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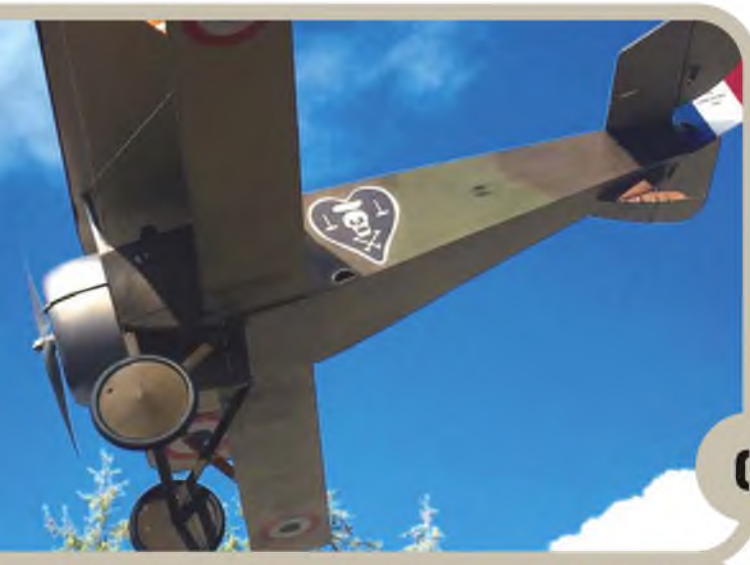

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ON THE COVER

The slight wing sweepback of the Nieuport 17c imparts a distinctly racey air to this WW1 scout/fighter. Simple lines have made it a firm modellers' favourite and Peter Rake has capture all the air of this attractive aircraft in his 1/6th scale model which is the subject of a three-part free plan construction series, starting in this issue.

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Subjects for scale modelling are entirely a matter of personal aviation interest. In the case of scratch-build 'conventional' aeromodelling, either from plans or wood-build kits (as opposed to ARTFs), one of the first steps in the project is the sourcing of reference material.

Time was, when the limited range of aircraft at air museums severely restricted the gathering of fine surface detail. The emergence of the recovery and restoration movement starting from the mid-1960s (and to some extent a transformation into a big business), has changed all that, aided by a 'learning curve' of restoration techniques. During the period, there have been some spectacular historical aircraft recoveries - for example the epic extraction of a Handley Page Halifax from a Norwegian Fjord and a Vickers Armstrong Wellington, from Loch Ness. A P-38 Lightning was recovered from ice entombment in Greenland.

Further afield, there have been recoveries of WW2 Luftwaffe types from the Russian arctic north and of US Navy types lost overboard from the US training carriers *Sable* and *Wolverine* from the depths of the North American Great Lakes

Another motherlode of recoverable WW2 warbirds has been in the wide expanses of the Pacific area, where the movement of the Pacific war across many thousands of miles dictated the abandonment of unserviceable or damaged aircraft as the war moved on.

Our P-39 Airacobra feature in FSM December issue rang bells with Neville Mines who, back in 1974 during his service with the Royal New Zealand Air Force, was involved the recovery of Bristol Beauforts and Curtis P-40s previously abandoned on Papua/New Guinea. Nev kindly sent along these photos.

Nev recalls that at the end of the airstrip was an enclave that had been the base of USAAF operations, where there resided the bones of an N.A. B-25 Mitchell, a Douglas A-20, some Curtiss P-40 Warhawks, the wreck of a B-24 Liberator and a P-39 Airacobra, on the last of which could just about be traced, the insignia ...*'Brooklyn Bum 2nd'*!

Soon after Nev moved on, the *'Bum'* did too, first to New Zealand, via Australia, for restoration to static condition for the Australian Aerospace Museum. After that, during 1994, it was acquired by the Duxford, UK based *The Fighter Collection* and reworked to full airworthiness by Californian based Fighter Rebuilders.

It flew at UK air shows, usually with Fighter Rebuilders' Steve Hinton at the controls until returning to Lewis Air Legends in USA.

LEFT & BELOW: **Brooklyn Bum 2nd as found on the long abandonned airstrip on Papua/New Guinea. It's now back in airworthy condition.**

BOTTOM: **Aerial view of the boneyard on Papua/New Guniea.**

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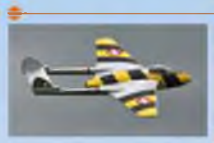

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NIEUPORT 17

PART 1: A 1/6 scale, electric powered model of the famous WW1 era French single-seat Scout aircraft . Designed by Peter Rake, with the prototype mode built and photographed by Pat O'Donnell

As an aircraft, the Nieuport 17 should need no introduction to fans of WW1 aircraft types. The mount of many well-known pilots, it went a long way to retaining a brief period of air superiority over the Western Front before being outclassed by the opposition.

Personally, I love all the Nieuport Vee strut types but my favourite will always be the Nieuport 11 'Bebe'. However, since that is a type I'd pretty much done to death in model form (although I have yet to design a built-up three-dimensional micro version) I thought something a little different was required. So, when asked for another design, it seemed only right to draw up the model you see here. My thanks go out to Pat for his first class efforts in turning my drawings into a functioning model.

ABOUT THE MODEL

Since I appear to have an excess of photos for this build, and the fact that you won't even be considering this model unless you know pretty well what you're doing (it makes a very poor trainer from both building and flying aspects) I'll keep my description of the build relatively short and rely on the photos to tell the story - for this part of the article at any rate.

Although not a particularly complicated build for an even moderately experienced builder, there are some points worth mentioning in order to better explain how things are done. So, although this won't be a 'stick part A to part B' type of article it will cover those areas in more detail than you'd otherwise expect.

DETAILS, DETAILS AND MORE DETAILS

Bearing in mind what has already been said, let's take a look at some of the niggling little points before getting into the build proper. Since as good a place to begin is the very front of the model, let's start with the cowl.

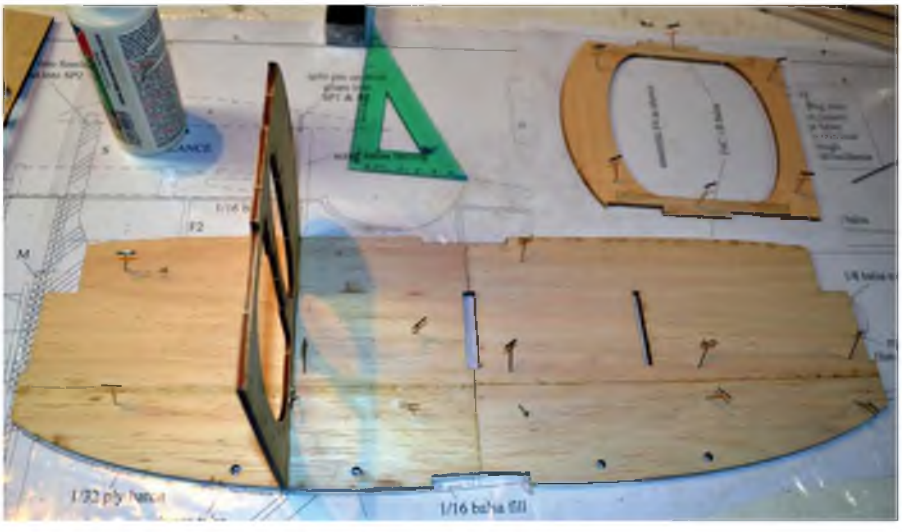
As you'll see from the photo, the rear cowl former has four lugs on it (four screws) with which to attach the completed cowl to former F1. If those mounting lugs are to actually align with the screw holes in F1, then C2 has to be assembled correctly. Don't just assume that the former segments can be used in any order and any way up - they can't!!!

You must assemble C2 over the drawing on the plan to ensure it all works out correctly. Laser cut (you are, of course using the laser cut parts made available by the publisher), CAD drawn models are great for accuracy, but only if you actually glue the parts together as intended by the designer (me). I make specific mention of this particular point because my previously presented 1/8th scale smaller version which uses exactly the same system, the test-builder didn't assemble C2 over the drawing and then concluded that the the mounting holes in F1 was in the wrong position. It wasn't, of course, but gluing in a former segment the wrong way up changed where that

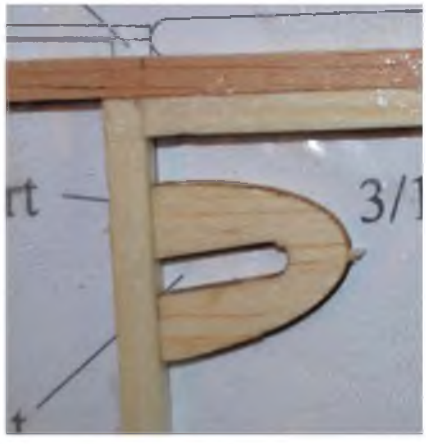
The Nieuport shows off her attractive lines as the pilot waits for a mechanic to come and swing the prop for him.

The assembled cowl sections. Note the lugs I made mention of in the text.

Another part to be assembled over the drawing is F4 which is built up from laser cut parts.



How the formers key into the fuselage sides.



A shot showing the rudder exit tube mount and that all important taper on the tailplane seat.

mounting lug was in the cowl ring.

Moving back a bit, you'll see something I don't normally do; the main formers are keyed into the fuselage sides by means of tabs and slots. This means that probably the simplest way of achieving a square forward fuselage is to assemble it stood on end, using F1 (the largest single area of perfectly flat wood) as the base. The forward centre section (c/s) struts can be glued in at the same time and the flat surface, combined with where they are glued to both fuselage sides and F1 should ensure these end up accurately aligned for when it comes time to glue on the top wing.

Once again, because of the accuracy available using laser cut parts (assuming they were drawn accurately in the first place), if the c/s struts are accurately aligned, then gluing on the wing will automatically ensure that too is accurately aligned. You know, it really is amazing how much better a model flies if the wings actually align correctly with the fuselage and tail surfaces. But then again, maybe not that amazing after all.

While talking about c/s struts, let's take a look at the rear one. There are no complicated bends involved and it's only 14 swg wire, so getting the wire part shaped accurately shouldn't pose too many problems. Getting the whole thing, complete with F3, accurately attached to the fuselage is another matter. As you'll see from the photos, Pat managed that rather neatly by making up a simple jig to ensure that the split-pin onto which the wing fits, is precisely centred. However, because of the tab and slot fixing of F3 into the fuselage sides, it can be done just as accurately by spot gluing the wire to F3 over the drawing, soldering the split-pin to the wire and binding/gluing the wire to F3 before installing the former in the fuselage box.

Either way works just fine, but to me, it just seems easier to use the latter method rather than messing about with jigs. I assure you, baring printing issues, that the drawing on the plan is accurate to within 0.001", so that part of things certainly shouldn't lead to any inaccuracy during this stage. Assembling the fuselage box on end also means you don't have to worry about the struts getting in the way and preventing accurate alignment.

Before we leave the front fuselage area, I'm sure you'll have noticed that the side sheeting between F1 and F4 is different on the left side, compared to that on the right side. This most definitely is not a drawing error, it's supposed to be different because that's how it was on the original aircraft! The slight bulge was there to clear an internal component. You could, of course, build both sides the same, but why spoil the ship, etc. It's easy enough to do, so it's worth having to enhance the scale accuracy (there's that word again).

Okay, I openly admit that the model is only 'sport' scale, but this is an obvious feature of the full size machine and, when included on the model, adds to the impression of there being more scale accuracy than is actually the case. Don't worry, the outlines are all as accurate as I could possibly get them and still end up with a reasonably easy to build model but it's by no means a competition class model.

Now, moving to the very tail of the model, you'll note that there appears to be an error concerning the top

Here you see the end result of what Pat did at the step position.

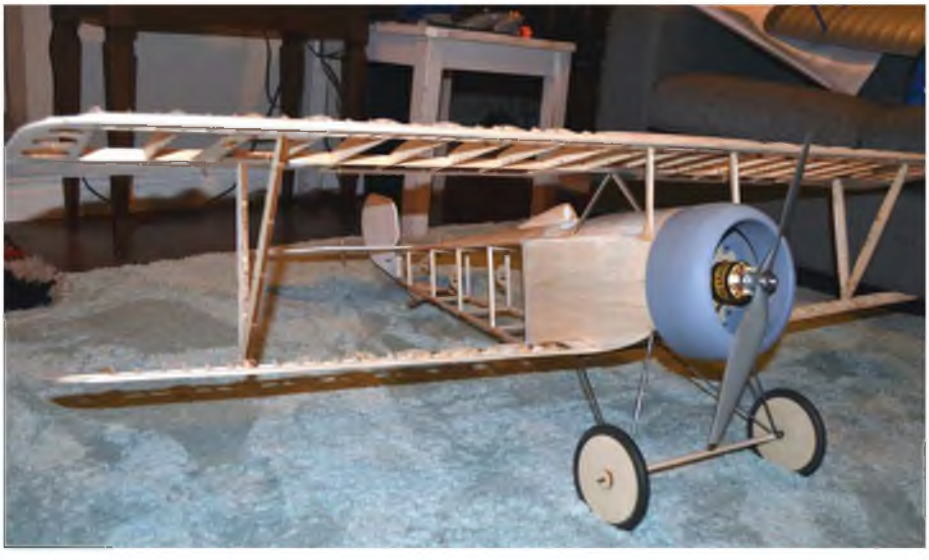
This shot shows the side sheeting going onto the right hand fuselage side. Note the shape and number of formers.

By comparison, the sheeting going onto the side with the slight 'hump'.

That bushed control horn I mentioned, and the way the control cables are crimped in place.

How the elevator cables pass through the tailplane. Just visible beneath the covering are the laser cut parts that enable this.

longeron/tailplane position. This is not an error. The top longeron should be tapered slightly at the tailplane position so that the tailplane fits at a slight positive angle of incidence. I tend to do this to all my biplane types because I find that such a slight angle of incidence helps to keep the tail up in flight. For some reason (probably involving reduced drag) it seems to work much better to have the whole tailplane angled, rather than just applying down elevator trim. That said, however, it only works as shown if the wing incidences and motor thrust angles are also exactly as shown. - just one of the reasons I keep annoying you by constantly mentioning the need for accuracy.



As close as we get to a bare bones photo shows off the basically simple nature of the model. Simple, but not for complete beginners.

YET MORE DETAILS

So, with most of the building details discussed, let's move on to what could be termed 'detail' details. Yes, confusing isn't it? What I mean is more details about how some of the functional detail goes - scale detail that actually works to earn its keep.

That said, let's begin with something Pat added to his model that is pure 'twiddly-bit' and serves no function other than to look good. He felt that the step in the fuselage side looked somewhat plain as it was and that it should be sealed off in some way. The way he chose was to cut up a round fishing float to provide a curved, inverted half cup and glued in a floor of 1/16" balsa. Picture a quarter globe with one open side. The open side was then glued inside the fuselage side, effectively sealing off the step and providing a point of interest. I'm not sure the original had it, but still felt it worth mentioning, since it's a neat idea for use on other models.

If you look at the fuselage sides, you'll see some rather strange looking little bits glued to the uprights, one with two slots in it and another with just a single slot. These are the mounts for gluing in fine nylon tube cable exits. Not only are these shown in pretty much the scale positions that the cables exited the fuselage on the full size Nieuport, they also serve a purpose by being where they are - the elevator exits at any rate. If you also look at the photo illustrating the cable ruins, you'll notice that the upper elevator cables actually pass right through the tailplane. Therefore, if the cable exits aren't in the correct position, the cables won't run freely through the slotted parts built into the tailplane, all of which, I might add, were carefully worked out to work precisely given accurate assembly.

The CAD drawing system is great for that sort of thing, but it can only ensure things work if the model is built exactly as drawn. Fortunately, when you combine the accuracy of CAD with the precise fit of laser cut parts (always assuming the idiot doing the drawing got it right in the first place), it only takes a little care to ensure that that is actually the case.

As regards the cables themselves, nylon coated beading wire is probably about the best thing to use for them. Thinner and more flexible than most fishing trace wire that I've been able to find, it's relatively inexpensive, is more than adequately strong enough for the task and adds scale effect for no extra effort. Use tube 'crimps' and a spot of CA to secure the ends and you have one of the lightest, strongest forms of linkage available.

If you look closely at the photo, you'll see that Pat appears to have bushed the holes in the control horns using short lengths of aluminium tube. My only comment about that involves making sure it is aluminium tube and not brass tube. If there any wear or chaffing occurs place in use it's always a good thing if it is the cable wears into the aluminium bush rather than the bush (brass tube) wearing into the cable. In an ideal world neither will be the case, but we live in a world that is far from ideal and these things do happen. One free trailing elevator cable isn't a major disaster, but a free trailing rudder cable could be just that.

Of course, you could always replace the closed loop linkages with simple pushrods, but you'll lose much of the scale effect gained from the former. The beauty of these models is that, although only Sport-Scale, they are sufficiently accurate to allow them to be finished to the level of the builder's choice; anywhere from basic model to highly detailed.

Pat has opted for somewhere towards the upper end of middle ground with this one and very nice it looks too, but you only have to look at the work of such builders as Pat Lynch and Darrin Covington to see what can be achieved from similar sport scale designs. It just depends on what you want from your model, and whether you're more builder than flyer or more flyer than builder. ■

The model swoops in for a low pass. No, I don't know where the hatch went either.

NIEUPORT 17c

SURELY ONE OF THE NEATEST LOOKING FIGHTER BIPLANES OF THE WW1 ERA, THE NIEUPORT 17C WAS CERTAINLY A GREAT SUCCESS AND ONE WITH FLYING QUALITIES THAT PRODUCED SEVERAL OF THE HIGHEST-SCORING 'ACES' OF THE GREAT WAR

The Nieuport 17 is undoubtedly the best remembered of the line of single-seat Scout/Fighter aircraft built by this French Company during WW1. It was a slightly larger development of the earlier Nieuport 11, trimmed for the heavier powerplant used by the Nieuport 16 and with larger wings and improved aerodynamic form. It was at first fitted with a 110 hp (82 kW) Le Rhône 9J engine, though later examples used uprated 120 or 130 hp (97 kW) engines

Production of the (then) new Alkan-Hamy synchronization gear permitted the wing mounted Lewis gun of the '11' to be replaced with a synchronised Vickers gun mounted on the fuselage, to fire through the propeller. The standard Royal Flying Corps synchroniser, the Vickers-Challenger gear, was unreliable, and so, in British service, the over-wing Lewis gun was retained, mostly on the new Foster mounting, a curved metal rail that allowed the pilot to slide the gun back to change ammunition drums or clear jams. Some aircraft, particularly French, were fitted with both guns, but a single machine gun was most common.

A SIMPLE AIRFRAME

Basically the Nieuport 17 maintained the simple airframe structure established with the earlier Nieuport 11, but with considerable refinement of structure. The fuselage was a plain box girder based on four spruce longerons that terminated in a vertical knife-edge of steel tube. The lower pair of longerons were set closer together

Yes, they really did get that close in combat back then! WW1 combat enactment during the annual Flying Legends air show at Duxford.

The sesquiplane wing planform is well illustrated in these pictures of this replica Nieuport 17. Narrow chord lower wing provided improved downward view for the pilot.

than the upper pair which gave the fuselage sides a distinct taper. Forward, the longerons were reinforced with ash as far aft as the cockpit, spacers were of spruce routed to a 'T'-section, except at the second station where steel tube was used and incorporated the lower wing attachment sockets.

The tailskid fairing was a neat streamlined structure and not a flat fin, as photographs tend to make it appear. Hereabouts, the fuselage was additionally strengthened by ply sheet fastened to the inside of the side members. Forward, a near circular fairing with large access panels, tapered from the cowling to the cockpit - this appeared asymmetric in plan view due to the drum, which retained the used ammunition belt, being mounted outside the basic framework on the port side. Aft of the cockpit extended a slightly curved decking built up of light stringers.

Wings were a normal braced structure based on two (upper) and one (lower) box spars, ribs in the upper wing halves being of beefed up section to act as compression members where necessary.

Ailerons were of light gauge steel tube and of inverse tape, which, with the angular rake of the tips, gave an elegant and distinctive profile to the wings. Operation of the ailerons was through a torque tube actuated by bellcranks in the centre-section - a follow-on from the Nieuport 11.

On many Nieuport 17s the centre section panel was covered with clear celluloid to improve upward vision for the pilot, but invariably, as this deteriorated with use and became only semi-transparent, it was replaced with normal linen fabric.

The complete tail assembly was of light gauge steel tube, with the tailplane braced to the fuselage by light streamline section tubes. The tailplane was attached to the fuselage by clips at the centre of the leading-edge and a spring lock on the main spar which could be 'quick-released' by a length of chain with a ring on the end, running through the fuselage stern tube, thereby facilitating speedy removal and servicing. (There is no truth in the rumour that some enemy pilots took to hunting with a boat hook specially adapted to pulling Nieuport chains!). The normal Vee-type undercarriage was fitted with dual spreader bars and sprung with elastic shock cord, wheels had tyres of 650 x 80 mm. section.

OPERATIONAL HISTORY

The new type reached the French front in March 1916 and quickly replaced the Nieuport 11 and 16 fighters in French service that had been instrumental in ending the 'Fokker Scourge' of 1915.

The Nieuport 17 went into combat with Escadrille N.57 on May 2, 1916. Almost all of the top French aces of WW1 used the nimble Nieuport during their careers, including Georges Guynemer, Charles Nungesser, Maurice Boyau, Armand Pinsard, René Dorme, Gabriel Guerin and Alfred Duellin.

The type was also used by American volunteers of the *Escadrille Lafayette* when they replaced their earlier Nieuport 11s and 16s. During the latter part of 1916 and into 1917 the Nieuport 17 equipped every fighter squadron of the French *Aéronautique Militaire*. Charles Nungesser scored most of his victories while flying Nieuports.

It was Capt. Albert Ball V.C. who first proved the effectiveness of this machine to the British Royal Flying Corps (R.F.C.) and Royal Naval Air Service (R.N.A.S), with his fiery attacks regardless of the odds. Later it was flown, also with devastating effect, by Mannock and McElroy of 40 Squadron, and Bishop of 60 Squadron who scored many of his 73 victories on this

A good view of one of the different types of over-wing Lewis gun mounts fitted to Nieuports of various types. This Lewis is a Mk.II (RFC Pattern), fitted with a No.2 magazine containing 47 rounds. Also well illustated here are the direct-drive crank sto the ailerons, either side of the gun on the top wing.

The propeller spinner on this example is similar to that applied to the Nieuport 17 of French ace Georges Nungesser.

type of aircraft, which was markedly superior to all British fighters available during most of its period of front line service. The RFC in particular still had large numbers of obsolete DH.2s in service nearly a year later when it incurred severe losses during *'Bloody April'* Spring Offensive of 1917. While the majority of R.F.C. aircraft lost during that Offensive were obsolete observation aircraft such as the Royal Aircraft Factory B.E.2, the Nieuports had by then begun to lose their decisive advantage and took losses as well.

British squadrons that used the type include Nos. 1, 29, 32, 40 and 60 of the Royal Flying Corps and No. 6 of the Royal Naval Air Service. During the Battle of Arras much use was made of British Nieuports in balloon-busting attacks to prevent enemy artillery spotting. No. 40 Squadron experimented with low level hedge-hopping attacks to reach the balloons undetected, while Nieuports of No. 60 Squadron co-operated with F.E. 2bs of No. 11 Squadron to carry out massed strafing attacks on German infantry entrenched on both sides of the River Scarpe.

GUNS AND ROCKETS

Varying armament was installed in Nieuport 17s, but the evolution of a reliable interrupter gear saw the almost universal installation of a single Vickers gun. Usually this was mounted on the

A French Nieuport 17C.1, without unit markings. It is armed with a centrally placed Vickers Gun.

A Nieuport of Escadrille N.3 'Les Ciganes'. It is camouflaged, but with no upper wing roundels.

fuselage centre-line, but occasionally it was offset to starboard. Prior to the introduction of synchronised Vickers, Lewis guns were mounted on top of the centre- section, but mountings were far from standardised. The mounting used by Capt. Ball enabled him to slide the gun back and thereby fire upwards.

Occasionally Le Prieur rockets were fitted for balloon strafing; these were attached four to each Vee strut and fired by a push-button switch on the instrument panel, the struts being protected by a metal sheath. On at least one occasion a load was accidentally fired inside a Bessoneau hangar after which an isolating two-pin plug was fitted!

ACE MAKER

Many British Empire air aces flew Nieuport fighters, including top Canadian ace Maj. Billy Bishop, who received a Victoria Cross while flying it, and also Capt. Albert Ball, V.C. who often hunted alone in his Nieuport. Maj. 'Mick' Mannock VC flew Nieuports early in his career with No 40 Squadron. His

The Star insignia on the wings and rudder of the N.17 would indicate that is an example operated by Russian forces, post October 1917 Revolution.

Just about got away with it! N.17c of the Belgian 5th Escadrille, mired in the mud after a nose-over, is manhandled by ground crew. Rough, ill prepared WW1 airfields were a major cause of such incidents.

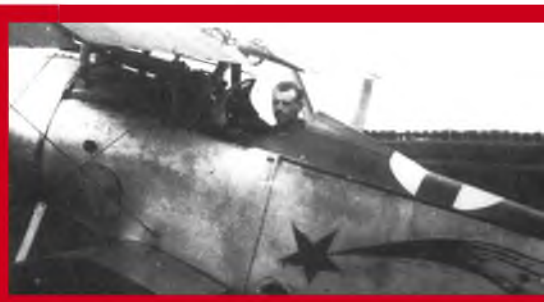
The pattern of the upper wing underside of roundels of this N.17 tend to indicate that it was one of those used by the Imerial Russian Air Service pre-October 1917 Revolution.

An ex-RFC Nieuport 17, presumably 'downed' in combat and 'under new management'. Examination of captured examples led to the German near-copy, the Siemans-Schuckert D.1.

Type 17c with Gnome 80hp engine in the famous markings of Lt. Charles Nungesser. Note red & white personal identifier stripes on top wing upper surface, applied after Nungesser was attacked by allied aircraft.

Capt. W.A. (Billy) Bishop V.C., D.S.O., M.C. with is Nieuport 17c B1566, which has his mount for many of his aerial victories.

A further example of a French Nieuport 17 with large nose spinner, but more noteworthy for the serious armament of two Vickers Guns on the fuselage front upper decking and two Lewis Guns mounted on the upper wing centre section. By the standards of the day, a massive punch!



Belgian Ace Edmund Thieffret seated in the cockpit of his N.17, which bears the 'Comet' motif of No.1 squadron, Belgian Air Service.

VC award reflected his whole combat career - including his time on Nieuports. The top-scoring Nieuport ace was Captain Phillip Fletcher Fullard of No.1 Squadron RFC, who scored 40 kills between May and October 1917, before breaking his leg during a football match!

IN AIR-ARMS NEAR AND FAR

Italian aces such as Francesco Baracca, Silvio Scaroni and Pier Piccio all achieved victories while flying Nieuport fighters. In Belgium, the 1st and 5th Belgian escadrilles were equipped with the Nieuport 17 and Belgian aces flying the type included Andre de Meulemeester, Edmond Thieffry and Jan Olieslagers.

Imperial Russian forces operated large

French Nieuport 17 with left and right V-strut mounted salvoes of four Le Prieur incendiary rockets for attacks on Observation balloons.

A few Nieuport 17s were early types that served with the air arm of Finland during 1918-1923. This one was manufactured in Finland.

numbers of Nieuports of all types including the Nieuport 17 with many continuing in service after the Russian Revolution with the air arm of the newly established Soviet Union. Russian Nieuport aces included Alexander Kazakov.

Like other Nieuport types, the N.17 were used in large numbers as an advanced trainer after its operational days were over. The American Expeditionary Forces purchased 75 Newport 17s for training while the French also operated large numbers as trainers.

Approximately 150 were manufactured by Nieuport-Macchi and operated by five Gruppo.

Beyond that, the type found its way to Chile, Columbia, Czechoslovakia, Estonia, Finland, Netherlands, Romania (four squadrons), Imperial Russian Air Service, Russian White (anti-communist), Soviet Union (Red Army), Siam (Thailand), West Ukraine Peoples Republic and USA (American Expeditionary Force. ■

SPECIFICATION

Wingspan: 26 ft 9 in. (8.16 m)
Length: 19 ft 0 in (5.80 m)
Height: 7 ft 10 in (2.4 m)
Powerplant: 1 x Le Rhône 9Ja 9-cylinder rotary engine, (110 hp)

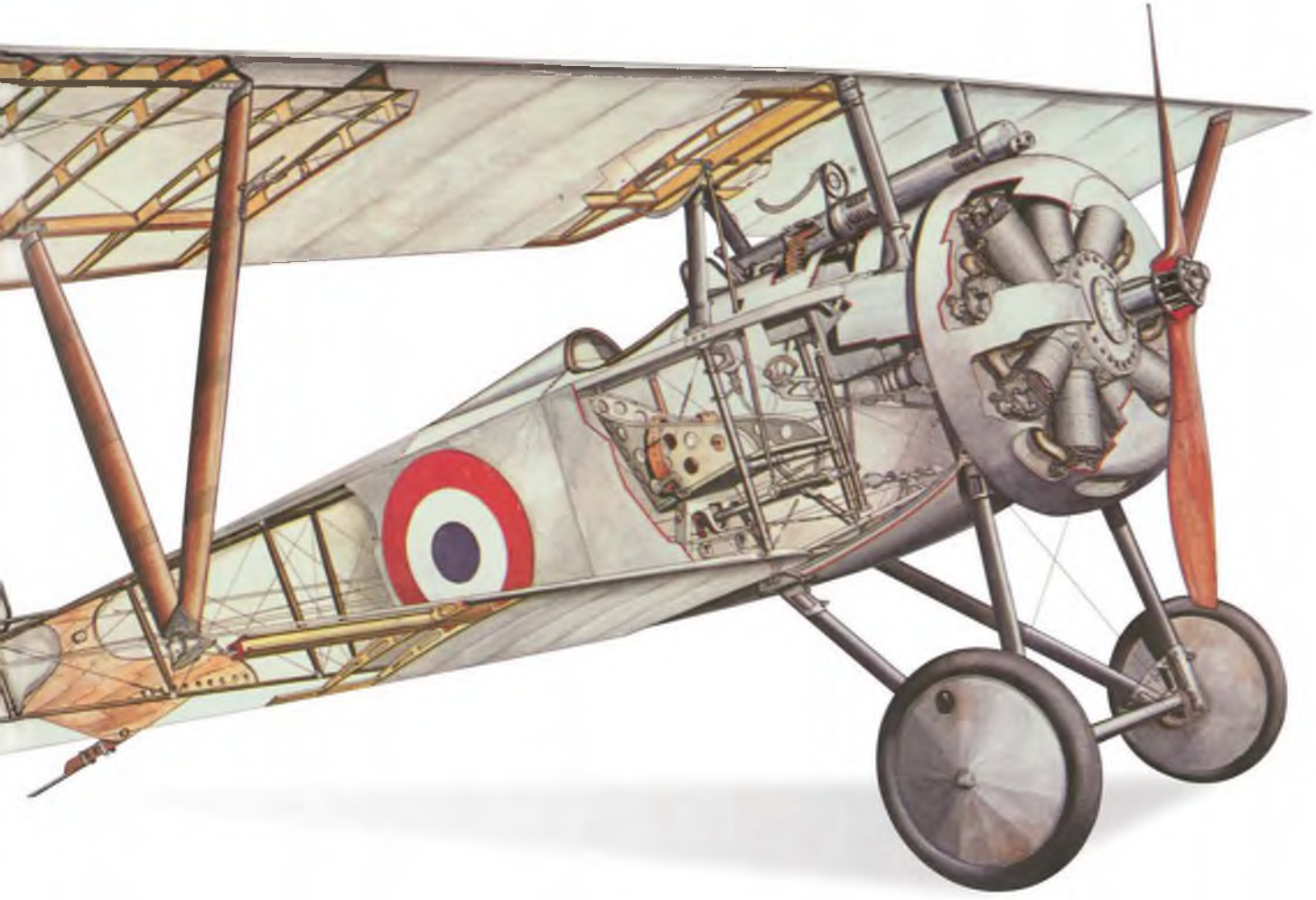
PERFORMANCE

Maximum speed: 110 mph (177 Km/hr) at 2000m
Service ceiling: 5,300 m 17,390 ft (5,300 m)
Climb to 3,000 m (9,840 ft): 11.5 min

ARMAMENT

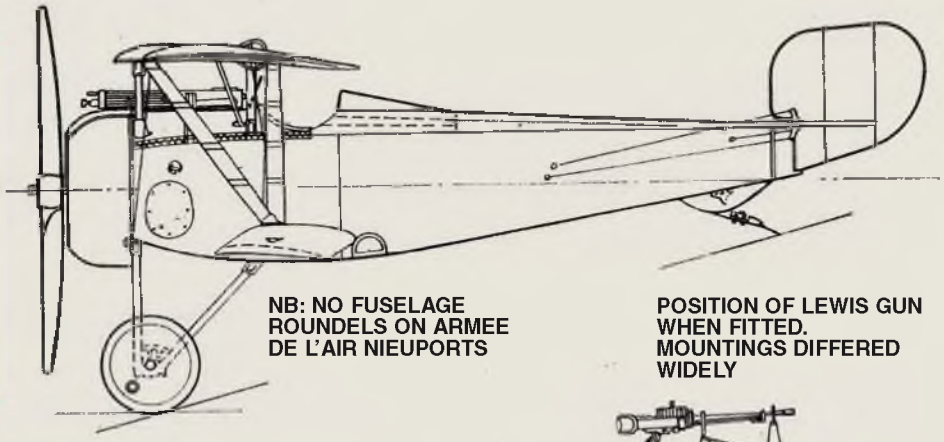
Guns:
(French service) 1 x synchronised Vickers machine gun and sometimes 1 x Lewis gun on upper wing mounting
(British service) 1 x Lewis gun on Foster mounting on upper wing
Rockets: 8 Le Prieur rockets (rarely)

The simple airframe structure of the Nieuport 17 is well illustrated in this cutaway illustration. As mentioned in the text, he under-fuselage tailskid support has an airfoil profile, rather than a flat-pate shape.



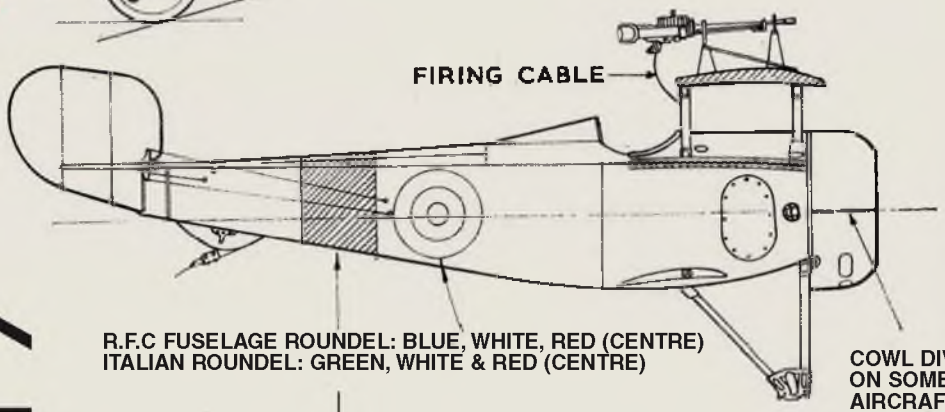
SCALE 1:50

NIEUPORT 17



NB: NO FUSELAGE ROUNDELS ON ARMEE DE L'AIR NIEUPORTS

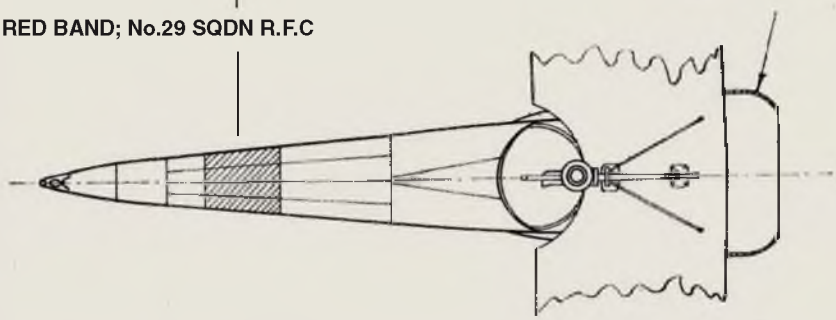
POSITION OF LEWIS GUN WHEN FITTED. MOUNTINGS DIFFERED WIDELY

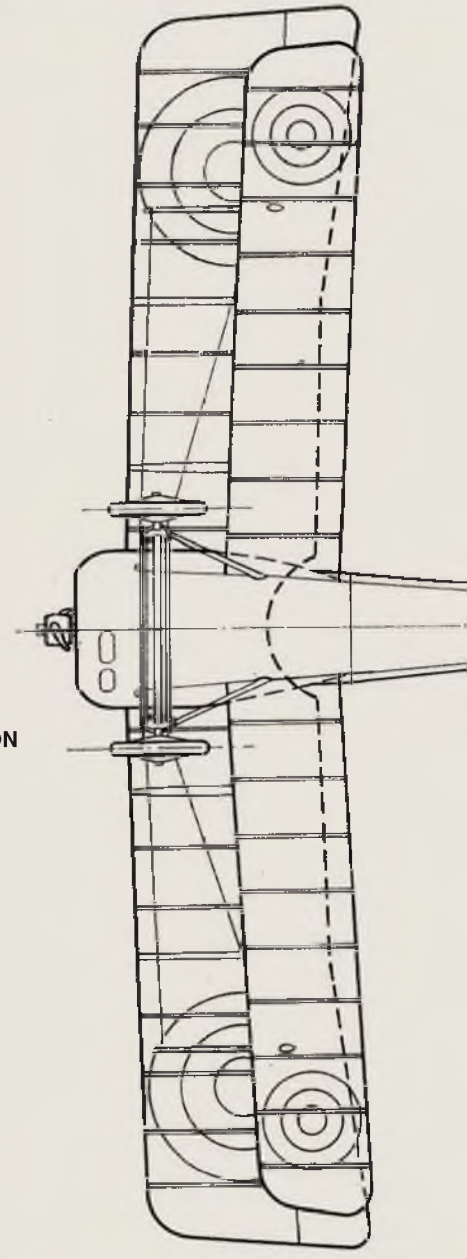


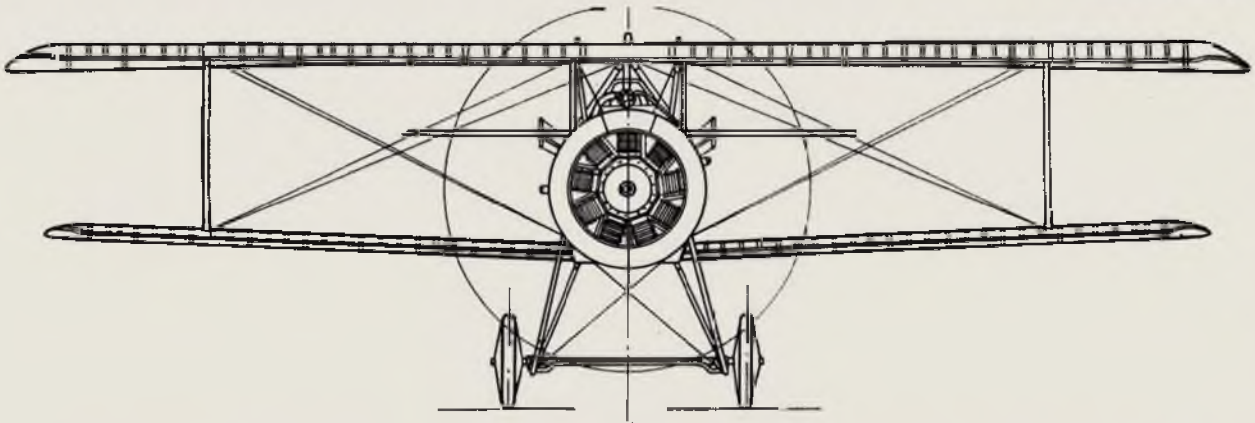
R.F.C FUSELAGE ROUNDEL: BLUE, WHITE, RED (CENTRE)
ITALIAN ROUNDEL: GREEN, WHITE & RED (CENTRE)

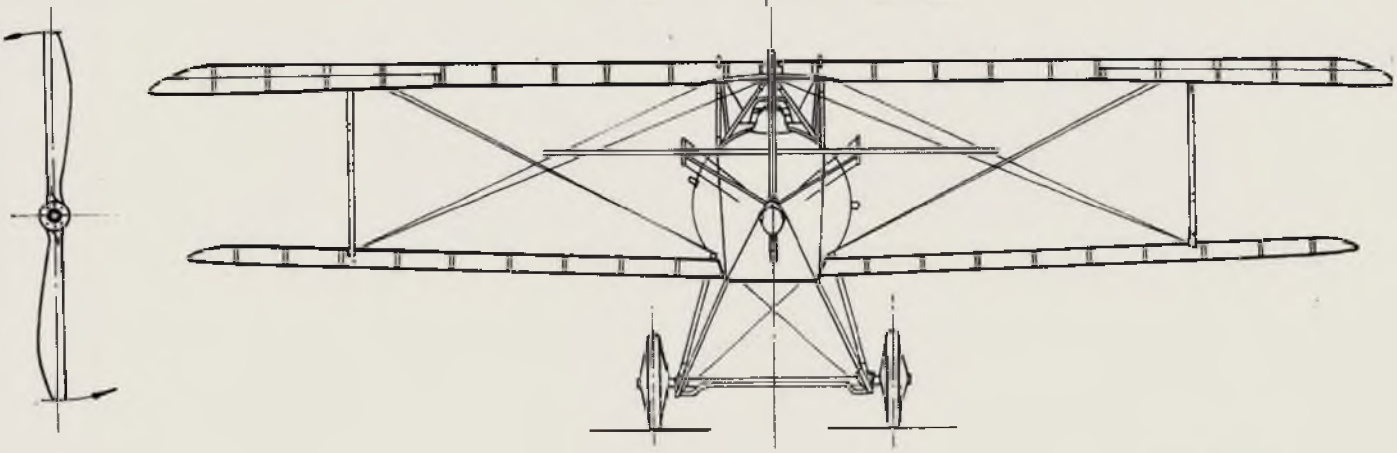
COWL DIVISION ON SOME AIRCRAFT

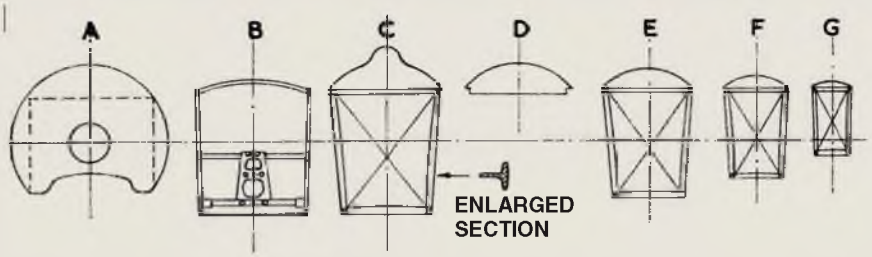
RED BAND; No.29 SQDN R.F.C

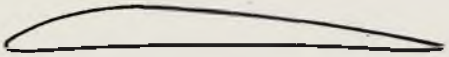




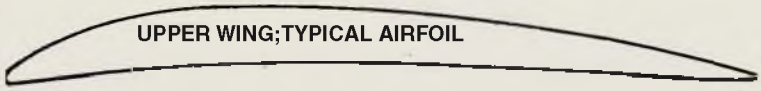




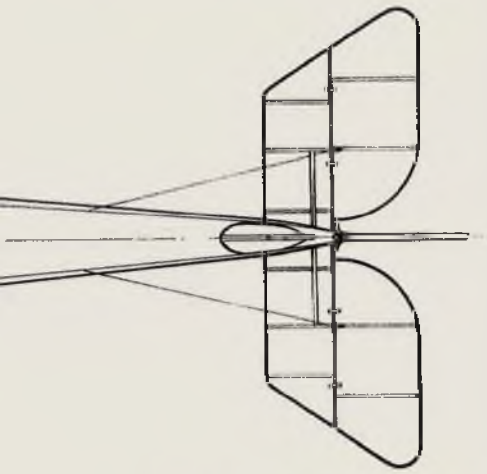


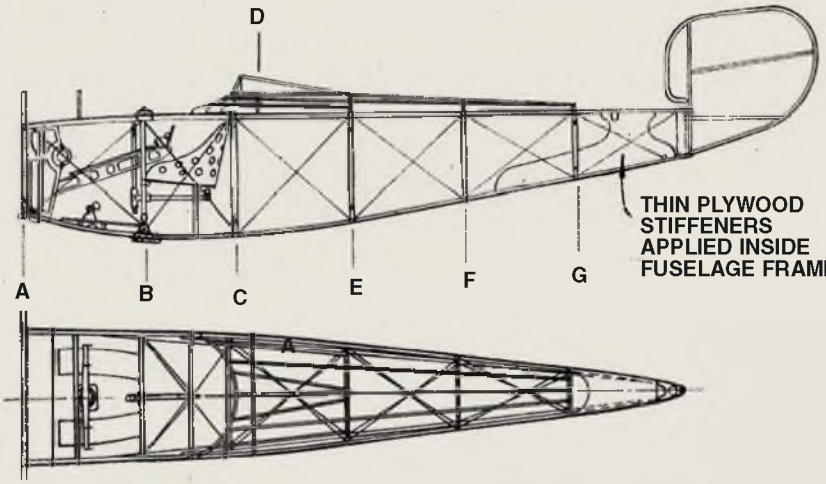


LOWER WING ;TYPICAL AIRFOIL



UPPER WING;TYPICAL AIRFOIL

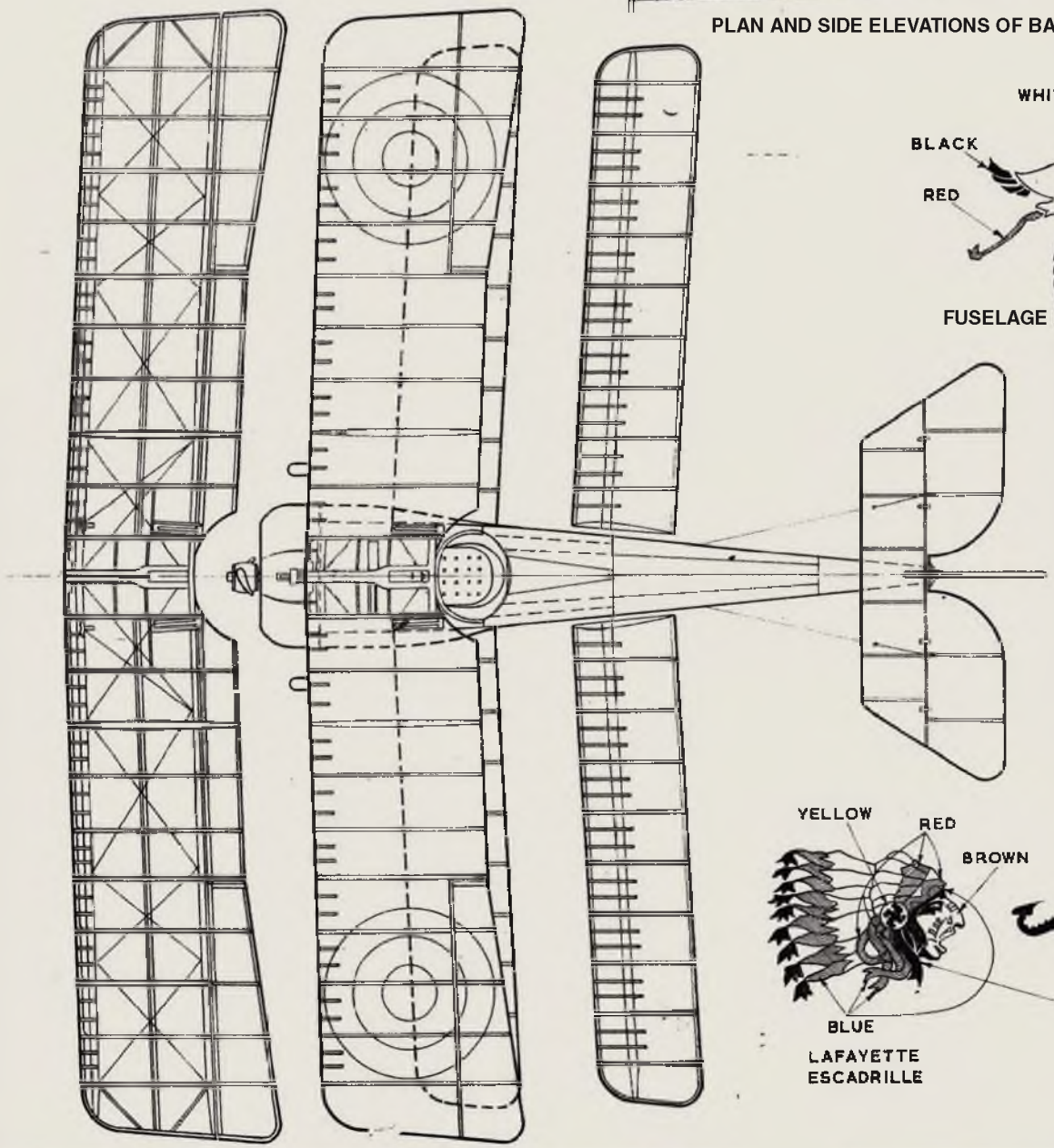




PLAN AND SIDE ELEVATIONS OF BASIC FUSELAGE.

FUSELAGE LOGO CIGONES N.3

OTHER CIGONES UNITS WERE Nos. 26; 73; 103 & 167, WHICH ALSO CARRIED THE STORK INSIGNIA IN DIFFERING ATTITUDES



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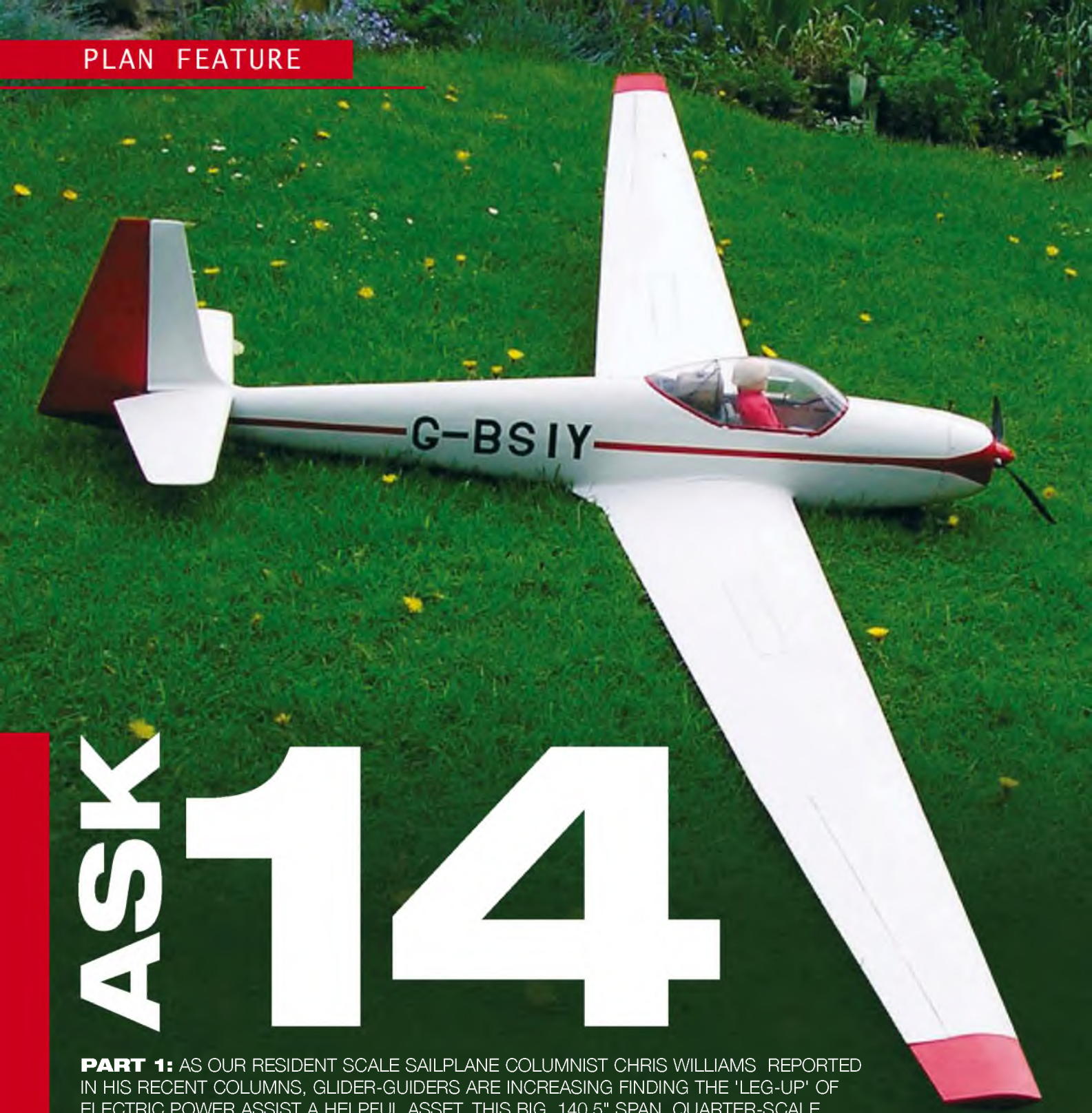


ASK 14

PART 1: AS OUR RESIDENT SCALE SAILPLANE COLUMNIST CHRIS WILLIAMS REPORTED IN HIS RECENT COLUMNS, GLIDER-GUIDERS ARE INCREASING FINDING THE 'LEG-UP' OF ELECTRIC POWER ASSIST A HELPFUL ASSET. THIS BIG, 140.5" SPAN, QUARTER-SCALE VERSION OF ALEXANDER SCHLEICHER'S LAST ALL-WOOD MOTOR GLIDER, DESIGNED BY PETER HORNBY IS AN ELEGANT CHOICE OF THE TYPE.

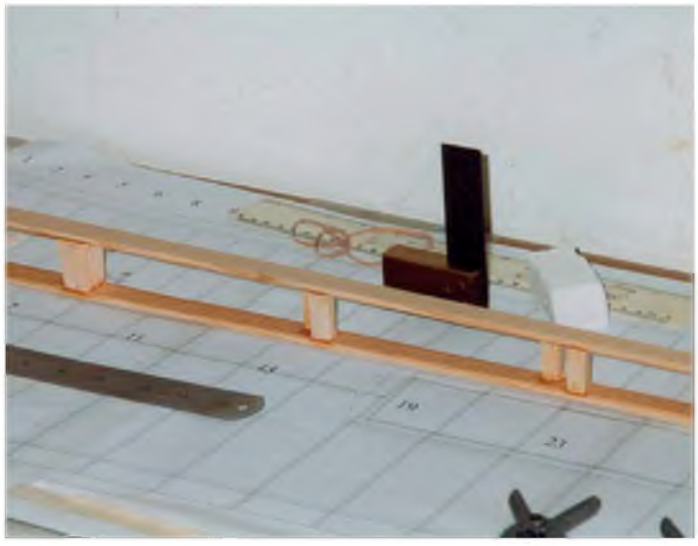
When I read that the ASK 14 was the last all-wooden powered glider manufactured and sold by Alexander Schleicher, I decided to investigate its suitability for modelling at quarter-scale. The Schleicher website gave sufficient details and photographs to enable me to make the decision to design and build it as a model, and fortunately they were willing to sell me drawings of the full-size aircraft. Also, I was able to find on the CAA website an ASK 14 of which the owner allowed me to take photographs and with these to hand, I was able to design a model that conformed to the original in both shape and construction.

Electric power seemed ideal (you can switch it on and off just as the pilot of the full size does during flight) and my calculations and those of *Motocalc* showed an LRK 350 to have adequate power. With this information and a copy of *Turbocad* on my computer, I proceeded to do two things at once - design a model and learn how to use the CAD program! Both were successful, but the latter still needs a lot practise and learning.

Construction

Start by building the wing (or wings when two-piece). For the ASK 14, I will describe that sequence. Two long pieces of aluminium angle are required to ensure straight and true spars are made. I used 15 mm x 15 mm x 1500 mm obtained from a local DIY shop.

A metal straight-edge is used to ensure that the mainspar is true.



Mainspar top abd bottom strips with vertical spacers in place.

Mainspar at the wing root before adding the side - showing the brass diherdral tongue box.

The completed mainspars.

First, produce four identical top and bottom spar sections from 3/8 in. x 1/8 in. x 36 in. and 3/4 in. x 1/8 in. x 48 in. spruce strip. Cut to tapered shape and then glue the 1/16 in. spruce to the root end. This thickening of the spars at the root reduces the surface stress levels where the BM is highest. Set up the aluminium angle down the line of the spar edges on the plan and clamp the top and bottom sections in place. By gluing in spacers at regular intervals down the spar, the finished shape can be formed.

The 1/16 in. ply and balsa vertical webs are glued to one side, after which, the rectangular brass wing joining-tubes (15 mm x 3 mm to suit a 14 mm x 2 mm steel joiner) can be fitted. Great care has to be taken to ensure the correct angles are set using the 1/8 in. ply formers (which may require slight modifications). When this has been done, the remaining vertical webs can be glued in place and the spars are finished, except for cutting the root to the dihedral angle and checking the spars are identical but opposite.

Now that the two spars are finished and look like the ones in the accompanying photograph, the wing building sequence can begin. Make a template from 1/8 in. ply of each rib and use the lower part as a jig to accurately set the ribs and trailing edge in position relative to the spar and lower datum. Using the templates, cut two ribs from 1/16 in. cross-grain balsa from each of the templates, except for the ply and 1/8 in. balsa ribs. Now is a good time to decide on the tube runs for the servo cables and to cut the necessary holes in the ribs. When you are satisfied that you have two full sets of ribs, then building may begin.

It is essential to fit the false leading edge vertical and again the aluminium angle is used to ensure it is perpendicular to the building board and in line with the drawing. Set up the spar using the front ribs and glue the ribs to both false leading edge and spar. At this stage, it is important to accurately place the jig ribs in position. Small pieces of triangular balsa can be glued to them so that they can be pinned in position. Do not forget to use a long tapered piece to set the trailing edge at its outer extremity to the 3/16 in. washout.

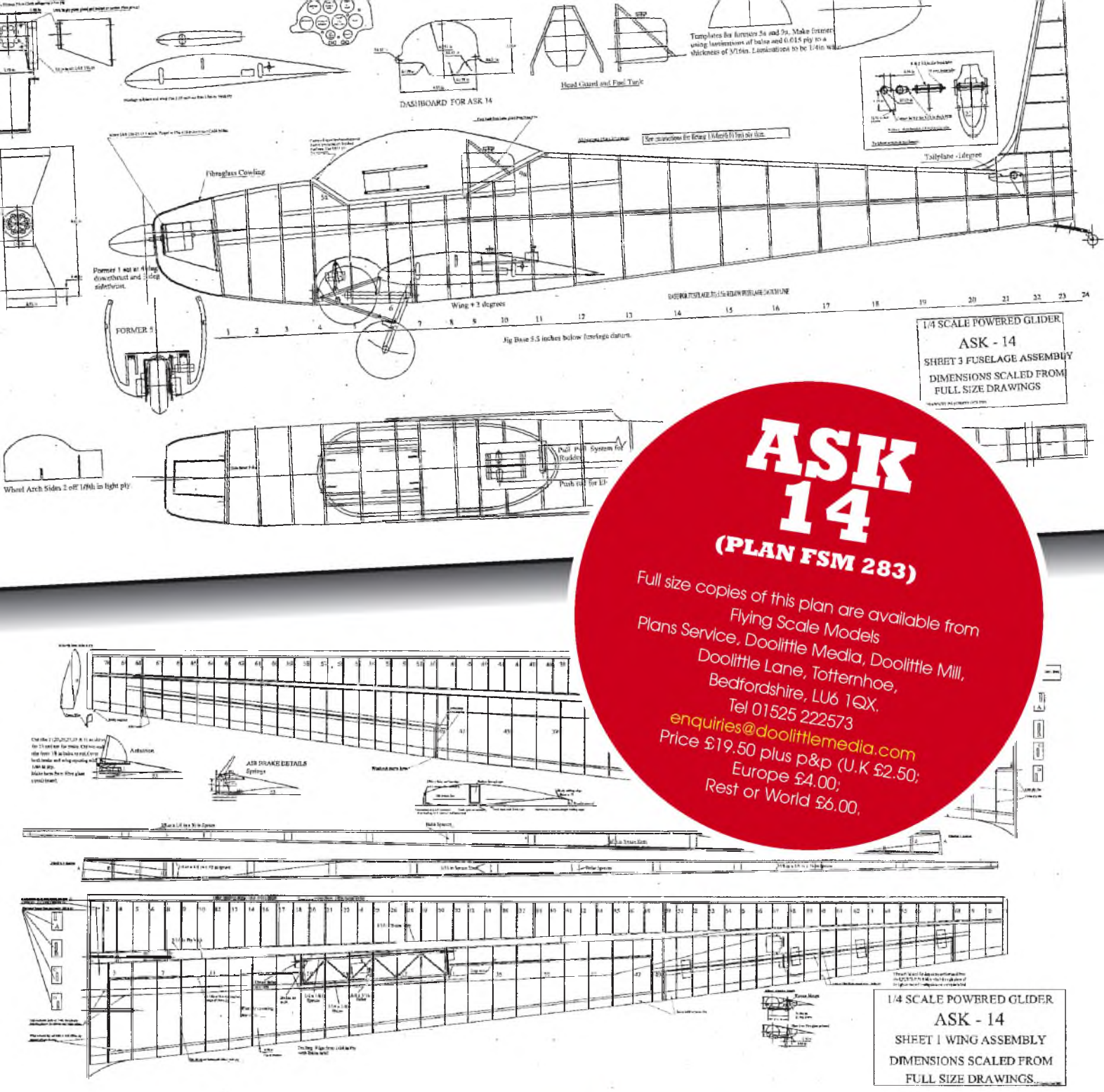
Glue a very straight piece of 1/4 in. sq. spruce or similar hardwood to the trailing edge pieces of 1/64 in. ply as shown on the plan and in the photograph. This helps to achieve a straight trailing edge.

For the aileron, fit the complete underside 1/64 in. ply to the jig, then fit spar and ribs. Also fit the complete underside piece of 1/64 in. ply from rib 68 to 71 and to the middle of the main spar.

Now introduce the rear ribs, gluing them to the spar and the trailing edge, but do make sure you have made the relevant cut-outs for the airbrakes, servo boxes and holes for the servo wire tubes. Add the balsa in-fills between the ribs on the lower trailing edge and aileron, along with the balsa for the aileron horn fitting and aileron hinges. Fit the floor for the airbrake with slots for the springs and the horn. Then glue in place the two balsa longerons to form the front and rear edge of the airbrake cavity and fit the 1/8 in. x 1/16 in. pieces between ribs 3 and 19, and 31 and 49.

Assemble the airbrakes and fit the 16 s.w.g. brass tube in wing and airbrakes to hold the 16 s.w.g. piano wire hinges. Temporarily apply hinge pins and check that the brake has adequate clearance and swings freely - if not, adjust to size.

When the top of the false leading edge has been sanded to the correct contour, the eight top pieces of 1/64 in. ply can be glued to the spar, false leading edge and ribs, using contact adhesive. Cut pieces so that they form a straight line down the



The wing going together. Mainspar in place together with leading edge ribs. Note tghe rib jigs placed ready to support the ribs behind the mainspar.

centre of the spar. If they overlap the false leading edge, they can be trimmed later, but this needs to be done before the 3/8 in. leading edge is fitted.

The top of the trailing edge can now be applied. The sheeting from rib 49 to 71, which includes the aileron, can also be glued in place using contact adhesive then finally, before removing the wing from the building board, glue the two remaining 1/64 in. ply pieces between ribs 3 and 19 and ribs 31 and 49 and the capping strips.

The underside of the wing is covered in ply only from the leading edge to the spar, between ribs 1 and 3 and from rib 49 outwards. Leave that between ribs 1 and 3 until both wings are nearly finished as the rear joiner tube has to be fitted

accurately in each wing before covering with ply. The area in front of the main spar can now be covered, with eight pieces required, but these need to be placed from the rear of the main spar.

After that, the next job has to be the construction of the servo boxes in the wing for the aileron and airbrake servos. When the servos are fitted (I used Hitec HS-81MG), the ailerons can be detached and hinged and then the connections to the horns can be made. When satisfied with the servo/horn relationship, the servos can be removed and the remaining area under the wing from rib 49 outwards covered in ply.

At this stage, both wings are now ready, so it is a good time to fit the rear wing joiner tubes. It is helpful to do this before the leading edge is fitted, as the flat surface of the false leading edge is easier to line up in a straight line. On a flat surface of large enough size, fit the main wing joiner to both wings and line up the two false leading edges to form a straight line. Pack up the tips so that the assembly is rigid and fit a single long rear joiner tube into and between the wings. When satisfied that the front and rear tubes are parallel to each other and the base board, glue the rear tube with epoxy to the ply ribs and also glue a 1/4 in. x 1/8 in. hardwood strip to the top of the tube and to ribs 1, 3 and 5.

When the adhesive has set, the wings can be parted by sawing through the rear joiner tube. Each wing can then be finished by fitting the leading edge and the tips and sanding to the shape required.

Tailplane and rudder

Before starting the actual construction of the tailplane and rudder, it is advisable to complete the production of the metal parts. Both the tailplane actuation mechanism and the rudder hinge are made from material readily available from K & S. The tailplane actuation mechanism relies entirely on the good fit of 11/32 in. tube in 3/8 in. tube. When these parts are ready, construction of the tailplane can start as follows.

Cut out templates from 1/8 in. ply of the

Mainspar at the wing root before adding the side - showing the brass diherdral tongue box.

Tailplane construction, with ribs, spar and trailing edge components laid out. Note the rib jigs in place.

The tailplane is 'all-flying' (i.e.- no separate elevator). This view shows the wing root failing rib and the 'elevator' mechanism.

One of the completed tailplane panels, with leading edge fully skinned.

Detail of the metal rudder hinges purpose made by the author.

eight tailplane ribs and use the bottom portions as a jig as shown in the photograph. Produce the ribs from the templates and jig drill ribs 1, 2, and 2a for the brass tubing. The spars are made from hardwood and ply as shown on the plan and the assembly is completed using the jig ribs for location accuracy. When both halves have been assembled and before they are removed from the building board, the brass tubes can be fitted in ribs 1, 2 and 2a.

For this, a jig is essential. I used the same jig to drill the holes accurately in the PCB horns of the actuation mechanism and for the assembly of the tubes in the tailplane. When the epoxy has set, the two halves are separated and the actuation movement checked, skinning can now take place. Carefully wrap 0.015 in. ply around the leading edge back to the spar and secure with contact adhesive to form a strong but light 'D'-box. After this, cap the rear ribs and fit the soft balsa tips.

Although the fin is built on the fuselage jig, its main spar needs to be built at the same time as the rudder spar so that the hinges and the long hinge pin can be fitted and adjusted to allow the rudder free movement relative to the fin.

When satisfied with the hinge, then the assembly of the rudder can take place. If the position of each rib is marked on the back of the spar and the spar pinned to the building board, the ribs can be set vertically on it and the two pieces of 0.015 in. ply that form the trailing edge glued in position. From this construction, it is fairly straightforward to finish this assembly, but care has to be taken in fitting the semi-circular leading edge and fillets. ■

The complete fin and rudder assembly, installaed and hinged.

MODEL SPECIFICATION

Type of model:	1/4 scale ASK 14 powered glider
Designer:	Peter Hornby
All-up weight:	11.5 lb. (184 oz. (inc. motor bat.)
Wing span:	140.5"
Wing area:	1164.4 sq. in.
Aerofoil section:	NACA 63-614 14% thick, 3% camber
Chord:	Average chord 8.25 in.
Aspect ratio:	17: 1
Fuselage length:	62.5 in.
Motor:	Flyware LRK350-25 electric outrunner
Gearbox:	No gearbox -14 cells and 15.5 turns of windings gives speed required.
Propeller:	Aero-naut 15 x 10 CAM carbon-bladed folder
Power consumption:	40 amps at 5,900 r.p.m. full throttle - about 600 watts input. Short take-off on tarmac

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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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SIMULATING A WWI RADIATOR

Paul Blakeborough describes the construction of the fully exposed radiator on his Pfalz D.XII

There are many items on a scale model that turn modellers away from a potential subject, and one of those is the radiator on WWI types that quite often were such a prominent feature that you have to include them! The good thing for us is that they tend not to be filled with water! So we simply need to simulate the visible parts of the unit.

The Pfalz D.XII, amongst others, has what I'd call a 'common' type of radiator, not unlike the type found in your car. However, more times than not there is a fan that blows or sucks air through the matrix of tubes, where the Pfalz relied on a rather larger fan in the form of a propeller... which forces the air through the matrix. That said, the engines of WWI ran extremely 'Hot' and, combined with notoriously poor cooling from the radiator, were prone to suffer from overheating. An aircraft was not left running for too long on the ground, so a 'jockey' of those days

had much more to worry about than being shot down, engine failure was a major problem too!

Documentation

When designing a model or an appendage thereof, the first thing that must be done is to collect together some documentation. An estimation, from photographs, can sometimes suffice but now-a-days, documentation can generally be found mainly from the Internet. Luckily I found full size dimensions and drawings so I had no excuse not to build a fairly accurate 1:5 scale version. So, on the trusty drawing board I drew up the model sized version of the radiator. Once complete, decisions were made as to what materials to use for the construction. I dare say many of you would prefer to mould parts of the rad', and especially with 3D printing now available... but I simply love bashing balsa! So, I decided to make the upper and lower sections from balsa and the simulated tubes from ply and balsa. On each side at the rear of the full size item there was a hinged door that could be closed or opened to limit the airflow through the rad', and I made these from Lithoplate, with a piano wire hinge pin. There was also a deflector plate on the right hand side (from the cockpit) to aid deflection of propeller draft, again made from Lithoplate.

The Build

So, with dimensions in hand, I firstly fashioned the top and bottom of the rad' to their respective finished shape and faced the inside faces with 1/64" ply, then gave the balsa areas a few coats of sealer and sanded to a smooth finish.

I then needed to jig these into their finished distance apart so I was able to glue the tubes in between. This was simply carried out by gluing two 6mm square uprights in between at the rear after ensuring the two sections were square over the drawing..... (these would be removed later) The first parts added to this unit were the section around the centre, which surrounds a hose that would have attached to the engine. Both of these were simulated using balsa sanded to shape. After this, I dwelled on thoughts of how to ensure as much air as possible got to the precious Laser 100 behind.

The idea prompted by this, was to build some of the simulated tubes into a door, using natural break lines as per the full size, whether to be manually opened or to use a servo was something I could look at later. So this was built from 1/64" ply strips and hinged in-between the bottom section and the 'hose' section using pins epoxied into ply lugs.

With these in place I could build outwards with fair ease and so I began to rattle out 'radiator tubes' (simulated) from balsa or ply. I chose to use ply for adding a bit of strength to the corner areas where I thought they may get knocked and balsa for others as it is simply easier to work with. The strips of material were cut slightly longer than required so I could sand for a snug fit and also sanded to a rough aerofoil section.

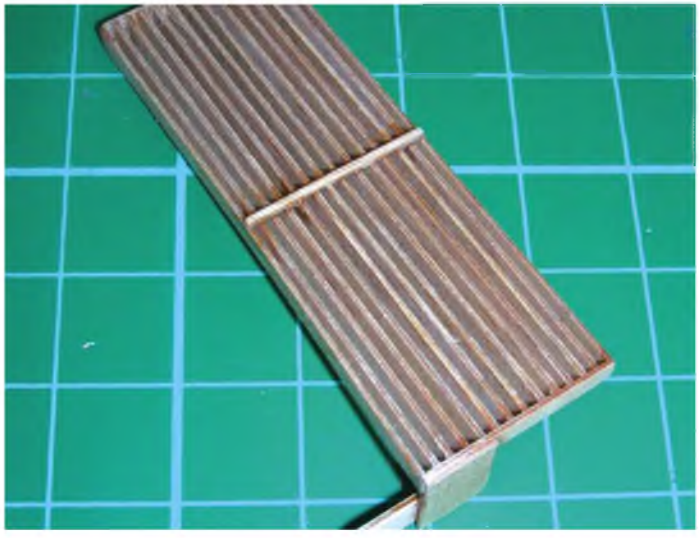
The strips were then glued into place using cyano and to aid spacing, I used a couple of strips of ply to keep them nice and parallel. Most strips are mounted directly face-on to the air flow, but towards the right hand side (from front) I angled them slightly to the right so the air flow from the blades of the propeller would force more of the cool air through to the Laser engine.

Once all the strips were mounted in place I needed to simulate the sub-shelves that held the tubes in position on the full size... with the height of the tubes measured into thirds, these were mounted at these equal divisions. To simulate these, I simply used balsa let into the stepping of the strips and then sanded back to the form on the radiator.

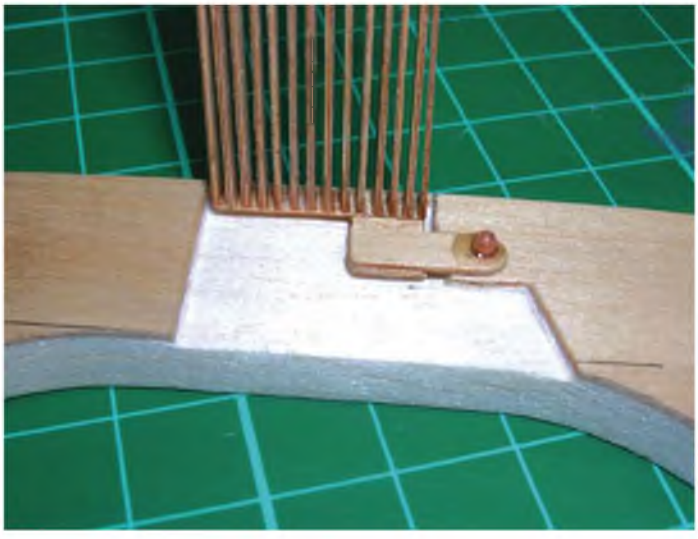
It was at this stage that I cut off the jigging uprights and dressed up the matrix.

Basic upper and lower Radiator sections fashioned from block/sheet balsa and faced with ply.

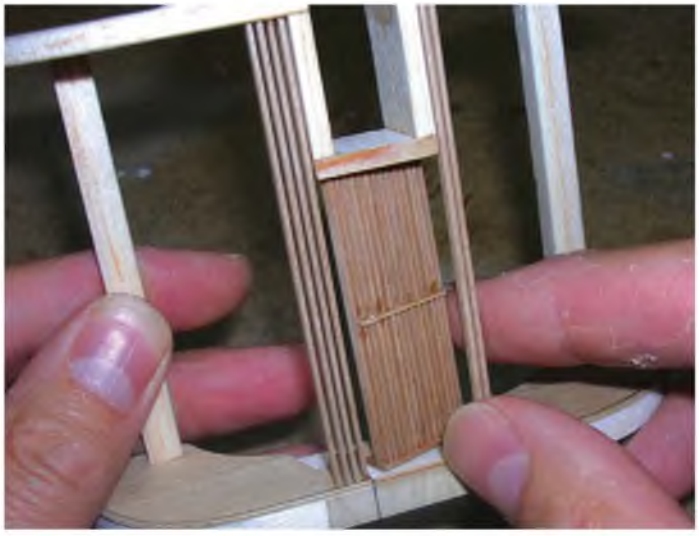
1/4" (6mm) square spacers to hold sections at correct distance apart.



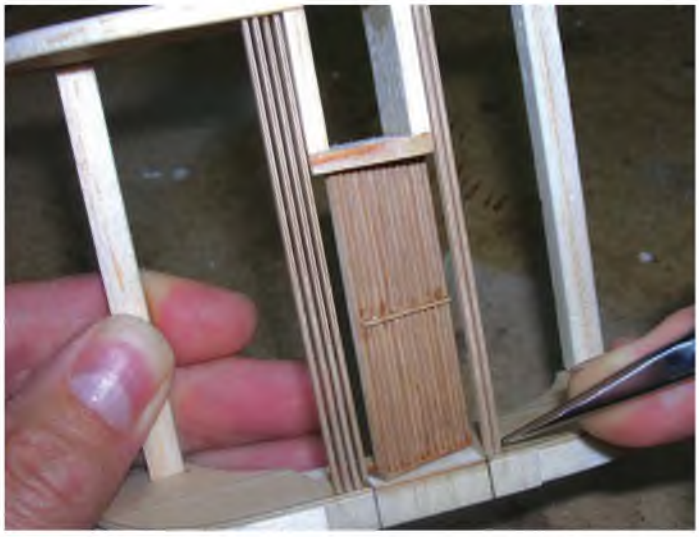
The "Cooling" door, made from 1/32" ply.



Cut out in ply on lower section allows door to pivot open and closed.



Checking the smooth action of the door and first few strips (vanes) attached.



Ensuring the strips are a snug fit allows accurate positioning with tweezers.

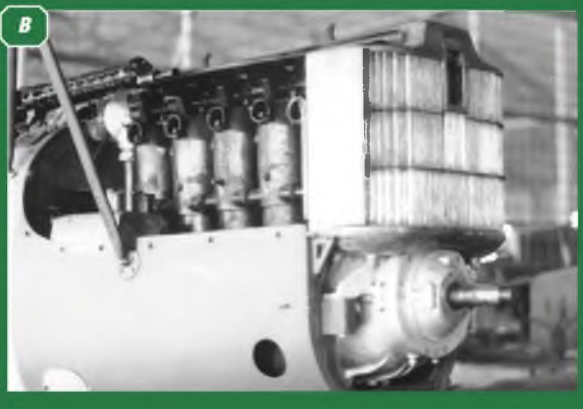
Two views of the radiator grille as it builds, as more strips are added.

With the front of the matrix complete you have the simulation of the full size radiator and I also added a line of strips on each side on the rear of the unit, up to the hinge points of the baffle flaps. The unit was then sealed, doped and sanded in preparation for a coat of silver paint, followed by fuel proofing.

Appendages.

The simulated radiator filler cap, for this, or for any item that requires a round appendage can be simply turned in a drill. I always use the same material for these... good old "Plastic Padding", or I would imagine any other vehicle "filler" would do. The idea is to cut a short piece of suitable wood dowel a affix a "blob" of filler around the end, and wait for it to harden. **(See diagram)** This is then mounted in a drill chuck and using various sanding tools you can carefully turn the shape you require. The emphasis on this technique is be "CAREFUL". You must make sure that nothing gets caught on the chuck, and if using a hand drill, make sure it's held securely in a workmate or

FULL-SIZE EXAMPLE

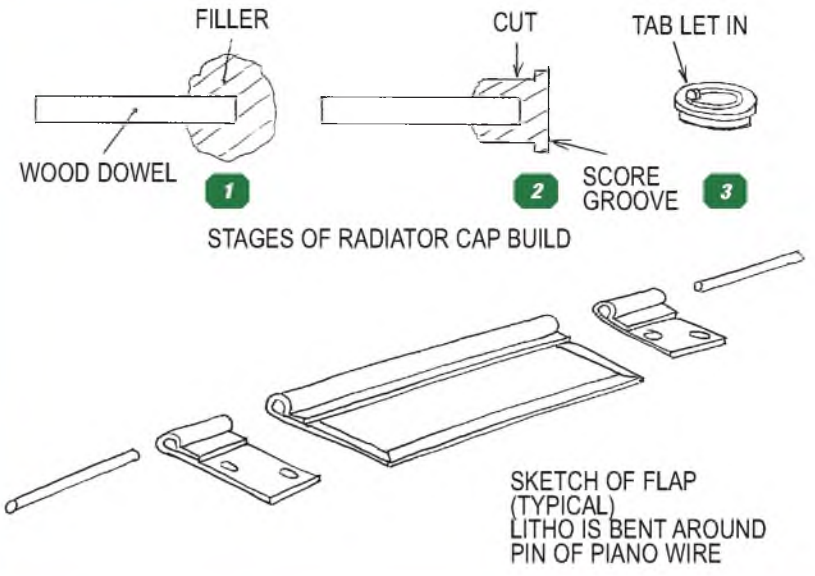


A TO E: This run of images depicts the original full size Pfalz D.XII held on display at the Australian Wor Memorial Museum, Canberra,

similar! A radial drill can obviously be a handy tool for this.

As previously mentioned, I used Lithographic plate to make the deflector plate and baffle flaps, but I suppose ply or the like would suffice. Litho' is basically a thin form of aluminium used in the printing industry and I find it a joy to work with. It can be annealed so it's easier to work with. If annealing is unknown to you, it's a process where you can heat the metal to a certain temperature and then by quenching it in water makes the material much more malleable. Annealing is carried out by taking the temperature of Aluminium to (If memory serves me right) to 800 degrees F dependent on the type. However Litho' doesn't have to go anywhere near that and is more like 250 degrees F. The gauge for this is to simply smear the surface with a little hand soap, then heat the metal with a blowtorch and when about right the soap will turn dark brown/black, this is the time to quench in cold water. You will find the material becomes quite "bendy" and easier to

DIAGRAM 1



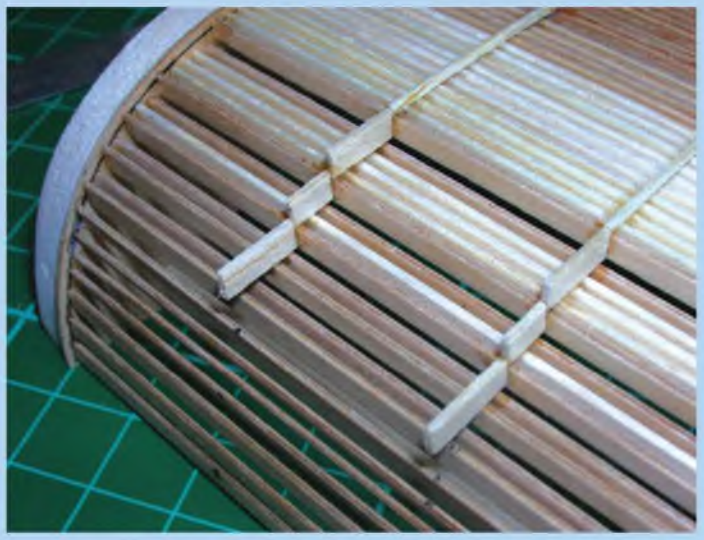
D

E

showing the radiator, cowl and engine installation of the example held on display at the Australian Wor Memorial Museum, Canberra

The large opening to the top centre is for the hose connection.

All strips added and a light sanding to finish.



To simulate the sub shelves , infill with 1/32" balsa and sand back.

Test fitting of the basic radiator in previously manufactured fibreglass cowl.

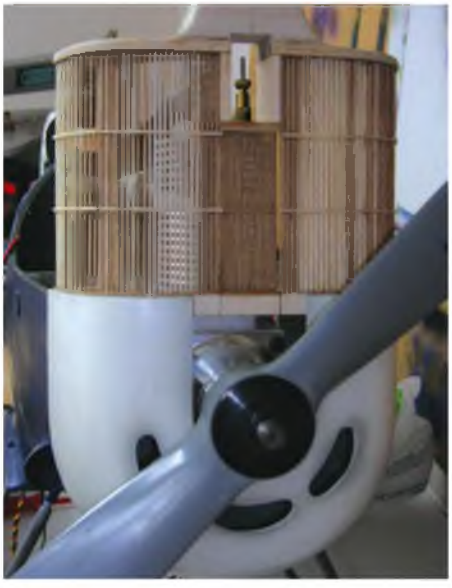
work with. It also cuts easily with scissors, however best not use the wife's dressmaking scissors.... Sacking may result!

The deflector plate once shaped is pinned and epoxied in position. The rear hinged flaps were made to hinge, and using piano wire for a hinge pin I bent lugs of litho' to make the outer parts of the hinge. These again were epoxied in place so as to allow the flaps to hinge. In reality the full size versions were adjusted by the pilot from the cockpit, to allow more or less air to flow through the radiator matrix.

With all appendages suitably affixed resulted a reasonable "rendition" of the original radiator and satisfaction that another challenge was overcome! In practise the door in the centre of the radiator opens with the revs of the laser wound up... it is simply closed after sortie to maintain the scale appearance.

I'm happy with the finished results of the simulation, a process that can be added to the mental notebook for further use! The scale appearance and functionality serves a model well, adding to the aesthetics and allowing for that all important cooling of a precious model engine... give the idea a try! ■

pblakeborough@mail.com

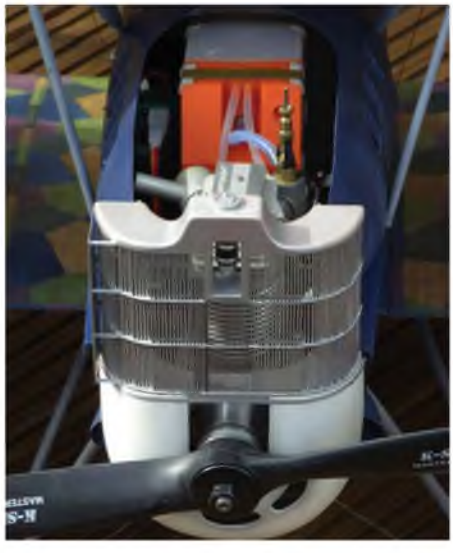


Finally ready for the dummy hose connector and paint.

In position resplendent and finished with dummy WWI Prop'.

Deflector screen in position would aid cooling to the left side.

For aesthetics only, the cooling dampers at the rear.



Dummy radiator cap finishes the assembly.

THE QUIET ZONE

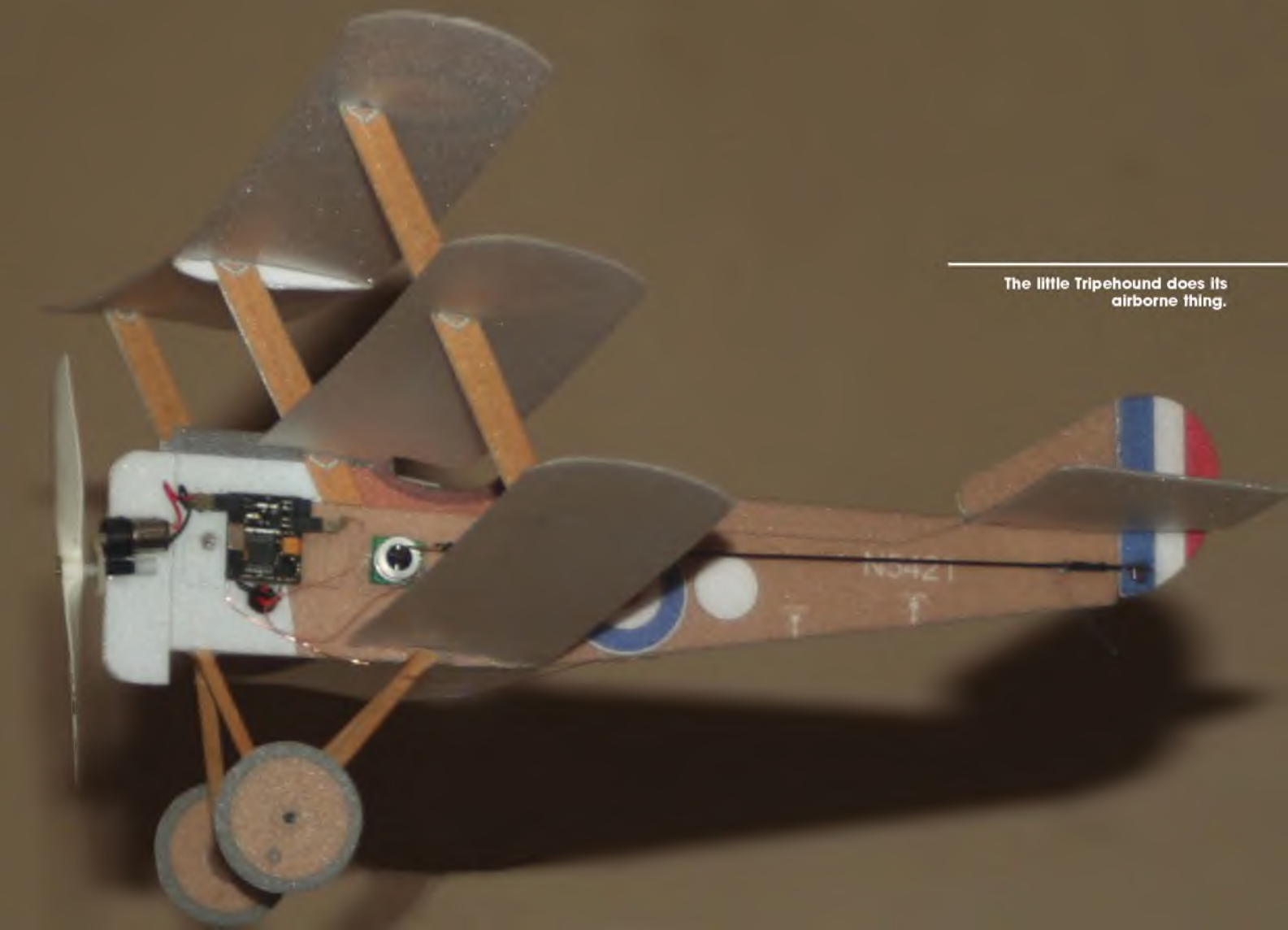
R/C SCALE ELECTRICS WITH PETER RAKE

Well, I'm afraid it's that time again, time for another bout of electric flight doings. Here we are, already well into yet another New Year, all the goodies you received from the chap in red are now old hat and you're looking for something new. Well, bear with me and I might just have what you want.

Since we're also still into deepest, darkest winter and nobody in their right mind wants to stand around in the middle of a field freezing their bits off, how about another indoor flyer to while away the hours? Last month I gave you a rehash of an earlier model but this time, although the techniques are much the same, you get the treat of something completely new. Working on the theory that if one triplane was good, two triplanes had to be better I drew up the graphics for Sopwith Triplane to use the same type of equipment as the Fokker Dr1 presented last month. Although construction is very similar to the Fokker there are some pretty obvious differences. I'll deal with these as I describe the build, but first off lets take a look at the gear I used.

KITTING OUT A TRIPEHOUND

Although the plan shows the receiver and motor from a Nano Stik coupled to a Plantraco Microact I had none of those items available at the time. My printer had



The little Tripehound does its airborne thing.

IMAGE @ 70%

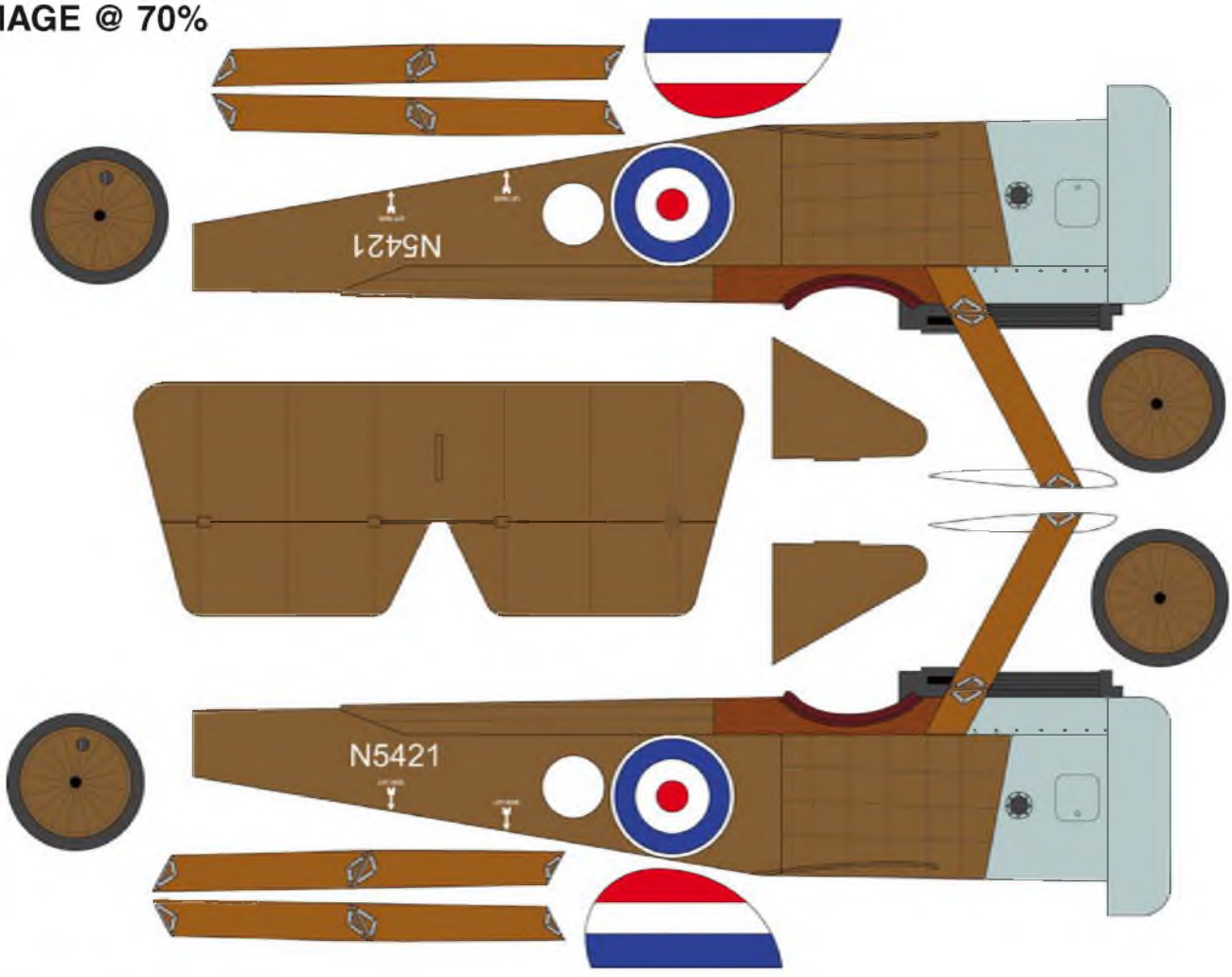
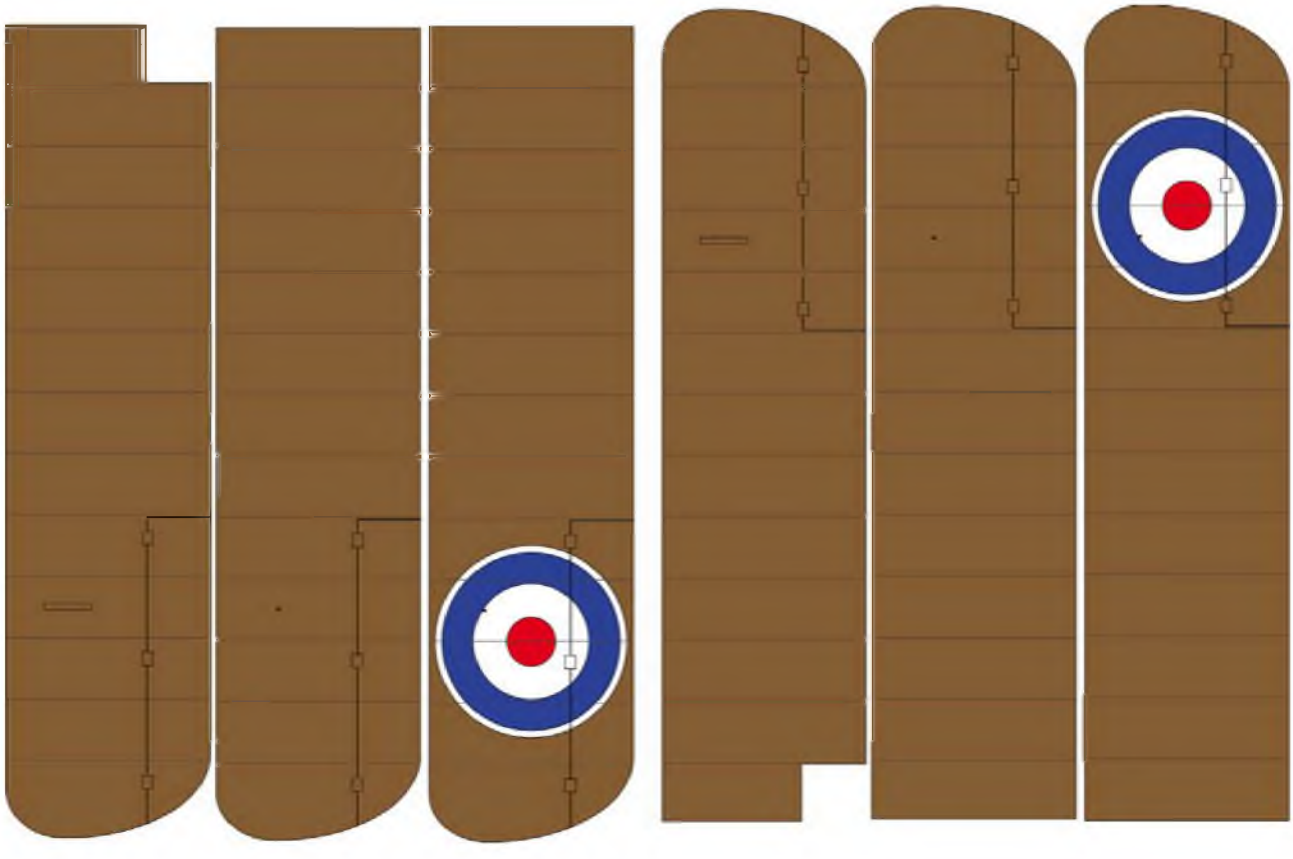
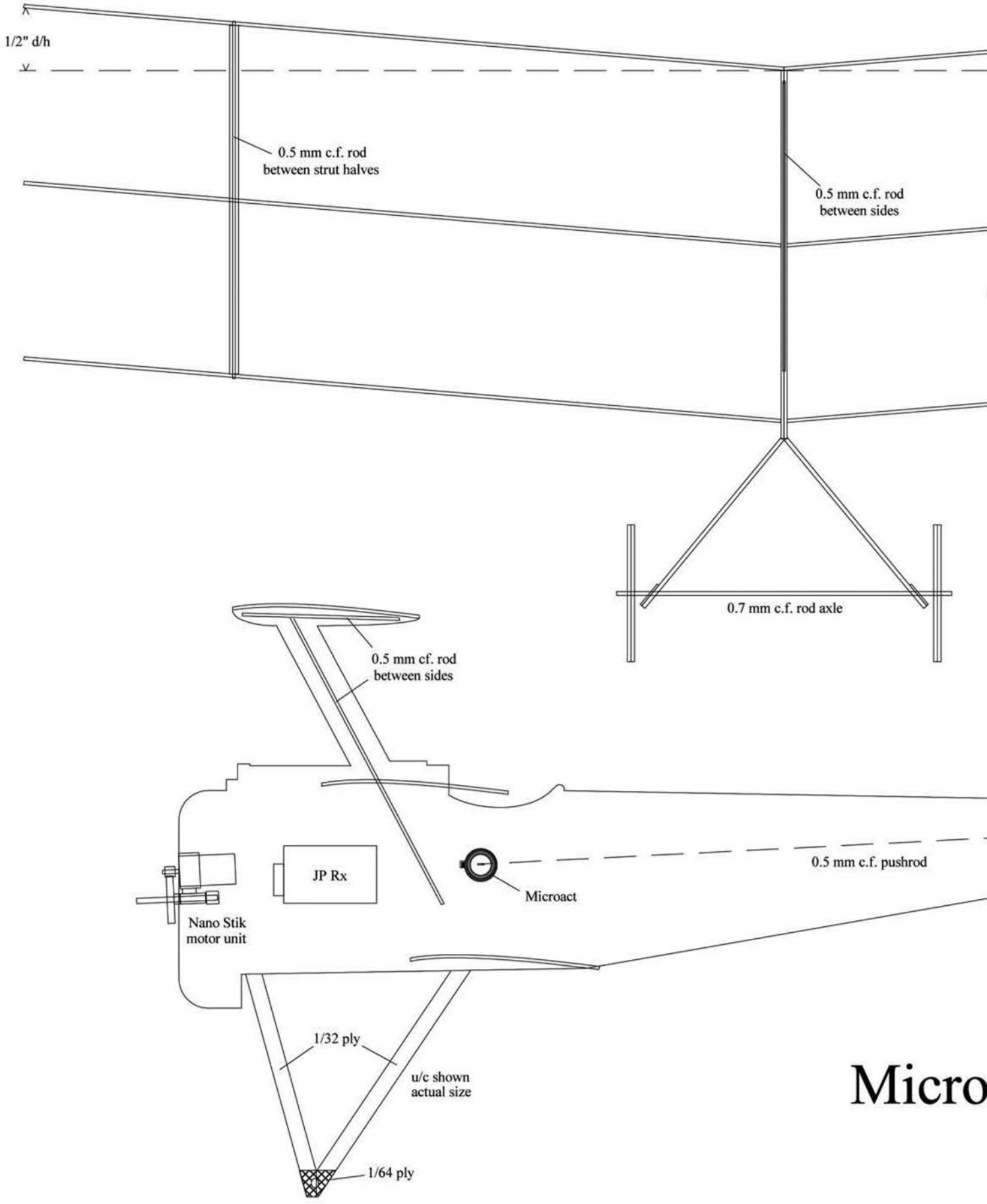


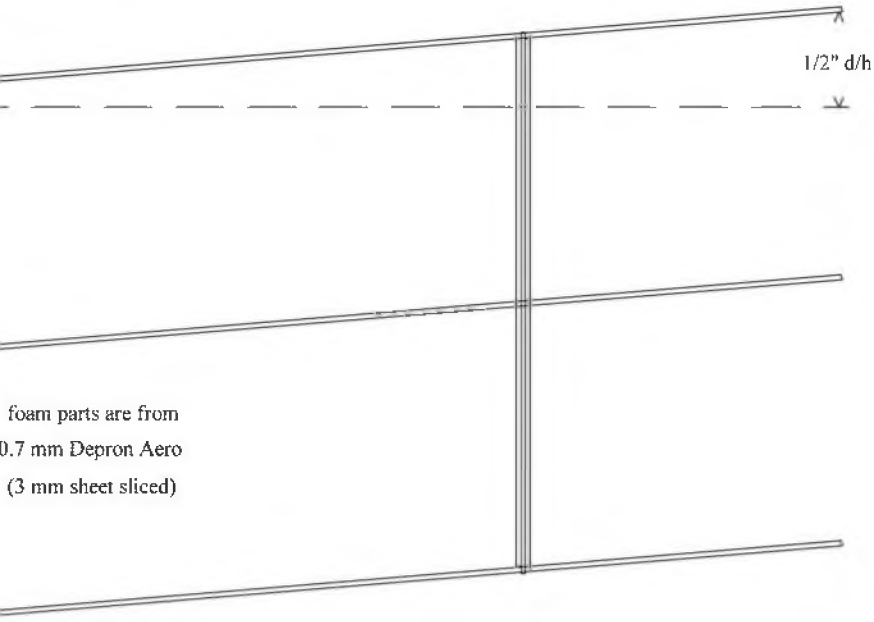
IMAGE @ 70%



PLAN: FULL SIZE



Micro



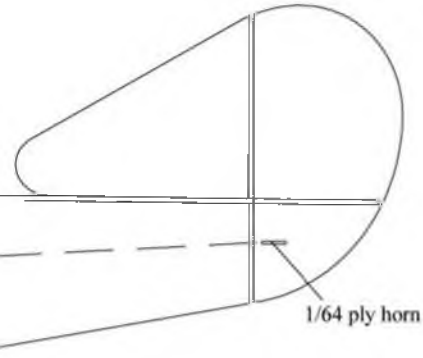
materials

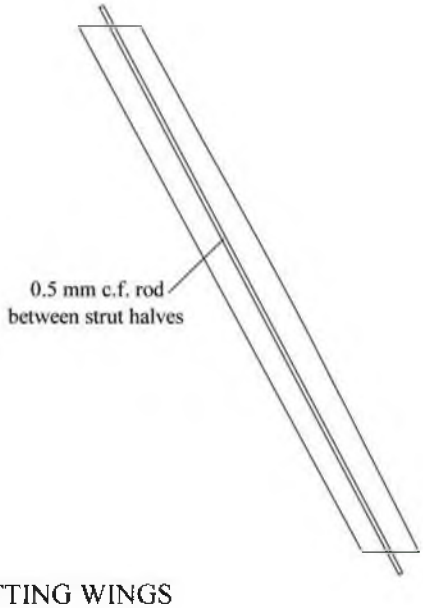
0.5 mm c.f. rod - 18"
(cs strut, i/p struts & p/rod)

0.7 mm c.f. rod - 3"
(axle)

brass wire - 1.5"
(pushrod ends)

1.5 mm heat shrink - 1"
(pushrod ends)





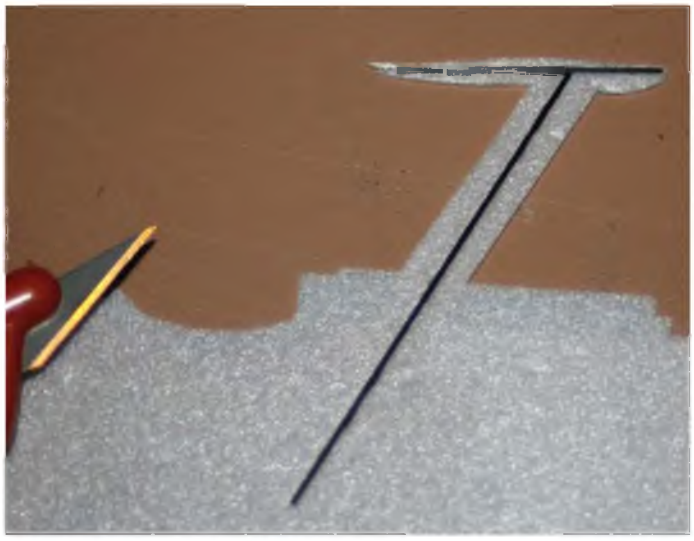
Tripehound

FITTING WINGS

Glue top wing to platform
Butt glue bottom wing panels to fuselage
Glue interplane struts into middle wings
Glue middle wings to fuselage
and strut stubs into top & bot. wings

Bracket positions show angle of
struts in middle wing & wing on fuselage

I used a steel rule to make a groove for the carbon rod stiffener to fit into before gluing it in place.



Rods glued in and the two sides are ready to glue together using a very thin coat of RC Modeller's Glue.

just died the death and needed replacing, thereby eating up the funds I had intended to use to equip this model. Time to check precisely what equipment I did, in fact, have available. As luck would have it there was still one functioning actuator stashed away, a Micro Invent item with its' plug changed, a three channel Plantraco receiver with the battery magnets removed and replaced by a battery lead and a 4 mm motor unit of unknown origin. I have a feeling that it might have come from a Mini Aviator, but it could well be one made up from salvaged parts. Whatever, it was the right size, used the right prop and appeared to deliver the required amount of power. The fact that it even had the correct type of plug fitted was just an added bonus.

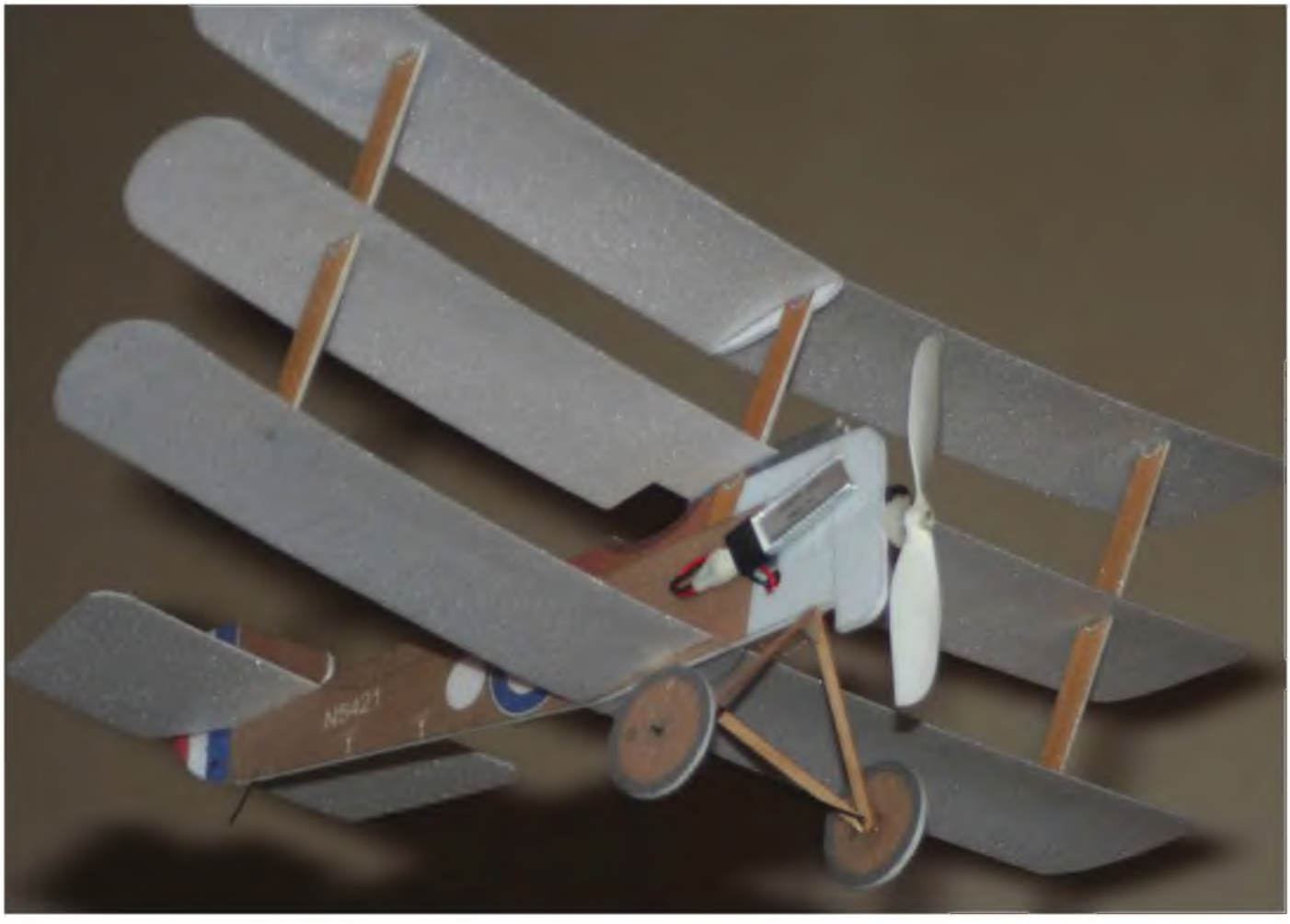
So, as you see, the model isn't restricted to using only the equipment shown on the plan. As long as it isn't hugely different pretty much any radio gear will do. If you have a Mini Vapor brick looking for a home that too could be used and you get the option of three channel control to boot. As for me, I'm happy enough just using rudder and throttle controls. Keep the gear you fit small and very light and you won't go far wrong. Remember, the aim here is to finish up with a ready to fly model that weighs less than half an ounce. My model, complete with battery finished up at just less than 10.5 grams.

BUILDING A SOPWITH

The first thing to do, once you've printed and cut out all the parts, is to make up a series of sub-assemblies. The most obvious of these is the fuselage and that requires a little preparation before you glue the halves together.

One difference between this model and the Dr1 is that the top wings mount onto a platform and the logical arrangement is to make that platform part of the c/s strut. Both the strut and the platform need to be stiffened up a bit

The model drifts by overhead. That wall is actually at least five feet away so I've no idea why the shadow is so obvious.



Although they're hard to see, there are two narrow strips of Blenderm tape used to hinge the rudder before joining the laminated halves.

Not a lot of camber is required but it does help to stiffen the wing panels and, combined with camber and incidence on all three wings works well.

before the sides are joined so each has a length of 0.5 mm carbon rod glued to one side and then the other side is glued in place using RC Modeller's Glue. A very thin coat should be smeared all over the second side, the two brought together and adjusted for alignment before being placed on a flat surface and weighted down to dry. Applying some pressure where the carbon rod is trapped between them will bed it slightly into both sides, assisting the gluing process.

A similar process is used to trap 0.5 mm carbon rod between the interplane strut laminations. Here it's important that both struts end up with the carbon rod in the same relative position or it will complicate accurate wing alignment during the final assembly stage. Note that there is a distinct top and bottom to these struts, so make sure you end up with matched sets. Although only slight, there is a convex curve at the top and concave curve at the bottom. The carbon protrudes at both ends and will plug into the holes in the wing panels as the struts are fitted.

When joining the fin and rudder parts I like to combine this step with hinging the one to the other. Apply two narrow strips of Blenderm tape to one fin half and hinge the matching rudder half. Then it's just a case of gluing the remaining halves in place and weighting it all down while the glue dries.

Now for the technical part; the wings. On this model only the top wing panels are joined before they are fitted to the fuselage. The centre and lower wing panels are butt glued at the points indicated by the printing. The bottom wing position is clearly shown, while the 'brackets' on the c/s strut determines the position of the centre wing panels.

However, before any of this joining or gluing in place can happen you need to induce camber into all six panels and sand their roots for the correct dihedral. To induce the camber just draw each panel over the edge of a table until it is curved by the correct amount. Strangely enough, a sharp edge works best, and does less creasing of the lower surface. Just work gently, gradually increasing pressure until the desired curve is achieved.

To sand the wing roots I find an emery board (I 'borrow' one of the wife's) works best. Pack up the panel to the correct angle, butted against the edge of a board, gently hold down the root making sure you don't alter the camber and run the emery board along the edge of the board, which will help keep it vertical.

When it comes to joining the top wing panels I use Uhu Por as adhesive, using it as an 'impact' glue. Thinly coat both wing roots and allow the glue to virtually dry. Then, CAREFULLY bring the two roots together at the correct angle and alignment. I stress carefully because you only get one shot at this, once the two parts touch they are stuck. I usually lay both flat on the board and gradually bring them together. Then it's just a matter of raising one tip until the sanded in joint meets along its' entire length. A little extra pressure to ensure they meet precisely and the job is done. Using the glue this way produces a slightly 'harder' joint than if it is applied and the parts joined immediately. Don't ask me why, that's just the way it works out.

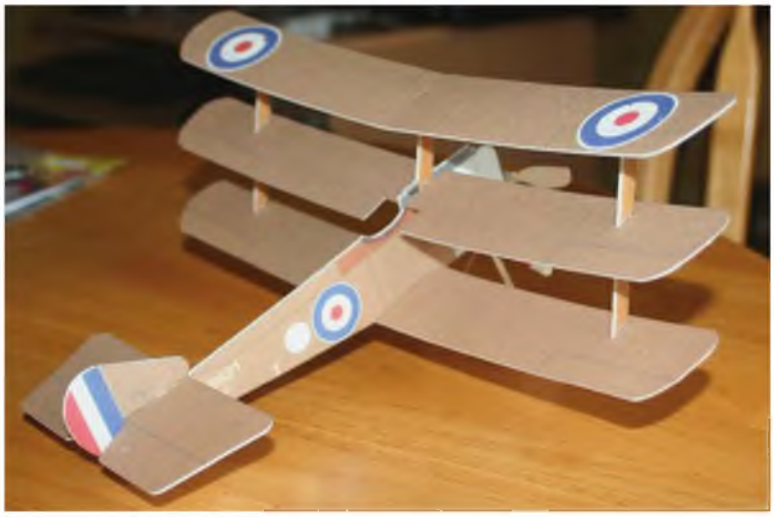
The final sub-assembly involves the u/c and this is definitely one of the areas that differs to the Fokker. Whereas on the Dr1 the u/c was tubular, and is easily represented by carbon rod, the Sopwith u/c was much heavier looking and made from wood. I considered carbon rod, but think what I came up with not only looks better but is easier too.

The main legs are made from narrow strips of 1/32 ply, with a patch of 1/64 ply over the joint as reinforcement. The leg strips were lightly sanded to remove any roughness and then a piece was laid over the full-size drawing on the plan to cut it to size. Cut both front and rear legs as matching pairs and position one set over the drawing. Cut and sand a wider strip of 1/64 ply and glue that in place over the join. Trim the 1/64 ply to match the u/c leg shape and drill the assembly for the axle to fit. The second set is assembled over the first, making sure you don't end up with two right hand sets.

Open up the drilled holes to ovals, slip in a piece of 0.7 mm carbon rod and lightly glue the legs at the correct spacing on the axle. You shouldn't wait for the glue (I used medium CA) to cure fully, just enough so the legs don't slip on the axle. Bring the tops together, checking that it all remains even, and glue them together. Allow this to cure and that's all the sub-assemblies ready. Talent

I can see that it's also about where I run out of space for this month. Next time we'll look at getting the model together, equipping it and how it flies. Possibly with a bonus.

In the meantime, if you'd like pdf files of the printed foam parts AT FULL SIZE, or want to contact me for any other reason, you'll find me at the usual place - PETERRAKE@aol.com. ■



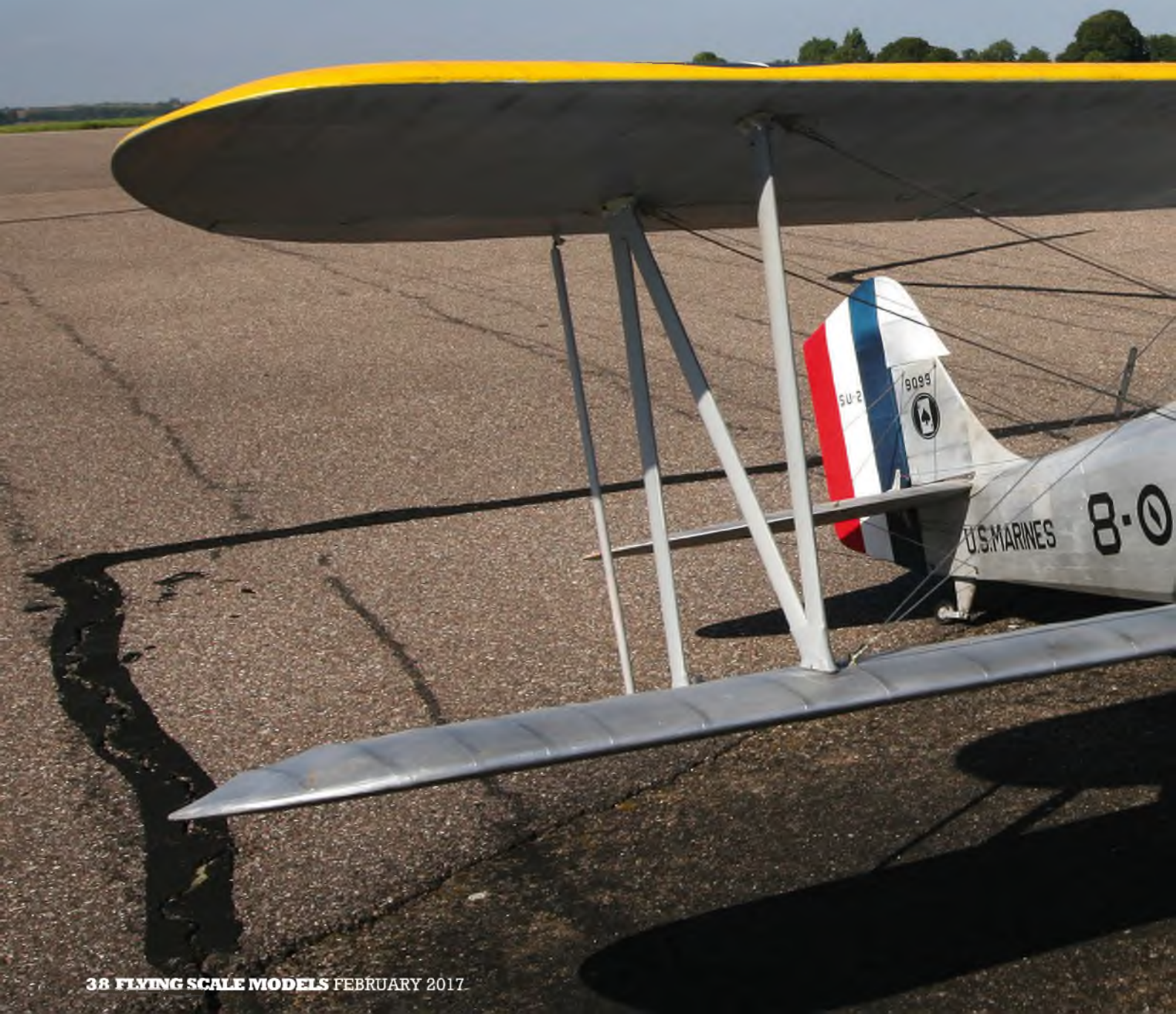
The printing over a simple hair spray base gives good results on the finished model to give a nicely understated finish.

SCALE BIPLANES - MY WAY

PART 1: The practical philosophy to building a competition standard scale biplane as followed by MARTIN FARDELL

Over thirty years ago, I wrote a series of articles on scale biplanes. Since then I have built more than twenty big biplanes, and maybe it's time to pass on some more ideas. Over the years, scale models have moved on considerably, as the photos shown here, demonstrate.

Our models have become larger and heavier; they fly beautifully, and are much more realistic in the air, but has this progress come at a price? One of the photos here shows Pete McDermott's superb DH9A. Probably the finest R/C



1977. My DH 9A, 84" span and OS 40 power (the only engine I could afford then!)

Martin with his Vought SU-2 Corsair, a perfect example of the standard of scale biplane that he covers in this series. Span of around ten feet, powered by a big Laser V-twin.

1987. RE 8 - 96" span and Laser 90 power.

1997. Douglas O38 - 100" span, Laser 180 power.

scale model ever made, Pete's 9A is accurate down to the last instrument dial on the dashboard, but I wonder whether seeing models like this does not have a negative effect on ordinary mortals - *"...If that's what scale modeling involves, then I know when I'm beaten..!"*

My aim in writing this series is to join our editor and get more people back into building (and designing) scale models; models that fly well and look entirely realistic in the air, but have not taken thousands of hours to build. While Pete McDermott was researching and building his 9A, I completed and flew four new scale models, admittedly to a lower standard (much lower!).

When I am at the Nationals, or giving talks at club evenings, many, many people come up to me and say *"...that's my kind of model! One day I'm going to build one"*. We know that there are plenty of modellers out there who would like to build big, slow biplanes. So let's get stuck in and see if we can lead a few of you to your modelling paradise.

So what's the problem?

Two out of three scale models are never finished (apart from the ARTFs). Worse still, hundreds of perfect scale models are never even started! We just have to find ways of moving things on, setting a realistic standard, and getting the thing built and into the air. The old *'Stand-off Scale'* class was on the right lines. Models were judged from three metres, and judges were not allowed any closer. Developing this idea, think about four different levels of realism:

Level 1: Looks OK in the air
Level 2: Looks OK at 3 metres
Level 3: Looks OK at 1 metre
Level 4: Get as close as you like with a magnifying glass

Be very clear; even at **Level 1**, we are

2007. Martin's Vickers Vildebeest. 120" span, Laser 360 power and 14kg weight.

not talking about 'semi-scale', with silly short undercarriages, lengthened cowlings, and silencers hanging underneath. The aim is that the model should look completely realistic, provided you don't get any closer than the specified distance. The outline and shapes are correct, but there is a self-imposed limit on the detail and surface finish.

Moving up to **Level 2** will double the build time, take it from me. Six months for 'OK in the air', but at least a year for 'OK at three metres' - and four years for **Level 4!**

It's not only the extra careful workmanship that takes so long, it's time spent researching every single part of the aeroplane, and the time spent checking each bit of scale detail against the photos; and time re-doing the bits you get wrong - all very enjoyable and well worth it if you are aiming for perfection and building a world-beater. But it is a bit sad if old age and infirmity catch up with you before the thing is finished!

What is your approach? I know I won't change you perfectionists, but we of the 'good enough' brigade have a lot going for us!

If an aeroplane is neatly made, accurate in outline, with a realistic paint finish and tidy markings, it will look absolutely fine in the air. Of course, it's very nice when someone comes up, peers into the cockpit and admires the accurate working compass. But let's get our priorities right; by all means dream of one day making that perfect scale model, but in the mean time, let's get some models in the air!

Enthusiasm retained?

Sadly, it's not only lengthy build-time that causes projects to grind to a halt. That initial enthusiasm, which got us off to such a good start, can easily fade over the months. Once the building becomes a bit of a chore, we might as well give up. This is supposed to be hobby, not slave labour. So what do we need do to retain that initial interest and keenness? I am still turning out models at roughly one each winter and enjoying doing it as much as ever, so here are five ideas to help keep things going. They work for me and I pass them on for what they are worth.

Incentive no.1

Design your own models. There is no question that there is far more interest in completing something that is entirely your own creation, right from the drawing board to final coat of fuel-proofer. Of course it's easier said than done, and nobody can go straight from building an ARTF Tiger Trainer to a ten-foot own-design biplane in one go. Your first scale model will probably have to be from a kit or plan, but the sooner you get into creating your own designs, the greater will be your enjoyment. Much more on this later in the series.

Incentive no.2

Build aeroplanes that interest you. All scale modellers are part-time historians, and there is tremendous satisfaction in creating a little bit of living history. I doubt if a real Loening amphibian is ever going to fly again, so seeing my model is the closest you are going to get to viewing the real thing in the air. The US Navy led the world in naval aviation in the early thirties and these aircraft make fantastic models.

Similarly, most of the aircraft of the RAF in the thirties are much under-modelled. My interest here probably stems from my Dad's cigarette card collection, and I can still see in my mind the little pictures of Westland Wapitis, Gloster Gauntlets and Handley Page Heyfords. I am gradually modeling my way through the list! Follow your interests and get away from those endless modelsof the Tiger Moth and SE 5a!

Incentive no.3

Get some company. Model building is a solitary business, and like most solitary occupations it can easily lead to gloom and despondency. Join a club where there are other scale enthusiasts; get your mates round to the workshop to view progress. And most importantly, get down to the club field as often as possible and do some flying! This is where ARTF models have really made a difference. While the scale masterpiece is progressing in the shed, you can always have a flyable model available to keep you in touch with the real world.

Incentive no.4

Re-adjust your priorities. If we waited until the lawn was mown, the dog walked, the car cleaned and the bathroom re-decorated, we would never get any balsa cut at all! Surely, in our busy lives we, can allocate a bit of time each day to something as worthwhile as scale modelling? Maybe watch just a bit less telly? A useful tip from the psychologists is to always stop work at a point when you know what you are going to do next, that way, you are keen to get going again and you don't without waste ages pondering, or decide to weed the garden instead.

Incentive no.5

Get out and about. When you have actually finished your scale model you really do need to take it away from the home patch and out into the big wide

Pete McDermott's DH 9 - a masterpiece in all senses of the word!.

Ian Cook's own design Heinkel. His first scale model!

Living History! A Loening OL-8A back from the 1929 Alaskan Survey comes in to land at Barkston Heath in 2008! (Martin's latest competition model).

Nice Stampe by Mick Henderson. Modified from 1/4 scale precedent kit to Belgian Air Force version.

Hawker Demon. 1/4 scale, and it flew beautifully. Unfortunately, I never completely cured the engine cooling problems and after the umpteenth forced landing with an overheated engine, I gave up on it.

Curtiss O2C-1. This aircraft is the first in the famous line of Curtiss Helldivers. The first Helldivers started life as fighters and dive bombers, but were soon relegated to observation duties. My model is again 1/4 scale and mildly aerobatic on a Laser 360V.

Martin T4M. This was the US Navy's standard carrier based torpedo bomber in the late 20's. A crew of three and a one ton torpedo, all done on 525 horse power! My model is big - 130" span - and looks quite impressive in the air with its dummy torpedo and strange undercarriage.

world. Scale fly-ins, LMA events, BMFA Competitons - chose the type of event that suits you. But getting out amongst like-minded enthusiasts gives a tremendous boost to the enthusiasm factor. Personally, I like the BMFA events. I like flying in front of judges, and I like the peaceful style with no razzamatazz, but best of all is the feeling that you are part of a sort of mobile club, which meets at different venues around the country every two weeks or so during the summer months. You exchange ideas, and catch up on progress on their latest projects. And it's a club that anyone can join!

Getting Started

The biplanes I model these days now have a ten foot wing span, weigh about 14kg and need a 60cc engine. These fly beautifully, and hopefully give some idea of how the real ones must have looked in the air. However, there is no question that the jump from ARTF models to designing models of this size, will be too much for many people. The obvious answer is to build a model from a kit or plan first, to get a feel for the techniques involved and then move on from there. Unfortunately, there are few kits and plans available for us lovers of slow biplanes. If you are into Warbirds, there is no problem - I will guarantee that you will be able to find a kit or plan for virtually any British or US fighter from WW2. For biplanes the choice is quite limited; Mick Reeves does the Sopwiths in various sizes, and there are also some good Flair kits such as their Bristol Fighter. Various plans that have appeared in the magazines over the years are another source of options. Some of these designs are from a long time back, and techniques have advanced quite a bit over the years. In particular, some of these old designs take an age to rig and de-rig. As we shall see in a month or two, there is absolutely no reason why it should take more than five minutes to get your biplane out of the car and have it ready to fly. A bit of forward planning is what's needed.

Actually, if you are reasonably competent and have a general knowledge of aeromodelling techniques, there is really no reason why you shouldn't jump straight in at the deep end and design your own models. One of my clubmates did just that - having learned to fly (on non-ARTFs, admittedly) he went straight in and designed his Heinkel He 51. (see photo). A complete success! He even won a BMFA competition with it. The basic structure of most early biplanes is very simple, and in two month's time we will be setting out an all-purpose design process, which can be used to generate a design for the slow flying biplane of your choice.

How big?

The bigger they are, the better they fly. But there are limits - time; money; workshop size; car size; flying field restrictions. It all means that we have to

draw the line somewhere. My models have crept up to the 14 - 15kg size over the years, and that is absolutely the biggest I can cope with. In fact, the next size down, i.e. 8 -10 kg with a 180 size engine, still produces a model that will fly really well and is a practical proposition for most. Go much smaller and I think you will be disappointed, as it will be very difficult to achieve that stately progress through the air that we biplane fanatics are after.

Engines?

All my models are powered by four-stoke glow motors, mostly Lasers. I have grown up with them and have become used to operating them. Also, I quite like the noise they make. What about petrol? Much cheaper to operate, and generally cheaper to buy, too. The snag for my sort of models is that they just can't be hidden in amongst the dummy engines - they are too bulky, and there are too many bits sticking out.

The fact is that Lasers and other similar glow motors are very compact for the power they deliver. It is amazing how a Laser 360V or a Laser 180 single can be tucked in inverted between the cylinders of a dummy radial engine. It's very nice when people peer at the nose of the model and ask: "Where's the engine?" Or better still, look at the Pratt and Whitney nine cylinder radial and ask: "Does it fly on that!"

We like to kid ourselves that the noise of a four-stroke is more realistic than a two stroke. To be honest, no model engine sounds remotely like the deep rumble of a full size big radial. Just stand by the flight line at Old Warden as the Gloster Gladiator taxies past! The best we can hope for is to make the engine noise reasonably unobtrusive. Four-stroke glow, or well-silenced petrol - I don't think there's much to choose between them as far as realism is concerned. ■

Vickers Vildebeest. I had fond memories of a Vickers Vincent that I built many years ago, so decided to do the Vildebeest, which is essentially the same aircraft, to a larger scale. A good one for competition flying as it handles windy weather well. That nice wide undercarriage helps too.

Loening OL-8A. The Prophets of Doom were proved wrong on this one! In spite of the ungainly appearance, it flies really steadily and handles wind well. Nearly defeated on the third day at the Nationals this year though, when the wind speed more or less equaled the forward speed of the model. Home-made retracts (on a screw jack principle) have so far not given any trouble.

BELLOW: Vought SU-2 Corsair. Vought named all their two seat biplanes Corsair, and to my eyes the SU-2 was one of the most attractive. Mine had an argument with a barbed wire fence early in its career (misjudged approach!) but I got it back together again and it has since done a lot of flying. It does lovely biplane-style aerobatics.

NEXT MONTH

That's it for this time. Next month, as a change from all this philosophy, I will be getting down to some real practical nitty-gritty; how to make the difficult bits, like dummy engines, and wheels and tyres. See you then!

Grumman Duck

UNGAINLY YES, BUT WITH BUSTING WITH A 'PRESENCE' AND ATTRACTION ALL OF ITS OWN! CERTAINLY A MODELLING SUBJECT ONLY FOR THE BRAVE, BUT THE DUCK HAS BEEN MODELLING SUCCESSFULLY AS IS REVEALED ELSEWHERE IN THIS ISSUE

Preserved Grumman J2F-6 still flying, this one with the narrow chord cowl and early style of cockpit canopy framing.

The Grumman JF/J2F 'Duck' series was one of those military workhorses performing a myriad of mundane tasks before and during WWII, doing a tremendous job but receiving none of the publicity of the more glamorous front-line combat aircraft of the period. In physical appearance it was, by any standard, very much an ugly duckling of an aircraft which, nonetheless thanks to its quaint shape, had a presence all of its own.

Be that as it may; when no other bomber could be found, it would carry bombs; when no other transport could be found, it transported; when no other photo aircraft could be found, it photographed and when no other rescue aircraft type could be found, it rescued. When it came to 'Utility Craft', the JF/J2F was the definitive of its era.

Grumman's Duck originated from designs and production aircraft made by the *Loening Aeronautical Engineering Corporation*. When Loening was taken over by Curtiss-Wright in 1929, several key employees of the former Loening Aeronautical (among them Leroy Grumman) formed the Grumman Aircraft Engineering Corporation, which was financed by Grover Loening, but In 1928 even before Curtiss-Wright took over Grover Loening Aeronautical Engineering, Loening himself formed the *Grover Loening Aircraft Company* and in 1931, this new Company submitted their XO2L-1 design to the U.S. Navy for its new 'Utility' category.

This actually had its roots in a previous Loening design, the Loening Model 23 'Air Yacht' (produced during the 1920s) which served with the US Army Air Service during that period. It had a somewhat more than casual resemblance to the Duck.

The Navy showed an interest in the XO2L-1, but as Loening had no production facilities, he was referred to Grumman, where work on the design was progressing as Grumman 'Design 7'. After modifications to make the design more easily manufactured, Grumman submitted the specification to the Navy in 1932 and the Navy accepted it as the XJF-1 at least in part due to Loening's previous reputation.

Duck prototype XJF-1 flew for the first time on April 25th 1933 when test pilot Paul Hovgaard, took the craft into the air from a grass strip in front of the Grumman factory at Farmingdale, NY. Power for the XJF-1 and the JF-1 was a 700 hp (522 kW) Pratt & Whitney R-1830-62 Twin Wasp engine and a three-blade Hamilton Standard prop. To keep it afloat, a single large float was built into the fuselafe underside. Faired flush into the sides of the main float was the main undercarriage that could be raised and lowered by a system of motors, sprockets, chains and gears, a basic system that had previously been used for the Grumman F3F fighter biplane and thereafter applied to a subsequent Grumman design, the F4F Wildcat fighter.

Small outrigger floats mounted near the tip of each wing kept the craft stable at rest and during take-off and landing runs. Crew consisted of a pilot and rear gunner, each under the long enclosed canopy with sliding panels that overlapped when slid back, while provision was also made for two passengers located just aft of the lower wing in the main float below the fuselage.

Grumman delivered the XJF-1 to the NAS Anacostia for testing and evaluation in May 1933 resulting in a recommendation for a minor revision to the shapes of the tail surfaces. The originals were triangular in shape and the Navy considered that horizontal and vertical control could be improved by adding more area to the surfaces. Grumman changed both the rudder and elevators to a more rectangular shape and re-submitted the XJF-1 for further evaluation in early 1934 at the Naval Test Unit at NAS Norfolk, Virginia.

Shortly after, the Navy ordered 27 JF-1s and the first Ducks were delivered beginning in May 1934 to Norfolk NAS. These had provision for mounting a machine gun at the rear crew seat facing aft. In addition, a bomb rack was mounted under each wing, capable of carrying a single 100 lb bomb or depth charge on each. The JF-1 had the same Pratt &

ABOVE: This picture of a US Coast Guard Duck preparing to taxi is at least as interesting for the mysterious aerial contraption from behind which the picture was taken - a true 'period' image!

Grumman J2F-1 on the hangar deck lift of USS Yorktown in November 1937. Note the black walkway on the lower wing.

Whitney R-1830-62 engine as the prototype, with the main centreline float of Grumman design (Grumman Model 'A') and, like the prototype, it included retractable main landing gear, making the Duck a true amphibian. In addition to being able to operate from land or water, the JF-1 came complete with an arrestor hook for operation from a carrier deck.

The Duck was an extremely rugged aircraft. For example, in December, 1937, Marine Sergeant Bernard Belcher flipped his aircraft completely upside down while trying to land in a cross-wind (a particularly hazardous undertaking in a Duck) and, though the JF-1 dug its nose into the ground and somersaulted, the only damage sustained were a few wrinkles in the top of the rudder and fin. Sergeant Belcher was uninjured.

The next variant, the JF-2 looked very similar to the JF-1, but there were differences, including the change to a Wright 1820 Cyclone engine which resulted in a much narrower chord for the engine cowling. The JF-2 Duck was built exclusively for the U.S. Coast Guard, and all were supplied without the tail hook. In December 1935, a JF-2 set a world speed

J2F-1 Duck, showing the outrigger floats and the main undercarriage. From a modeller's viewpoint, there may be a lot of work in the airframe, but there is not too much interplane rigging.

record for single engine amphibians at Quantico, Virginia, when a JF-2 achieved a speed of 191 mph. A total of 14 JF-2s were built, most of which were later transferred to the Navy and Marines.

The J2F series development of the type was flew in April 1936 and although it was still the basic JF Duck, many improvements were incorporated into the new Grumman design no.15, starting with a new 750 hp (Wright 1820 Cyclone engine. This was an even more paired-down 'utility' version, but with the arrestor hook installed again, along with provisions for a heavier bomb load and a stretcher in the lower passenger compartment to carry wounded. It was also fitted with smoke laying and target towing gear. The JF-2 could also be used for photo or reconnaissance missions as well as its normal function of a small transport. The main float was extended forward 12 inches and a total of 29 J2F-1s were built by April 1937 to complete the production run.

The J2F-2 again had its Wright 1820 Cyclone boosted in horsepower, this time to 790 hp. There was also a change to armament with a .30 calibre Browning gun firing from between the cylinders of the Cyclone. A variant (the J2F-2A) had twin .30 calibre Brownings in the rear gunners position along with an extra pair of bomb racks.

A Grumman J2F-3, the first aircraft to be assigned to US NAS Jacksonville, Florida, on 16 January 1940.

Beyond that production run came twenty J2F-3s in 1939 for use by senior Navy personnel, with plush interiors and Navy blue with silver paint jobs, but were otherwise standard J2F-2s. Also entering service in 1939 was the J2F-4, which was basically a J2F-2 except for minor modifications, but the most numerous of the line, at least manufactured directly by

A U.S. Marines Grumman J2F fuels up at Quantico, Virginia.

The rear gunner's Browning .30-calibre machine gun in the stowed position. The box-like item in an ammunition feed box.

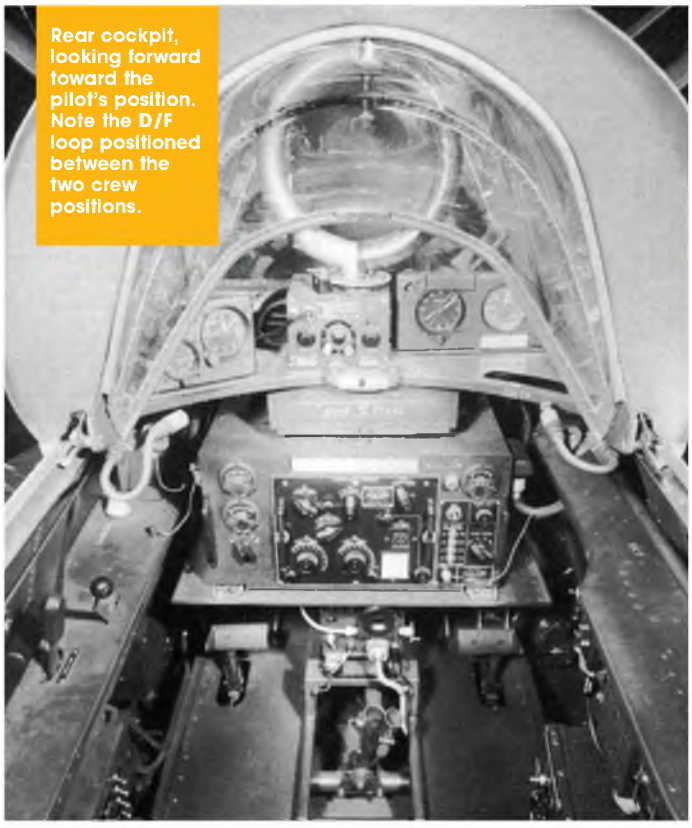
Grumman, was the J2F-5 introduced in 1941, with Wright 1820 Cyclone now providing 950 hp, of which a total of 140 were built. Visual differences included oil cooler repositioned to the engine compartment and the broad-chord engine cowling of the Pratt-Whitney engine.

When the last J2F-5 rolled off the assembly line, Grumman concentrated on other more important aircraft which were desperately needed in the first months following the Japanese attack on Pearl Harbour in December 1941, so the J2F Duck project was shifted to the *Columbia Aircraft Corporation*, which built the J2F-6 at their Valley Stream, Long Island factory from early 1942 to the end of WWII. The J2F-6 was identical to the -5 except for the Wright 1820 Cyclone, which was again reworked to deliver 1,050 hp the most powerful Duck built and the most numerous, with 330 being built for the Navy and Coast Guard.

The AO-12 variant of the Grumman Duck was produced for the U.S. Air Force as an Air/Sea Rescue craft. All were drawn from surplus Navy, Marine and Coast Guard J2F-5s and -6s, rebuilt and modified for Air Force operations, but the basic Duck airframe remained essentially the same.

A number of Ducks were produced for

DUCK-TO-WATER! A U.S. Coast Guard Duck taxis across the water, the pilot assisted by the second crew member at lookout station watching for obstructions in the water.

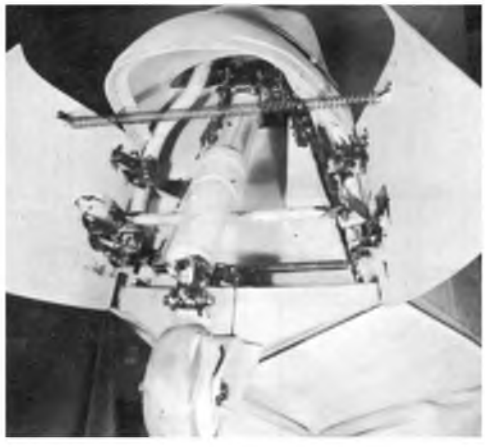


Rear cockpit, looking forward toward the pilot's position. Note the D/F loop positioned between the two crew positions.

The front cockpit looking forward at instrument panel.

South American countries including Argentina, Columbia, Mexico and Peru. These bore the model numbers of G-15 through G-20, all being identical to JF/J2F models.

In all, a total of 632 JF/J2F Ducks were built in all. By 1945 these were scattered all over the world, performing duties nothing short of amazing. Ducks could be seen airborne as late as the mid 1950s. Probably the most famous Duck of all was J2F-6 Serial Number 33587, which starred in the movie *"Murphy's War"* in the early 1970s. ■

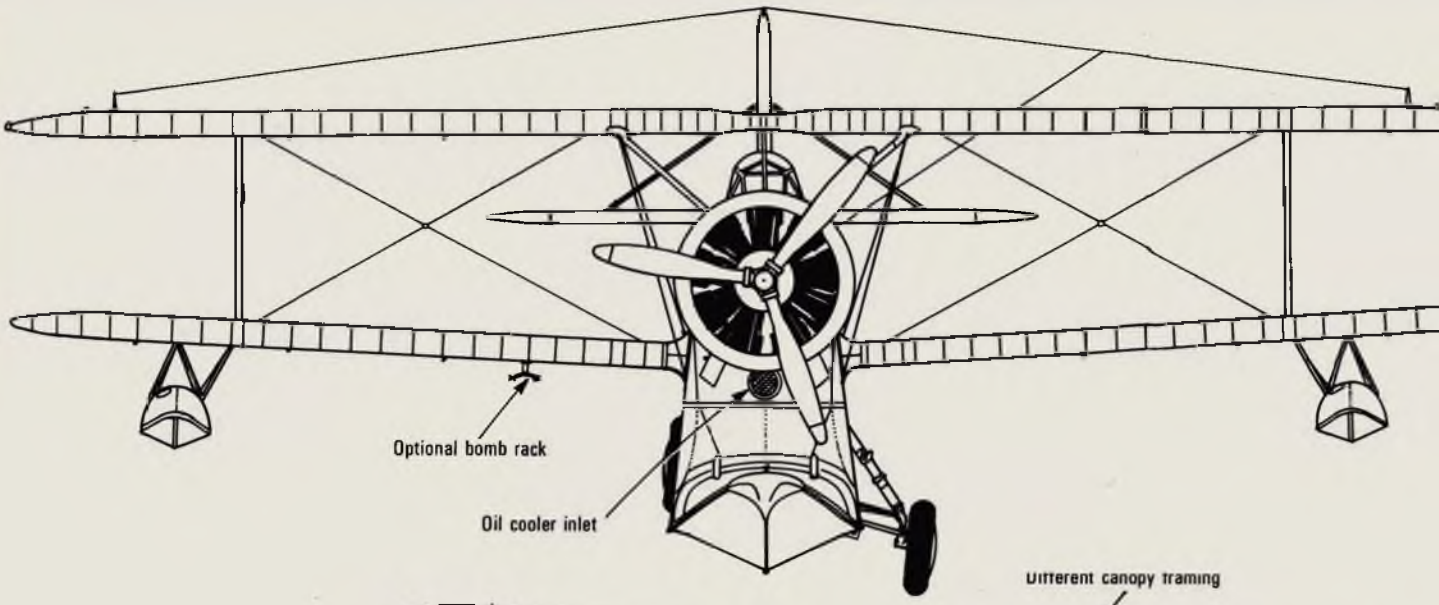


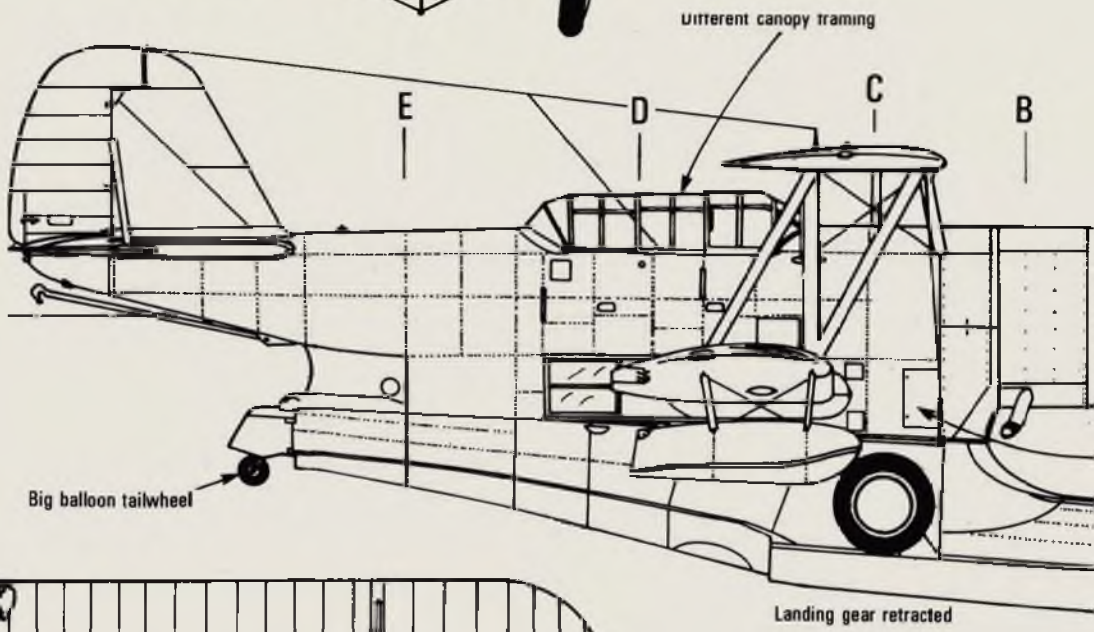
RIGHT: The right side retracting undercarriage that lifts and folds into the side of the lower fuselage/float.

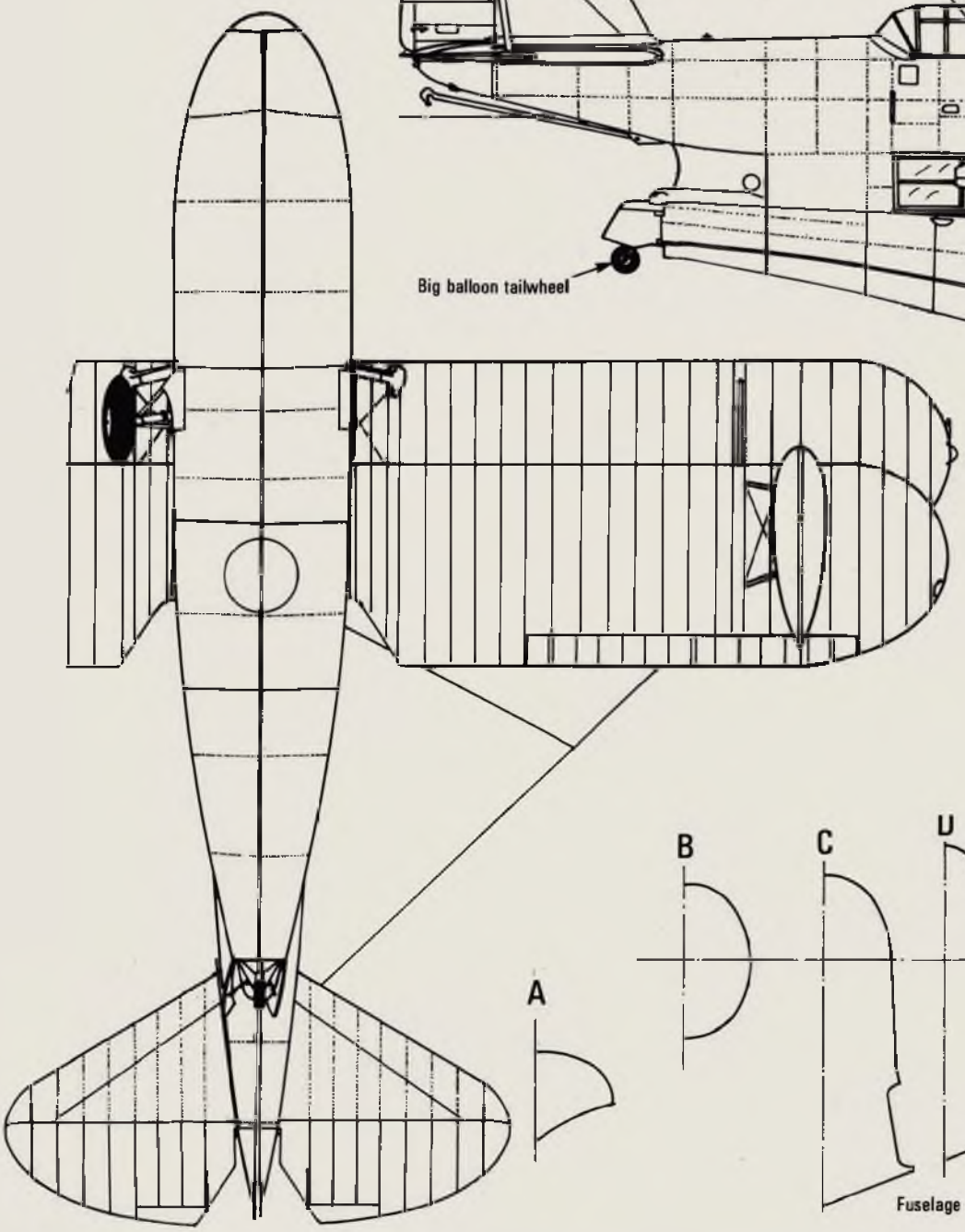
FAR RIGHT: Retractable tail wheel unit at the extreme rear of the hull/float, showing the clamshell wheel covers.

A J2F-6 Duck, with the wide-chord engine cowl in late WW2 US Navy two-tone finish of bark blue upper surfaces and light grey wing undersides and fuselage.

SCALE 1:60

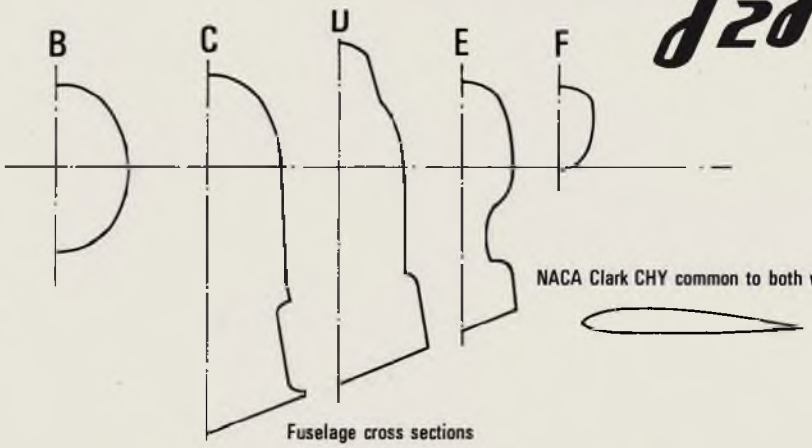


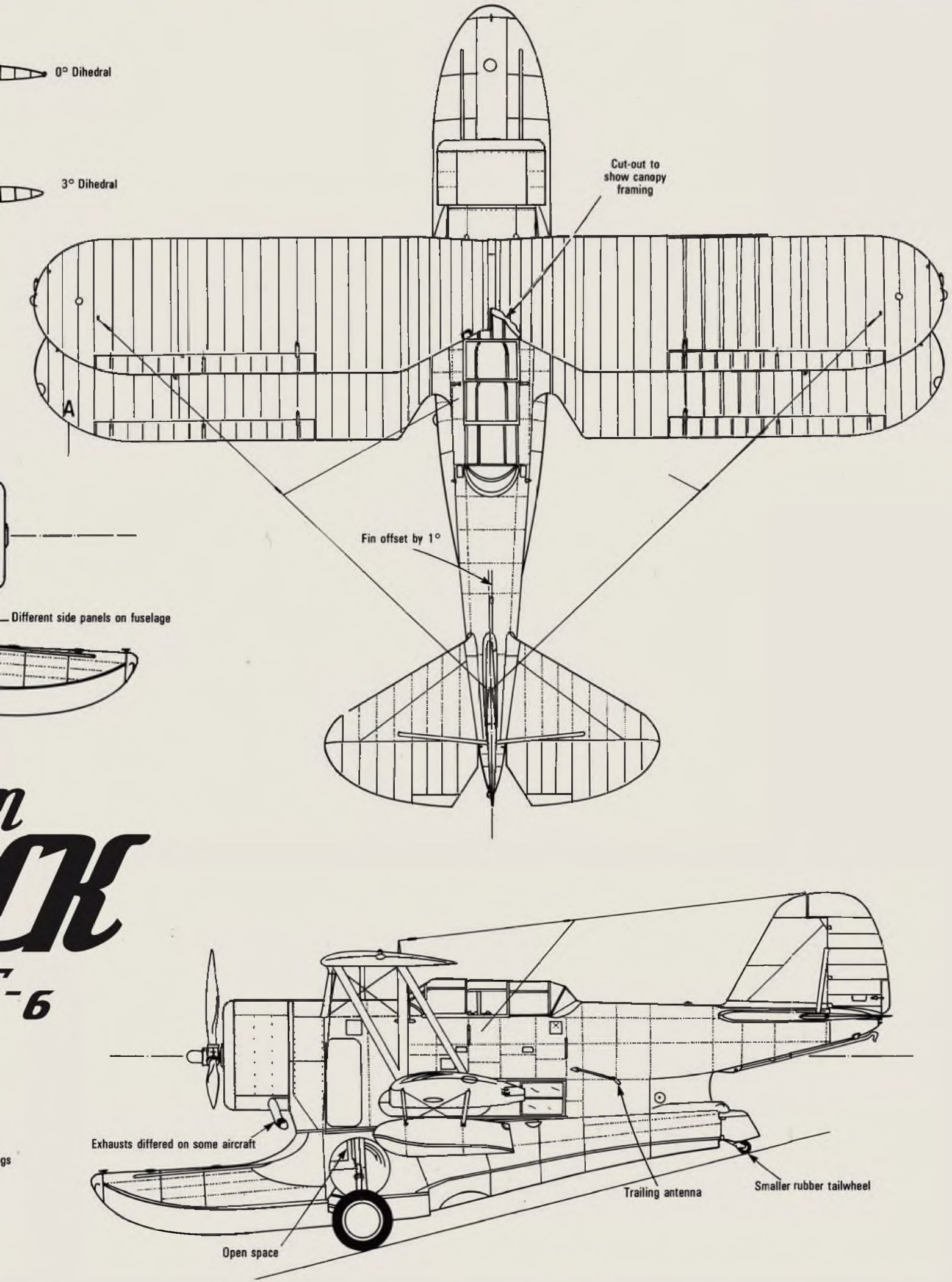




Grumman

J2F




0° Dihedral
3° Dihedral
Cut-out to show canopy framing
A
Fin offset by 1°
Different side panels on fuselage
Exhausts differed on some aircraft
Trailing antenna
Smaller rubber tailwheel
Open space

GRUMMAN DUCK FLYING COLOURS

Grumman JF-1 Duck, 1-J-7 of VJ-1, USN, 1935. Aluminium dope overall with Chrome Yellow top wing upper surfaces; Willow Green vertical and horizontal tailsurfaces, and float front tip. All lettering in black.

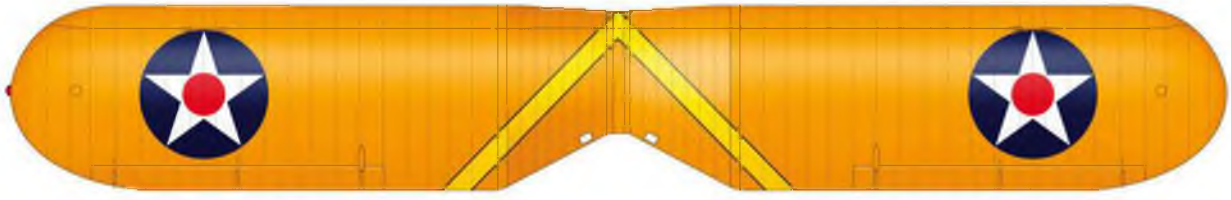
Grumman JF-1 Duck, U.S. Naval Air Station Pensacola, Florida, 1937. Aluminium doped overall with Chrome Yellow top wing upper surfaces; lettering in black. Star markings in six wing positions; '6' repeated in black at centre above top wing. Note arrestor hook removed

1:72 Scale

0 METRES 1 2

0 FEET 3 6

Grumman JF-1 Duck, USS Ranger (CV-6). Light Gray overall with Chrome Yellow top wing upper surfaces; star markings in four wing positions. Blue/white/red rudder stripes; all lettering in black.



Grumman J2F-1 Duck, 2-J-24, of VJ-2, Hawaiian Detachment, 1940. Aluminium overall with Chrome Yellow top wing upper surfaces; Ident Yellow vertical and horizontal tail surfaces, and chevron above wing thinly outlined in black. Star markings in four wing positions; lettering in black

Grumman J2F-3 Duck, 1587, USS Wasp, March 1940. Aluminium dope overall with Chrome Yellow top wing upper surfaces; lettering in black; star markings in six positions. Red float tip; blue/white/red vertical rudder stripes.

Grumman J2F-3 Duck, '2', USS Heron (AVP-2), Asiatic Fleet. Aluminium overall with white cowling, fuselage band and chevron above wing; Chrome Yellow top wing upper sufaces. Star markings in four wing positions; blue/white/red rudder stripes. Lettering and waterline mark in black.

1:72 Scale

0 METRES 1 2

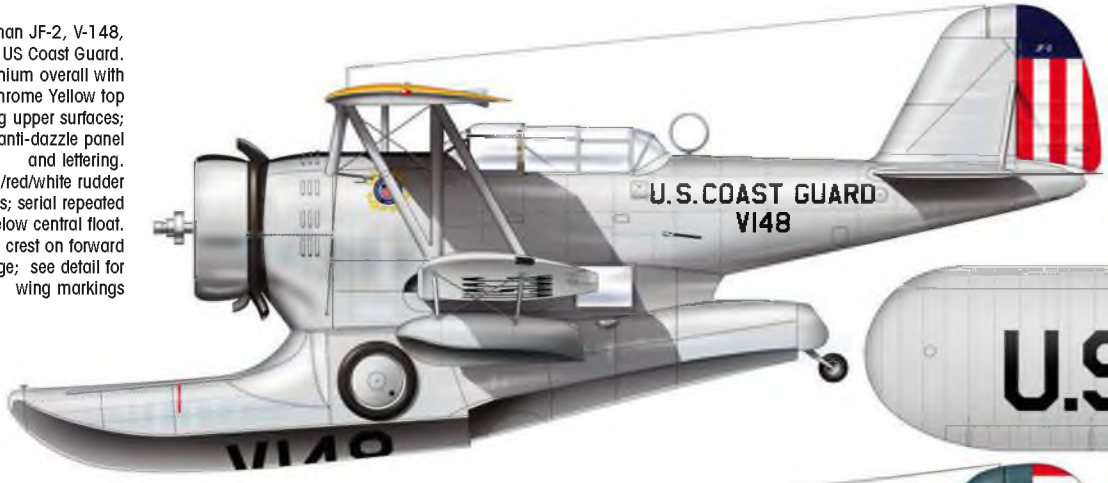
0 FEET 3 6

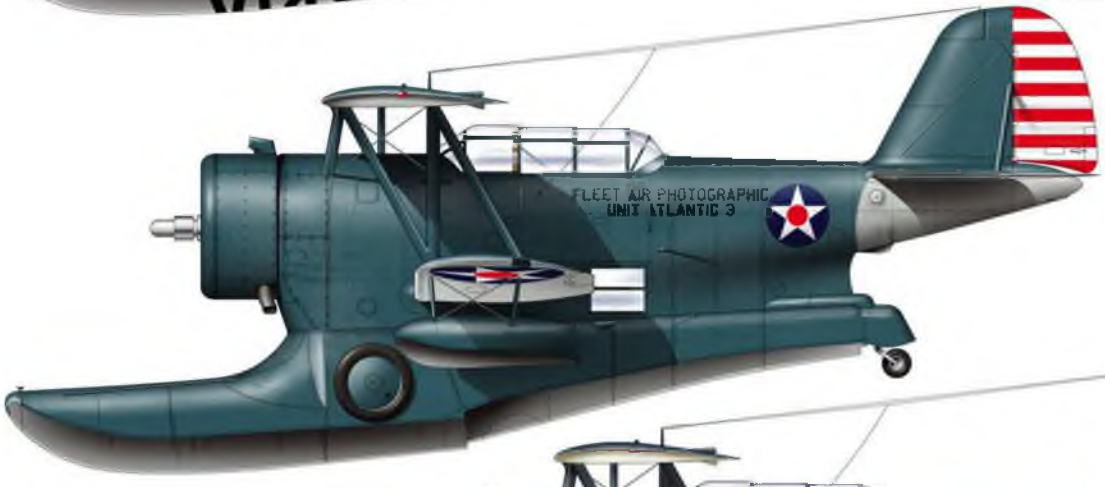
Grumman J2F-2A, 3-MS-1, of VMS-3, Bourne Field, Virgin Islands, 1940. Aluminium doped overall with Insignia Red cowling, rear fuselage band and chevron above top wing; star markings in six positions. Blue/white/red vertically striped rudder; lettering in black, except 'MS' which is white. USMC badge on fuselage sides; see scrap view for upper wing details

Grumman J2F-2A, 1200/3-MS-1 of VMS-3, Virgin Islands, 1940. Finished similarly to 3-MS-3 except for the lack of a red fuselage band

GRUMMAN DUCK FLYING COLOURS

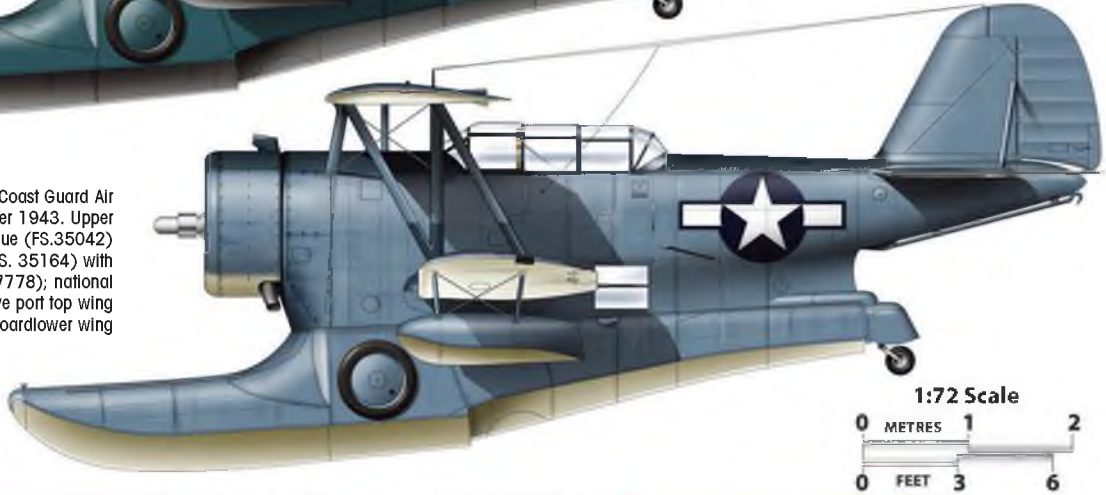
Grumman JF-2, V-148, US Coast Guard. Aluminium overall with Chrome Yellow top wing upper surfaces; black anti-dazzle panel and lettering. Blue/red/white rudder stripes; serial repeated below central float. USCG crest on forward fuselage; see detail for wing markings





Grumman J2F-5 Duck, Fleet Air Photographic Unit Atlantic 3, 1941. Intermediate Blue-Grey upper surfaces with Light Gray undersides; star markings in six positions. Red/white horizontal rudder stripes; lettering in black.

Grumman J2F-5 Duck, U.S. Coast Guard Air Service, New York, December 1943. Upper surfaces in Non-Specular Sea Blue (FS.35042) and Intermediate Blue (FS. 35164) with undersides in White (FS.37778); national markings on fuselage sides, above port top wing and below starboardlower wing



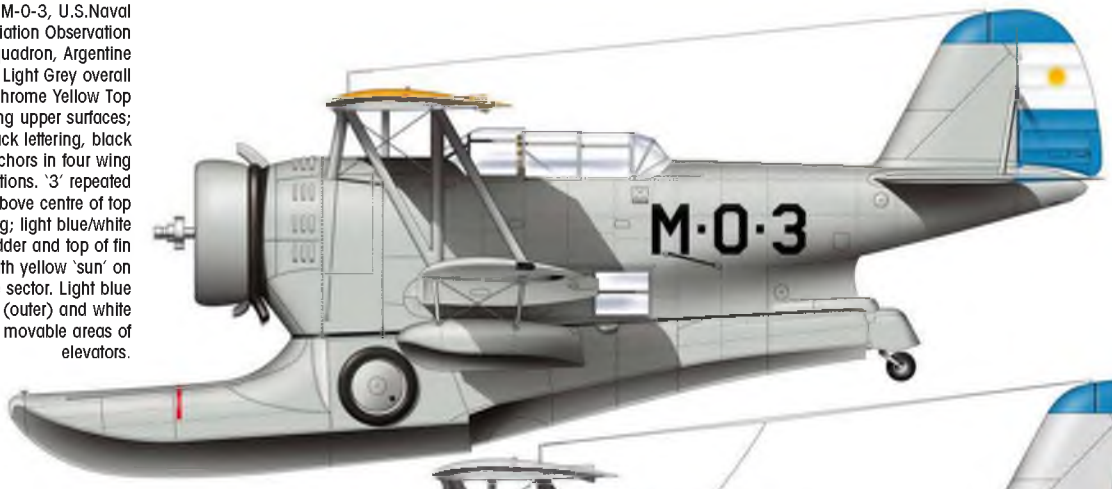
1:72 Scale

0 METRES 1 2

0 FEET 3 6

Grumman (Columbia) OA 12A, 48-566, 10th Rescue Squadron, Alaska Air Command, Elmendorf AFB, 1953. Aluminium overall with red tail, floats and outer areas of wings; black anti-dazzle panel and serial. US national mmarkings on fuselage sides, above top port wing and below lower starboard wing. White waterline marking on float

Grumman Model G-20 Duck, M-0-3, U.S.Naval Aviation Observation Squadron, Argentine Navy. Light Grey overall with Chrome Yellow Top wing upper surfaces; black lettering, black anchors in four wing positions. '3' repeated above centre of top wing; light blue/white fin/rudder and top of fin with yellow 'sun' on white sector. Light blue (outer) and white movable areas of elevators.

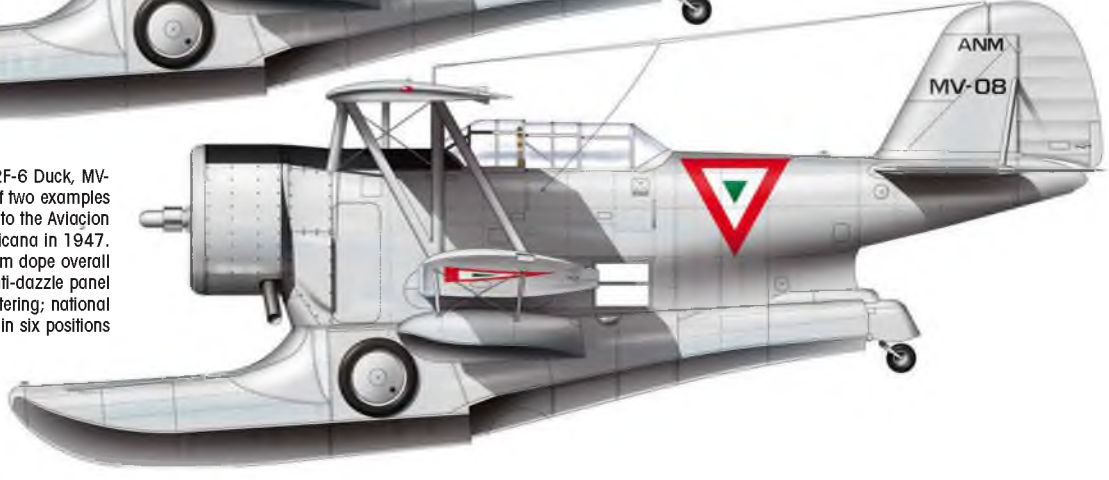


Flying Scale Models
Original Artwork by Richard J. Caruana
© FSM 2017

Grumman J2F-6 Duck, 2- 0-7, of Escudrilla de Observacion, Escuadra Aeronaval No. 2, Argentine Navy, Puerto Belgrano. Aluminium doped overall with black anti-dazzle panel and lettering; light blue/white fin/rudder and topmof fin with yellow 'sun' on white sector. Blue (outer) and moveable areas of elevators; black anchors in four wing positions. '7' repeated, in black, centred above top wing.

1:72 Scale
0 METRES 1 2
0 FEET 3 6

Grumman J2F-6(Columbiabuilt), 0256/2-0-28, Escudrilla de Observacion, Escuadra Aeronaval No. 2, Comandante Espora base, 1957. Aluminium doped overall with black anti-dazzle panel and lettering; Chrome Yellow top wing upper surfaces with black anchors in four wing positions; '28' at centre above top wing. Light blue/white tail and elevator markings; Argentine Navy roundels on fuselage sides only



Grumman J2F-6 Duck, MV-08, one of two examples delivered to the Aviacion Naval Mexicana in 1947. Aluminium dope overall with black anti-dazzle panel and lettering; national markings in six positions

Grumman J2F-6 Duck

A retrospective appreciation, from 2009, of John Scrivener's successful electric powered scale beauty. With photos by Walter Margreiter

As a subject for scale modeling, the Grumman Duck is definitely one for the brave, of that there can be no doubt. Equally certain, is that for some of us, a particular aircraft gets a grip on you and you can't let it go!

John Scrivener just loved the Grumman J2F Duck and over the years he built three models of it, the first of which he brought over from his home in Austria back in the mid-1980s to fly at one of the Old Warden Scale Weekends. If memory serves correctly, that first one made considerable use of lithoplate in the hull

Start of the take off run! The nose is up and the float is getting up onto the step. Reliable off water operation is an achievemant in itself!

construction. John reckoned the one shown here is the best of them and, with the advancement of years it's the last.

It took five years to build and John's master building is evident in the photos of the machine, both in the water and in the air. What does he say about its handling? Well, she flew slowly, a bit heavy and needed to be flown all the time - it could not be trimmed to fly hands off. All that rigging, the integral float and retracting undercarriage made it not the most aerodynamic layout! It rolled like a waddling duck (rather appropriately) and during landing approach, needed to be flown right down onto the water.

In all, not an easy plane to fly, but with three model Ducks under his belt, John certainly learned more than anyone else about the type's foibles and peculiarities!

The model

A complete own design, based on Paul Matt's scale drawings, John's Duck is just under 1/4 scale (1: 4.7), which gives it a span of 2.53 metres (78"), a length of 2.21 metres and an all up weight of 18.6Kg (41lb.). So what powers this EP aquatic monster? John is based in Austria and chose a Rolf Strecker 5KW LRK 680.45 outrunner motor, through a Kontronik Power Jazz 63v 120Ah esc, powered by 4 x 5S2P 5000mAh Emcotec Longgo Light Lipo cells (2 x 10 x 10000mAh). The propeller is a Mejzlik 22" x 12" carbon three-blader. This combination gives a static thrust of 12.6Kg (27.7lb.).

The full-size

The original Duck which was the subject of this scale project was based at Chino, California, under the auspices of the Friedkin Family Warbirds Collection, flown by Steve Hinton and John Maloney. The restoration was completed March 2002. ■

1: Majestic! John's Duck powers by on a slow pass - it's not a fast machine and has to be flown all the way - but what a rewarding project! 2: John introduces the Duck to water, prior to the first flight. 3: A couple of circuits to feel her out and trim her as best he could, John brings the Duck past for a photo opportunity, showing her copius undersides and detailing. 4: Splashdown! She has to be flown down onto the water, but it's a textbook landing - time to celebrate!

SPECIFICATION

SCALE: 1:4.7
SPAN: 2.53m
LENGTH: 2.21m
ENGINE: ELECTRIC LRK 680.45
CONTROLLER: KONTRONIK POWER JAZZ 63 VOLT 120 Ah
BATTERIES: 4 x 5 LIPO EMCOTEC LONGGO LIGHT 552P 5000 (2 x 10 CELLS WITH 10 Ah CAPACITY)
PROP: MEJZLIK 3-BLAT 22 x 12 R
THRUST: 12.60KG
ALL UP WEIGHT: 18,60 KG

SCRATCH-BUILT DUMMY RAD

Bernard Seale reveals his construction techniques to replicate a dummy radial engine with

Stage 5

The next stage is to replicate the valve stems and springs. On my first Gamecock I managed to find enough springs (36) of the right size and held them in place with small screws, threaded into the top of the cylinders. I could not find anywhere near enough for the second Gamecock, so I resorted to using short lengths of M6 studding **(Photo 11)**. These were a pain to cut and clean up, but after drilling and tapping four holes in each of the cylinder heads and epoxying them into place, they do actually look quite convincing, especially after painting with gloss black. With the thread showing through the paint, they look just like oily springs **(Photo 12)**. In fact, I prefer this solution - it looks much tidier.

Now for the rocker arms. The first time round I used flattened brass tube, but I was not over-impressed with the results, so on the second model I used 20-gauge aluminium sheet. The exhaust rocker arm is started by folding a strip of aluminium back on itself, marking the shape required, marking the centre of, and drilling the 12BA clearance hole for the pivot screw. It can then be cut/filed to shape **(Fig 6)**. The inlet rocker arm has to fit inside the exhaust one, so a spacer needs to be made up, equal to 2 x 20 gauge in thickness. How it is used is shown in **Fig 7**.

The nose (front) end of the folded exhaust arm has to be held in a vice, the arms opened out and then flattened back along the sides of the spacer, as shown in the diagram. Then, a centre-punch or small drill is used to make an indentation in the underside of the nose section, in which to locate the pushrod. Finally, the arms are opened out behind the 12BA clearance hole to a position where the ends will rest on the front pair of valve springs **(Fig 8)**. The inlet rocker arms are, in some ways, harder and in other ways easier to make. They are started in the same way, i.e.: by folding a strip of 20g aluminium back on itself and then cutting/filing to shape and drilling the 12BA clearance hole for the pivot screw. The shape is rather more complicated **(Fig 9)** but the opening of the arms is much simpler this time. Once again, a centre-punch or small drill is used to make an indentation in the underside of the nose section, in which to locate the pushrod **(Fig 10)**. Also, the rear end of the underside semi-circle needs to be filed to a point, so that it can fit in behind the exhaust rocker arm (also shown in **Fig. 10**).

Stage 6

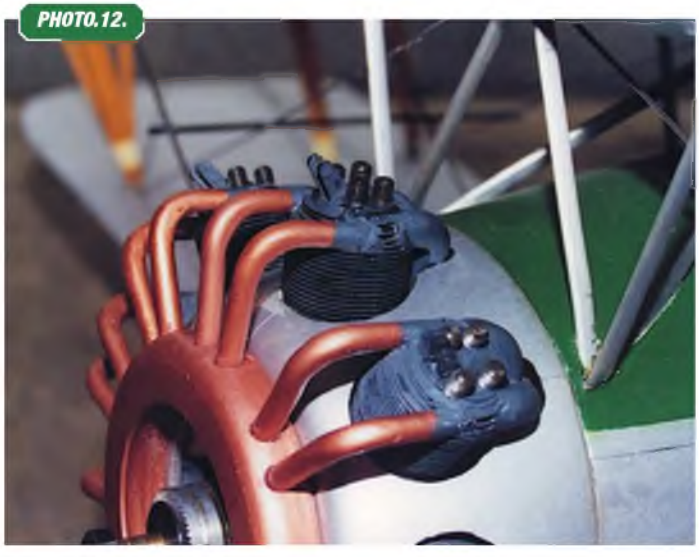
And now the whole lot has to be fitted together. Once the M6 valve 'springs' have been epoxied in place on the cylinder heads, the pairs of rocker arms can be put together and held in position through the rocker arm pivot with 12BA (or similar) screws and nut (see **Photo 13**). Here, you have to be careful not to break one side of the pivots off.

Next, a couple of holes have to be drilled in front of each cylinder position in the cowling to take the pushrods. In reality, there should be three, because a decompressor was also used, but at this scale it was impossible to fit that in, in addition to the exhaust and inlet valves; perhaps when I build a 1/4 scale version?

The exhaust collector, painted in a

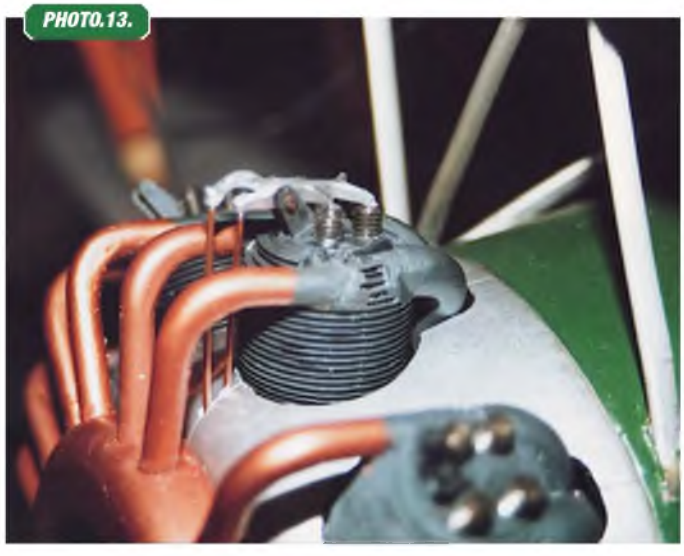
PHOTO.11

PHOTO.12.



Valve springs in place - pretty convincing, eh!

PHOTO.13.



The rocker/pushrod assembly.

Part 2

IAL ENGINES

exposed cylinder heads using his 1/6th scale scratchbuilt Bristol Jupiter VI radial as an example

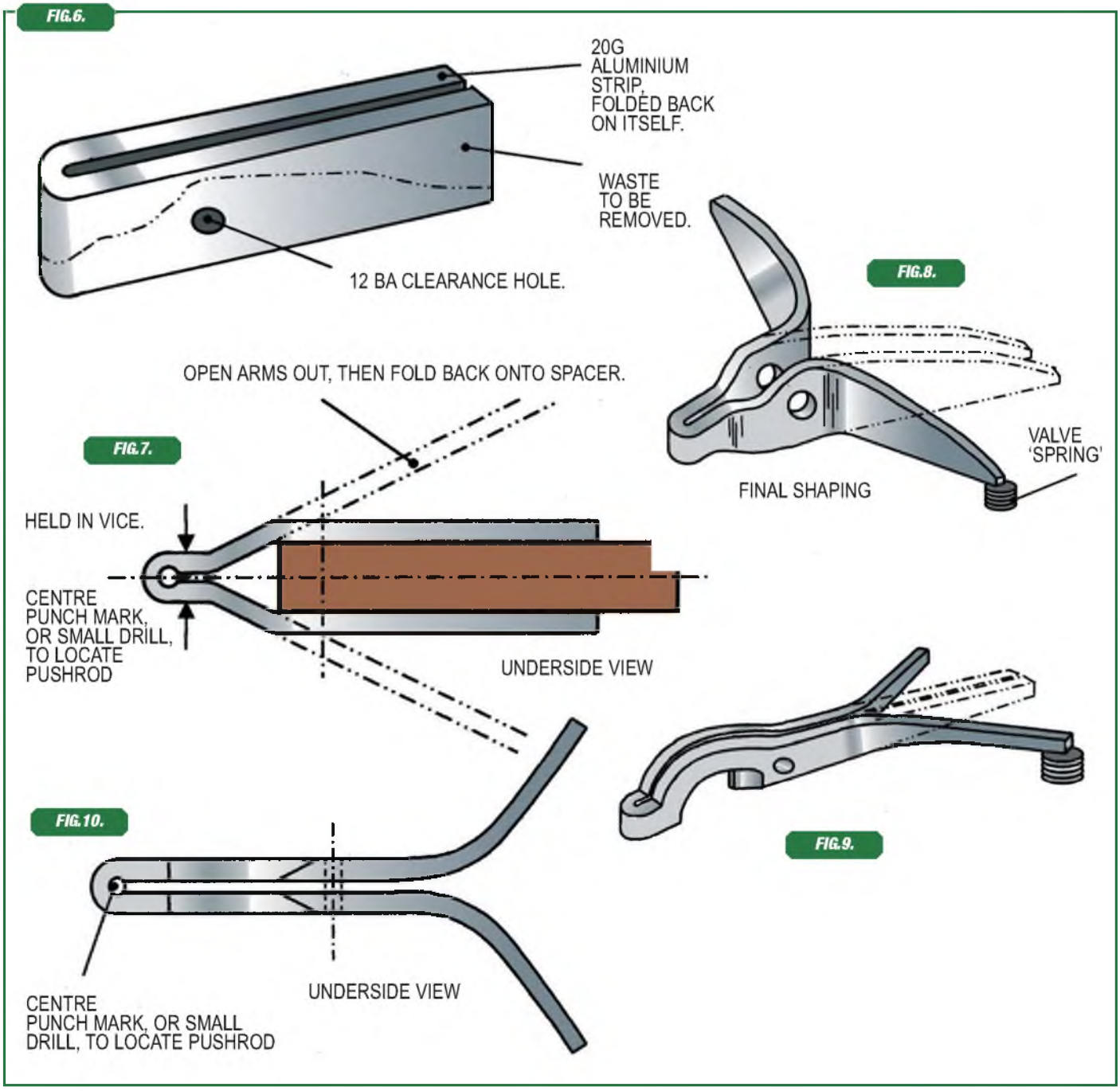
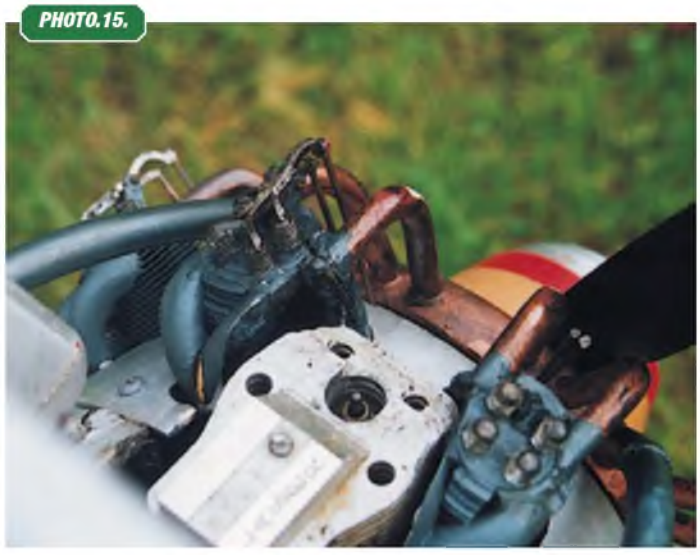


PHOTO.14.

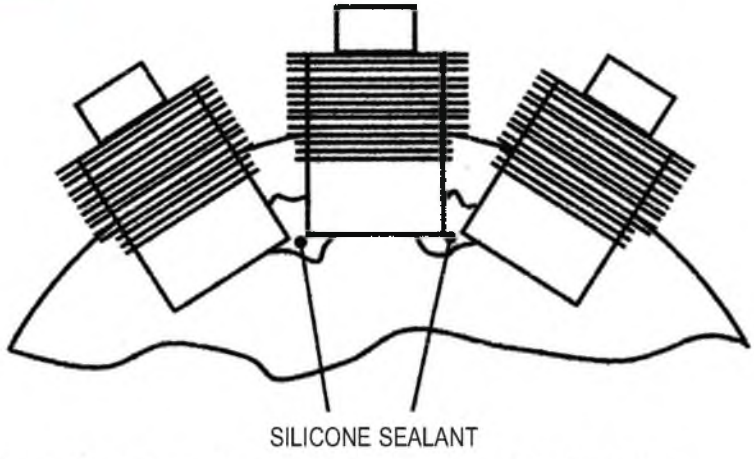
View inside of cowl from the rear showing how cylinders are held with silicone sealant.

PHOTO.15.



The 'valve springs' from M6 studding.

FIG.11.



SCHEMATIC FRONT ELEVATION OF TOP THREE CYLINDERS IN COWL

FIG.12.

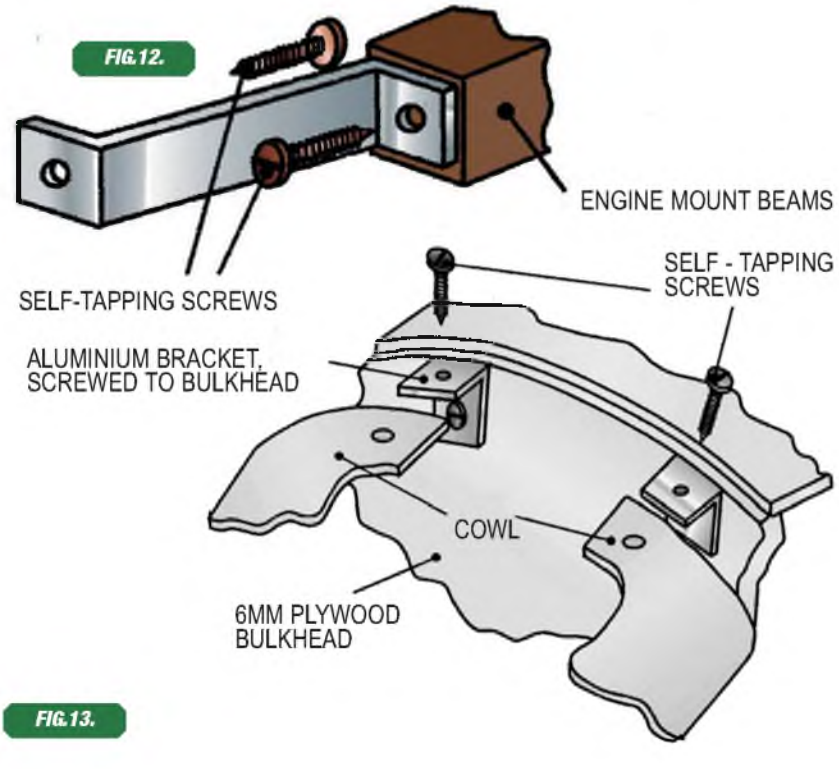


FIG.13.

copper colour, is fitted to the front face of the cowling by screwing through from the inside face of the cowl. Then the cylinders, ready-painted in gunmetal colour, with their attached exhaust and inlet pipes, also ready-painted (exhaust tubes also in copper) are placed into the holes in the cowling, and the exhaust pipes cyanoed or epoxied into the collector ring. When pushed into place, the bottoms of the cylinders virtually touch each other (see **Fig 11**).

When all nine cylinders are in position, the bottoms of the cylinders are joined together with silicone sealant, available from most good DIY stores (see **Photo 14**). Although this is rather heavy, its weight is useful on a short-nosed aircraft like the Gamecock. Also, the hollow cylinders make a useful storage space for lead ballast, should it be needed (it was on my Gamecocks), once again held in place with silicone sealant.

The whole assembly can now be offered up to the front of the fuselage for final fitting. On my Gamecocks, this entailed cutting away some of the lower two cylinders in order to fit them around the cylinder head of the Laser four stroke (see **Photo 15**). A Dremel type drill and burrs does this. The cowl is pulled back into place by screwing through a pair of metal brackets (**Fig 12)**, preferably steel strip - aluminium tends to fracture at the corners with vibration - guess how I found this out) into the front end of the engine bearers (glass-filled nylon mount) and into the inside of the cowling and exhaust collector ring, with self-tapping screws. On the underside, the edges of the cowl are fixed with self-tapping screws and brackets (see **Fig 13**).

Stage 7

Now we come to the pair of exhaust pipes that run under the lower wing. These are shown, finished, in **Photo 18**. Note that the starboard one has an extension pipe, routed back into the side of the fuselage to provide a rudimentary form of cockpit heating. This is shaped and epoxied to the main pipe.

Before we get to that though, the correct shape of the main pipes will need

PHOTO.16

Components of jig used for forming the exhaust pipes.

PHOTO.17

Jig used for forming the exhaust pipes

PHOTO.18

The finished exhaust pipes.

PHOTO.19

The completed exhaust pipes installed on the model. Note the saw cuts as refered to in the text.

to be worked out from the drawings, and then a suitable jig made up - I used a sandwich of ply (**Photo 16)**, the centre part being the same thickness as the diameter of the plastic tubing being used; the outer parts were of 4mm ply **(Photo 17)** - in order to produce a matching pair.

After softening the plastic tubing with a heat gun and pressing it into the jig, you should get a result as shown in **Photo 18**. The rear end of the pipe then needs to be heated and pinched together with a pair of combination pliers. A series of saw cuts then needs to be made in the underside part of the tubes to the exhaust exit slots (see **Photo 19**). Before being painted and epoxied into the collector ring, a couple of details can be added to the pipes, i.e., a ring of plastic tube slid over the pipe to mark the joint between the main pipe and the manifold, where the colour changes from copper to gunmetal, and also the flange joint, made of thick paper, where the top of the pipe joins the collector ring (see **Photo 20**).

After being painted and epoxied into the collector ring, the main pipes are then fixed to the underside of the lower wing with thin aluminium brackets, folded around the pipe and screwed, using self-tapping screws, into the underside of the wing, at the main spar position (see **Photo 21**). A hard-point of ply has to be fitted before covering the wing - but you had planned that, hadn't you?

Well, I hope this article has shown you that it is not impossible to produce quite a reasonable looking exposed radial engine. I am sure that many of the techniques shown here could be applied to other types. And my next project? At the moment I'm working on a 1:6 scale Fiat CR 42 where the scale radial will be hidden reasonably well inside the cowling. However, I quite fancy an Armstrong Whitworth Siskin III. The only trouble is - it's powered by a 14 cylinder, two row, Jaguar Mk IV radial, which just happens to be exposed - Aghh!!! ■

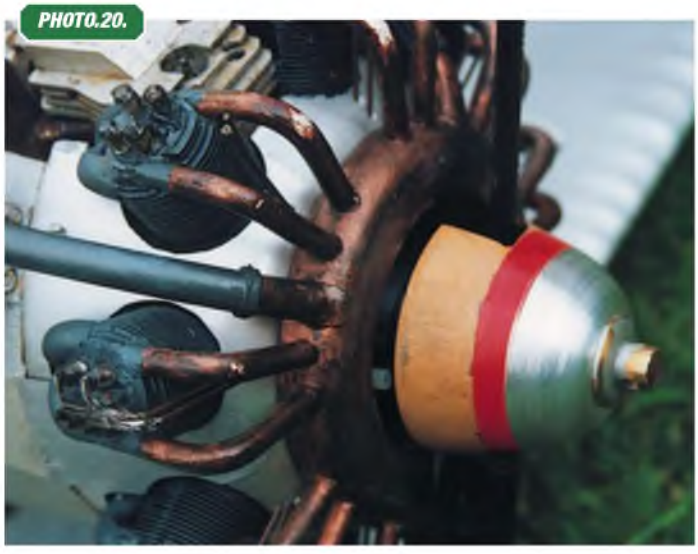


PHOTO.20.

EDummy Biristol Jupiter engine installed on the austor's Gloster Gamecock, showing final details.

PHOTO.21.

Method employed to fix exhaust pipes to underside of lower wing.

On Silent Wings by Chris Williams

SCALE SOARING

As has become traditional in recent years, the Ghost Squadron's event at Middle Wallop marked the last of the major events of the 2016 season. An iffy forecast (how unusual!) seemed to favour the first day of this two day event so, my compatriots, Motley and Smallpiece, we duly rolled up on the Saturday, determined to make hay whilst the sun shone.

There was much to see and admire, none more so that the Scheibe SF-27 of Noel Rumers, who had travelled all the way from his native Belgium. We had had marvelled at the build of this masterpiece on the SSUK forum over the previous winter

Scene that Ghost Squadron's last event of the season at Middle Wallop.

Terry Holland's new Goppingen Wolf on its maiden flight.

months, and as more and more masterful engineering went into the airframe, I offered the opinion that it might be too heavy to fly! Noel, retired now, was an engineering teacher at a college, and often had his students make up articles that could be described as having an aeronautical use. The model has an electric Up-and-Go pylon plus a tow release, and many of the scale components, such as the elevator trim tab work as per the full size. As it turned out, the model wasn't too heavy at all, and Noel put in many fine flights during the course of the day, and is to be congratulated on his impressive achievement.

Some time ago, quite some time in fact, Smallpiece had started to build a Skylark 4 from my old *Traplet* plan. He is one of those people who like to tinker, and will never leave a plan unchanged if he can possibly complicate it a more. (This is directly opposite to myself, who tries his damnest to make things as simple as possible). In the fullness of time his tank of enthusiasm became dry, so the unfinished airframe was passed on to someone else, and I presumed would be lost to history.

Amongst the many gliders parked up on the day, I noticed a very pretty Skylark 4, painted in a fetching red livery, with a white stripe along the fuselage. This had been brought along by one Graham Foster, and stap-me, it turned out to be the very airframe that Smallpiece had started, way back during the reign of Queen Victoria. This model, too, went on to make many flights during the day after the initial successful maiden flight, and for many days afterwards I had to fight the urge to build another one!

Every now and again we get to see a twin tow: that is to say, two gliders towed up simultaneously behind one tug. This is an occasional full-size practice, too, and the idea is to have one line slightly shorter than the other to give lateral separation, and for the glider pilots to keep as far apart as possible during the tow. Some time ago Peter Balcombe built a 1/4 scale Olympia 2b from the Cliff Charlesworth plan, finished in the livery of a recently restored full-size version, here in the UK. Last year, Cliff Evans persuaded him to build another one, finished in the self-same livery. So, here they were, both

Noel Rumers with his scratch built 3rd scale Scheibe SF27.

The SF27 in action with the up-and-go extended.

Graham Foster's Skylark 4 on its maiden flight.

models present at the same event, and the idea was born to attempt a double-two with the pair of them.

Unaware of this cunning plan, I had to move fast to get the camera switched on and get into position for a decent shot, once I saw them line up on the runway. I was expecting a bit of excitement, but in the event the whole thing was a bit of an anticlimax, with both models gaining a respectable height before releasing.

A few years ago, Smallpiece and I were both flying Minimoas from aerotow at our home patch and, despite them having entirely different colour schemes, I still managed to start flying the wrong one. Hats off to Peter and Cliff then for pulling the thing off.

Every year, Terry Holland brings along the fruits of his winter endeavours to one or other of the Middle Wallop events. He had left it a bit late this time around but, true to form, he had brought along a very nice version of the Goppingen Wolf. Just before WW2 in the mid -thirties, the Wolf was produced to compete with the - then - very successful Grunau Baby. Its most noticeable feature is the large, lobate ailerons, which give it a very distinctive appearance. It's worthy of note that the prototype was sold to a buyer in the UK, and subsequently toured with the Alan Cobham Flying Circus.

Not being a flier himself, Terry entrusted the maiden flight to event Head Honcho, John Greenfield, and the model was duly pronounced fit for purpose. I must now confess to a lack of bravery: having seen the forecast for the next day, replete with strong winds and a side order of heavy rain, I decided to give the Sunday a miss, although it apparently turned out to be less bad than expected.

That was it for 2016, then, and we could look back on a season with much to be grateful for in terms of weather clemency. Thanks, as ever must go to the hard-working tug pilots and the guys and gals of the Ghost Squadron.

Here's to an equally good time in 2017...

IN THE WORKSHOP

Last time around we saw the Zugvogel in its bare bones, waiting for the covering and painting process to begin. These days, I try to keep my models under the 7kg threshold to make self-launching just

The Zug on a White Sheet fly-by .

that little bit easier, and one way to achieve this is to use iron-on film for the flying surfaces.

The yellow film duly arrived, and I checked it with the yellow paint I had in stock and declared it close enough. Alas, once the model was painted and rigged, it turned out not to be close enough at all, and the painful conclusion was that it would have to be painted again. There was no way to tint the colour at home with the limited stocks I had, so I sent a sample of the film off to a paint factor up North to be scanned with a spectrometer and, within days, a litre tin of the stuff turned up, and proved to be spot on.

Pretty soon it was time to be contemplating the maiden flight, and my trusty pals and I turned up at White Sheet Hill one morning, only to find it socked in, with visibility down to about a hundred yards. It has always been my practice to attempt a hand launch on the flat, just in case things were drastically awry and so that there wouldn't be far for the model to fall! I reckoned one hundred yards was good enough for this task, but once Motley had launched her and she seemed to floating along just fine, I utilised the advantage of the E-assist; fired up the motor and performed a tight three-sixty, before landing again. I pronounced my self well satisfied, and a few days later had the chance to check her out properly on the slope with an unlimited visibility.

To my eyes, this is quite a pretty glider, and with the ability conferred by the E-assist to fly in a much wider range of conditions, I look forward to many more sessions.

ADDENDUM

Subsequent to the previous paragraphs, a third opportunity to fly arrived; only this time, when I went to connect up the batteries, there was a mighty flash and a strong smell of smoke. Judging that the ESC had gone off to meet its maker, it was irony indeed that I spent the rest of the day flying the Zugvogel as a pure glider, of which, of course, it was quite capable.

A few days later I fitted a new ESC, and it was then that I noticed a horrendous rent down the side of the much-painted fuselage. Luckily, I have a plan for such situations - a plan that I may have shared with you in the past. During the painting process of any model, I always take the precaution of also painting a sheet of sticky-backed vinyl, still known by the brand name Fablon. Carefully removing the wrecked decals with the aid of a hair dryer, a suitably-sized piece of the material was first stuck to the lower part of the rent, and then pulled tight and stuck to the upper half, giving a more or less instant and quite acceptable repair. Here the rapidity of the repair came to a shuddering halt, as it took me three days to remember where I had stored the spare decals! This was a week or more ago at the time of writing, and I still haven't plucked up the courage to test the new ESC...

Should have gone to Specsavers? Twin Oly 2b's on tow, sporting identical livery.

SWANSONG FOR 2016

Looking back at 2016 I discovered that I have designed and built three scale gliders in that time, and I am well into the fourth. This time around it's a French sailplane, with a wing shape that will remind those of you as long in the tooth as I am of the old Mercury Swan free flight glider of my youth, and the one which must have sparked off my interest in gliding when I was ten years old. More of that next time around... ■

Terry Holland with his latest creation, the Goppingen Wolf.

Our Columnist Chris, prior to the maiden flight, shrouded in mist.

Not good .... a nasty tear in the Solartex

Self-launching the Zugvogel at White Sheet Hill.

Brakes out, ready to land: no propeller.

Done & dusted: not perfect, but perfectly acceptable.

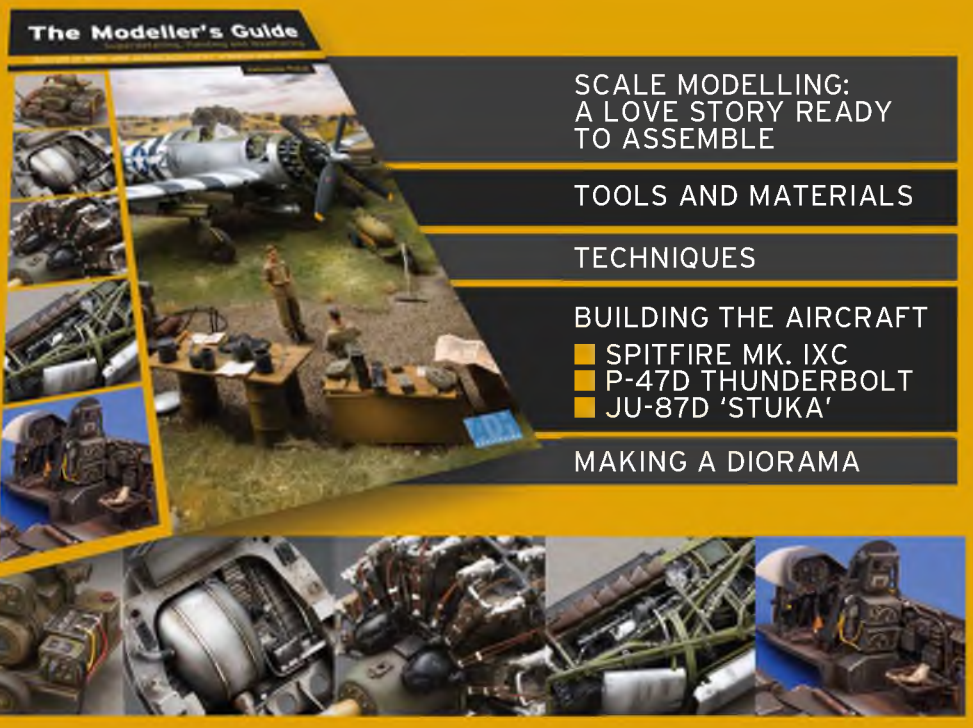
Classifieds

NEW FROM DOOLITTLE MEDIA

The Modeller's Guide

Superdetailing, Painting and Weathering

Aircraft of WWII, with airfield accessories, ordnance and diorama



SCALE MODELLING:
A LOVE STORY READY TO ASSEMBLE

TOOLS AND MATERIALS

TECHNIQUES

BUILDING THE AIRCRAFT
- SPITFIRE MK. IXC
- P-47D THUNDERBOLT
- JU-87D 'STUKA'

MAKING A DIORAMA

Aleksandar Pocuc

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