wings

The basic construction of the upper wings is very much the same as the lower but a larger version, of course! The main thing to remember with the ribs is that this time we need holes for the closed loop system for the ailerons. Having mentioned closed loop it is not absolutely necessary to use this system as a bellcrank: or snake could replace it. However, for scale appearance and scale workings, it is the only way to go and is a much more positive way of operation. The upper wings are joined using four 1/16" ply braces so provision is needed for these and the way I did this was to build them into one half of the wing and leave out the last few ribs on the other wing until





I was ready to join and add these as the wings are joined.

Ailerons were built as separate items once the wings are removed from the board. The hinges used were the Robart medium size, the hinge line being shrouded using 1/64" ply to give a neat fit as were the full sized. All the mounting pieces and ball joints for the strut fixings are added at this point and then, before the centre section of the wing is added, it is necessary to build the fuselage.

The big bit in the middle

The construction of most of the fuselage will not pose any problems to any modeller with a few years' experience, the detail on top of the basic structure where I used lithoplate extensively is the problem area. However, the model can easily be finished with minimal detail and still look a pleasing sight on slow fly-pasts, the choice is yours!

For step-by step-construction here goes. I first cut out two accurate 1/16" ply sides and marked out the exact positions of the front formers and floors, etc., the small cut-outs for the lower wing spars and the undercarriage/cabane mounting blocks were also made.

Ply F2s and F3s were now manufactured; ensure these are fairly accurately made, it does make for a sound, square unit with which to build on the outer structure. Glue on F3 squarely in position onto one of the 1/16" sides, followed by the tank and battery bay floors in the positions you require for your tank, then add F2 to this. At this point I suggest that you add the throttle control of your choice - I prefer a bowden cable for this - also the tank feed and breather pipe holes can be drilled in F2. F4 is then added to the structure, and finally the addition of the other ply side to complete for the moment. Now epoxy in the engine bearers and their 1/16" ply reinforcing sides, completion for the time being is accomplished by marking out and the addition to the structure of the 1/8" and 3/16" balsa doublers, contact adhesive being the order of the day. Now put this unit aside.

The side frames are now manufactured from 1/4" square balsa and 1/4" x 1/8" spruce; this is done over the plan ensuring that the two sides are the same size. These are then fixed to the initial structure; they should meet up neatly with the top and lower sides of the 1/8" doublers ensuring that the top longeron is parallel to the top edge of the ply structure. Then, either using a fuselage jig or the well proven straight line drawn on the table top, pull in the rear of the side frames and glue in the cross/diagonal pieces of 1/4" balsa to complete the basic fuselage structure.

The mounting holes can now be drilled for the engine used and the captive nuts for fixing epoxied in. The correct position can now be found for Fl and this is then glued in position. The balsa tops of both F2 and F3 can now be added, along with the sheet infill between Fl, F2 and the bearers. This infill will mate up with the 3/16" planking which covers the front upper fuselage. Similarly infill at the side of the bearers and F2 which tapers to Fl.

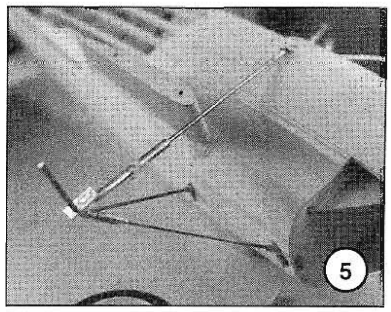
The battery and tank bay can now be suitably completed with padding/fuel proofer as necessary. At this point I also manufactured a removable ply plate which houses the main three servos. This plate is mounted on bearers on the side walls and the removal of two screws and this plate allow the tank to be removed through the radio bay. (Sod's Law states that "if a tank is built into a model it will leak or a problem will arise with the clunk")

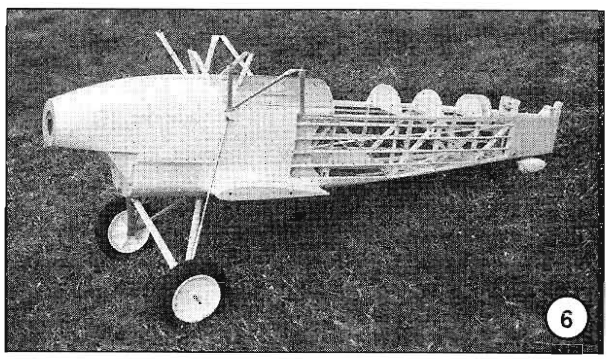
At this point I manufactured the tailwheel assembly, built from a fabrication of brass tubing and piano wire. It allows the free castering wheel to spring and caster as necessary. If you opt to do this as I did, the assembly can be fitted through the top of the fuselage allowing for near completion of the rear fuselage without the wheel fitted. However, do not solder the collet on the top of the castering shaft as this will have to be fitted into the main assembly afterwards before the rear top of the fuselage is fitted. The hinge pin for the assembly is supported by two small ply fillets adhered to the side framework and the fairing and wheel spat were shaped from balsa.

If you fancy, as I did, a jacking tailplane (this allows adjustment of incidence) then now is the time to manufacture the jacking assembly within F9. Also the rear mount for the tailplane pivot dowel can be affixed in position. When you are satisfied with everything within the rear structure, the sides are sheeted with 1/16" balsa. Dummy set-up the fin and rudder and glue in exits and guide tubes for the closed loop rudder cables in the correct position and also the snake for the elevator.

The tops to the rear formers can now be added (from the cockpit rearwards) making sure they are in line. The ply mounting plates and mountings for both the cabanes and undercarriage are now manufactured, the u/c mounting strut is 8 swg piano wire annealed at the ends and drilled to accept a 12 BA bolt (bind and epoxy to ply bearer). The cabane mountings are small pieces of tube which, when again are bound and epoxied to the ply bearers, allow the completion of the fuselage before the cabanes are finally mounted. Final mounting is accomplished by sliding the lower strut ends through the fuselage sides and into 'the tubes. The strut ends are then retained by soldering on a short piece of tube.

At this point I built in all the framework and flooring for the cockpit,





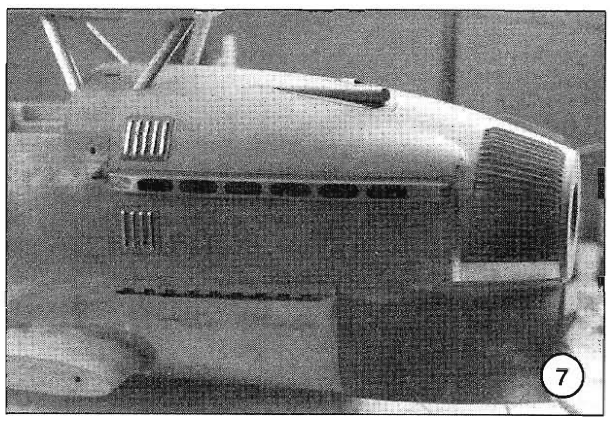


Photo 3. 1/4" square balsa side-frames attached to front fuselage structure and pulled together at the rear to form final fuselage shape.
Photo 4. Nose detail showing balsa block laminations prior to carving the cowling. Paul used this as the master for a glass fibre unit.
Photo 5. Piano wire undercarriage before cladding with balsa and ply and glass fibre strengthening. Plan shows lengths and shapes.
Photo 6. Coming together. Fuselage framework almost finished with cabane struts and undercarriage in place.
Photo 7. Super-detailers will find the CR-32 a challenging project. Paul made extensive use of thin lithoplate to simulate vents and louvres around the engine covers.

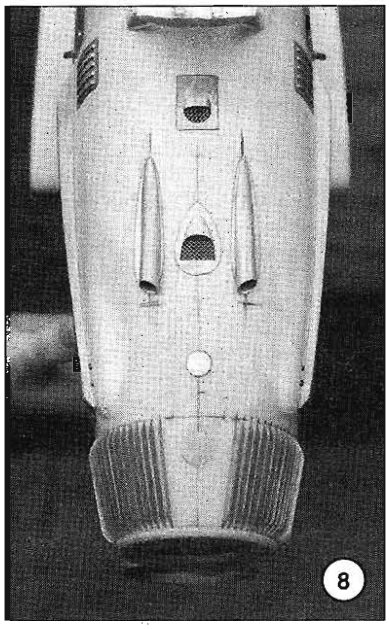


Photo 8. More lithoplate detailing on the prototype. You don't have to use the stuff and many will not feel sufficiently confident to give it a try. Alternatives are card and balsa scraps.

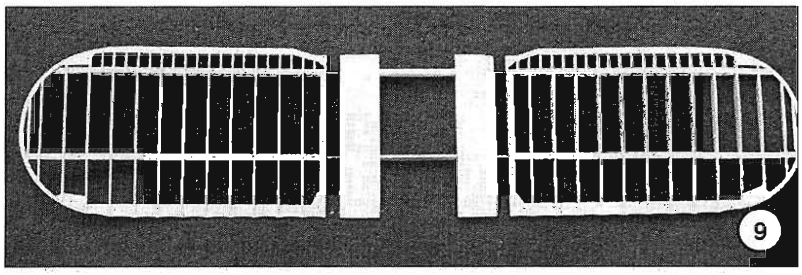


Photo 9. Wing structure is basic and simple enough. This is the shorter lower wing unit.

Photo 10. Fin and rudder. Dead easy to make using a 1/16~ balsa core with rib detail built on each side sandwich fashion.

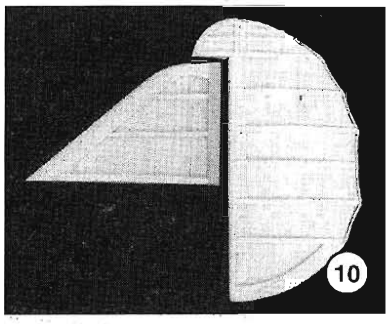
however skip the cockpit detail if you prefer. The underside of this area is next strengthened with 1/8" balsa between the tails of the 1/16" ply sides. Add the 1/4" side pieces between F4 and F6. Infill at points X to Y with 1/16" balsa so that side sheeting, when added, lies flush, then after adding F3a and F4a which create the oval shape to the fuselage sides, all the 1/8" sheeting can now be added, that being between F3/F4 and also the piece between F3/F5 just below the R/C hatch. This is followed by the forward 3/16" planking. The raised appearance above the exhausts (which on the full-size were to clear the V engine blocks) was added when the 3/16" is sanded to shape using resin/microballoons. The 3/16" sheet lower sides that were earlier attached to the ply side frames are planed/sanded to about 1/16" thick at the front to allow for more airflow, but before any of the underside sheeting is added, fit in the u/c ball joints. These are bolted through F2 and F3, and the sheeting was then applied between these two bearers but no further back as the lower wing centre section is left off until the last minute. The sheeting has obviously to be relieved around the ball joints to allow the fixing and movement of the u/c wishbones. Next job to attack is the fairing of the air escape ducts at the lower front sides of the fuselage. This I first attempted with foam but I just don't seem to get on with it, so it was replaced with well proven soft balsa which fitted the bill to a tee!

The cowl was now manufactured from glass fibre. A plug was first made from balsa which was built on the model. This was then removed and a female moulding made over it from glass fibre. The plug was subsequently removed and a male cowl, the finished shape, moulded within this.

Another quite complicated set of items are the cabanes which I found I had to manufacture on a jig. For this I built up a simple framework of beech to simulate the dimensions of the fuselage where they were to be mounted. The cabane framework has two sides (i.e. one left and one right-hand) made from 12 swg piano wire bound and soldered. They are finished with a sandwich of balsa and ply. At this point I also made the small brass plates that fix the top of the cabanes to the top wing. However, these are not soldered to the piano wire until we are able to set-up the top wing.

Now, before the top wing can be set-up correctly, the lower wing centre section requires fitting. This item should be a nice slide fit over the ply side plates, should butt up to the 1/8" balsa sides and, most importantly, the correct incidence should be ensured. Measure this to the datum (side frame top edge). This is then followed with the 1/8" balsa underside sheeting.

The first part of the process to set



the top wing incidence, is to fit on the lower wing halves. Once in place, the model requires setting up on a level surface. I use small screw jacked for this. Once this is established the cabanes can be slid home into their mounting tubes and the top wing set-up on them. Once in place and correct (which takes quite a while to perfect) the brass mounting plates can be soldered in place. These plates will hold quite sufficiently if you ensure that the hole you drill in each for the cabane is a good tight fit. Once the two wings are in position the interplane struts can be made up. The upper ends are all fitted with ball sockets, which are fixed by drilling the ends of the struts to accommodate a piece of studding with the ball socket screwed on. These, after being epoxied, are faired with microballoons and resin. The lower ends of the struts are again drilled and epoxied to a wire fitting. These fittings locate in the lower wings, and are nipped up with a 2mm nut on the underside.

All the remaining top formers and sheeting (ply/litho), plus the fuselage stringers can now be attached. Remember the radio hatch. For this I used sub-formers and litho and held the hatch on with a small I spring, but use your own proven methods if you prefer. All the areas I covered with litho can be just as easily covered with 1/64" ply. The headrest is again carved from block balsa.

At this point it is as well to complete the centre section of the upper wing (before this add the control wires and cover the upper wing with your chosen covering). On the full-size this was an auxiliary fuel tank. To do this I first built up sufficient block balsa in situ and carved the tank to shape. This proved to be susceptible to knocks at the front so was replaced with a fibre glass. moulding up to the panel lines. The lower centre section is then cut from this finished shape and the inners hollowed out as much as possible to allow the mounting of the servo. The removable portion is fixed to the centre cabanes to accommodate the lower section of the servo plug so that when the wing is lowered onto the strut, the plug mates up giving electrical contact. The actual completion of this is quite tricky and requires the spruce/litho struts to be fixed to the centre section and the top of the fuselage while the top wing is in place. Remember this item bears no load, so butt joint all the items to their mating surfaces, and also

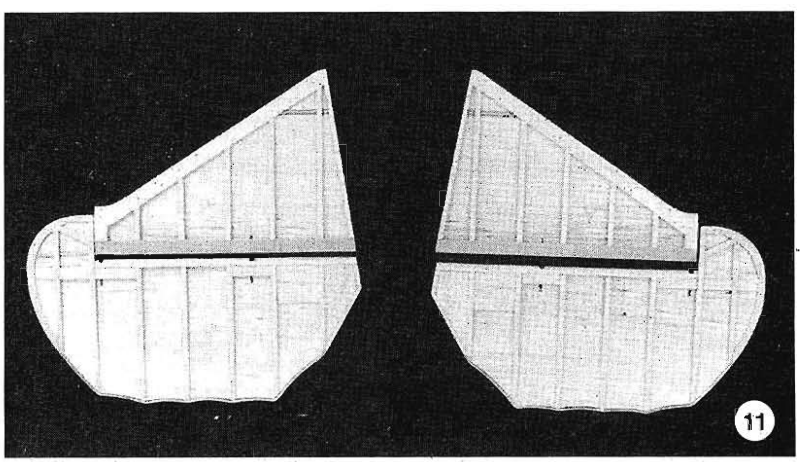
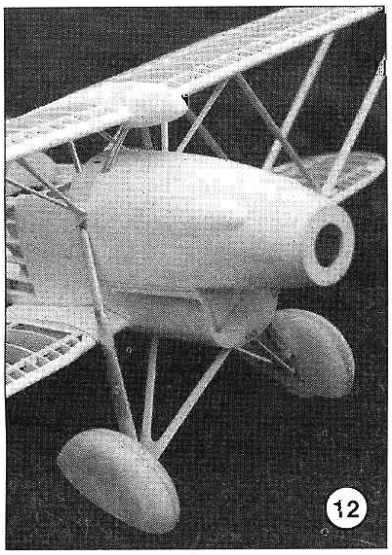
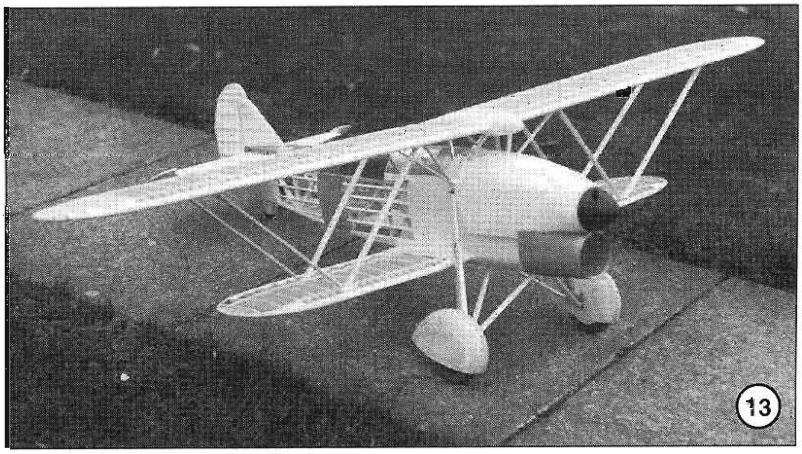


Photo 11. ... and the same system is used for the tailplane and elevators.





Photos 12 & 13. Model finished ready for covering. Prototype used Solartex with airbrushed Humbrol matt enamels.

if you require, as I did, to lead a servo cable up to the plug, one of the struts will have to be hollow!

Tailfeathers, etc

The only remaining parts to manufacture for completion of the fuselage are the tailfeathers. These are very straightforward and are constructed from a simple sandwich of balsa around a central core of 1/16" balsa sheet. The inclusion of the tubes for mounting the tailplane to the tilt and jacking mechanism, and also the reinforcing ply on the tailplane arid fin for the support struts, completes these. Depending whether you decide to make a hollow fin/fuselage fairing or use carved up balsa, will decide the way of mounting the elevators. This I will leave to your experience, and don't forget that the tailwheel requires final mounting before you fit the fin and tail. Hinges again on these were Robart types.

Odds and ends

The undercarriage was manufactured from a piano wire skeleton faired with balsa/ply with strengthening where necessary with fibre glass. The plan shows how these were made, however many short-cuts can be made in their manufacture and again will depend on your personal preferences. I did try a few ideas I had picked up on the oleo main undercarriage legs, the oleo being a simple tube assembly with sealed ends and a 1" x 1/4" spring. The inside was lubricated with undercarriage grease from Unitracts which proved to be the icing on the cake. This silicone based grease is perfect for giving just the right amount of resistance when compressing and expanding the oleo.

Bench aileron tabs were manufactured from ply and fibre glass PC board; these seem to have no affect on the model's flying characteristics.

The tailplane support struts underneath the tail are balsa sandwiched piano wire and, on the upper side, are made from flat steel rigging wire. These are bolted to the fin, tailplane and lower fuselage with 12 BA bolts.

R/C gear is traditionally mounted within the R/C hatch, receiver and batteries packed underneath the servo tray and switch suitably mounted.

Again I could go on and on about the detail I have added to the prototype which carries as accurately as possible all the full-size detailing. Nearly all the surface detail is from litho plate while the painting, except for very small detailing, was airbrushed Humbrol matt enamel with matt Aerocote to fuel proof. Markings were either created using stencils made from tracing paper which were stuck to the model using Scotch temporary spray adhesive, or by using plain masking tape.

Maiden flight

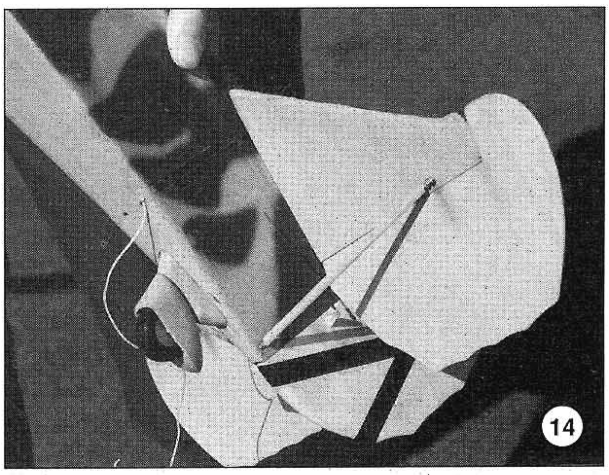
A reasonably calm evening was finally chosen for the big flight (I was sick of being called chicken!). As usual the model was placed on the strip into wind with the O.S. 48 ticking over nicely. The power was increased and the model tracked smoothly with only a slight swing which was easily compensated with a touch of rudder. However, after the aircraft left the ground it became apparent that even the slightest touch of aileron caused a sharp drop of the wing concerned. This caused the aircraft to rock from side to side violently. I gained enough height as quickly as possible to get out of trouble. As per usual, rates were much too high and the completion of the flight could not come soon enough. This was eventually achieved to my great relief!

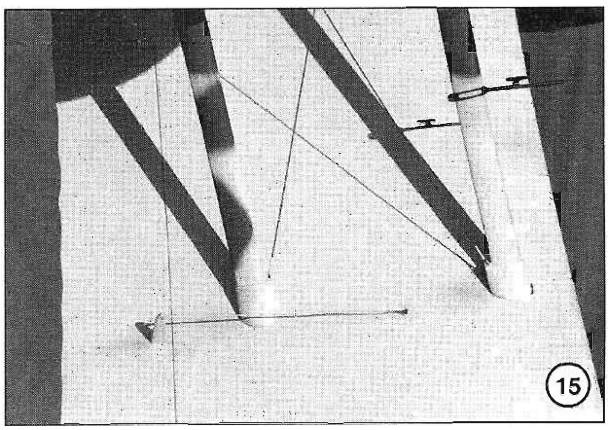
Subsequent adjustments made to moving surfaces and balance enabled more sedate flying characteristics. Coupling of the rudder to the ailerons helps with turning, and the model can be put through most scale manoeuvres, however you need to work when inverted as she tends to screw out.

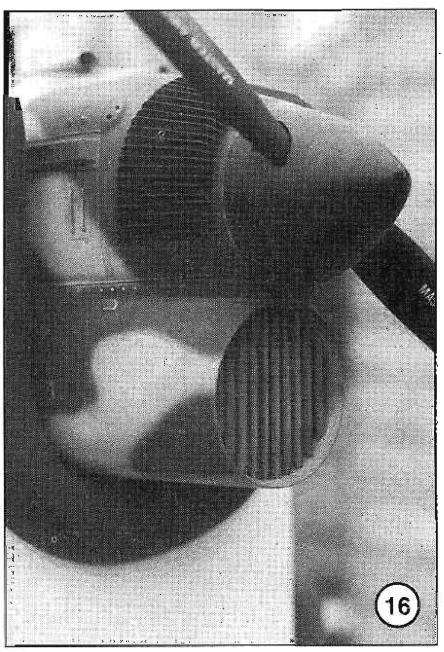
The model has become a great favourite of mine. The full-size lines appealed so much to me when I was first shown the three-view - it's not difficult to imagine a close formation of them with those mighty 12 cylinder V engines roaring in unison as they fly past... I'm getting carried away again!

Seriously, if the design does appeal to you, she will perform all the scale manoeuvres that the full-size could and more! Although quite small(so they keep telling me) she handles well on both grass and tarmac surfaces and, for convenience, you won't require an artic' to transport her.

Build one and enjoy a spot of scale flying for a change. RM







Photos 14, 15 & 16. Detail close-ups of the finished job. Markings on the 'Chirri' were sprayed through stencils and the whole paint job then fuel-proofed with matt Aerocote. As mentioned, much of the surface detailing was done using thin lithoplate.