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FLYING SCALE MODELS - THE WORLD'S ONLY MAGAZINE FOR SCALE MODEL FLYERS

ON THE COVER

The Fokker Dr.1 Triplane of WW1 will always be be known for its association with Germany's top scoring WW1 fighter ace, Baron Manfred von Richthofen. This month's issue commences a three-part construction feature for Peter Rake's electric powered 1/6th scale, 47" wingspan model of the type with full size free plans.

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EDITORIAL ADVERTISEMENT & CIRCULATION: Doolittle Mill, Doolittle Lane, Totternhoe, Beds, LU6 1QX.
Tel. 01525 222573 Fax. 01525 222574.
Email: enquiries@adhpublishing.com

CIRCULATION TRADE ENQUIRIES: Seymour Distribution, 2 East Poultry Avenue, London, EC1A 9PT
020 7429 4000.

NEWSTRADE: Select Publisher Services, 3 East Avenue, Bournemouth. BH3 7BW.
01202 586848
Email: tim@selectps.com

SUBSCRIPTIONS: Doolittle Mill, Doolittle Lane, Totternhoe, Beds, LU6 1QX.
Tel. 01525 222573. Fax. 01525 222574.

PRINTING: Symbian Print Intelligence, Calverley House, 45 Dane Street, Bishop's Stortford, Herts, CM23 3BT.
Tel: 0870 870 1670; Fax: 0870 870 1675

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CONTACT

Since our first ever issue, which went on sale in August 1997, FSM has provided Scale enthusiasts with a very wide range of plans-based construction features, covering all eras of aviation from the earliest, right up to the jet age.

But in more than a century of manned, powered flight there are a wide range of subjects still to fill gaps, some more significant than others.

One those gaps that has stood out a mile is one of the most famous of the WW1-era fighter types - the Fokker Dr.1 Triplane, made famous, perhaps even infamous, as the final mount of the top German fighter ace Baron Manfred von Richthofen, who met his death on April 21st 1918 while flying the type in combat low ever the lines on the Western Front in France.

The Dr.1 is not quite as original a design as one might perhaps think - being prompted by the capture of a Sopwith Triplane, which German aircraft manufacturers were quickly invited to examine and evaluate - but it was Dutchman Anthony Fokker who made the most of that opportunity (Netherlands remained neutral during WW1 and Fokker's factories were in Germany).

Now though, we are able to fill in this significant gap in FSM's plans presentations with Peter Rake's 1/6th scale example. Even at 1/6th scale, and notwithstanding the compact nature of the aircraft, Peter's design requires a full six sheets of plans to present and so will run as a three-part free plan feature starting with this issue. Even though it spans only 47" (1194mm), it is 'triplane-tall' and so is, nonetheless a reasonably substantial airframe, while still being compact enough the fit inside a car fully assembled - except for the top wing.

Naturally, being a Peter Rake design, it is intended for electric power, although, if the electric enthusiasts will excuse such 'heresy', I/C power could be substituted.

A full set of laser cut parts will back up this feature.

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Tasty Tiggie

Alex Whittaker talks to Alan Glover about his quarter scale DH 82 Tiger Moth

Most modellers have built, bought, or planned to build a De Havilland Tiger Moth at some stage of their scale modeling careers. No matter how many times he or she sees a new model of a Tiger Moth, the true scale modeller will always be drawn to it. I was going to say " ... like a Moth to flame.." but you get my drift. There is a familiar reassurance on encountering yet another fine scale model of the Tiger Moth. It is always fascinating to see how different modellers tackle key elements of their individual Tiger Moth, and to see how far they take their detailing. The choices they make of power plant, silencing,

Naturally, the model will perform all the aerobatic manoeuvres of the full-size aircraft.

undercarriage, propping, covering, scale detailing and finishing are endlessly absorbing.

The model

Alan Glover is a well known modeller on the UK scale competition circuit. He is a respected Scale Judge and a Nationals Scale competitor too, so he knows a thing or two about scale appearance. Alan has very high standards. Looking at her detailing, she is a first class scale model. Needless to say, when I caught up with Alan and his Tiger, they were competing in a BMFA scale event.

Plan

The model is built from the original Duncan Hutson Kit. Duncan is a celebrated UK scale man renowned for his design accuracy, so the faithfulness of the Tiger's overall outline is assured.

Documentation

The colour scheme chosen by Alan is based on a full size example which, until recently, flew from Old Warden. Alan took his own photos of the original to use in the construction of the model.

Construction

Duncan Hutson kits were known for their accuracy, and he always employed traditional balsa and ply construction, sometimes augmented, as here, with accurate fibreglass components, which were included in this fine kit.

Engine

The engine is a Laser 180 four stroke single. For the sake of tidiness, convenience, and added reliability, the model is fitted with an *SM Services* on-board glow system, controlled via a Y-lead on the throttle channel.

Prop

Graupner 18"x6" for normal sports flying.

Exhaust

Alan employed a custom Laser exhaust.

This incorporates an integral 2" silencer outlet extension which allows the exhaust gasses to escape from the scale position below the cowl.

Undercarriage

The undercarriage is practical, but closely follows the original. It was built up from the well-known *Flair Models* 1/4 scale kit of parts.

Covering

Good old fashioned but miraculous *Solartex*, doped with thinned shrinking dope before painting.

Painting

The model was sprayed with Flair Spectrum paint for the main airframe; i.e. the silver and yellow.

Legending / Decals

The decals, registration etc. are hand-brushed using *Humbrol* paints, laid-out with ink-compasses, and masking tape. The legending was made using photos from the original aircraft, scaled down to the correct size on Alan's home computer. He then printed out on water slide transfer paper, applied in the same

Looks like you could climb in the back cockpit.

1: Scale Man: Alan Glover and his highly detailed DH 82a Tiger Moth. 2: Scrap box to the rescue! Fine venturi and convincing hinge, screw, rivet and fastener details. Note strut fairings. 3: Lots of superbly accomplished scale detailing on the Tiger: doors, hinges, luggage compartment, flying wires, cockpits. Luvverly! 4: Alan was helped by his old instructor Frank Ashcroft with the instrument panel. Frank flew Tigers in the RAF. 5: I love this guy, especially his insouciant moustache. 6: Alan hand-brushed the roundels in Humbrol paints, after first marking them out with an ink compass, a la Gordon Whitehead's seminal scale book. 7: Anti-stall strake and intricate cable runs. 8: Scale wet grass on the scale tyres! Nicely detailed wheel hubs. 9: 1/4 scale undercarriage built from a kit of parts from Flair. Functional and practical.

manner as Airfix plastic kit decals.

Fuel proofer

The whole airframe was given several thin coats of *Flair* fuel proofer.

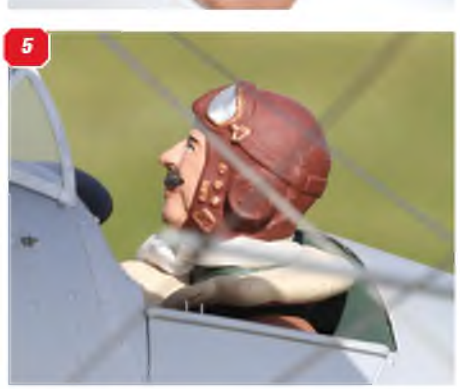
Scale details

The cockpit instruments were made from scratch by club mate Frank Ashcroft.

Frank was the chap who, years ago, taught Alan to fly model aircraft his local club site. Serendipitously, Frank is an ex-RAF pilot who flew Tiger Moths, Chipmunks, and Vampires during his service. The model pilot is an original quarter-scale full length *Pete's Pilot*, bought from the man himself many years ago when he gave a club night presentation. Alan painted the pilot. Most of the other scale details are made, as most modellers do, from scrap box odds and ends.

Items of note

The only real departure from the original kit is that that Alan made the cowl side panels hinged in order to gain access to



10: Trademark DH corrugated petrol tank on the upper wing. Note sight gauge. 11: Lower aileron details. 12: Rib-taping and finely finished flying surfaces. 13: More scrap detailing: convincing pitot tubes. 14: Beautifully executed wires, terminations, and struttery.

the fuel filler and on-board glow system. If you look closely, you will be able to see Alan's piano hinge, which is a work of art.

Radio

The radio is a 2.4 *JR XG11* set. The most useful feature of this is the telemetry, which allows Alan to monitor the signal strength and the Rx battery condition (6v Eneloop pack) during flight. Any problems are highlighted by an audible warning alarm on the Tx.

Pilot's notes: Alan relates..

"The model is actually one of the nicest flying models, scale or otherwise, that I have ever had. It is very predictable and docile right down to the stall, which itself is just a gentle drop of the nose. It will land at walking pace and performs very nice three-pointers. That said, it is capable of anything that the full size will do as regards its aerobatic performance. Rolls, loops, reversals and stall turns are all very

Alan's model is built from the Duncan Hutson kit.

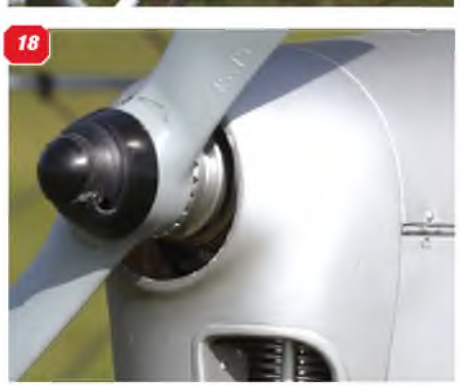
easy. Most of the flying including take off is done at between 50% and 75% throttle with more only needed for loops, stall turns etc. For smooth 'tidy' flying the model needs quite a lot of coordinated rudder during turns, but then, so does the real thing. I would have to list this as my favourite scale model. As such, I probably don't fly it as often as I should as I prefer to only fly it during calm weather. The model will cope with breezy weather, it's just that I most enjoy watching it waft around in light breezes when it can be flown in a realistic manner on low a throttle setting when it looks and sounds just right".

The Tiger Moth looks very pretty in a moderate bank at a good height.

MODEL SPECIFICATION

Model:	DH Tiger Moth
Scale:	1/4
Wingspan:	88"
Wt:	19.5lbs
Engine:	Laser 180 30cc four-stroke glow
Prop:	Graupner18"x 6"

15: Alan modified the cowling to hinge in the correct scale fashion to give access to the engine and the glow system. 16: Mouldings were in the Duncan Hutson kit, but Alan's detailing makes them come alive. 17: Alan modified the engine cowling. Great hinge and rivet detail on the now working cowl. 18: Laser 30cc four stroke glow engine is fully hidden in the cowl. Exhaust exits in the scale position, too. 19: Note Angel One Five logo and surface detailing. 20: Graceful and distinctive DH rudder.



Techno Scale

Mike Evatt sc

Jetex.org at www.jetex.org exists to serve the world-wide community of enthusiasts for models powered by micro rocket motors, especially those exemplified by the old Jetex series of engines. Their mission is to be the premier Web resource for information and advice about such models and the motors that power them. Additionally, in their *Forum Archive* you can take advantage of the extensive collection of the past contributions of fellow aeromodellers, historians, scientists and assorted other micro rocket enthusiasts from all around the world, as they discuss everything from how to build and fly model jets to collecting vintage motors. There is also an extensive plans archive!

It is sad that there appears to be no current product of Jetex or similar jet motors. So how can we fly those delightful scale jet models of yesteryear? All is not lost as the SAMS Models website at www.samsmodels.com reveals. Convert to EDF! The F570n KP 24mm Bore Electric Ducted Fan can be used to power many of their Rapier or Jetex powered models up to 18", built light. This should be used in conjunction with F515 timer and a Li Poly battery. This tiny unit is 35mm in length has an outside diameter 26mm and weighs 8.8gm.

Dave Maskell, the proprietor of **Flywize Models**, has been involved with modelling since 1968. All these years of modelling prompted himto start up a small but personal business catering to fellow enthusiasts. Check out his website at www.flywizemodels.com The ASW 28-18 is a 1/4 scale, all fiberglass sailplane of the ASW-28 Alexander Schleicher GmBh. The model contains installed retract gear and detailed cockpit. Whether you prefer thermal soaring or slope soaring, this model is made for you.

Scale soaring enthusiast **Zbigniew Michalczyk** hosts an excellent website at http://mysite.verizon.net/vze2qbfc If you are tired of seeing ASH, ASW, DG, Ka6 gliders on your flying field, this site is for you. If you are familiar with Foka, Swift, Fox or Wilga and would like to know more about other less known Polish gliders and soaring related aircraft then log-on now. In the years after WW II Poland produced over 5,000 gliders in over 75 different types. If you consider another 75 plus pre-war designs there are almost unlimited possibilities for an interesting prototype.

Noggin End is a small friendly company which supplies metals and plastics, mostly to model engineers and hobbyists, but they are happy to supply anyone who needs a small quantity of material. They like a challenge, so if you require strange or unusual material, why not give them a call. They do very good 12in length bundles of Aluminium Grade 6082/HE30: Medium strength manganese alloy with excellent corrosion resistance. It has the highest strength of the 6000 series alloys. Check them out at http://nogginend.com

www.windsockdatafilespecials.co.uk is the official web address of **Albatros Productions.**This is the home of the world's largest range of WWI aeroplane books and journals for modellers and enthusiasts. If you're a fan of classic 1914-1918 aircraft such as the Albatros, Bristol Fighter, BE2c, Fokker, Gotha, Nieuport, Pfalz, Roland, Rumpler, SE5a, Sopwith Camel, Pup and Triplane, Spad and many more, this is the

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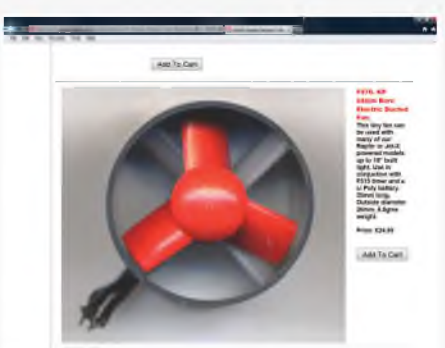

Convert to EDF! A new power source for your Jetex models.

Dave Maskell's ASW 28-18 is a 1/4 scale of the ASW-28 by Alexander Schleicher GmBh.

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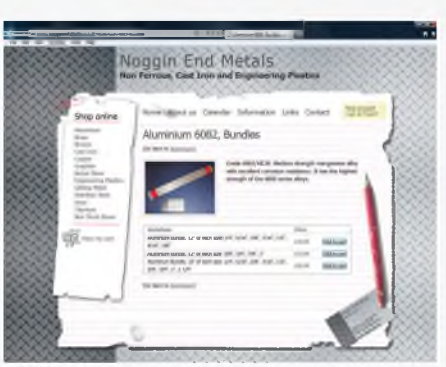

Noggin End supplies metals and plastics to model engineers and hobbyists.

Albatros Productions, the home of the worlds' largest range of WWI aeroplane books.

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site for you! Written, illustrated and produced by experts in their field they offer the finest references available, whether you're interested in aces, camouflage and markings, squadron histories, technical data on aircraft ,and modelling WWI aeroplanes, they cover it all!

The website at www.nurflugel.com/Nurflugel/Fauvel is a transport of delight!It will introduce you to some rather unusual flying machines, the 'flying wings' created by **Charles Fauvel**, best known in aeronautical circles as the designer of tailless type gliders. Yet his life was equally rich in many other events which marked the development of French soaring, and which is evoked throughout this biography. The AV-10 shown in the screen-shot was the first airplane-only design of Fauvel to be flown.

Ozark Model Aviation is based in Hurst, Texas USA and is a business dedicated to the advancement and promotion of free flight scale modelling by offering flight tested scale model blueprints, model kits, and the 'right colour' tissue that works with many of the colour schemes of the models presented. These prints address subjects rarely seen, but nonetheless are exceptional flying models. Many unique WW-I and WW-II subjects can be found here. Chief test pilot Mike Midkiff is fascinated by the results that can be achieved when engineering principles are applied to model aircraft concept and design. Take a peek at their web presence at www.ozarkmodelaviation.com

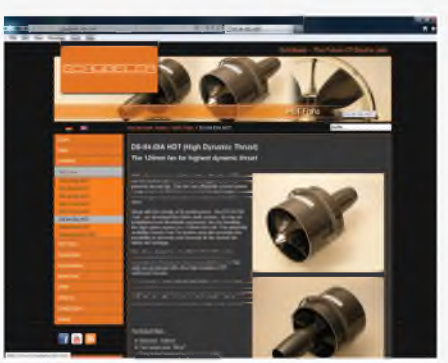
The homepage of **Schübeler Composite** - manufacturer of high quality electric fans and GFK airframes resides at www.schuebeler-jets.com They can supply suberb EDFs! With a fan swept area of 94cm and a diameter of 120mm the DS-94-DIA HDT is currently their biggest and most powerful ducted fan. This fan can efficiently convert power inputs of up to 5.7KW into a very high thrust impulse - thus being an ideal alternative for turbines of the 80N-class. All ducted fans of the DS-XX-DIA HDT series come fully assembled, finely-balanced and quality-checked, you simply have to install your motor and the system is ready to fly.

I enjoyed re-visiting **Chris Willis'** website at www.williswarbirds.co.uk Chris has been a modeller of R/C aircraft since 1986 and has been very successful in bringing to life replica scale models from WWII including Hawker Typhonn and Tempost, plus Airchi D3A 'Val'. His 1970s-era Yak 50 aerobatic aircraft is to 1/4 scale. spans 94ins and is a cost effective and easy-to-construct introduction into large scale models. The flights of the prototype also prove it's a very good flier with a very low stall speed but will also perform all the aerobatics as per the full size. This design features a flat bottom wing and the model can be glassed/painted or be covered in film.

Flightline Graphics at www.flightlinegraphics.com are suppliers of Standard and Custom paint mask systems for scale models and full size aircraft. Firstly, of interest to WWI model builders are a set of Axial rubdown decals for propellers. They are available is 1/3 scale and 1/4 scale. Because there are differences in opinion, as to what colour the decals should be they are supplied with a white, cream, silver, or gold background. Not only that they can supply Paint Masks for insignia, Dry Rubdown Decals and Stencil Masks. ■

The fascinating "flying wings" created by Charles Fauvel.

Ozark Model Aviation is dedicated to promotion of free flight scale.



Schübeler Composite is a manufacturer of high quality electric ducted fans.

Chris Willis' Yak 50 is a cost effective and easy-to-construct introduction into large warbirds.

Flightline Graphics are suppliers of Custom paint mask systems for scale models and more!

That's all there is time for from me this month so tap that rodent and if you find something out there of interest that might be good to share, email me at:

mikeevatt@hotmail.com

PART 1:

THE TRIPLANE LAYOUT MAKES THIS APPEAR A QUITE COMPACT MODEL, BUT AT 1/6TH SCALE, IT REQUIRES THREE FULL SIZE PLAN SHEETS TO COMPLETE, SO THIS FEATURE WILL RUN OVER THREE PARTS WITH PARTS 2 & 3 IN OUR JANUARY AND FEBRUAY 2014 ISSUES

Rightly or wrongly, the Fokker Triplane is probably the most famous aircraft of WW1. Even non-aviation oriented people have heard of it, and if asked to name a WW1 aircraft, this is probably the one they will come up with. Needless to say, when they think of the type, it is invariably all red and they are often surprised to hear that it came in any other colour. Darrin, it would seem, has gone out of his way to prove that other colours were in fact available. Really, it wouldn't be too far from the truth to say you could have any colour you liked, including black.

The story behind the model

The story of how we arrived at the model you will see here is, as is often the case, somewhat convoluted. It all started when Darrin was gifted a true scale kit from *Arizona Model Aircrafters*. This particular model featured an aluminium tube fuselage, that ultimately had to be replaced with dowel if the model were to be used as a radio control scale model. (I believe it is really intended as a museum quality display model.)

Anyway, after spending a lot of time, effort and money doing his usual high class build on the model, it was time for the test flight. The model took off nicely, but proved very reluctant to climb. When the first turn was attempted, the model did its level best to destroy itself by attacking the ground.

Rather than spend even more time and money repairing a model that obviously wasn't going to fly in the way Darrin had expected (if at all) he gave up on it. But he

FOKKER Dr.1

A 1/6 scale, 47" (1198 mm) wingspan, electric powered model designed by Peter Rake, with the prototype model built by Darrin Covington.

You really would be hard pressed to tell Darrin's model from a real Fokker Dr.1 in this shot.

elected to salvage as much of the scale details and fittings as possible and then approached me to design a model that would stand a better chance of flying - all of which just goes to show how truly desperate he was for a model of the Fokker Dr.1.

The original model had been accurate-to-scale (although I believe based on inaccurate drawings), and Darrin wanted this new model to be made to look just as accurate. This meant keeping the cockpit area clear of obstructions and positioning all the equipment where it would be hidden from sight and allow scale-like control runs.

To this end, the structure is a little more refined than my usual designs and the radio installation is somewhat more cramped. None of that prevents you building a simpler model with wing mounted aileron servos and more conveniently placed equipment. Unlike most of my designs, which tend to get 'scaled-up', you have the option to 'scale down' this one into a simpler model than the one built by Darrin. Please don't cover it in glossy bright red film though!

Onto the build

Let's get you off to a gentle start by building the tail surfaces. In order to end up with roughly scale sections for the tail surfaces these are built in two basic stages. Once you have the laminated outlines prepared, the basic structures are built over the plan and allowed to dry completely. Then, because the surfaces on the full-size aircraft weren't actually of flat-plate section, cap strips and additional cut parts are added to each side and the finished structures sanded to a streamline profile section.

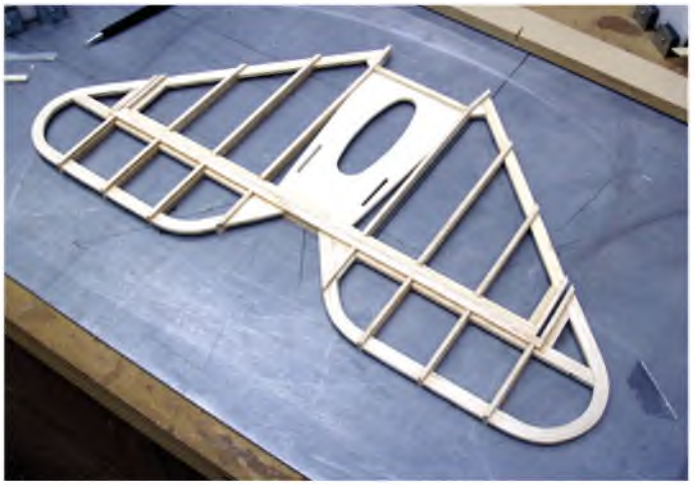
For the rudder, this is quite straightforward; a couple of cap strips at the rib positions, some strip to allow the hinge line to follow the overall shape and a couple of cut parts around the horn.

The tailplane gets a little more complicated because we need it to be to the correct section, but still seat accurately on the flat rear fuselage. To this end, the capping strips are added at the points indicated on the plan, parts T4 fit around the cable exits on the upper surface and parts T6 provide a fit against the fuselage sides.

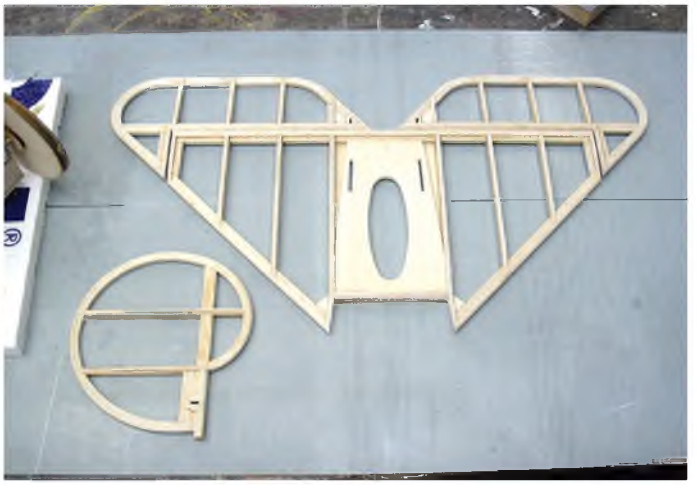
Bear in mind that keeping the tail end light is VERY important with short nosed types of which, the Fokker Dr.1 is a prime example. Therefore, if all you want is a Sunday flyer type model, the capping and additional parts may be omitted and the edges simply rounded off. Always remember that light models fly better than heavy ones and a small amount of weight saved at the tail can often mean saving six or seven times that amount at the nose - needed to counter the tail weight when it comes to balancing the

Here we see the tail surface outline laminations securely strapped to a substantial former.

The basic rudder core being built over the plan. Darrin uses a magnetic building board, so no pins.



The tailplane with all the capping pieces added. Just a few cut parts still to be fitted.



Those same tail surfaces, after the shaping is done.

model. A reduction of half an ounce at the tail could well mean a model that ends up four ounces lighter overall.

I realise this may sound like preaching to the converted, but it's only too easy to get carried away when detailing your model. Darrin's first Dr.1 was over a pound heavier than this one - and it showed.

Top wing

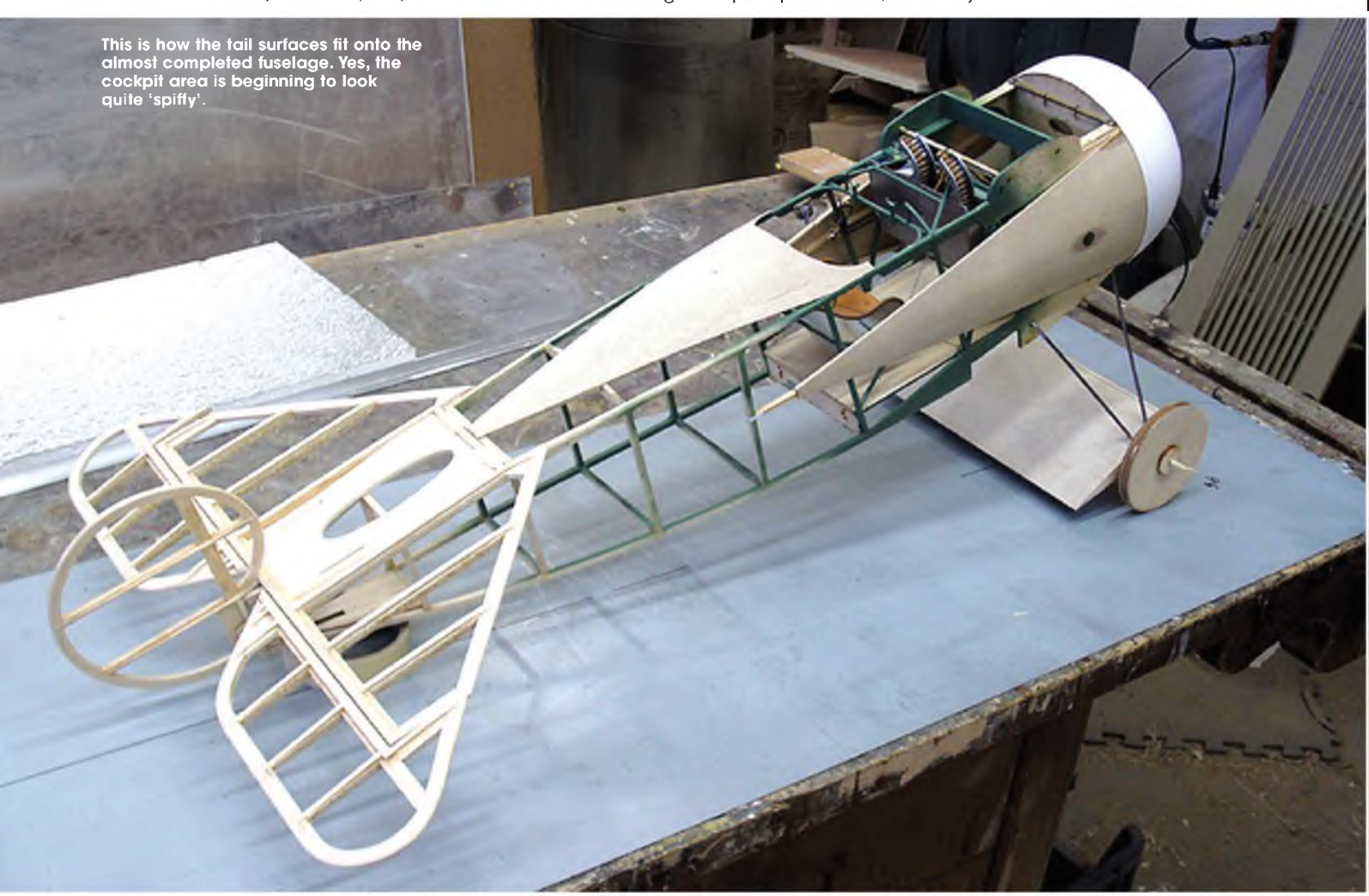
Moving along in easy stages, the top wing is probably the next thing we should tackle. It looks relatively complicated, but isn't really - as long as you study the plan and sort out what goes where before you begin building.

Once again, the model was designed to result in a very accurate looking replica Fokker Dr.1, so the spars are in pretty much scale locations and the wing section is as accurate as I could get it without making for an unduly complicated build.

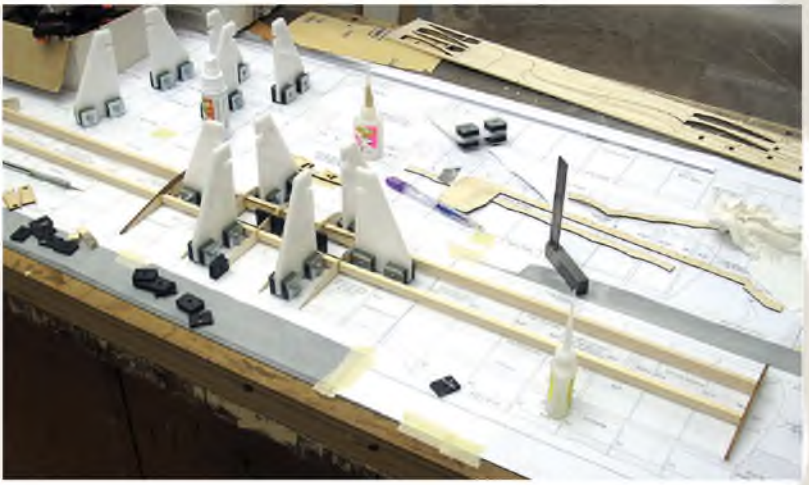
Since all three wings need the tip pieces curved to follow the under camber, you might as well do them all at the same time. By the time you're ready for them, they will be dry and already curved, so you don't end up building in any stresses at the wing tips. Soak them, pack as required and clamp down the ends to produce the required curve - then start building wings to which they can be attached once dry.

Because this isn't the largest model imaginable, and the span is quite condensed due to the triplane layout, none of the spars or leading edge pieces are more than 42" long from tip to tip. Therefore, if you want to build the wing as a single unit, that shouldn't make obtaining long enough wood a major issue. If, however you can't get it (and that's the premise I was working on when I designed the model) the plan shows the wing built using separate components for the individual panels and ply braces at the joins. Just make up the spars and what have you first, and then proceed to build the wing in one piece - or not, as the mood takes you.

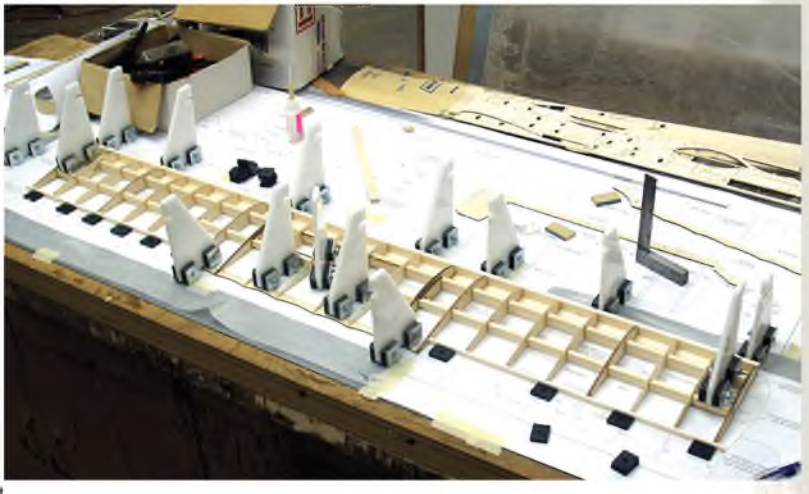
Begin by pinning down the leading and trailing edge pieces and sliding all the ribs onto the spars and arranging the spacing to match that shown on the drawing. Don't glue them to the spar yet or, if you do, use a slow setting glue that will allow plenty of time for adjustment.



This is how the tail surfaces fit onto the almost completed fuselage. Yes, the cockpit area is beginning to look quite 'spiffy'.



Darrin decided to get the centre ribs securely set up before adding the remaining ribs.



The basic top wing all assembled over the plan. Note how chunky the leading edge spar looks.

You'll notice that the aileron spars and leading edges are listed as being cut from sheet rather than stock sizes of strip. That's because the wing doesn't quite touch the board in this area and you'll need to make up the slight gap so that your wood can fit flat against the building board. It avoids the risk of building in warps and this is another reason why building the wing as a single unit is a good idea. As you can see from the photos, that is how Darrin built his top wing. As a cabinetmaker he is a stickler for accuracy of build, so if it's good enough for him, it must be the best way to go about it.

Apply glue to the leading edge, aileron spar and trailing edge where the ribs go, and position you spar/rib assembly accurately over the plan. Make any final adjustments, including ensuring that the centre section strut position ribs are precisely at right angles to the board before pinning it all down and leaving to dry.

Build the ailerons and fit the interplane (i/p) strut locating 'ribs' and once again check that they are at precise right angles to the board. If the struts aren't a smooth fit into their sockets that might well induce warps as you assemble the model, so put in the little extra time needed to ensure this area is right.

By now, those tip pieces should be dry and nicely curved, so you might as well glue them, and their supporting gussets in place.

While the wing is still pinned firmly to the board, glue in place the ply leading edge sheeting. Study the sections to see how it attaches to the spar and not that you will need to trim the i/p strut socket slightly to get it to fit that area. I felt that the 'tabs' on those parts would ensure your strut sockets aligned properly with the spars, and getting the struts to fit accurately was more important than having to do a little trimming later on.

Now you can remove the wing from the board and install the aileron cable entry and exit tubes as shown on the plan. Then you can spend a pleasant (?) hour or so trimming and sanding everything to shape ready for covering.

Just a few pointers

A few notes are in order at this point, so here goes. Don't be tempted to replace the aileron leading edge with balsa, even hard balsa. Once shaped there isn't very much of it and by the time hinge slots are made, those counterbalanced wingtips are likely to put quite a strain on the outer hinge position. Originally, the plan did show balsa for those parts, but it did indeed cause problems. Both aileron leading edges fractured at the outer edge of the hinge slot - you have been warned!!! If you think your Dr.1 may see a lot of 'combat action' I would suggest you make them from thicker bass - or an even harder wood. The bass shown worked just fine, but Darrin doesn't tend to stress his models too much.

Because there's ample space for a servo between the spars, the scale linkages aren't essential. They add realism to the finished model, but do take a bit of setting up if they are to work correctly. A dummy (elastic cord) top cable and a pushrod below the wing, to a wing mounted servo (one in each wing) is a viable alternative. It's easier to install (as long as you remembered to cut lead holes in the ribs before you built the wing) and allows differential to be dialled in.

Darrin wanted his model to be a one-piece affair, and at less than 48" span, that's quite practical. However, the assembled model is also over 19" tall, which may cause transport and storage problems. To ease this, I would suggest that you make at least the top wing removable. This isn't too difficult if you have opted for wing-mounted servos, but is hardly practical if you are using cable linkages. Bear this in mind while deciding how you want to build your model.

The intricate, but not overly complicated structure is evident here. Note Darrin's use of litho plate to form the cockpit decking and centre wing fairings.

Once set up and working correctly, cable linkages are much better left well alone. The last thing you need is to have to set them up every time you take the model flying. Turnbuckles in the fuselage-to-wing run are an option, but there's always the risk that they will undo in flight. Ailerons that suddenly no longer 'ail' are of no use to anyone.

To make the top wing removable I would propose a slight modification to the brass strip the wing seats on at the centre section strut, adding a pair of lugs to allow the wing to be screwed in place. Similar brass strip tabs at the i/p strut positions would allow the wing to be bolted to the strut. The one thing you absolutely must remember is just how narrow those mounting points are. That alone makes it extremely difficult to ensure the wing goes on at precisely the same incidence angle each time. The choice is yours, either a one-piece model you know will retain all the right angles, or a removable one that may not do. ■

Stencil marking, dummy engine and very realistic 'streaky olive' finish make this an absolutely stunning model.

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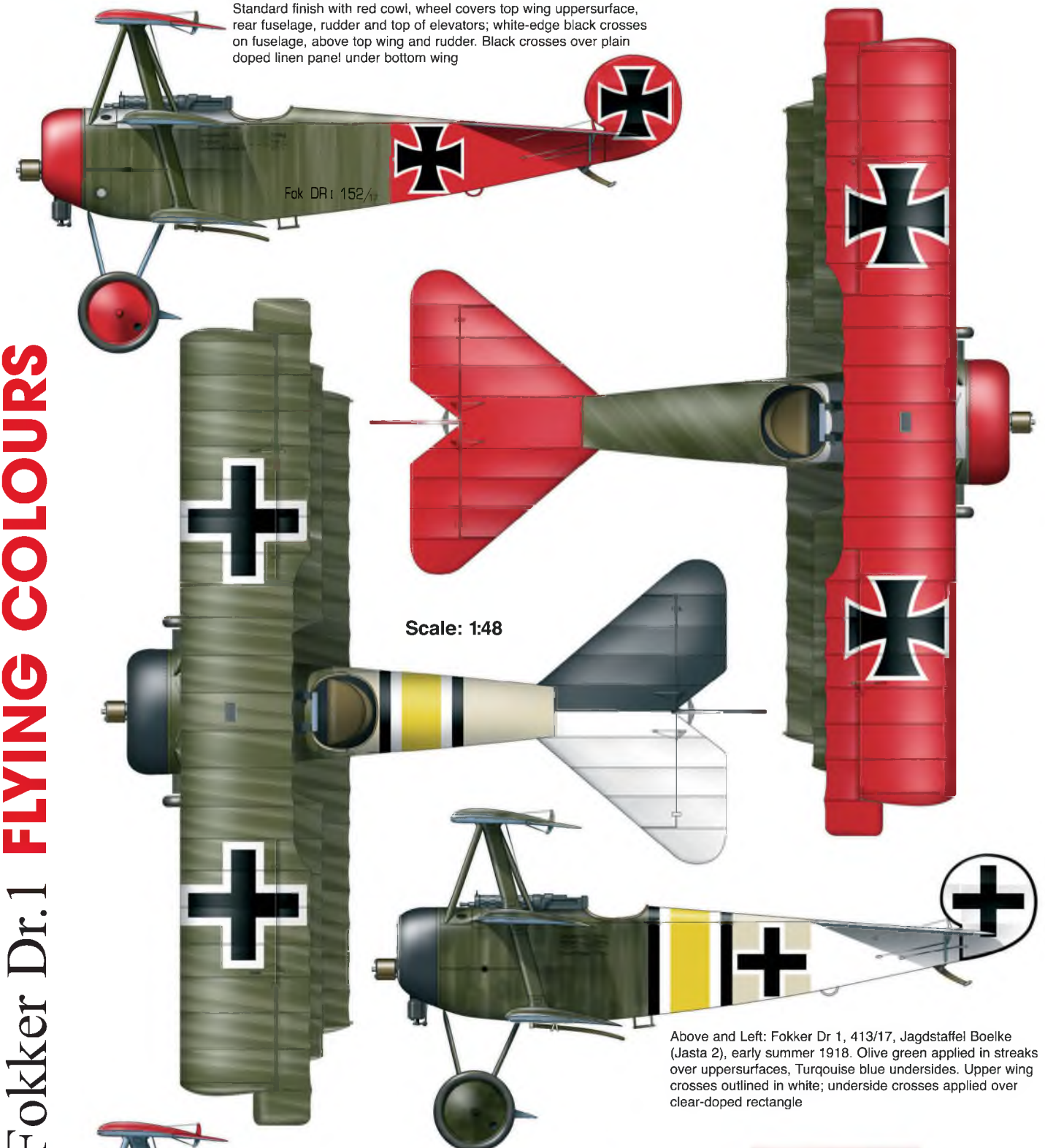
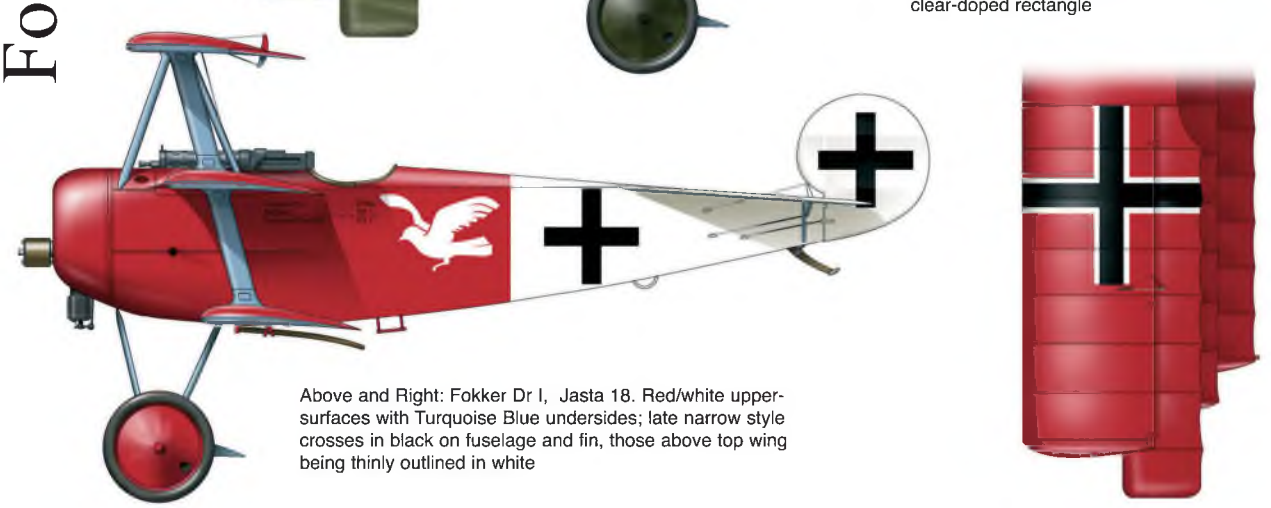
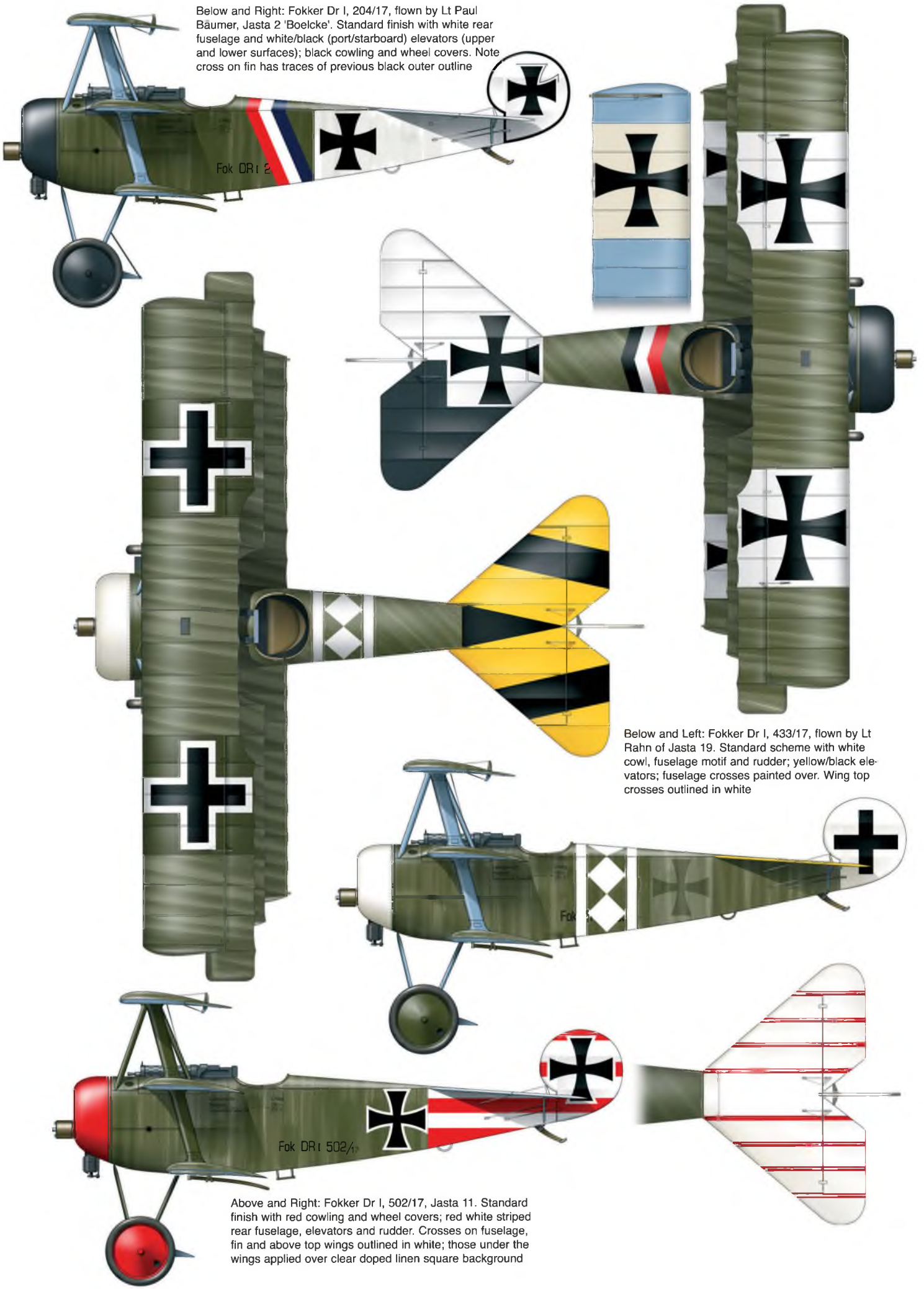
Below and right: Fokker Dr I, 152/17, flown by Lt Jantzen of Jasta 6. Standard finish with red cowl, wheel covers top wing uppersurface, rear fuselage, rudder and top of elevators; white-edge black crosses on fuselage, above top wing and rudder. Black crosses over plain doped linen panel under bottom wing



Above and Left: Fokker Dr 1, 413/17, Jagdstaffel Boelke (Jasta 2), early summer 1918. Olive green applied in streaks over uppersurfaces, Turqouise blue undersides. Upper wing crosses outlined in white; underside crosses applied over clear-doped rectangle



Above and Right: Fokker Dr I, Jasta 18. Red/white upper-surfaces with Turquoise Blue undersides; late narrow style crosses in black on fuselage and fin, those above top wing being thinly outlined in white



Below and Right: Fokker Dr I, 204/17, flown by Lt Paul Bäumer, Jasta 2 'Boelcke'. Standard finish with white rear fuselage and white/black (port/starboard) elevators (upper and lower surfaces); black cowling and wheel covers. Note cross on fin has traces of previous black outer outline

Below and Left: Fokker Dr I, 433/17, flown by Lt Rahn of Jasta 19. Standard scheme with white cowl, fuselage motif and rudder; yellow/black elevators; fuselage crosses painted over. Wing top crosses outlined in white

Above and Right: Fokker Dr I, 502/17, Jasta 11. Standard finish with red cowling and wheel covers; red white striped rear fuselage, elevators and rudder. Crosses on fuselage, fin and above top wings outlined in white; those under the wings applied over clear doped linen square background

FAIRCHILD F.

ELEGANT 1:4.9 SCALE. 88.9" (2286mm) FOR 1.00 - 1.20 CU.IN. ENGINES. DESIGNED BY PHILIP

My first model of the Fairchild Argus was a 36" span rubber powered model, in 1949. This was the radial engined machine as opposed to the in-line engined version modelled here. This model was never finished, the part-built airframe being squashed when an ironing board fell onto it. Early in the 1960s I managed to produce another model from the same Eddie Riding plan, but rather than power the model with rubber, I fitted a small diesel engine. This proved to be a wise choice and the model was flown most successfully for over twenty years before being sold.

Later, when my aeromodelling interest moved to R/C, I wanted, for a long time, to build a radio-controlled version of the Fairchild F.24 but it wasn't until 1998 that I finally got a model into the air. This was to a scale of 1:4.8, giving it a wingspan of 90" and a most reliable Laser 100 four-stroke engine that just fitted within the radial cowl powered the prototype.

The version featured here however has been built as the Ranger, in-line engined type. Be careful though; with the longer nose of this version the model could turn out to be nose heavy. There was no need to add any nose weight to the radial engined prototype in order to get the centre of gravity in the right place, but for the Ranger, it might be worth moving the battery further back into the rear cockpit area for the 24R version.

Construction

The model uses standard model aeroplane built-up construction methods

24R

P S. KENT

and materials. I like to get all the formers and wing ribs cut out before I start building. The technique that I use is to trace out the parts and then prick through shapes onto the balsa. I also like to make a start on something that lets me see a result early on in the construction programme. With this in mind we will start off with the construction of the tail unit.

Tail unit

The rudder and elevator are built on a 1/16" sheet balsa core. Cut the four 5/16"

sheet spars for the elevator and glue two of them to one side of the elevator cores. Add the 1/16" ribs and tips and the 5/16" sheet pieces at the inboard end of the elevator. Sand the units to the correct section and repeat on the other side. Both elevators should be symmetrical in section.

The rudder is built in exactly the same way, but the ribs are from 1/8" balsa.

The tailplane is built in two halves directly over the plan. Cut the 1/4" spars and pin these over the plan. Add the ribs, tips, ply braces and the 1/8" sheet false leading edge, then sand to the section shown and cover with 1/16" light balsa. Make a second half and, when both are completed, join together. Add the 1/4" sheet leading edges and soft balsa capping for the tips, sand to the section shown.

The fin is constructed in a similar manner to the tailplane. Build this in two halves, cover with 1/16" sheet and join together. To complete the structure, add the 1/4" sheet balsa. leading edges, then shape and sand to the correct section. I find that balsa cement is the best adhesive for this particular job as it sands down easily without leaving a glue ridge.

All the hinges used on the model are the *Robart* steel pinned type and arrangements should be made to accommodate these within the structure. Note also the positions of the hinge centre lines. A 14swg piano wire elevator joiner is used with a 1/16" brass or mild steel horn silver soldered in place. A commercial item may be substituted, but note the angle of the horn.

Wings

Cut a plywood template for the wing Rib no.3 but without the cutout for the flaps. All the slots for the spars, allowances for the sheeting and leading edge should be incorporated into the template.

Cut 24 ribs to the template from 1/8" sheet balsa. The ribs can then be cut down to make Rib no.3 with the flap cut out on Rib no.4 for the ailerons. Copy the shapes of the remaining ribs onto tracing paper and transfer the shapes onto the required size of sheet balsa by pricking through with a pin.

Using a Rib no. 3 as a template, draw out the doublers onto 1/16" plywood. Cut out and bond to the ribs using epoxy. Note that the doublers fit onto each side of the ribs. Note also, that there is a laminated rib at the point between the aileron and flap that is the same as the template rib. On the prototype model, both servos that drive the ailerons and flaps were fitted at the root of each wing with access being afforded by removing the dummy fuel tanks in each wing. The aileron servos could be mounted further outboard in line with the hinges. The choice is yours.

Pin the bottom spar over the wing plan, slide the ribs on to the rear spar, and glue this unit in place. Add the false leading edge, the ply trailing edge, the aileron spar and top spars. Note that the aileron spar is made up of two pieces of sheet balsa. I found it easier to carve this to shape before fitting; the section at the wing rib shows the shape.

I made the laminated wing tips by wrapping four glued strips of 1/16"x 1/4" round a former made from 1/4" plywood. Cut the strips slightly longer than required and glue them together using white PVA glue. Place the glued strips onto the former and fasten in position with a strip of masking tape at the middle point. Work round the tip, pulling the glued strips down onto the former with further pieces of masking tape. When this task is completed leave overnight to set before removing the formed tip from the pattern.

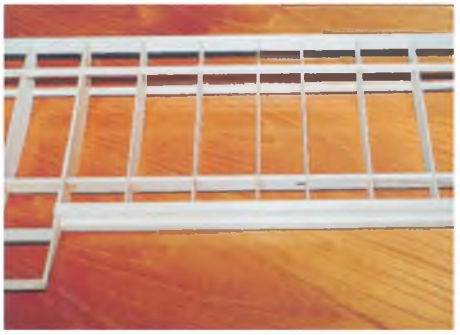
Fit the laminated tip in place and fill between ribs and spars with 3/32" sheet balsa. Note the shape of the wing tip when viewed from the front when positioning the lamination. This part of the construction might be easier with the wing removed from the building board.

This is also a good time to fit the wire locating dowels in place. Fill between the front spars with 1/4" balsa and add the 1/16" ply filling pieces. Set the wing up with 1 " dihedral under the last full width rib and then epoxy the wires in place. Block in around the wires with bass, ply or spruce. After the tip is glued in place, return the wing to the board and add the 1/16" sheet vertical webbing, the 1/16" plywood mountings for the strut fittings and the top leading edge sheeting. Finally, fit the capping strips onto the ribs and the 1/16" sheet that is on the aileron spar; note the direction of the grain here.

With the wing, for the last time removed from the board, repeat the sequence on the underside of the wing. The ailerons are built separately directly over the plan. Do

Basic fuselage sides made up from balsa strip, showing 0.4mm ply reinforcement gussets.

Start of the fuselage box assembly, commenced by joining the sides with former.



Underside of the wing at the position of the aileron.

not omit the thin ply gussets at the trailing edge. Note how the hinges for the ailerons are extended with aluminium tube and where the centre lines of the hinges are positioned - it is most important that these centres are in the correct place for the operation of the ailerons.

The flaps are made from 1/16" plywood with a bass or spruce spar and ribs. I gave the completed units a full coating of laminating epoxy to prevent any warping - it seemed to work as I have had no trouble in this respect. Again I have used *Robart* hinges, but set outside the flap. The wing section drawing gives the details. The original model used some vacformed covers for the hinges but these can be made from balsa.

Fuselage

The fuselage is a box structure filled out with formers and stringers. Build two fuselage sides directly over the plan. Use spruce or bass for the longerons and balsa for the uprights and cross members. Note that the fuselage section forward of the wing is built separately and fitted, complete with engine bearers, after the rear box is assembled.

Make up and fit the undercarriage mounting pieces and the wing fixing tubes to the basic box structure. When this work is complete, fit the remaining formers and stringers. Check the position of the stringers by eye before notching out the formers. The doors are built on a bass or spruce frame and covered in O.4mm plywood. The hinges are the *Robart* type, similar to the ones used on the flaps.

The tail wheel is a steerable unit and this should be fitted before the model is covered. Fit all the bellcranks and push rods for the elevators, rudder and tail wheel at this point.

The fuel tank box should be fitted before the nose area is covered with 1/8" balsa sheeting. The tank is accessible from the front, but the engine will have to be removed. The cowl is made up of a balsa front section with sheet balsa planking over O.4mm plywood that joins the front and rear. Litho plate panels can be added after shaping the balsa covering. Consult photographs of the prototype being modelled for details of these panels and the exhaust outlets as they do vary. A

The basic wing structure complete, before addition of tip components.

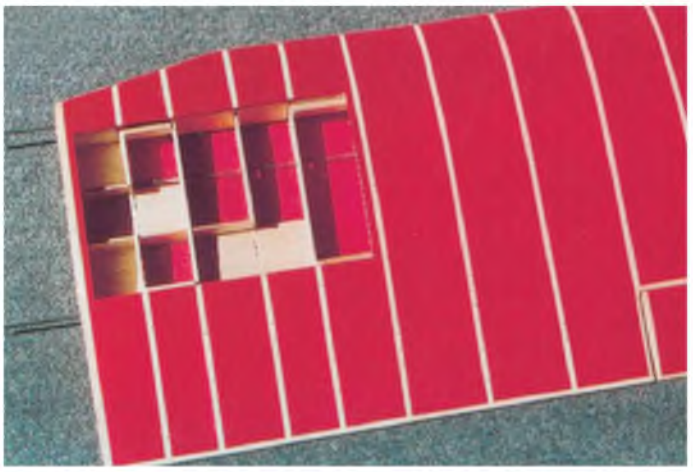
The tailplane and elevator prior to covering. Both are made up over a 1/16" balsa centre-line plate.

The wing before covering, showing the Robart hinges fitted in extension tubes.

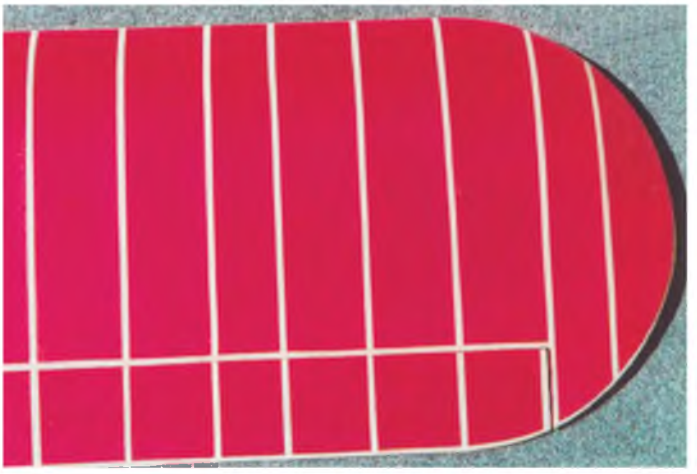
The strut and main undercarriage assembly. This is a prominent feature of the aircraft, so it's important to get it right.

The prototype model has opening doors for access to wing bolts.

The frames for the rear cabin windows.

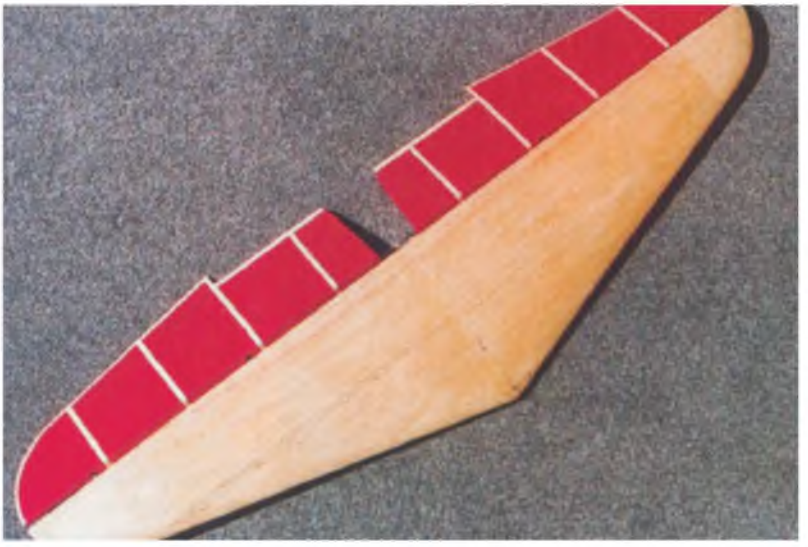


The wing root showing the servo access through the dummy fuel tanks.



The covered wing tip.

The covered fin and rudder. Note the rib tape on the rudder.



The covered tailplane, Solartex for the elevators, tissue for the stabilizer.

fibreglass cowl could be used and I would suggest that it might be moulded over a blue foam pattern using glass cloth and epoxy.

Main undercarriage

The undercarriage shown on the drawing is as fitted to the Swiss full size aircraft HB-ERO. This is without fairings around the oleos and the lower part of the struts in its early form. These fairings, now fitted on the full siz aircraft, can easily be added from balsa and thin aluminium sheet.

The window glazing is added after the model has been covered. Cut paper patterns for the parts before using the clear plastic material. Small screws were used to fix the panels in place with a bead of epoxy and micro balloons faired in with a finger dipped in acetone where the windscreen is attached to the nose area. This fairing should be masked off before the five-minute epoxy and micro balloon mixture is run in.

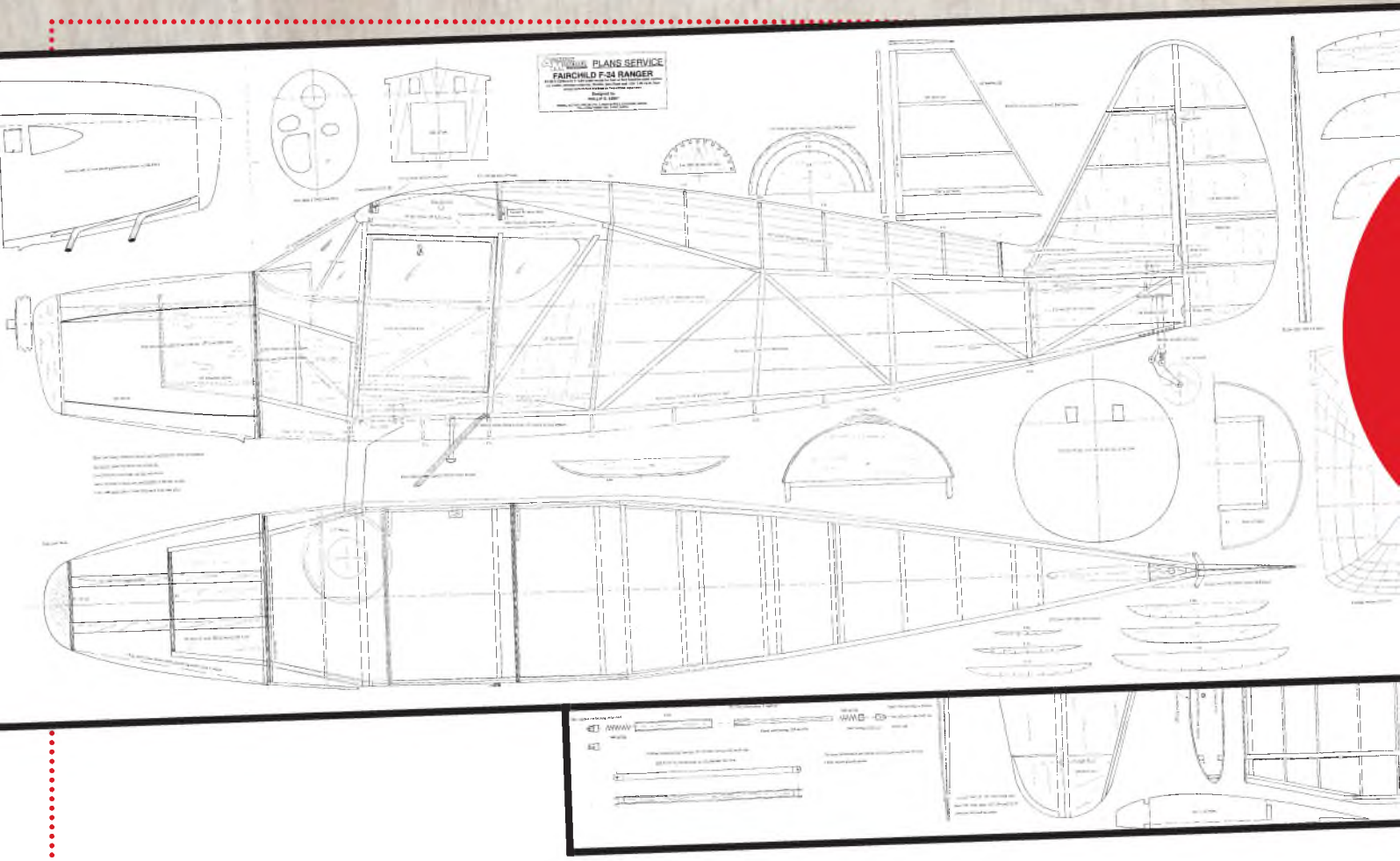
Details

The detailing on the model will depend on the prototype modelled and just what the builder wants. Simple features like the navigation lights and aerial add a great deal to the realism, it's up to you, the builder.

The original model was covered in an iron-on heat-shrink fabric. This was given a coat of shrinking dope before the rib tapes and stitching were added, again using dope as an adhesive. The model was primed with a cellulose primer and painted with auto cellulose sprayed on. The lettering can be from trim film or painted on, again use whatever you are happy with. A two-pack fuel proofer completes the finishing process.

Flying

Make sure that the balance-point is in the



correct position before attempting to fly the model. There was no problem getting this in the right place on the original model. Make sure that all the struts are attached and bolted in place.

In my excitement on the maiden flight of the radial engined version, I somehow omitted the small screws that hold the struts in place at the undercarriage/strut joint. The model took off and the dihedral on the port wing began to increase at an alarming rate. I realised what was wrong and made a heavy landing that resulted in some damage to the undercarriage and cowl, but it could have been much worse. There were no problems on the second flight with the model flying without any great alteration to the trims.

Subsequent flights have been a delight. The model goes where you want it to go and is as steady as a rock. The Ranger is not intended for aerobatics and I would not suggest that such are tried. This model is at its best flying accurate course manoeuvres, doing the odd touchand-go and nice slow, low, flypasts.

The flaps also add interest to the flying

The main undercarriage, viewed fron the front.

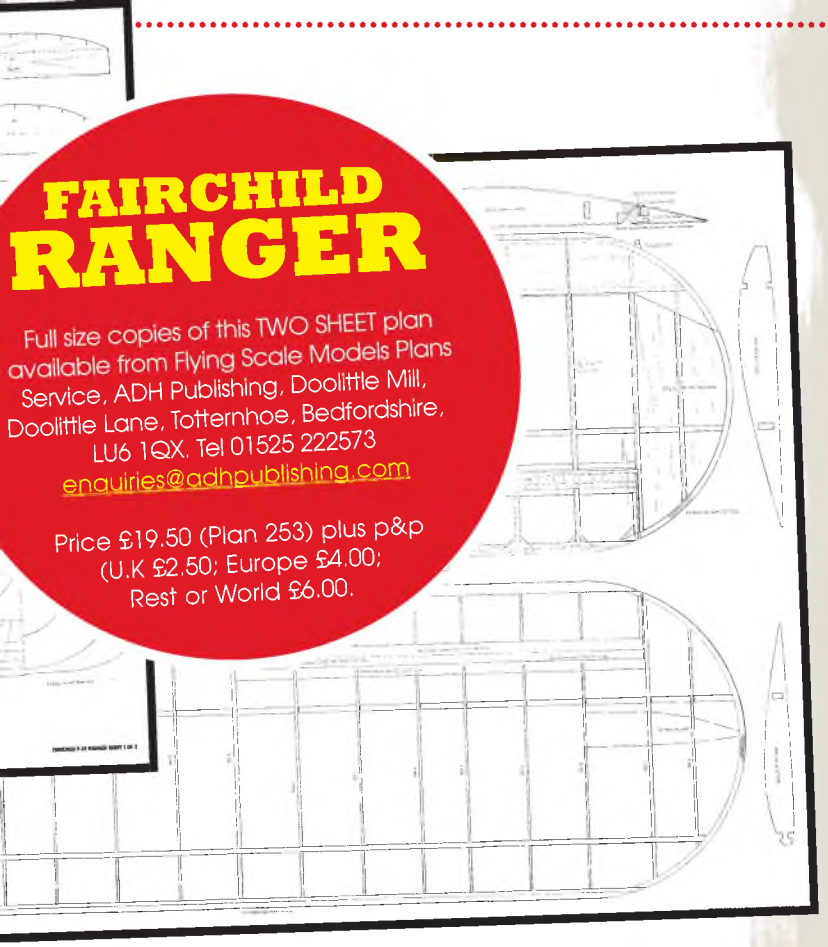
Further view of the dummy fuel tank access panels on the wing upper surface. Note the filler cap and vent.

View of the cockpit windscreen on Gary Protheroe's prototype model. Map tucked into the corner is a nice touch of realism.

Dummy pitot head on the left wing leading edge.

The wing flaps in the deployed position. Note Robart 'Hinge Point' hinges arranged to achieve the required action.

Close-up of the wing strut and main undercarriage anchor point on the fuselage.



FAIRCHILD RANGER

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programme. You will probably find that some down elevator will need to be mixed in with the flap movement. It is also a good idea to mix the aileron and rudder controls to give more realistic turns. I have not tried a gyro on any of my models, but it is a fact that one on the rudder might be a help on paved runways. Remember that gyros are illegal on competition models though. The Argus radioal engine prototype model has done well in Scale competitionsin the past and there's no reason that the in-line Ranger should not perform equally well. ■

The dummy access panels for the wing tanks on the wing upper surface.

View of the inverted Laser 150 with the cowl panels removed.

FAIRCHILD

ONE THE MOST ELEGANT LIGHT AIRCRAFT OF THE PRE-WW2 ERA MAKES A FINE MODELLI

The Fairchild Aircraft Corporation had its beginnings back in 1924, established as a parent company for founder Sherman Fairchild's many aviation interests. The Company was innovative, producing the first American aircraft to include a fully enclosed cockpit and to utilise a hydraulic damped main undercarriage.

Besides designing and building aircraft,

F.24

NG SUBJECT

Fairchild pioneered the commercial use of aerial photography. Some of its first aircraft like the Fairchild FC-2 were originally designed for that purpose, because the cameras of those days were extremely heavy and required stable, steady flight at altitude that was high by the standards of that era. In 1935 Fairchild was comissioned by the US government to undertake aerial photograph surveys of the United States to track soil erosion and its effects.

Like all organisations involved in the aviation field, Fairchild Aircraft was hard hit by the Great Depression during the early 1930s, as airline purchases disappeared. Thus, Fairchild attention turned to developing a reliable and rugged small aircraft for personal and business use. Their first entry into this field was the Fairchild 22, a parasol-wing, two seat, open cockpit touring and trainer monoplane, initially with a radial engine, but later with inline inverted powerplant, designed and produced by the Kreider-Reisner division of Fairchild. It was well received and led directly to the Model 24 with fully enclosed cockpit/cabin area and high wing configuration.

The F.24 gained rapid popularity in the early 1930s, noted for its pleasant handling characteristics and roomy interior. Having adapted many features from the automotive industry (expansion-shoe brakes and wind-down cabin windows), the aircraft was also affordable and easy to maintain.

In production continuously from 1932 to 1948, the aircraft remained essentially unchanged aerodynamically and internally,

GENERAL CHARACTERISTICS

Crew:	1
Capacity:	3 passengers
Length:	23 ft 10 in (7.27 m)
Wingspan:	36 ft 4 in (11.08 m)
Height:	7 ft 8 in (2.34 m)
Wing area:	193 sq ft (17.9 m²)

PERFORMANCE

Max speed:	124 mph; 200 km/h)
Range:	404 nmi (465 mi; 748 km)
Service ceiling:	12,700 ft (3,900 m)

except for the simple addition of extra passenger seating and optional equipment. The first models were equipped with only two seats, but in 1933 a third seat was installed and by 1938, a fourth was added and a minor airframe revision was made in 1938 with the redesign of the vertical fin and re-designation from C8 to F.24G onwards.

Fairchild offered the choice of two powerplants, the Warner Scarab and Fairchild's own 200 hp Ranger series in the F24C-8-D, E and F. Initially the 1932 model Fairchild 24C-8-B used a reliable and popular Warner 125 hp radial engine, and the Fairchild 24C-8-C used the Warner 145 hp radial. American Cirrus and Menasco Pirate inline engines were also occasionally used in some earlier Fairchild 24s. Later models such as the popular 24Ws upgraded to the 165 hp Warner Super Scarab.

Designed for operations from relatively unimproved grass airfields, the sturdy undercarriage construction used a vertical oil dampened cylinder above the wheel with a pivoting strut attached to the lower fuselage. The result was a complex but undeniably solid undercarriage that could absorb large amounts of shock and was also adapted for the fitting of twin floats for water-based operations.

Sales and service success

In civil use, the aircraft was a quick sales success with prominent businessmen and Hollywood actors purchasing the aircraft.

In 1936, the US Navy ordered Model 24s designated as GK-1 and JK-1 research and instrument trainers. The type was also used by the US Army as a light transport and by the US Coast Guard, with the designation J2-K. The American Civil Air Patrol operated many Fairchild UC-61/24s and some aircraft were fitted with two 100 pound bombs for what became successful missions against German U-boats off the east coast of the United States in the early stages of the Second World War.

Most F.24s delivered to the British military during WW2 were the radial engine version and a number of these found their way onto the U.K. civil register.

Under Lend Lease. Close to 500 Warner Scarab Fairchild 24s/C-61s were supplied to Great Britain, most of these seeing service service as Argus Is and improved Argus IIs and were allocated to the Air Transport Auxiliary (ATA), the organisation tasked with delivery of new and repaired aircraft to front-line combat squadrons.

An additional 306 Ranger powered Argus IIIs were also used by the ATA. In British service, the majority of the Argus type operated with the ATA ferrying their aircrew to collect or deliver aircraft to and from manufacturers, Maintenance Units (MU)s and operational bases.

Postwar

Following the end of WW2 in 1945, examples of the F.24 were used by small air charter operators for short distance taxi work and many were acquired by private pilot owners. It served with military forces as diverse as Finland, Thailand, Israel, Canada, the United States and Australia.

The last post-WW2 Fairchild 24 was assembled in 1948 from a large inventory of left-over parts in Winfield, Kansas. By then, the Fairchild organisation were back into mainstream aircraft manufacturing, and in the years that followed were a significant force with such types as the twin-boom military transport C-82 'Packet' and later C-119 'Boxcar', and C-123 'Provider'. ■

The first of the Fairchild line, the FC-2. The caption on the back of this ancient photo identifies this as the first aircraft used by the Mexican Post Office Dept, preparing to take off from Mexicao City for the inaugural run of a regular air mail service to Tuxcan and Tampico.

AeroDetail series

Making a scale model?

Finding the detail needed to finish a scale model can be difficult and getting full size images is not always practical. Our range of detail photo collections provides extensive close ups of a wide range of popular aircraft all on CD in J-peg format

Whitman Tailwind CD106
Two examples shown of this U.S. homebuilt lightplane, with boxey shape ideal for modellers. Complete close-up detail. (62 images)

Westland Lysander CD105
The Shuttleworth Museum's airworthy example shown in both camouflage and Special Operations black finishes. Full close-up detail. (62 images)

Waco Ymf-5 CD104
Beautiful and graceful spatted undercarriage biplane of the 1930s 'golden aviation era'. Example photographed is an accurate-in-every-detail modern replica. (130 images)

Vickers Supermarine Walrus CD103
The famous 'Shagbag' biplane seaplane, used during WW2 as an air-sea rescue craft and fleet gunnery spotter. (80 images)

Tipsy Belfair CD102
Highly attractive Belgian low wing light aircraft from the era of simple, open cockpit private flying. Machine offers scale modellers pleasant lines and simple shape. (35 images)

Thulin Tummelisa CD101
Swedish 1919-era fighter trainer that served the Swedish air arm for many years. Example depicted is a faithful reproduction. (55 images)

Supermarine Spitfire MK.XVI CD100
Last of the Merlin-engined Spifires. This collection depicts the cut-down fuselage, bubble cockpit canopy later version. (116 images)

Supermarine Spitfire MK.IX CD99
The most numerous version of the classic Spitfire that turned the tables on the Luftwaffe's Focke Wulf Fw 190. (90 images)

Supermarine Spitfire MK XIV CD98
2nd of the Griffon-engined Spits (Mk.XII was first), the bigger engine forced a change of the classic Spifire shape. (58 images)

Supermarine Spitfire MK Vc CD97
Shuttleworth Museum's airworthy example presented in it's latest form with classic rounded wingtip planform. (160 plus images)

Supermarine Seafire Mk17 CD96
The Seafire 17 was no navalised Spit. A true ground-up naval fighter. (64 images)

Stinson 105 CD95
Light, private aircraft of the 1940-50s era, with lots of character. (75 images)

Steen Skybolt CD94
Attractive U.S. aerobatic biplane, presented in full detail. (89 images)

Sopwith Triplane CD93
The last example of the 'Tripehound' is the one built (in 1980!) from original Sopwith drawings by Northern Aero Works and given sequential manufacturer's number by Sir Thomas Sopwith himself in recognition of the outstanding workmanship. Extensive detail. (120 images)

Sopwith Pup CD92
The charismatic Sopwith Scout (to give its correct designation) is a great scale modellers' favourite. Example depicted is the one preserved and regularly flown at the Shuttleworth Collection, Old Warden. (50 images)

S.E.5A CD91
Shuttleworth Museum's airworthy example presented in full detail. (100 plus images)

Ryan Pt-22 CD90
US military primary trainer aircraft that served with both US Army and Navy, thus providing ab-initio flight training for the majority of US airmen of the WW2 period. A highly attractive aircraft. 90 images of the preserved, airworthy aircraft, hangared at the Shutleworth Collection, Old Warden.

Republic P-47D CD89
Bubble-canopy version of the much loved 'Jug', photographed in fine detail. (105 images)

Polikarpov Po-2 CD88
The world's most numerously produced aircraft of all time, the P0-2 was a great maid-of-all-work used by both military and civil groups in the old Soviet Union and its satellite states. Example depicted is pristine, and now in storage at Old Warden. (170 images)

Polikarpov I-15 CD87
The ultra agile Russian biplane fighter aircraft that saw widespread service prior to and in the early years of WW2 and during the Spanish civil war. Example illustrated is a superbly restored machine. (100 images)

Pitts S.1 CD86
Homebuilt example by Bob Millinchip, as seen at 2002 PFA Rally. Complete detail study. (36 images)

Piper Tomahawk CD85
Cranfield Flying School example of this civil ab-initio trainer aircraft. (54 images)

Piper Super Cub CD84
The later, 'cleaned-up' version of the famous Piper J-3, with more elegant engine cowl. Two examples shown. (80 images)

Piper L-4 Grasshopper CD83
Military version of the famous Piper J-3 Cub used during WW2 and close reconnaissance and spotter aircraft and for many other tasks. (80 images)

Percival Provost CD82
Airworthy, preserved example of the RAF piston engined basic trainer used in the 1950s. Full detail. (30 images)

Percival Mew Gull CD81
Famous 1930s racing and record setting aircraft that will forever linked with the achievements of British aviator Alex Henshaw. (35 images)

North American T28 CD80
The advanced trainer aircraft that served in many air arms worldwide and also became a counter-insurgency ground attack aircraft. Examples illustrated are from France, where the type served for many years as the 'Fenec'. (100 plus images)

North American P51D Mustang CD79
The definitive bubble canopy Merlin Mustang. In detail, showing several restored examples. This is the Fantasy of Flight Museum's overpolished example, but the close-up detail is all there. (102 images)

North American P51B/C CD78
First of the Rolls Royce Merlin engined Mustangs, this collection depicts the Fantasy of Flight Museum's restored example, with overly polished plain metal surfaces. Much detail. (102 images) Also, 41 images of The Fighter Collection's P-51C in bare metal restoration, showing much surface and internal airframe detail. A real bumper bundle! (over 140 images)

North American B25 Mitchell CD77
Fantasy of Flight Museum's example. Photographed soon after superb restoration. Full nose to tail detail. (74 images)

North American AT6 Harvard CD76
AT-6, SNJ, Texan, Harvard – call it what you will. 55,000 were built – this example is in U.S. Army colours, with comprehensive close-up detail, nose to tail. (76 images)

North American A36 Invader CD75
The ground attack variant of the Alison engined P-51A. Photos, in detail, of the world's only airworthy example. (69 images)

Morane Saulnier MS406 CD74
French WW2 fighter that fought in the Battle of France, 1940. Swiss restored example (92 images)

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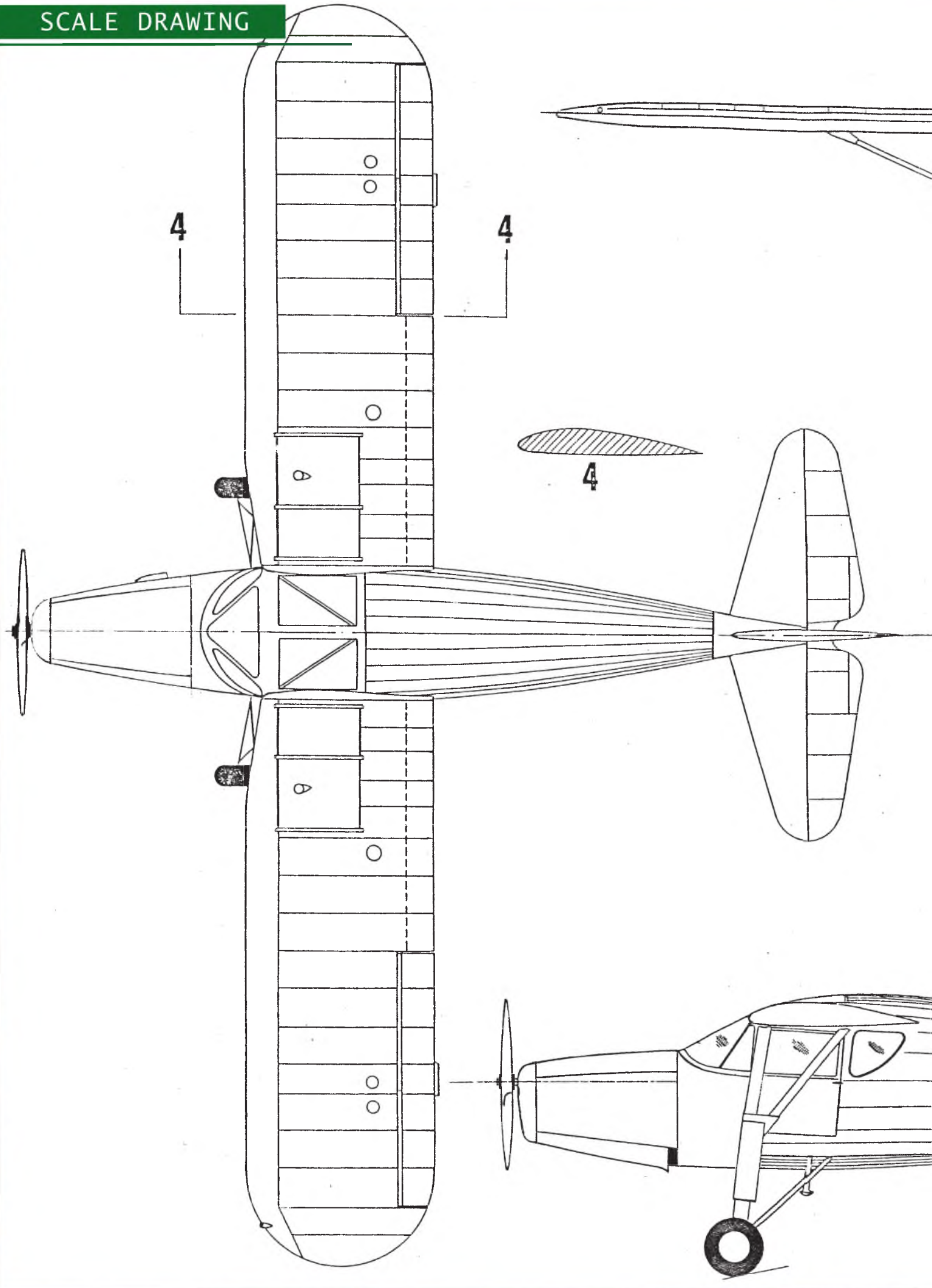
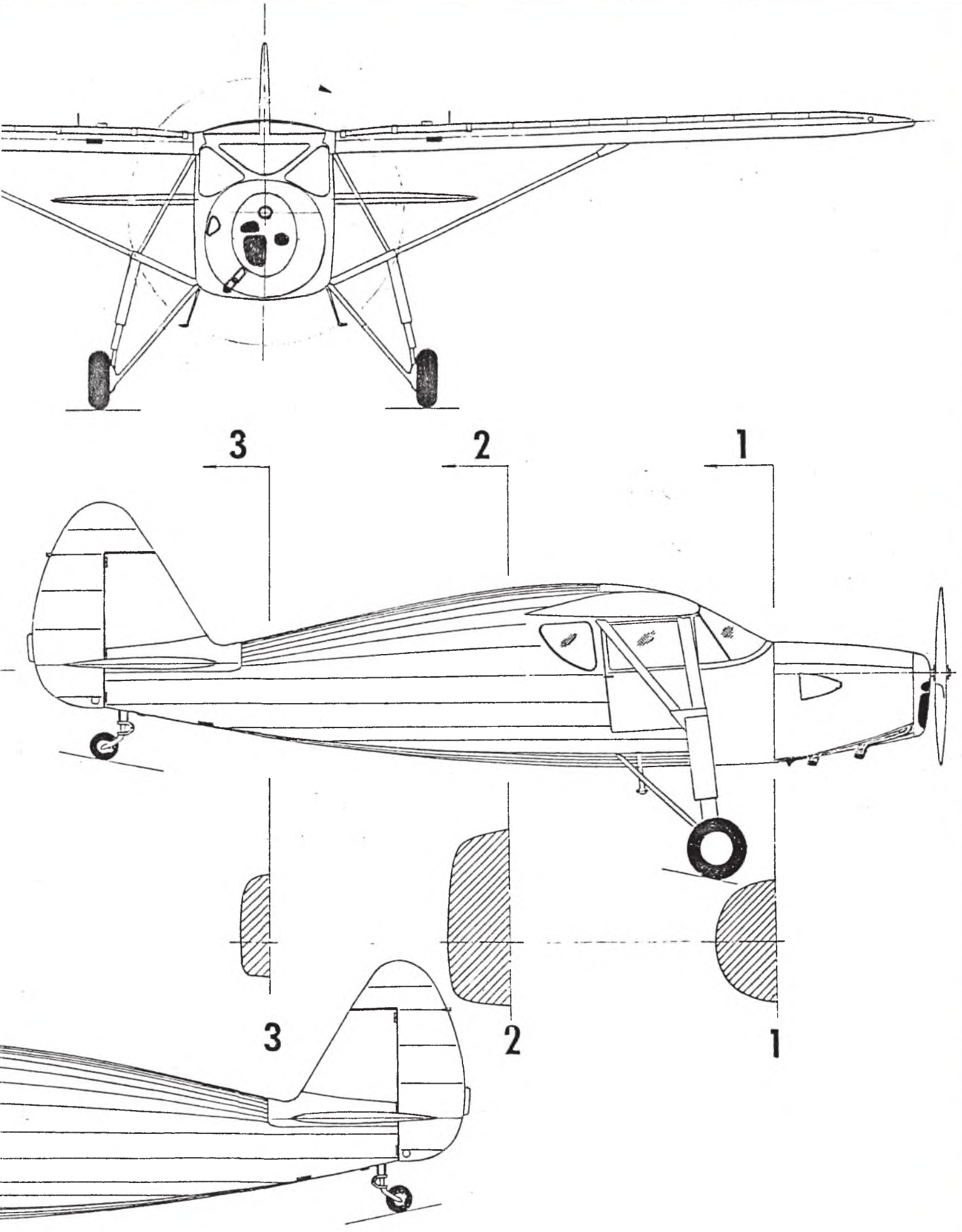




FAIRCHILD F.24 RANGER Scale 1:40

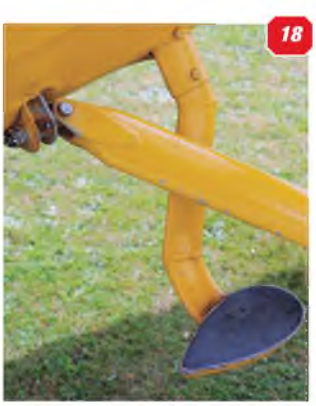
FAIRCHILD F.24

CLOSE-UP SURFACE DETAIL IS WHAT MAKES A MODEL SPECIAL

1: Nose section showing panel lines and air intakes. **2:** Cabin door hinge and the fairing where the wing/undercarraige strut meets the fuselage. **3 & 4:** Two views of the cabin area showing the line of the cabin access door and the window panelling.

5: View under the engine cowl showing the exhaust stack, offset the the right. 6: Engine cowl. showing panel lines and air vent. 7: Further view of the engine cowl underside, showing panel lines and vents. 8: Nose close-up, showing air intakes. 9: Two blade wooden propeller. Tips are metal clad. 10: Metal cuff panel that fairs the tailplane and rudder joint. 11: Right hand elevator, viewed from the rear, showing the trip tab.

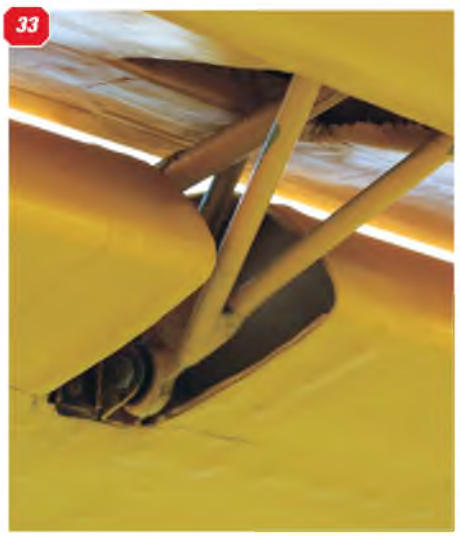
12: View of the elevator upper surface, again showing the trim tab which is hinged on the top surface. 13: View under the tailplane showing the mounting lugs that attach it to the fuselage. 14: Tail light on the rudder trailing edge. 15: The tail wheel unit. 16: The wing strut, where it fairs with the fuselage. 17: The wing strut-cum-undercarriage mount, viewed from the rear, is a complicated arrangement. 18: Foot step for access to the cabin. 19: Front view of the wing strut, showing the bare metal face plate around the leading edge.



20 & 21: Two views showing the main undercarriage wheel and strut arrangement. 22: One of the main wheels seen from the opposite side. 23: View of the bottom of the fuselage, showing the mating and fairing of the wing strut and main undercarriage, where these attach to the fuselage. 24: Fairings over the wing strut attachment points.

25: Front and rear wing struts converge to a single fuselage attachment point and are heavily faired with folded metal sheet.
26: Same position as 25 viewed from a different angle again reveals folded sheet metal components. Note also the bare metal leading edge face plate.
27: Detail of wing root.
28: Faired hinges to the wing flap on the wing underside.

29: Wing root at the leading edge.
30: Landing light on the left wing underside, seen in the retracted position, flush with the wing surface. Unit is hinged to face forward when deployed. 31: Wing underside showing the flap hinge line and one of the faired hinges. 32: Aileron hinge line viewed under the wing. Note that the centre hinge is different from the other two and is seen, close up in 33. 34: One of the other two aileron hinges. 35: Metal panels on the wing upper surface, viewed from behind the wing trailing edge. 36: Further view of the aileron hinge line viewed from under the wing.
37: Wing tip navigation light.



Erco Ercoupe 415 & Alon Ercoupe

A neat and tidy looking American light aircraft with an inviting appearance for scale modellers

The Ercoupe was the product of the Engineering & Research Corporation of the U.S.A., formed at Washington D.C. in 1930 to manufacture aircraft industry machine tools and propellers. Their development of two-seat all-metal monoplane light aircraft started in 1937 with a single-fin low wing machine, that led to the launch of the twin finned Ercoupe 415 in 1940.

This aircraft was the culmination of a series designed by Frederick Weick. During his period with the National Advisory Committee for Aeronautics, (NACA - eventually became NASA -National Aeronatics & Space Administation), he experimented with spin-proof aeroplanes. On joining the Engineering & Research Corporation, he designed a smaller prototype from which the second vrsion, the Erco 415, was evolved. Both these aircraft had 55 h.p. Erco engines which were also prototypes themselves. This experimental engine was replaced by a 75 h.p. Continental C.75 air cooled, four-cylinder horizontally opposed engine, when it became known as the Ercoupe 415c.

The concept was to produce an aircraft for the masses, that would be ultra easy to fly and impossible to stall or spin. Control arrangements did away with the conventional foot-operated rudder bar. There was no 'joystick', but a semi 'stearing wheel' type control column projecting from the dashboard. This was capable of sliding horizontally fore and aft and was connected to the elevators. The 'spectacle' shaped wheel at the end of the column controlled both rudders and ailerons with a left/right swing of the 'wheel', these two controls being interconnected, (coupled aileron & rudder) making a rudder bar unnecessary. In this configuration, the aeroplane, with its generous dihedral, could not be spun or rolled.

The idea of a single-axis control system operated through a 'steering wheel' similar to that of a car was intended to appeal to those with no previous flying experience, who were car drivers and who, so the logic went, would more easily relate to the problems of piloting a small aircraft.

That the idea worked is undeniable, but

In 1952, *'The Aeroplane'* magazine test flew and reviewed one of the first UK-registered Erco Ercoupe 415s, finding that it required a flying technique quite different from 'normal' light aircraft with separate rudder control.

those with existing flying experience did not necessarily get on with this 'simplified' control arrangement, which made control difficult in poor weather conditions. So later Ercoupes had conventional three-axis control systems.

Production ran from 1940 until the following year, when it ceased after completion of just 112 aircraft. Closure was the result of lack of materials for which the war-effort had first call and in any case, millions of Amercans would shortly be very much more 'othewise engaged' overseas.

Back on track

However, when peace returned after 1945, the entire US aircraft industry was faced with rapid contraction as all air

Cockpit layout exudes 'automobile style'.

LEFT & RIGHT: An example of the later Alon Ercoupe with Canadian registration. Cockpit canopy centre section appears to slightly 'blown' with a hint of double curvature.

arms, Air Force, Navy and Marines returned to a peacetime footing. Major aircraft manufacturers were faced with the prospect of building anything that would keep them in business. The result was a flood of small sport and personal aircraft designs to satisfy a perceived demand that would emanate from military servicemen with wartime flying experience who would want to carry on flying for their personal enjoyment.

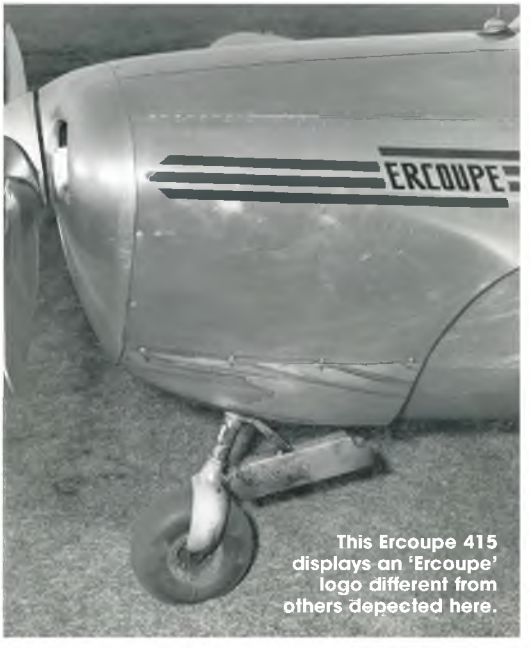
That demand never really emerged at the level anticipated, but Erco had a head-start on most in this field with a ready-to-go design that was well up to date and with a concept likely to appeal. So production recommenced in 1946 and Erco made 5,081 Ercoupes of various versions before production again came to a halt in 1951, due to the Korean war and other pressures that made production unecconomic.

The Ercoupe concept nevertheless had staying power and after a lapse, rights to the design passed through a number of small companies, starting with Sanders Aviation which assembled aircraft from Erco parts. Vest Aircraft had the rights in 1954, then Forney Aircraft in 1955, where a further 115 were made.

SPECIFICATIONS:

Length:	20 ft. 9 in.
Span:	30 ft. 0 in.
Height:	5 ft. 11 in.
Wing area:	142 sq. ft. (gross).
Loaded weight:	1,260 lbs.
Tare weight:	750 lbs.
Max. speed:	127 at sea level.
Cruising speed:	110 m.p.h. at 1,000 feet.
Stalling speed:	48 m.p.h.
Range:	500 miles.
Ceiling:	14,000 ft.

Back in the late 1940s. early1950s, polished bare-metal finish was popular for for American light aircraft, but proably best avoided when modelling the type!



This Ercoupe 415 displays an 'Ercoupe' logo different from others depected here.

Air Products Inc were the next, with their Aircoupe F-1A, where another short run finished in 1962. Alon Inc. took over in late 1963, producing a number of versions including the A-2, A-2A, plus some further developments, before Alon merged with Mooney Aircraft Corp in 1967.

Production then continued for a while, but Mooney's developments ran to a reconfiguration that included a single fin and from that point the distinctive Ercoupe features just faded away. ■

LEFT & RIGHT: **An example of the original Erco Ercoupe 415, also with Canadian registation.**

A nice subject for scale

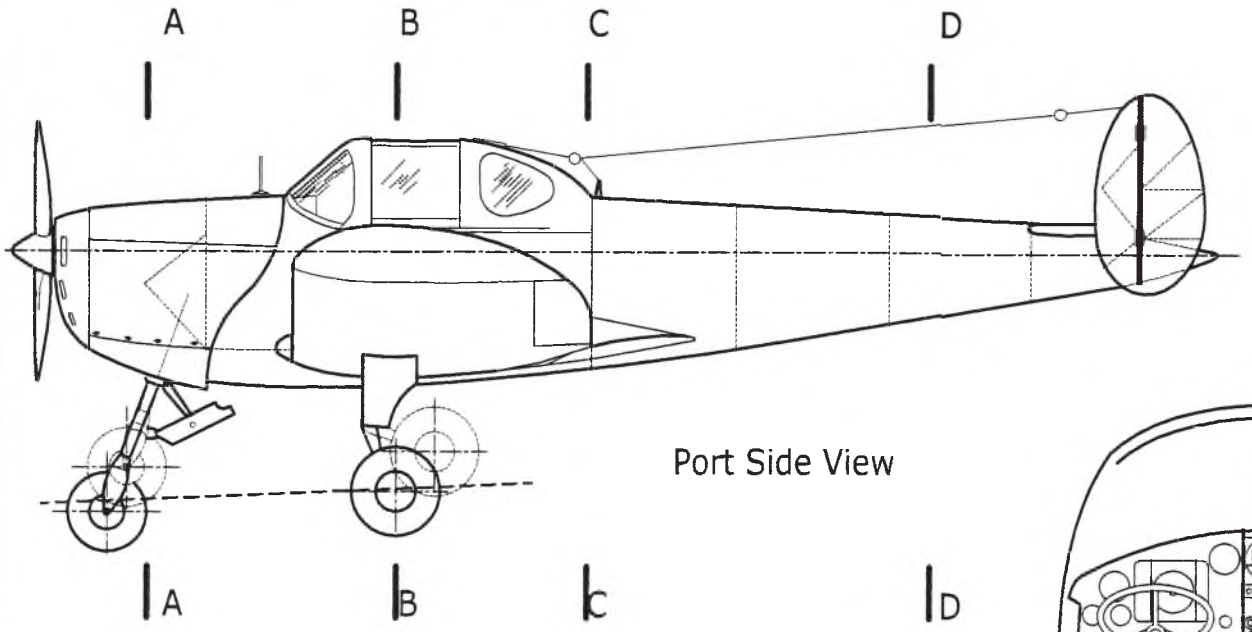
There is a sort of timeless, comfortable, not-too-modern feel about the shape of this cute little aircraft, many of which still survive and give immense pleasure to their happy owners. If you are not up to designing your own then the Nick Ziroli Service has plans and parts for an 80" span version of the '415, designed for 150 size engines.

In UK, the plans are available from Belair Kits (www.Belairkits.com) price £55.00. They also offer a set of cut wood parts for £175.00 and a moulded glass fibre cowl at £55.00.

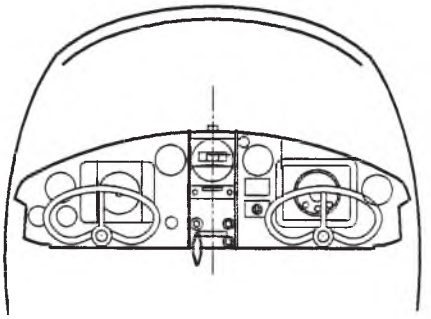
If you want a full kit, then Balsa USA have a 1/3rd scale Ercoupe 415-D.It has a wingspan of 120" (3048mm) and is intended for 45-65cc (2.7-4.0 cu.in) petrol engines) and is quite pricey ay near of $900.00. In UK, Pegasus Models advertise the Balsa USA range and although it's not listed on their web site, it's worth asking the question about availability.

BALSA USA ERCOUPE: 1/3rd scale, 120" wingspan

ZIROLI 80" WINGSPAN ERCOUPE: Plans & Parts from Belair.



Port Side View



Control Panel

shaown at 2x general scale

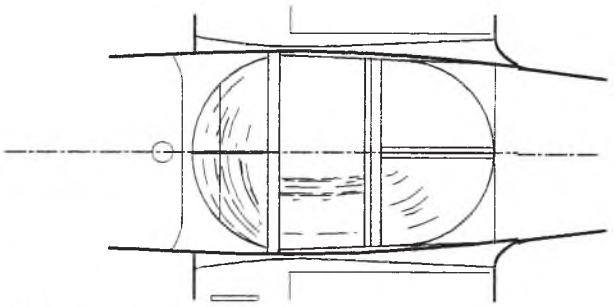
Details
Sanders ERCOUPE '52-'54

SPECIFICATIONS FOR ERCOUPE
STANDARD and [CLUB-AIR]
As sold by Sanders 1952-54
SPECIAL FEATURES
Two Control
Spin Proof
Stall Warning Cushion
Tricycle Landing Gear
Steerable Nosewheel
Full Horizon Visibility

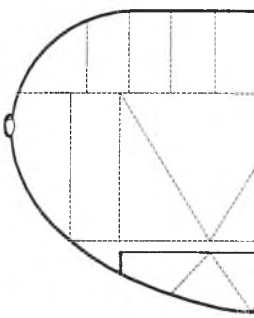
EQUIPMENT
75 HP Continental Engine [85 HP]
Sensenich Propeller
Electric Starter, Generator, Battery
Propeller Spinner
Foot Brake
Carburetor Heater
Bubble Windshield
Plastic Cabin Enclosure
[Full cabin upholstery]
Baggage Compartment
Full Set Contact Flight Instruments
[2-way radio]
[Dual wheel control]
[Nav' lights]
['Junior' Seat]

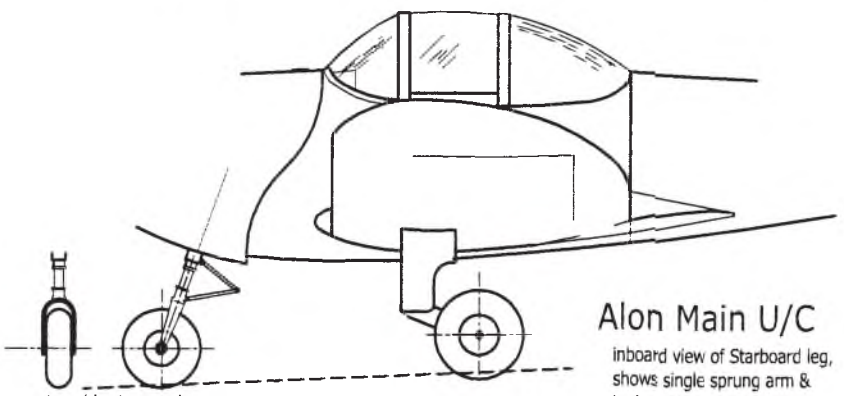
DIMENSIONS and WEIGHTS
Span 30 ft
Length 20'-9"
Height 5'-11"
Tread (track) 7'-2"
Tail Span 8'-4"
Gross Weight 1260 Lb [1400]
Weight Empty 800 Lb [830]
Baggage Allowance 65 Lbs
Gas Capacity 24 Gallons
Main Tires 6.00 x 6
Nose Wheel Tire 5.00 x 4 [5.00 x 5]

PERFORMANCE FIGURES
(All Performance Figures from Sea Level & Full Gross Weight)
Top Speed 120mph [125]
Cruising Speed 105mph [110]
Climb 720 ft per min. [560 ft/min]
Service Ceiling 14,000ft [11,000]
Range (no wind or reserve) 450 miles @ 105, 530 @ 80
[430 @ 110, 550 @ 80]
Take-Off Run (no wind) 520 ft. [570 ft]
Landing Run (no wind) 190 ft. [210 ft]
Stalling Speed 48 mph



Alon production U/C and Cockpit

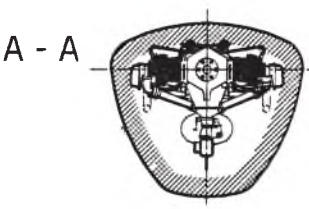




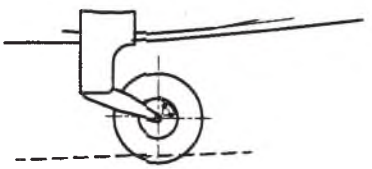
steerable styrup axle

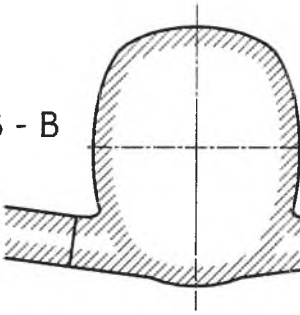
Alon Main U/C

inboard view of Starboard leg, shows single sprung arm & hydraulic wheelbrakes



A - A





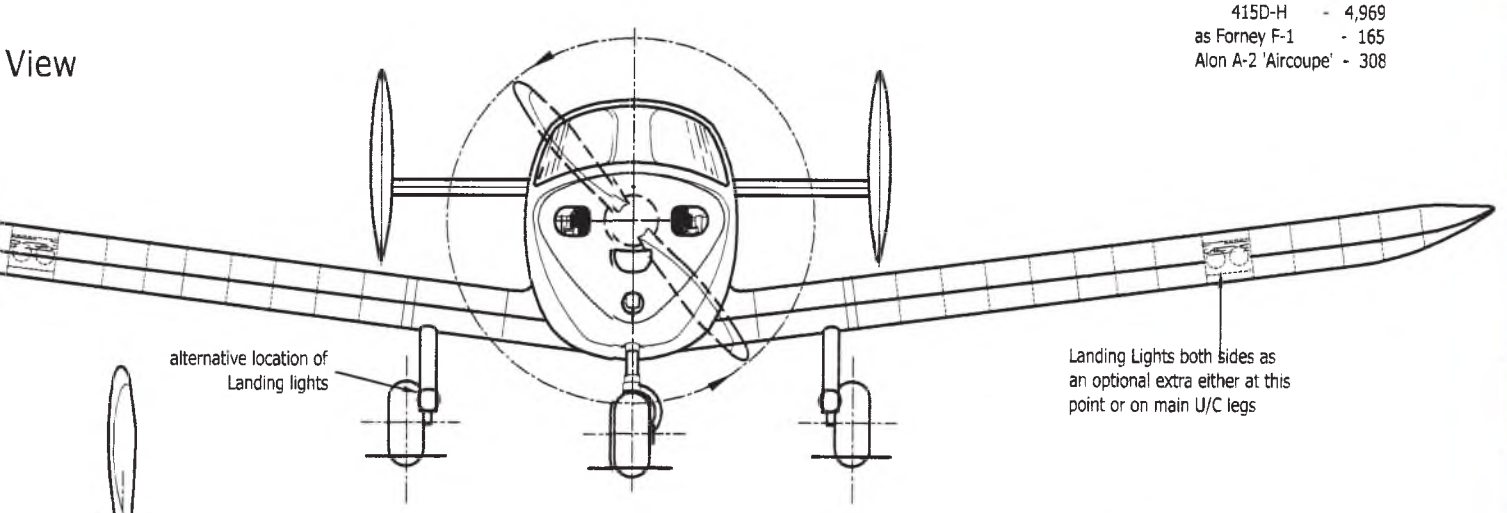
B - B

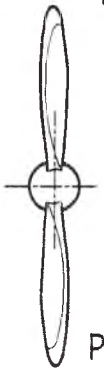
M feet 0

Other Information Alon A-2
'Aircoupe' (from 1964)

Production:
Erco 415C - 112
415D-H - 4,969
as Forney F-1 - 165
Alon A-2 'Aircoupe' - 308

View





Propeller

ERCO ERCOUPE

Main Views show 415c

SCALE 1:40

Typical Wing Section

Plan View

C - C

D - D

ERCO 415
Nose Structure

ALON 'Aircoupe' REVISED ELEVATOR

Erco Ercoupe 415 Alon Ercoupe

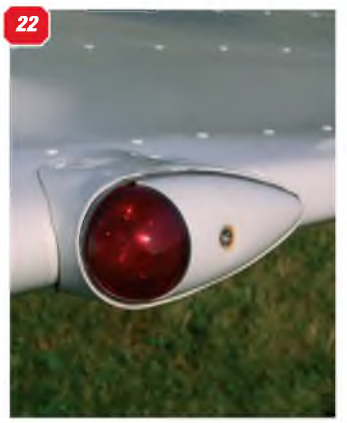
Close-up surface detail is what makes a model so special

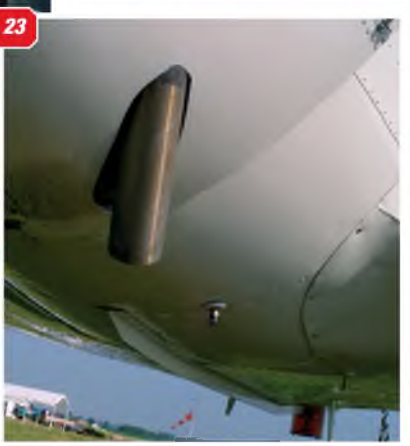
Erco Ercoupe 415

ERCOUPE 415

1: The upper engine cowl, showing the hinge line of the inspection covers.
2: Fuel filler cap in front of cockpit windscreen.
3: The nose shape of the Ercoupe has a distinctive 'V' profile.
4 & 5: Cooling air intakes either side of the propeller spinner.
6: Side view of the engine cowl, showing the inspection hatch lines.
7: Detail of the original Ercoupe logo.
8: The complete tailcone. The tailplane of the Alon version has a different elevator shape and the fuselage tailcone also differs.
9 & 10: Two views of the main undercarriage.
11: View of the tailplane showing the junction between tailplane and fuselage.
12: Fuselage side detail at the cockpit position.
13: The wing tip showing the up-swept lower surface and the wing tip light mounting.
14: Further close-up of the wing tip light.
15: The wing root junction with the fuselage. Note the leading edge spoiler.
16: Further detail of the fuselage tailcone showing the shape and the tail light.
17: Wing upper surface detail, showing panel detail and the cockpit access tread patch.

Alon Ercoupe





ALON ERCOUPE

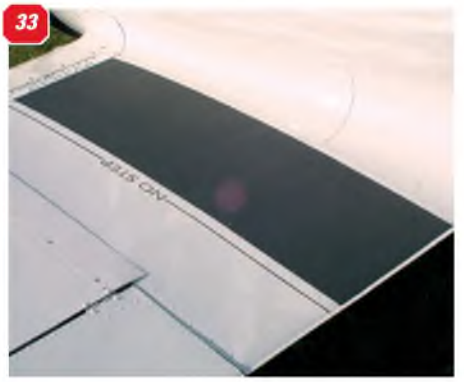
18: Cockpit framework differs from Ercoupe 415. Frames are more slender for better vision.
19: Cockpit viewed from rear. **20:** Cockpit windshield. **21:** Detail of the cockpit slider rails.
22: Alon version has wing tip light faired into wing tip edge. Note shape of rivets.
23: View from under the engine cowl looking rearward at the fuselage underside.

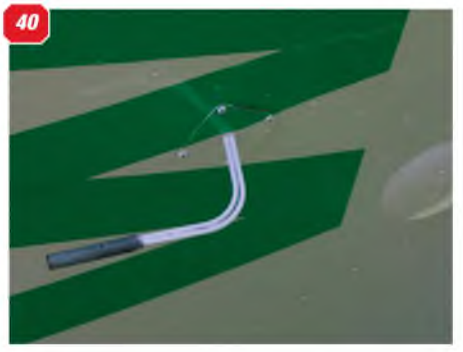
ALON ERCOUPE

24: The contour of the rear edge of the engine cowl.
25: Fuselage underside at the wing root trailing edge.
26: Cockpit rim and colour trim detail.
27: Blister fairings on the upper surface of the engine cowl.
28: Contours of the engine cowl and air intakes on the Alon version are similar to the Ercoupe 415.
29: Air-exit grille on the engine cowl underside, viewed looking forward.

31 & 32: Main undercarriage. The trouser fairing is more deeply scalloped than on the '415 version.

33: Cockpit access tread-panel at wing root.





34: The undercarriage noseleg.

35: Detail of the drag link on the noseleg.

36: Detail of the wing fairing shape at the wing trailing edge.

37: The Alon Ercoupe has this double landing light in the left wing leading edge approx 2/3rds out from the wing root.

38: Shape of the tailplane of the Alon Ercoupe differs from earlier version with a 'bite' out of the centre. Note also the stepped shape of the fuselage tailcone.

39: Elevator trim tab, showing the hinge line.

40: Pitot head under the left wing.

41: Elevator hinge and bracket that secures the fin.

42: Elevator trim control on lower surface of elevator.

43: The Alon Ercoupe logo as applied to the inner surfaces of both fins.

44: Detail of the fuselage-to-tailplane fairing.

45: Graphic fin/rudder motif.

46: Panel detail at tailplane root.

Surviving Free-flight

Part 7 - Andrew Hewitt reviews engine installation options and engine bay accessibility

The most frustrating element in flying a scale free flight model can be the problems associated with operating the power source. This is often because we try desperately hard to hide the engine, and its controls from view for the sake of scale realism.

However, things soon change following a trimming session, or especially during a competition - cowlings get modified and butchered, access to needle valves and compression screws takes on a new dimension (never smaller). Most of these modifications should have been avoided during construction but, typically, they normally take a back seat behind the beautification treatment.

Then panic...!

I have often fallen victim to my own poor engine installations. Usually my designs operate wonderfully in my back garden the day before a competition - first flick starts, no problem. But on the day of the competition, however on a cold grey aerodrome, engine settings have completely changed, cowlings have to come off and its back to ...panic, flick, flick, PANIC!

So it is far better to have your power controls readily accessible, because conditions always change. My usual headache is that the engines are required to run flat out for take off and are thus running lean, so that a prime is required to start. Usually access to the exhaust ports is very difficult (due to the desire to completely hide the engine from view) and choking the intake near impossible, if a front induction motor is used. I have to use a long spout on the end of my fuel filler bottle, often poked through the radiator grill and give a good spray of fuel, making sure the piston is at TDC to prevent the dreaded flooding and more ...PANIC.

I have also used the method of blowing down both fuel pipes (fill and vent) to prime the engine - tastes awful, but better than some beers!

Plumbing the depths...

The tank should be positioned as close to the engine as possible with the minimum of fuel tubing from the feed to the needle. The level of the tank relative to the needle is the most critical for trouble-free operation. This should be such that the full tank level is at, or below, the level of the needle valve in the flying position. Having long lengths of fuel tubing will allow the fuel to bubble, froth, gum up and surge during acceleration. Remember, it is also important to be able to view the contents of the tank prior to each flight, or use a syringe to measure your fuel ... or thereafter, use a cycle and compass to find your model downwind!

Keeping your cool...

Engine overheating can be a serious

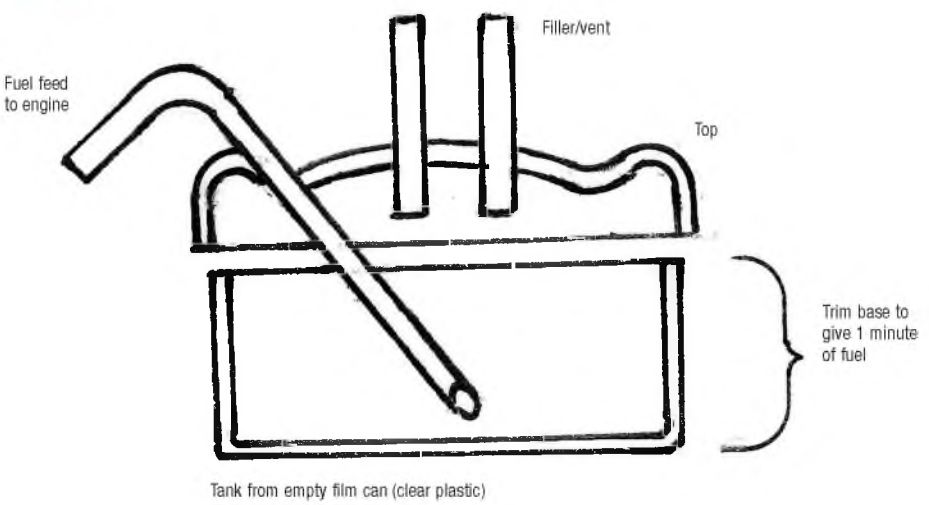
Mind those fingers! Bill Dennis maneouvres his Avro 504K to get at the inverted compression screw (Mills 75).

Scale by Andrew Hewitt

problem, especially if your pride and joy has just taken off and is still perilously close to the hard stuff. The main causes are an over-compressed engine, hot weather conditions, or ingestion of exhaust gasses. The latter is the most common cause - since we only run an engine for one minute, or so, cylinder cooling is not required, but the exhaust gasses can quickly cook an engine if not removed quickly.

You must provide adequate exit area for these reasons - luckily, most full-size aircraft have the same problems, so often a scale cowling will do the work for us. As a general rule of thumb, make sure that the cowling exit area exceeds the intake area (a factor of 1.5 in area is regarded as the general rule), and you should have no problems.

FIG 1



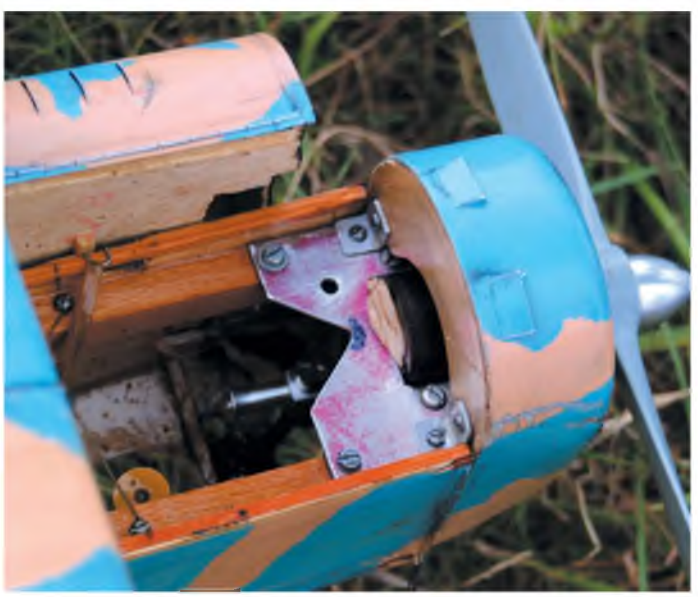
Tank from empty film can (clear plastic)

Engines

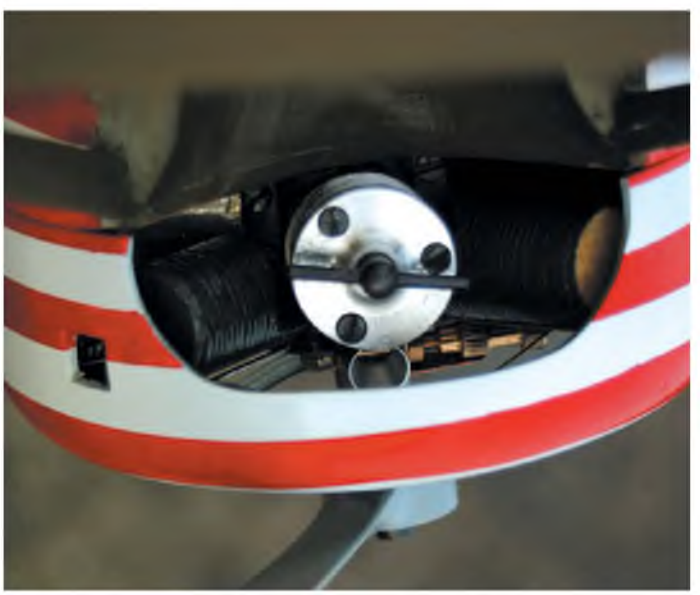
All the flicking and starting troubles are largely the result of using front induction engines, where the intake is difficult to access. This is the problem of building heavy models, where brute power is required to fly them. An inverted front induction engine stuck behind scale cowlings, radiators, etc., is a beast to get to choke, unless you are one of the lucky people with an index finger like ET! Rear induction engines, such as the Mills 75 and 1.3, together with the ED Racer and Comp Special, are much easier to install and operate. These can be choked from behind - and also have their needle valve in a more sensible location.

The only situation in which rear induction motors become difficult to operate is when installed in models of rotary engined aircraft, like the Sopwith Pup or Camel, which have short noses. Here, the intake ends up between the undercarriage legs and in the middle of the cockpit! To choke the engine, a larger hole has to be made between the undercarriage underneath, to allow ET to do his magic again!

The choice of engine to use is a personal preference, based on your experience with particular engine types, but also the configuration of your chosen aircraft. Both sizes of Mills engines are the classic motors to use, easy to operate and install, with a built-in tank. Original engines are



Practising what you preach! Metal mounting plate for thrustline adjustment, with cut-out for access to needle valve and choking. Note the rubber band- tensioned cowl hinge - dead easy for an inline engine on Andy Hewitt's Airco DH4.



The front induction PAW 100 in John Rimmer's Sopwith Camel - not easy to get at, when running - but easier than if a rear induction motor was fitted!

Another solution - an inverted mounting (Russian rear induction engine?), despite the large top 'scoop' cowl on Mike Kelsey's BE2. Note the press stud lower cowl mounting point.

The Fokker D.VII offers a more straightforward approach. The upright DC Sabre has a modified Allen key comp screw - note short length of fuel tube!

expensive and may have had a hard life, but we can now buy new reproductions from Irvine Engines in the UK, which are excellent, or buy a new Indian Mills reproduction, cheap but effective (also sold by Irvine Engines). The range of small diesels produced by PAW are excellent and economic engines, the pick of the bunch being their 0.8cc vintage classic, which is perfect for scale. The DC Merlin .75cc is also a good beginners engine, and very cheap on the second hand market.

Installation

Generally, the simplest engine installations are those with the engine mounted vertically upright (no more flooding!), with generous scale cowling over the top. The de Havilland, and German equivalent, two-seaters of WWI fall into this specification. Whatever the design, the needle valve should be easily accessible, even extended external to the cowling, to allow final setting ready for the off. This can be achieved by soldering some 16swg wire to the needle (with great care not to put too much heat on to the needle valve), so that it just pokes out of the cowling. This makes life so much easier and is hardly noticeable.

The compression screw (in the case of diesel engines) does not have to be so exposed, unless your motor is on its last legs; a simple generous hole cut over its location, to allow pliers or a tube spanner in to twiddle, will do the trick. However, if you require more down thrust and right thrust, this initially neat hole now wanders all over the new cowling. You had better trim your model first (chicken and egg syndrome).

It's a short nose, so it's all crammed in the cowl! Charlie Newman's little Sopwith Camel cowl sports a 0.5cc DC Dart, fuel tank - and lead weight - and it fits!

Tanks...

One of the most critical items on your IC powered scale model is the location and configuration of the fuel tank. The tank must be accessible for filling and should hold fuel for no more than one minute at full power. It should be small and squat-shaped, such that there is not a large head change as the fuel is drawn off. **(See Figs.1 & 2).** The eye-dropper type of tank gives a larger head change, which normally makes itself known by constantly changing engine settings. I have found it preferable to let the engine suck its fuel, rather than letting gravity help it. My fuel tanks are made

from cut-down clear 35mm film canisters (visible fuel level). The lid has three aluminium pipes superglued into it - one filler, and one vent and one feed. The body of the canister is cut down to give the one-minute of fuel, then glued to the lid.

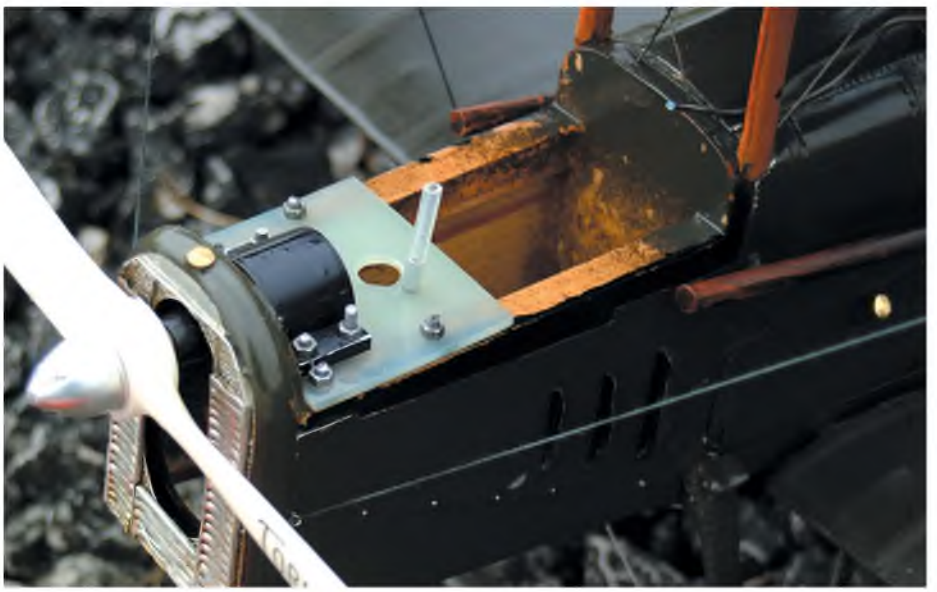
The tank should be positioned as close to the engine as possible, with the minimum of fuel tubing from the feed to the needle. The level of the tank, relative to the needle, is the most critical for trouble-free operation. This should be such that the 'full' tank level is below the level of the needle valve in the flying position, with a minimum length of fuel tube between.

Gas and gaiters?

The engine installation for CO2 powered scale models needs to follow similar principles to IC motors, in that the vital organs need to be readily accessible by use of removable cowlings and access holes. In some CO2 motors, where the throttle is on the front crankcase - the Modella and Gasparin motors need access to the cylinder head for throttle adjustments.

A good flow of air around the cylinder head/barrel is also required, to prevent icing problems. Any icing problems should virtually disappear if only gas charges are given, i.e. always fill the tank from an upright charge, thus preventing liquid gas entering the tank. With no liquid in the system, the "O" rings do no suffer the attack of ice crystals, and therefore last longer - the only drawback is that a larger fuel tank may be required to obtain the duration needed - or you should build lighter models!

Other troubles associated with CO2 models are often caused by kinked, or leaky, pipes and worn "O" rings. These normally occur at the soldered joints at the filler, tank and cylinder head, where most fiddling occurs. Neat tube bending is a must - use dowel or a pencil to form the tube around into a coil of one or two turns at the joints previously mentioned. This forms a neat spring around these vital organs preventing fatigue and prolonging life. Wherever possible, mount the filler valve securely - don't leave it flapping about, it's guaranteed to lead to kinking and damaged pipes. The fuel tank should also be secured in position, for identical reasons.



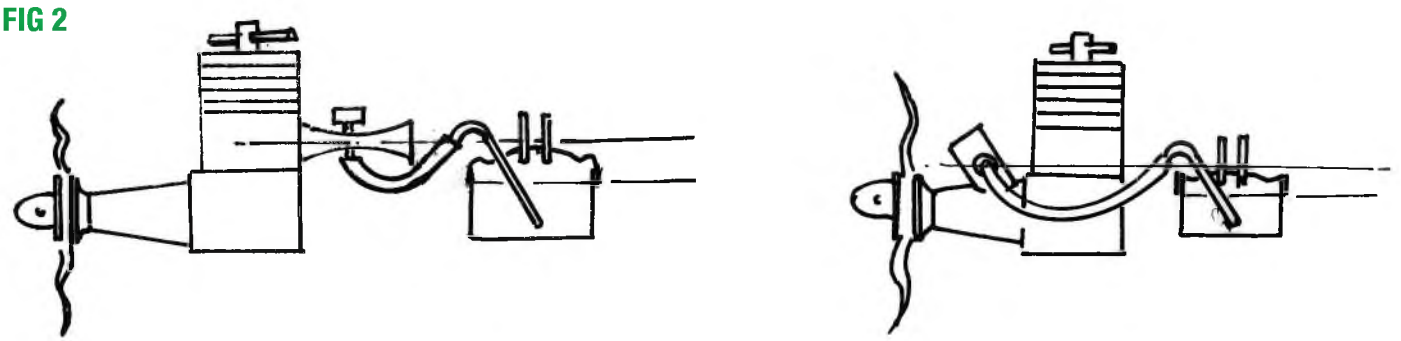
Another BE2, and a different approach. This version is powered by an inverted Mills 1.3, mounted on a glass-reinforced plate, which carries the tank filler tube and needle valve access hole. Note that there is plenty of room behind to access the venturi and tank.

Getting a buzz

Electric models have similar plumbing problems (electrically speaking). Charging points and all connections/leads need to be neatly secured to prevent the fatigue of solder joints. The pulling and pushing of leads and sockets for charging will break solder joints and guaranteed, it will always break just before a competition flight! Similarly the battery pack needs to be secure, to prevent it failing.

Both CO2 and Electric motors require mounting such that thrust line adjustments can be easily made without resulting to major surgery of the nasal passages, hopefully the scale panel lines will allow easy access to all areas. Think ahead and anticipate such problems - and take the pain out of your modelling. ■

FIG 2



Ensure fuel level is below the needle centre line.

SO WHAT IS PRE-TENSIONING?

John O'Donnell explains

In Part 6 of Andrew Hewitt's 'SURVIVING FREE FLIGHT SCALE feature last month, he dealt with the the techniques associated with rubber powered scale models and briefly mentionsed the practice of 'Pre-Tensioning' the rubber motor. This is a technique long used by aeromodellers whose experience goes back a long way, but may not be known to those withoutprevious knowledge of rubber as a means of powering scale models. Unfortunately, there was no space available to tack John O'Donnell's explanation, appropriately, onto the end of Andrew's piece last month, but here it is now.

This is a way of accommodating a long rubber motor in a relatively short fuselage to circumvent the problem of a long unwound rubber motor distributing itself unevenly inside the model. It is a technique regularly applied to 'open' competition free fight models where you can use as much rubber motor as you like (as distinct from the 'restricted' Wakefield and Coup d'Hiver classes that have so little rubber that motors are invariably taut between anchorages). But it is entirely appropriate for free flight scale rubber powered models. **(Fig.1)**

Many rubber designs with folding propellers (using the conventional 'spring and wood screw' stop system) side-step the problem by retaining the final few turns (which provide little or no power) on the motor. This is easily accomplished by suitable adjustment of the stop. A complete row of knots can be expected to be even, but a partial' row can be left at either nose or tail with resultant repercussions on the glide. **(Fig.2)**

Models with free-wheeling (i.e. all small kit designs), feathering, free-wheel-folding, and some with conventional folding propellers employ pre-tensioned motors. The rubber is plaited, or twisted on itself, so that when unwound it forms a 'rope' in which individual strands (being spirally disposed) are longer than the overall length of the motor. The effective length of the motor, and hence its capacity for withstanding turns is still effectively the length of the strands. To be pedantic the maximum turns are reduced slightly due to the residual turns used to pre-tension.

The easiest method of so treating a motor is to make up a motor of twice the intended length and half the required number of strands (it might not be superfluous to say that a loop is two strands). **(Fig.3)**

Pretensioning

A number of turns are applied to one end of this motor whilst the other is held stationary. The two ends are brought together, attached to a propeller, and allowed to unwind whilst the middle is held. The motor forms itself into a plaited skein.

The main snags with this system are that the preliminary turns may not be uniform and that the 'doubled over' part of the motor may not be its mid-point. This can lead to a motor that sometimes still 'bunches' inside the fuselage. The system also only works with motors of four strands or multiples thereof. **(Fig.4)**

A better and more versatile system is to make up two separate motors of the normal specified length, but of half (or plus or minus one) the number of strands. For a 14-strand motor make up an 8 and a 6 strand motor. These are attached to the same rear fitting, wound in turn attached to the same propeller, and allowed to unwind together. It is important that the two separate parts of the rubber are, at this pretensioning stage, wound in the SAME direction, not in opposite directions as the diagram here implies. **(Fig.5)**

This ensures the two 'halves' have the same length and same turns. Even an odd number of strands can be managed by including a separate strand (with a loop on each end) in one 'side.' **(Fig.6)**

In all cases the number of turns required has to be determined by experiment as it depends on the number of strands as well as motor and fuselage length. It should also depend on the propeller type. A freewheeling propeller should have the motor just tight enough for the propeller nose block to remain in place on the glide, but slack enough for the propeller to 'knock out' rather than break on landing.

A (free wheel) folder model should have a tighter motor, as the nose block must stay in place during the jolt of the propeller being stopped at the end of the motor run.

Allow the Pretension turns to unwind under tension to produce evenly distributed tensioning turns. This gives a motor longer than will result under normal conditions, so after tensioning and before flight apply a small fraction of 'contest' turns and allow the motor to unwind in the model. If the tension is not as required then repeat with more or less turns as appropriate. Then record the number for future applications.

Finally it is generally considered inadvisable to leave a motor tensioned FOR periods of several days or more. The rubber takes on a permanently wavy form - a hardly desirable feature.

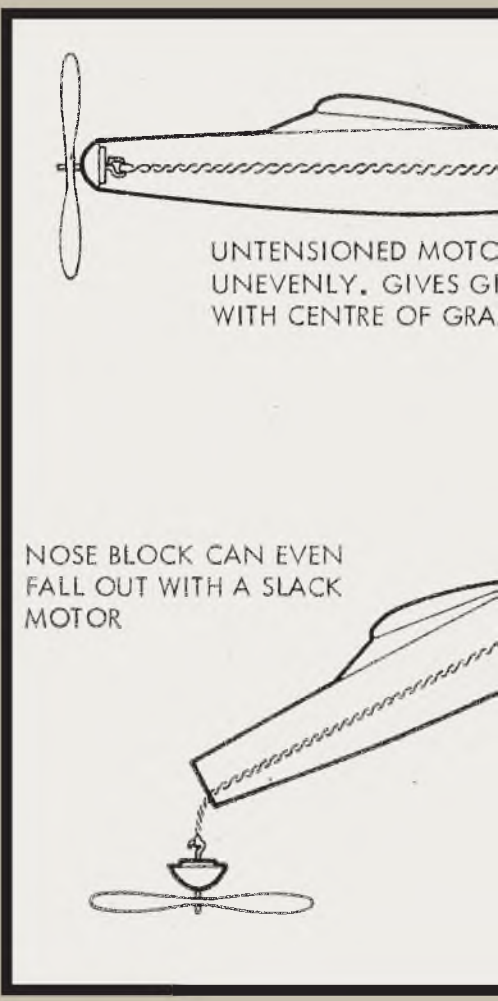


FIG.2

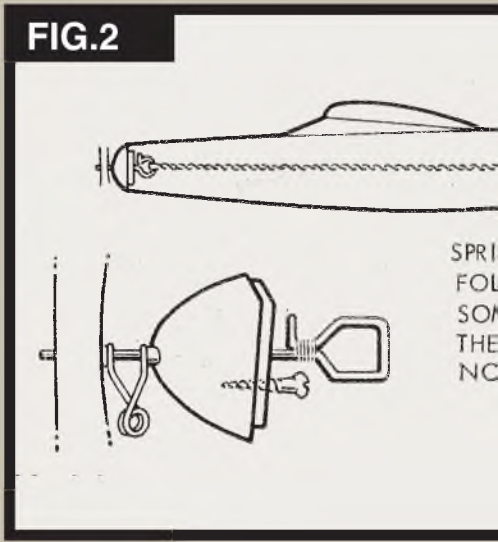
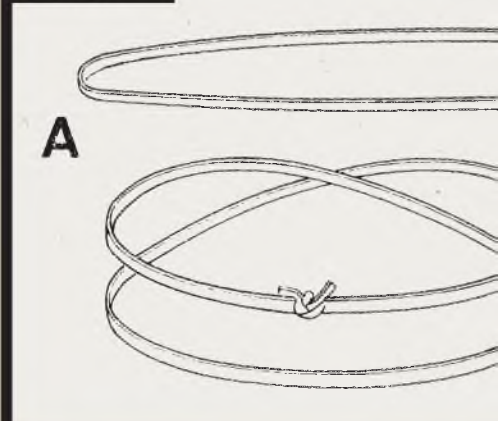
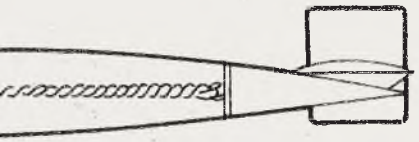


FIG.3





OR CAN UNWIND
LIDE TROUBLES
AVITY MOVEMENT

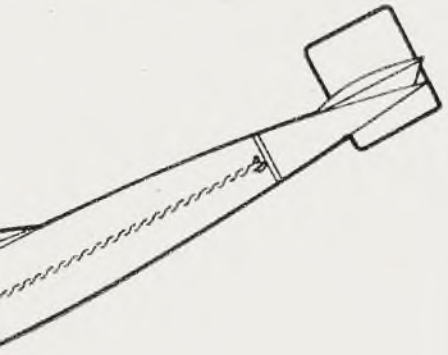


FIG.1

ING AND WOODSCREW SYSTEM ON
LDING PROPELLER MODELS RETAIN
ME TURNS ON THE MOTOR. MOVE
E SCREW STOP IN OR OUT OF THE
OSEBLOCK TO ADJUST.

PRETENSIONING

MAKE UP A DOUBLE LENGTH
WITH HALF THE REQUIRED
NUMBER OF STRANDS.

FIG.4

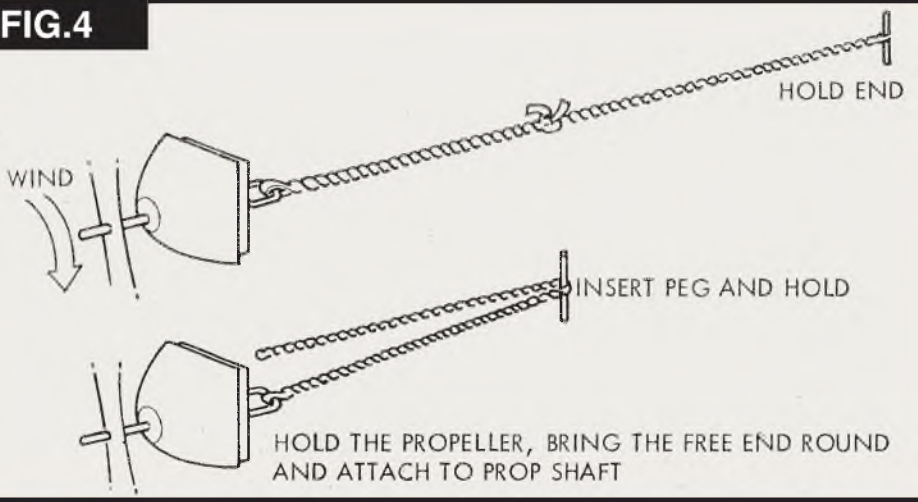
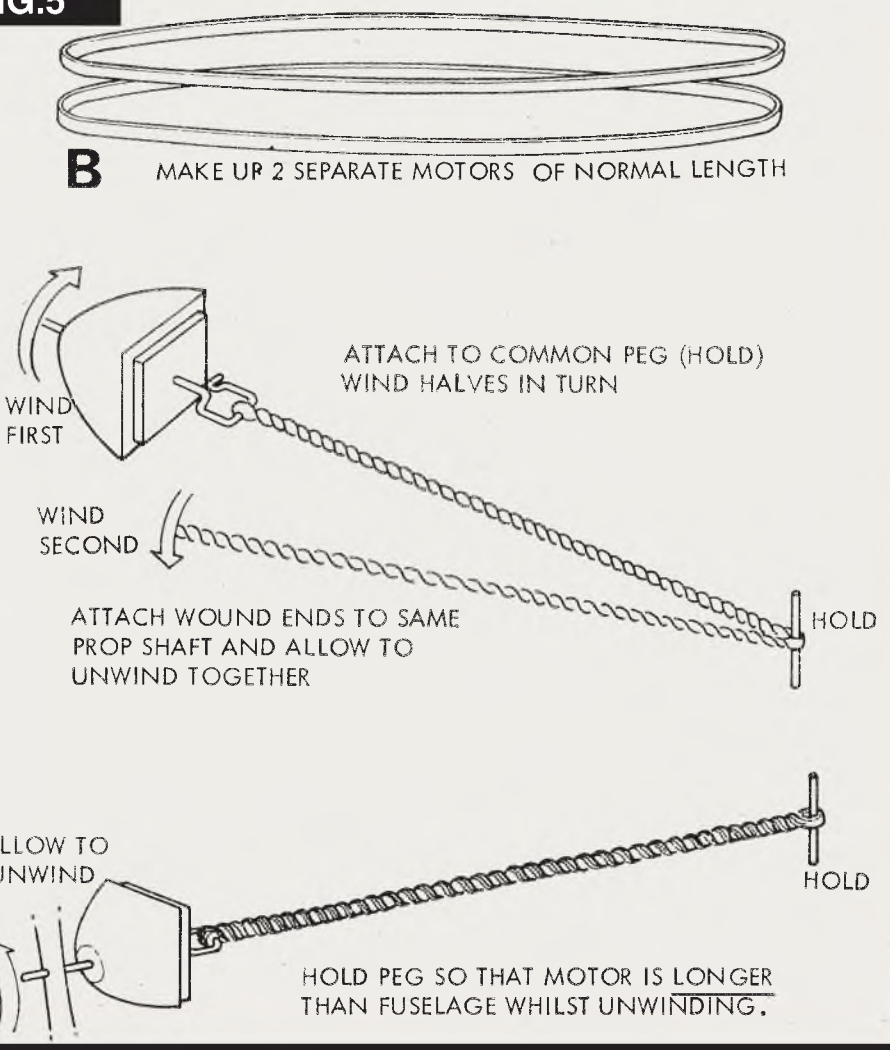
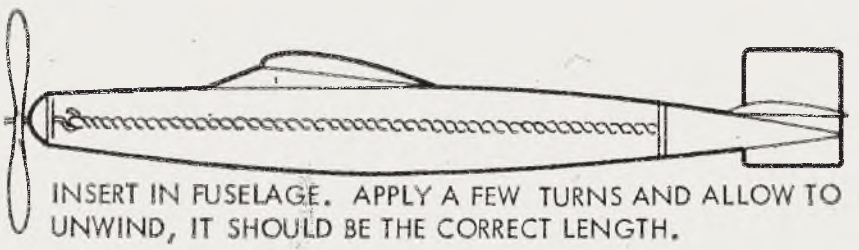


FIG.5





INSERT IN FUSELAGE. APPLY A FEW TURNS AND ALLOW TO
UNWIND, IT SHOULD BE THE CORRECT LENGTH.

FIG.6

Scale Action at The BMFA Free Flight Nats 2013

At last, the weather gods smiled on a bumper Free Flight Scale Contest

Steve Powell and his rarely-modelled Austin Whippet and flying high over Barkston Heath.

Held under the auspices the BMFA Free Flight Nationals, this is really two competitions: the *Aeromodeller / Model Aircraft Magazine Designs* competition, and the normal *Free Flight Open Scale* contest. Bill Dennis wisely (and bravely) decided to run both competitions at the same time, which ensured a great spectacle for the crowd, with continuous scale action. As if this bliss was not enough, the weather was excellent.

Austin Whippet

Contrary to popular myth, those of us 'Oop North do not see whippets every day. So to witness an Austin Whippet flying scale model was indeed a rare treat.

Steve Powell's silver biplane in the *Aeromodeller / Model Aircraft Designs* Class had the authentically stubby-nosed cowl enveloping its dummy radial in the scale fashion. This chunky nose-treatment also hid its real diesel. An appealing model of a rarely-modelled obscure British scale subject.

Miles Student

Derek Knight's creativity puts him in a class of his own. His new electric ducted fan (EDF) Miles Student was amazing. Originally designed for the famous but ancient Jetex solid fuel rocket pack, it now has an EDF unit of Derek's own design.

He had to sort out some annoying adverse trim issues, but after all, this is a challenging free flight subject. Later,

The Novocastrian Encampment at the comps. Terry's Aeronca Sedan to the fore.

Phil Smith's ambitious twin: a DH 10.

Impressive! Derek Knight's innovative and very rarely-modelled Miles Student EDF.

Delightful rubber-powered Comper Swift from Ken Bates, flying just beautifully!

Mike Kelsey's diesel powered Se5A turning nicely under power.

Derek came top in Open Scale with his equally demanding French Sud-Est SE 5000 Baroudeur.

Avro Avis

We have seen this orange and silver F/F scale model before. Designed and built by Billy Hanshaw, it remains a smasher. I noticed Billy had achieved a very straight climb-out with his immaculate model, but the torque-turn soon tightened. Note that Billy also designed and built the model's diesel power plant.

Aeronca Sedan

Terry Aydon placed 9th with his immaculate and impressively large (66" span) Aeronca Sedan. This was built from the plan in the famous and much admired Mercury kit and appropriately, it was powered by a classic Oliver Tiger

Bryan Lea's DHC-2 Beaver climbing out nicely.

Bryan Lea timing the engine run on his DHC-2 Beaver, whilst checking the wind.

Ray Hall fettles his Blackburn B2.

Hard to beat. Ray Hall launches his Blackburn B2.

Gareth Tilston informs the Judges of his intention to fly.

Fokker aloft! Gareth Tilston's Eindekker E.III.

diesel. With the Ollie Tiger on full song she set off on her aerial navigations with huge authority - satisfyingly big free flight scale model.

To modellers of my generation, who could never afford this classic kit, it was astounding to actually see a famed Mercury Aeronca in the air. It made a superb flight and made my weekend.

Chrislea SuperAce

Ron Smith's red and silver Chrislea Super Ace G-AKVR immediately appealed to me since, a few seasons ago, noted R/C scale man John Rickett kindly took me for a spin in his full size example, G-AKUW. It was an astounding experience. The Chrislea is such a distinctive and elegant British design. Sadly, neat Ron's Chrislea only recorded a score on one flight.

Piper L-4Grasshopper

Another modeller having trimming issues was my guitar-wielding mate Bernie Nicholls. His Piper L-4 electric-powered / enlisted-civilian / light-aircraft-cum-warbird was very attractive. Bernie stuck with the trimming all evening, but he did not make the scorecard. A pity, but free-flight scale isn't for wimps. Fret not! Bernie will have trimmed her out by the time you read this.

Avro Avian

Before I conclude these brief notes I must mention a fine scale model that wasn't yet ready to be entered for the comp. However, I managed to get a few snaps of her before it went dark. This was the stunning Avro Avian brought along by previously aforementioned Bowden Contest Winner, Terry Aydon. This Avian is exquisite, and we will return to it in a later issue.

Blackburn B2

One of my all-time scale heroes, Ray Hall flew his new Blackburn B.2. As you might expect, this is an accurate and impressively

It's the way you hold yer mouth. Gareth Tilston gives his Fokker E.III a textbook launch.

Billy Hanshaw's Avro Avis, powered by his neat own-design, hand-made diesel engine.

finished flying scale model. She flew very well indeed, and deservedly placed First in the *Aeromodeller / Model Aircraft* class.

Entries

There were 14 models in Free Flight Open Scale, and 6 in the Aeromodeller / Model Aircraft Designs Competition.

The verdict

A well organised contest, attracting a good entry. At long last we had bright sunny weather for a British Free Flight Scale Comp! No precipitation in sight, no gloomy evening snaps, but some pukka flying shots. For once, I was a happy snapper.

Acknowledgements

Thanks to Bill Dennis for his crisp organisation of two simultaneous comps. Bill also supplied me with the Official Results. As if all that were not enough, busy Bill also posted Provisional Rules for next year's FF Scale competitions. In both classes Bill proposes the removal of the Scale Documentation requirement, to encourage participation in the competitions. Speaking strictly as a punter, it looks good to me.

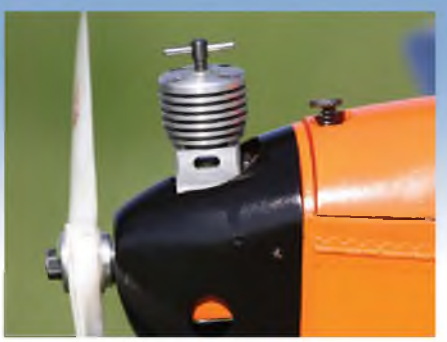
Results

Open Scale

1. Derek Knight	Sud-Est Baroudeur
2. Mike Smith	Airco DH 10
3. Andy Sephton	Grumman Wildcat
4. Gareth Tilston	Fokker E.III
5. Billy Hanshaw	Avro Avis
6. Philip Smith	Cessna L-19 Bird Dog
7. Martin Pike	Comper Swift
8. Bryan Lea	DHC-2 Beaver
9. Terry Aydon	Aeronca Sedan
10. Steve Powell	AustinWhippet
11. Ken Bates	Comper Swift
12. Ray Hall	Blackburn B2
13. Mike Kelsey	SE5A
14. Ron Smith	Chrislea Super Ace

Aeromodeller/Model Aircraft designs class

1. Ray Hall Blackburn B2
2. Derek Knight Miles Student
3. Gareth Tilston Fokker EIII
4. Mike Kelsey SE5A
5. Steve Powell Austin Whippet
6. Andy Sephton ABC Robin



Billy Hanshaw's own-design .75cc diesel in his Avis.

Billy Hanshaw gets Avis away.

Terry Aydon about to launch his superb classic Aeronca Sedan from the Mercury Kit.

Big banger! Terry Aydon's hugely impressive 66" span Olly Tiger powered Mercury Aeronca Sedan.

Bernie Nicholls and his new electric powered Piper L-4 Grasshopper.

Bernie Nicholl's fine L-4 Grasshopper on one of its many trimming flights.

Geordie scale maestro (and past Bowden Winner) Terry Aydon with his immaculate Avro Avian.

Terry Aydon's 44" span Avro Avian.

THE QUIET ZONE

R/C SCALE ELECTRICS BY PETER RAKE

Here we go again, another instalment of The Quiet Zone. Having rather a lot to fit in this time, I'll limit my input to a brief introduction.

Since you're going to need this sort of information before we press on with more details of that Sopwith Camel we were examining (before I interrupted it with a plan article). So, without further delay; over to Jonathan Rider for all the details.

Top gun

Early aircraft that were developed prior to and during early World War I were designed for reconnaissance and to be used as flying observation platforms. These aircraft would fly well above the range of the enemy small arms fire and make observations on troop movements, locations and gather other tactical data, returning it to the military leaders. Early on, aircraft from the opposing forces would encounter each other, so the pilots armed themselves with pistols, carbines, grenades, and an assortment of improvised weapons, and tried to shoot at each other. Many of these methods proved ineffective as the pilot had to fly his aircraft while attempting to aim a handheld weapon and make a difficult deflection shot.

As control of the airspace over the opposing armies became increasingly important, all of the major powers developed dedicated fighters to support their military operations. Early fighters were

The finished Vickers guns installed in the Camel. Note the cocking levers in the cockpit.

Typical of the assortment of bits required if you want to scratch build your own model guns. Never throw anything away.

The basic Vickers barrel sleeve scored and ready to roll.

Cooling louvers chiselled in and a few bits of tube help add 'life'.

More details added from wood, plastic card and metal tubing complete the basic gun.

very small and lightly armed by later standards, and most were biplanes built with a wooden frame, covered with fabric, and limited in speed to about 100 mph. But between the two world wars, wood was largely replaced by steel tubing and fighters were progressively equipped with larger weapons and more powerful engines. After the jet age arrived, the 'gunfighter' was essentially phased out to basically a pilot firing guided missiles, where the distance between aircraft is so great, the pilots would not even see each other while they were locked in battle.

The 'charm' of building WW1 models is the wealth detail you can add to the aircraft - from wood and fabric to spoked wheels and rigging wires. The aircraft fly at a leisurely pace and represent cutting edge engineering from the time where designs were drawn on the shop floor and trial and error was a 'one time' event. One key feature I like to detail is the guns and armament of these early fighters. The look of twin machine guns between wings and wire just reflects pure aviation bravery, chivalry and daring.

There were so many different designs of first-generation fighters back then, one example of an early fighter was a 'pusher' scout, the Airco DH.2, with the propeller mounted behind the pilot and a Lewis machine gun up front with excellent visibility and field of fire. It was a great fighter in its time, the dominant type over the front for a short time, early in the war. One of the main drawbacks was that the high drag of a pusher type's tail structure made it slower than a similar 'tractor' aircraft. German designs quickly surpassed the speed and manoeuvrability of the little DH2.

On front-mounted engine aircraft, lower wing mounted guns placed outside of the propeller arc, were tried but the unreliable weapons available required frequent clearing of jammed rounds and misfires and remained impractical until after the war. Other solutions were to mount the machine gun to fire forwards but outside the propeller arc like the Lewis on top of the SE5a wing. This worked well, but required a lot of attention to the gun if it jammed or needed to be reloaded.

Most fighters of the later WW1 period ended up having one or two machine guns right in front of the cockpit in easy reach of the pilot with an 'interrupter' gear that would prevent the guns from firing when the propeller was in the way. I can just picture Errol Flynn on a *'Dawn Patrol'* looking down two machine gun barrels at the dreaded enemy.

As we know, most early aircraft were made of light wood or metal tubing and cloth, they strapped on a very heavy engine, added a few machine guns and a few hundred rounds of ammunition, put a pilot on board with a few hours of fuel, and off he went. For conversation sake, 80% of this weight was in front part of the aircraft (let's for now rule out the DH series of pusher aircraft). But the Sopwith, Albatros, Fokker, Nieuport, Pfalz and SPAD aircraft all had most of the weight up in the front of the aircraft. The wings had to be aligned to support this 'nose weight', so they were also well forward on the aircraft. But where does this place your centre of gravity? Pretty far forward!

When making our model, we have to increase the structure of the tail to support the model flying, landing and add some strength for the loads these models endure, add servos and radio gear (sometimes behind the CG) and there will be a good chance that to make up for the tail weight, you will have to add some sort of 'dead' weight in the nose of the aircraft to make it balance correctly. There is one thing I dislike more than leaving my transmitter at home when I go flying - having to add 'dead'

The guns, still in need of painting and weathering, being test fitted into the nose of Jon's Camel.

weight to a model aircraft. We should always plan tp place anything of weight as far forward as possible.

O.K. Enough on the CG lesson, but the point of the comments is that you can add extra weight to your dummy machine guns, motor, cowl, and other scale items and it will actually help you balance your model better. Keep this in mind as we begin our construction.

Let's make our guns

Let's start with a small 1/16th scale Lewis gun. The first thing I do when I want to make a smaller scale of something full size is to get as many reference pictures I can of the item so thatI have something to design to - It's easier for me to make something that replicates a real object, I downloaded the *AirAge* document sheet of the dimensions and details of the Lewis gun without the cooling jacket (Many aviation modifications to machine guns had to do with removing water cooling jackets and protective covers, both not needed up at altitude). I used the specification sheet and the scale calculator, and reduced all of the drawings down to 1/16th - here is a great link to a site that will help you create the proper dimensions: *http://jbwid.com/scalcalc.htm*

Once the drawings and details are scaled down, I print out a 1/16th size picture of the three-view of the gun - that is my plan that I work to throughout the build. I first make the receiver and the grip all out of balsa pieces, starting with just a square block, and an adding vertical piece for the grip. The round action on the bottom is just one more piece of balsa. Use the drawing often and make sure you stay within the 'scale' size. Then you can add the trigger guard from a cut piece of T-pin or thin wire.

I then cut the barrel and the gas return-tube barrel out of a bamboo stick (don't tell my wife I raided her cooking tool stash) and I cut it to length - it's easy - just use the 'full size' drawing as a template - then I cut a brass tube and CA it all together. I added a balsa ring for the barrel to attach to the receiver.

Next, I cut a piece of aluminium tape plus some small strips and wrapped these around the gun for detail - use the plan as a guide. I then measured the diameter of the ammunition drum and cut that out from balsa, attached and added small strips of the aluminium tape to represent the notches in the drum, one small circle on top with a strip of tape for the leather handle, and then the drum is complete.

While you are at it, make a few ammo drums. In many cases, aircraft had extra drums attached to the outside of the cockpit, along the fuselage, or stacked inside the cockpit for easy change.

Make the rear handle from a T-pin and a small piece of bamboo - then attach with CA. Add any other details you need with the aluminium tape and CA - then harden

Nothing too complicated about getting this far making a model Lewis gun.

the whole thing with a very light coat of CA. Paint with flat black and gun metal grey - the fun part of the real aluminium tape is you can scrape off the paint to make the gun look used and worn - the shine of the metal tape will show right through the paint

The Vickers machine gun was also a conversion from a very popular infantry weapon for aircraft use. Most of the WW1 British and U.S. aircraft carried one or more of these machine guns. The Vickers had a large cooling jacket around the barrel that circulated water, and allowed it to sustain a rapid rate of fire without the barrel getting too hot. A can of water was used as a 'radiator' and worked though gravity circulation. On the aircraft, the weight of a water cooled machine gun was too great, so many times you would see holes cut into the front of the cooling jackets, and air exit slots or louvers cut in the rear. This would allow the slipstream to pass around the barrel and cool the gun.

Unlike the Lewis, the Vickers was belt-fed with a cloth belt feeding from the right (as you look from the rear). Spent cardrige cases were either dispensed overboard or, on some aircraft, collected in cartridge catchers, not only to keep spent shells from flying all around the cockpit, but to enable the cartridge cases to be recycled and re-loaded for re-use.

The Vickers should go together just like the Lewis, making the breech and the firing mechanism first, then the barrel shroud. Now, there are many ways to make a scale machine gun shroud, but before we dive in too deep, remember our centre of gravity? Don't feel as if you have to make the shroud out of paper or light material, brass tubing makes a wonderful scale machinegun barrel, as well as plastic tubing or even aluminium soda can metal. These added details make the gun more scale, and add some needed weight up front of the aircraft.

As you can see on my Sopwith Camel, the shrouds were made from sheet plastic, grooved with a small screwdriver, and the cooling vents were punched through the plastic with a small chisel and hammer. Remember, these machine guns were adapted or updated and repaired (mostly in the field) for the aircraft, so use your talents here, and there are many ways to make the guns scale and correct.

One of the fun parts of making a belt-fed machine gun is the level of detail you may wish to apply. The making of a belt with bullets in it is not that difficult, and adds a ton of scale realism to your machine guns. I used old bed or pillow case sheets, the sheet is thin enough to make a scale 'belt' and you can colour it with almost any brown or dark stain to give it the 'weathered' or much-used look. Here is a neat scale tip. How many of us have that medium sized bottle of model paint thinner sitting in the corner with the assortment of paint jars we have collected over the years? If your thinner bottle is anything like mine, it has a mass of grey sludge of paint at the bottom. To make wonderfully weathered material for your machine gun belts, strapping, seat belts or any other weathered of worn wood or fabric, shake that thinner bottle up, and dip the piece of cloth right into the thinner. It will come out weathered perfectly, grey and brown with the cloth texture showing through. Let it dry, and you now have a piece of cloth that looks like it has been run

A few bits of wire and some aluminium tape lend realism. Jon's fingers show just how small this gun actually is.

A bit of paint and some weathering brings it all to life.

With an installation like that, this just has to be a R.N.A.S. Sopwith Pup. It is typical of the arrangement used on night-fighters and anti Zeppelin duties.

A photo-etched cooling sleeve and a breach made from aluminium tape clad wood form the basis of Jon's Spandau gun.

through a machinegun a few times!

The bullets can be made with small cut lengths of brass wire, plastic pieces or small gauge single-strand electrical wire. I like to use brass, so that I don't have to paint the entire bullet - I can just add a lead-collared tip when done. When you have a few dozen bullets cut from your brass wire, take a thin strip of the weathered fabric material and place it on a piece of waxed (or parchment) paper on your building board and pin each end. Then, line up your bullets touching each other side by side. Again, have each piece right up against each other in parallel. Align the tips of the bullets so they are all in order. Use a straight edge to ensure everything is even and aligned. Put a drop of CA on the brass pieces to glue them to the cloth.

I know it does not look right with all of them touching, but hold on ... there is a method to my madness here. When the CA has hardened, pull out every other 'bullet' from the cloth strip, the CA does not stick as strong to the Brass as it does to the cloth, and you now have perfectly spaced, perfectly aligned and scale strip of rounds for your machine gun.

To finish off the belt, take another strip of cloth, the same width as your first one and place it on top of the brass shells, and CA the strips together. If you want to go a little further, you can carefully push the BACK side of a Xacto blade between each brass shell as you glue it to give the belt a sewn 'bumpy' look.

Finish your machine gun with the added details of a gun sight and the grips. The sight can be made with wire wrapped around a piece of brass tubing to keep it perfectly round, and thread used for the cross hairs. Don't tie the thread, but lay it on the wire loop you just made, add a little CA on both ends and trim it with a sharp knife. The CA, plus the paint will hold the thread in place. You can also use paper strips to make the sights, as they are light, and naturally hold a circle when glued together.

For the grips, I try to use real wood, even Balsa wood, so the gun has some colour and texture on the back end. Use wood stain, brown paint or dip it into your cloudy paint thinner bottle for a weathered and well-used look.

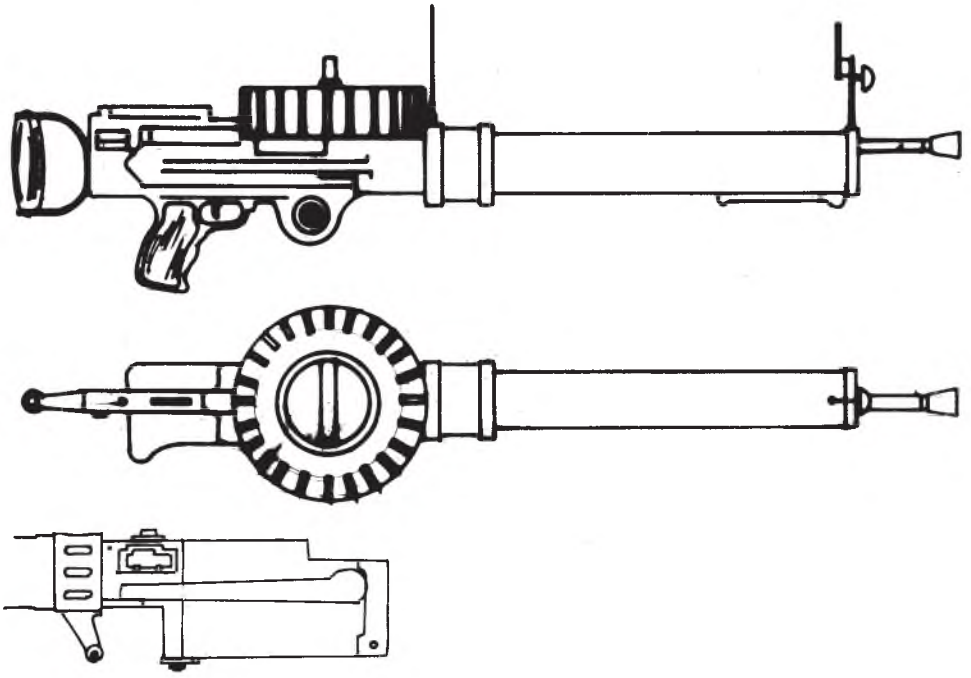
For the Spandau machine gun, most of the building steps are the same, except they took off the cooling jacket of the Infantry version and added a series of lightening holes. This is what gives the Spandau it's very distinctive look. To replicate that, you can purchase aftermarket (or make your own) brass etched pieces (like shown here on the 1/16th scale D.VIII) or you can make your shroud from paper or metal. Another neat trick is to print the pattern with your computer onto paper, and use that, it still looks very convincing from just a few feet away!

The machine guns described here are just the beginning on how you can add armament to your aircraft. Some aircraft had twin Lewis guns, some had combinations of each, and there was even a DH4 that had seven of them. You can also add bombs, flare guns, extra Lewis Gun ammo drums on the side of the aircraft and even in the case of some Nieuports, rockets were attached to the outer struts for ground attach missions.

This may have taken up a little more space than normal, but I felt we needed it all in one hit. Now, next time around, we can carry on looking closely at that model Camel.

As usual, I can be contacted at PETERRAKE@aol.com. ■

Here's a pair of finished Spandaus fitted to author Jon's 1/16th scale Fokker D.VIII.

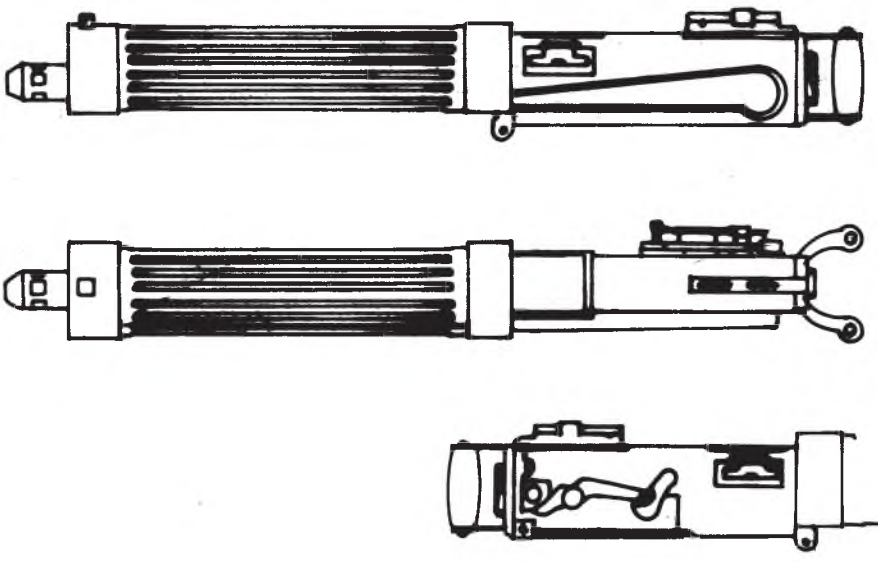


LEWIS MACHINE GUN

(Shown here with cooling shroud around barrel).

Scale 1:10

VICKERS MACHINE GUN



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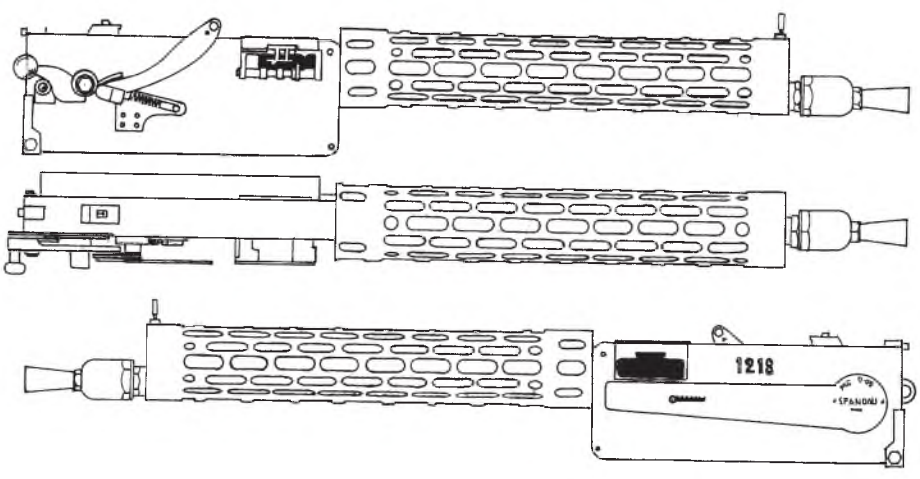

SPANDAU MACHINE GUN

Scale 1:10

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