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FORMATION...

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10

16

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ON THE COVER

In it's day, the Luscome Silvaire was aptly regarded as the top of the range among the private light aircraft that US aircraft manufactures offered in the immediate post-WW2 period in lieu of military contacts which came to an end. Keith Pryah's 37% scale 156" span replica weighs in at 40.7 lbs and is Zenoah 62 powered. It's a truly Master Model reviews in this issue.
(Photo: Alex Whittaker)

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CONTACT

In last month's issue we alluded to the aviation restoration achievements of the team at the *AeroAntiques* group headed by Mr Ron Souch. Our first ever contact with *'A.A'* came about back at the end of 2011 when we reviewed the full size Westland Widgeon that the Team were in the process of restoring to flying condition.

The *AeroAntiques* workshop turned out to be a treasure trove of restoration projects, some of which were mentioned last month.

One of the projects then very close to completion, was one to which we were, at the time, sworn to secrecy, so that our cameras had to be trained elsewhere - but what a project!

AeroAntiques' Ron Souch and test pilot Dan Griffith confer before flight.

Shipped to USA, for owner Richard Seeley, we now know that this **Travel Air Type R 'Mystery Ship'** reproduction has flown. Built using drawings commercially available and with recourse to another example held in UK as a reference source, the project took close to 5 years to complete.

The Travel Air Type R 'Mystery Ships' were a series of wire-braced, low-wing racing aircraft built by the American Travel Air Company in the late 1920s and early 1930s. They were so called, because the first three aircraft of the series (R614K, R613K, B11D) were built entirely in secrecy.

The environment in air racing at

the time was one of give-and- take with the military. A civilian designer would take an existing aircraft design, modify it for greater speed and enter it in the race. Since the military already had access to the fastest and most advanced aircraft available, it was simply a matter of upping the horsepower on whatever aircraft they were using and the problem was solved.

This led to the military completely dominating the air-racing scene. In an effort to combat this, two Travel Air designers; Herb Rawdon and Walter Burnham undertook to prove that a civilian aircraft built from scratch and designed exclusively for racing (as opposed to combat or passenger/mail service) could out-fly the military.

They were successful and in September 1929, the first 'Mystery Ship' was entered in the prestigious closed course Thompson Cup Race. Pilot Doug Davis won at a speed of 194.9 mph beating the military entries, even after the need to re-circle one of the course pylons. This was the first time in the history of air racing that a civilian racer had outperformed a military aircraft.

The Model R series set numerous speed records for both pylon racing and cross country flying, and were the most advanced aircraft of the day, by far outpacing anything that even the military could field. In total, five examples of the Type R were built and flown by some of the most notable flyers of the day.

By any standard, the Travel Air 'Mystery Ship' is a truly elegant aeroplane and a worthy subject for scale modelling - anyone out there like to try?

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152GX

Displacement	152.0.cc (9.3cu.in)
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Mounting dim.	234x288x118mm

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Displacement	116.0cc (7.2cu.in)
Engine weight only	3090g (109.07oz)
Mounting dim.	283x278x120mm

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BUZZ ABOUT A BUZZARD

One of the more obscure British aircraft that that has been a nagging thought in the FSM editor's mind is the Luton Buzzard ... well surely a few of you out there have heard of it?

We would like to present this unusual 1930s light aircraft as a *'Subject for Scale'*, but there seem to be a dearth of worthwhile pictures to be found. Can anyone out there point us in the right direction ...PLEASE?

NEW REFERENCE BOOK FOR THE HAWKER SEA FURY

This detailed guide to The Fleet Air Arm's Last Piston-engine Fighter Is the latest work by Richard A. Franks and is a new title in the **Airframe Album** series following on from earlier titles on The Hawker Typhoon and Hawker Tempest from which the Sea Fury draws it lineage. The new work provides scale modellers with detail information drawn from flight manuals and spare parts catalogues and also provides Walkaround images of preserved examples

These include pictures before and during restoration of the restored TFC and airworthy FAA examples. Also to be found here are fully detailed 3D isometric views of prototype and production machines by Jacek Jackiewicz plus colour profiles and concise camouflage detail by Richard Caruana.

This 100-page information source for scale modelers costs £15.95 and may be ordered as Airframe Album No.2 from ADH Publishing.

DUMAS RUBBER POWER KITS FROM J. PERKINS

J.Perkins Distribution is now offering the long-established range of Dumas free flight scale kits for rubber power. The range and choice of subject is wide indeed - anything from a Fokker E.III Eindekker to a model of the Supermarine S6B Schneider Trophy winner, with examples like the Beech Staggerwing biplane and Piper J4-E Cub Coupe in between.

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Luscombe SILVAIRE

Alex Whittaker admires Keith Pyrah's immaculate scratch-built high-winger

Modellers of my generation acquired most of their aviation education from building balsa kits. We first learned to love the appealing Luscombe Silvaire from the famous *Keil Kraft* Flying Scale Series kit (free flight power). It was as familiar to us as a Piper Cub or a Cessna 180. In fact, the full size was an aspirational product of the American Post-WW2 boom. Here was a private aircraft, presented and marketed in the fashion of a luxury automobile, with all the gracious lines and touches of luxury that would appeal to the fastidious buyer. It embodied the dream of popular flying, but carefully upgraded that concept to a luxury item.

Looks De Luxe

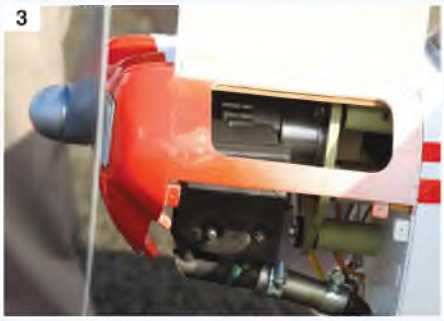
The Luscombe Model 8E Silvaire Deluxe dates from June 1946, and grew out of the earlier Model 8. Around 50 of the original Silvaires were built, before the Company fell into difficulties. Over the intervening years there have been many attempts to revive the marque, but all have failed. The last attempt to do so was in the USA in 2006. Thatfeasibility study concluded that the vintage Silvaire's two-seater design was now too small to "accommodate average sized persons".

From this it could be concluded that average Americans have super-sized somewhat since the late 1940s. By the way, it is a little known fact of aviation trivia that James May (of BBC TV's *Top Gear*) once owned a Luscombe 8A.

The model

We have dealt with the combined skills and artistry of Keith Pyrah and Doug Jeffrey before, when we looked at their amazing Piper Cherokee Archer. This time they have worked their magic on the beloved Luscombe Silvaire. Their modus

At this size, scale models "sit" correctly in the air.



1: The Luscombe Silvaire has a fully fitted office! 2: All scale hatches, apertures, and doors are fully functional. The aluminium door handle even has a brass barrel for the key. 3: Neat engine installation for the Zenoah 62cc petrol engine. 4: Scale exhaust outlets for the petrol engine. 5: Crisp rendition of the fully functional scale-access cowl. Superb panel, rivet, and fastener detail. 6: The best remembered part of the Silvaire is its friendly, curvy, engine cowling.

operandi seems to be that Keith devises the plan and prosecutes the structural design, followed by the bulk of the building. Doug specialises in their superb paint jobs and, most significantly, Doug is their test pilot. Naturally, test flying such a work of art can only be entrusted to the very best.

Documentation

The Luscombe Silvaire is affectionately regarded by both classic aircraft buffs and scale modellers alike, so Keith was able to assemble a hoard of detailed photographs of the full size example. Most significantly he was able to measure and photograph a British example.

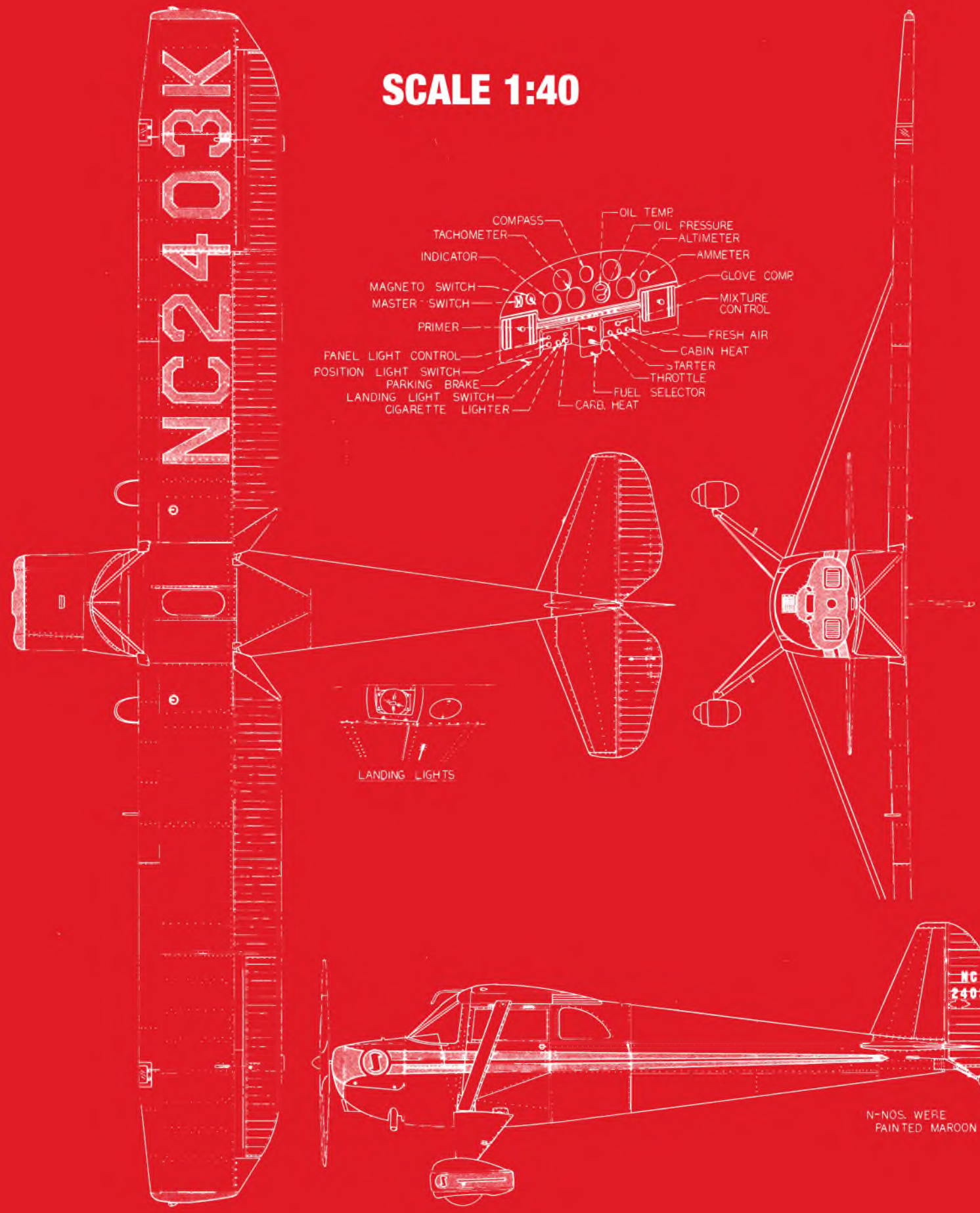
Construction

Conventional construction was employed, with aircraft grade ply for the formers. These were then planked with 1/8" balsa. Stailess steel rods of 3mm diameter were incorporated into two of the main formers which were extended and epoxied over the main wing spar boxes. Quarter-inch aircraft-grade ply formers in the lower fuselage section provide hard points to which the main undercarriage hinge points and suspension springs are mounted. Also incorporated are the anchor points for the functional struts.

Wings

Main spars are a box shape from 1/16" ply sides with a 1/4" spruce top and bottom. Incorporated into the spars is a metal plate, which overlaps in a box spar across the cabin area, and is bolted together when the wings are assembled at the flying site.

The Luscombe is a handsome and practical flying scale model.



Anchor points for the functional struts are built into the wings.

Ribs were cut from 1/8" Poplar plywood and slid onto the box spars, which, in turn, were set up on the building board with the required scale washout. Special hinge points were incorporated where applicable, to provide correct hinging for the frise ailerons. The whole is sheeted with 1/16" balsa and glassed with 1/2 oz /square yard glass cloth. Ailerons were then separated and finished.

The scale corrugations are produced with strips of triangular ABS section from the model shop, fixed with thin cyano.

Tail

Horizontal stabiliser and fin are constructed in the same manner as the wings with 8mm carbon fibre rod for spars and incorporate a closed loop operating system.

Engine cowl

There is something friendly about the characteristic Luscombe's engine cowl. Keith was careful to get this key scale

7: The corrugations on the control surface have been faithfully reproduced. 8: This over wing shot gives some idea of the sheer accuracy of the model. 9: The Luscombe has scale control horns and cable runs. 10: Keith and Doug have put an amazing effort into surface finish. 11: Elegant fin and rudder treatment, with retrained, but effective, flashes of colour. 12: Trademark Silvaire spats faithfully reproduced, complete with Silvaire logo. 13: Working lights, upgraded in power since this photo.

detail exactly right. The cowl front is carved from balsa and the top shaped with formers, and then planked.

A mould for the lower cowl was produced from a foam carving with glass cloth laid up on it to produce the mould. The glass fibre lower cowl was laid up in the mould. The hinged side engine cowlings are made from aircraft grade 1/32" ply heated and curved to the required form. These also provide some access to the engine and the fixings for the upper cowl to the fuselage.

Windscreen

A foam carving was made of the windscreen shape, and a mould produced. From this, a plaster cast was made and sent to Sarik VacForm to vacuum-form the windscreen blank.

Seating and pilot

Seating and trim details, together with the pilot figure, was carved from blue foam and painted with vinyl emulsion and acrylic paints.

Engine

Zenoah 62 petrol engine with standard Zenoah exhaust.

Prop

Menz 24"/8" with tips squared off to 23"diameter. Keith makes a very important point about propping for scale:

"Doug and I tend to slightly over-prop our models, which considerably reduces noise levels when flying".

Main undercarriage

The working scale undercarriage is hinged and sprung with coil springs as the full size.

Covering

1/2 oz/square yard glass cloth on all surfaces.

Painting

Two pack epoxy primer with two-pack epoxy finishing coat. The model was expertly sprayed by Keith's long-time collaborator, Doug Jeffery. The finish is truly exquisite. She looks like she left the factory a few weeks ago.

Legending / Decals

Spray masks and decals where required were produced by a commercial supplier to whom copies of the original graphics were provided.

Panel lines

After a priming coat was applied, panel lines were built up against 0.3mm tape with a mixture of two-pack filler primer thickened with microballoons.

Rivets

Rivet detail was marked out as per the full size, and applied using a 5cc glass hypodermic and PVA glue.

Opening windows

Opening windows with scale catches and hinges were produced from brass sheet.

Lighting

Both navigational and landing lights employ superbright LEDs. Over this winter it is intended to upgrade to a newer much brighter LED with improved daylight visibility.

Flying notes

Here are Keith's flying observations whilst attending a full-size Luscombe Rally:

" We were invited to take the model to Oaksea Park, where The European Luscombe Society hold an annual fly-in for their full size aircraft. We came away with the award of the best Luscombe of the weekend, voted by the full size pilots!

Doug and I both twiddled the stick of the full size aircraft which our model is based upon. Nigel Barret, Chairman of European Luscombes, gave us an insight into the flight characteristics of the full size. The model exhibits practically identical characteristics. Power management is important and turns need to be initiated with rudder just before ailerons to negate any adverse yaw. Ailerons are quite slow (just like the full size) which is surprising considering the size and position relative to the centreline of the aircraft.

Most flying is carried out on around 1/3 power to maintain scale appearance and very graceful stall turns. Wingovers etcetera are easily achieved with good power management. Power-off glide is impressive and judgement is needed not to overshoot the threshold on landing. The full size has a reputation for ground looping, but this tendency does not apply at all to the model. (Perhaps uneven braking is more the cause)

With around 100 flights under her belt she remains a beauty to look at and to fly". ■

14: Even the functional hinges are greased. 15: Keith moulded his own blank, from which the windscreen was professionally moulded. 16: Even the filler cap is accurately modelled. 17: The rather tasteful Luscombe badge.

Model Specification: Luscombe Sylvaire 8E

Scale:	37%
Wingspan:	156"
Weight:	40.7lbs
Engine:	Zenoah 62cc
Prop:	Menz 24/8 with tips squared off to 23"diameter

Walk up and get in!

Drifting by low overhead the Martin MO-1 poses an interestingly different shape in the air.

Mar

rtin MO-1

PART 1

A simple-to-build 60" span scale model designed by Peter Rake, with the prototype model built and described by Tim New

Before I hand over to Tim for the construction of this particular model, perhaps you might be interested in how it came about.

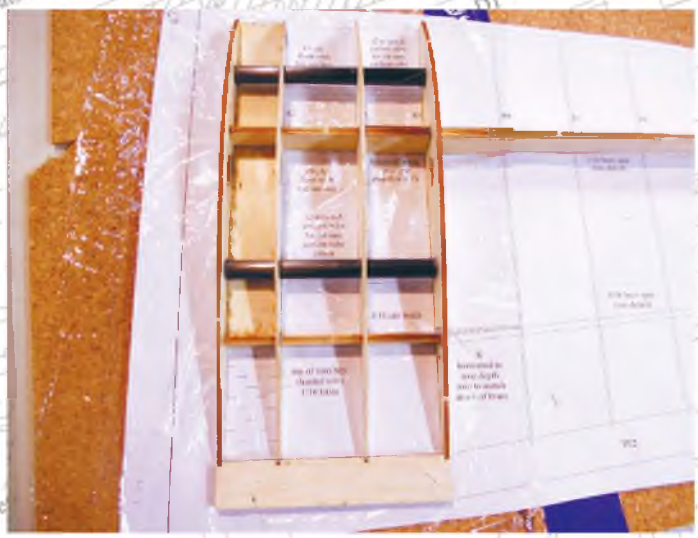
Years ago I spotted, on line, a rubber power plan for the Martin MO-1 and downloaded it to my computer - where the plan sat forgotten for some time. A few years ago I was asked for some more designs to suit the little GWS IPS motor units and, checking the size of the Martin's nose, it looked very promising. The fact that it also looked quick and easy to draw up clinched the deal and the plans were prepared. While drawing it, I'd really become rather fond of its ungainly charm and actually decided to build the model myself.

Once completed, and at the flying field, I was very pleased that I had. It looks as if it ought to be one of those models that chugs around the sky, but actually turned out to be far more nimble than I had expected. Even on just rudder, elevator and throttle controls it proved very stable, yet still capable of steeply banked, sweeping turns. If you set your mind to it, turns could actually put to shame those of some pylon racers. Sweep in low for the camera, hit rudder at the end of the run and yank on elevator and the little model would snap round on a wingtip.

Tim saw what I said about my model, built one of his own, terminated it and almost instantly began dropping heavy hints about a larger version, with ailerons. It took me a while to get around to drawing the plan, but once prepared, there was no preventing Tim volunteering for the prototype build.

Now I'm not suggesting you try those sort of tricks with this model, but at least you know that its sedate looks might just be hiding a fighter type performance. What you see here is the result of all Tim's pleading.

With that out of the way, I'll hand you over to Tim for all the details of this much larger model.



Begin the wings with the flat, parallel section. Note the carbon joiner tubes and ply plates for the retaining screws.

Lower the spar over the plan to build the main section of the wing, using the wedges and ply brace to join the rear spar.

The model

Peter's MO-1 is about 1/10th scale, resulting in a wingspan of 60 in. and a length of 45 in. It is designed as a four function model with ailerons, rudder, elevator and throttle. The wings are designed to be removable. The prototype model was built using laser cut parts. My model weighs 4 lb. 2 oz. and I'm running a 985Kv motor with an 11x7 propeller and a 60 amp ESC. It uses four servos - two minis for the elevator and rudder and two minis for the ailerons, one in each wing half. This set-up, with a 3S1p 3000 LiPo battery gives me over 250 watts and 27 amps at full throttle and provides plenty of power. I'm sure Pete will say it's too much power and he's probably right. *(Just over 60 watts/lb. sounds about right for less than perfect weather conditions; a little more and it may emulate my original model, but I don't guarantee the wings will stay on. PR)*

A few years earlier, I had built a smaller version of the MO-1 that was also designed by Pete and it was a very nice flyer. When it met its demise (through no fault of the design), I knew I wanted another one. But I wanted the next one to be bigger. Now thanks to Pete, I have one. Of course I can't help but want an even bigger one now... *(Be careful what you wish for Tim, that can easily be arranged. PR)*

The build

The MO-1 model is a traditional balsa and ply design. The laser cut parts are fairly simple. You don't need a short kit, but having said that, a short kit certainly speeds up the build. *(For those who require a kit of parts, the publisher will make a laser cut set of wood parts available to end of this article - PR).* In addition to the short kit, 12 mm and 10 mm carbon fibre (CF) tubes, balsa and basswood strip wood, balsa sheets, 10 and 14 swg piano wire, and 1/32 in. brass were required to complete the build. I used mostly CA glue with some 5-minute epoxy applied as needed.

(It would probably be cheaper to use wire in tube wing joiners, as opposed to the carbon tube, but I wanted something that wouldn't allow the wings to flex in the way wire joiners do. Besides, you'd have to make a whole new set of wing ribs with smaller holes. PR).

Wings

The flat bottom wing is a typical spar-and-rib construct. Since it is removable the wing is made up of two halves. Each half is comprised of 15 balsa or ply ribs, basswood spars, 12 mm carbon fibre tubes, balsa leading edge (LE) and trailing edge (TE), and ply wing tips. The plan shows both the left and right halves so there is little chance of making two rights or two lefts.

The wing sections are each 28.5 in. long. The spars are tapered on the underside. To get the shape right, the forward spar and

At 13" chord, these are not small wings. Lots of area to carry the model though, despite the taper.

Front fuselage sides joined, doublers fitted and the position of the score line marked before the real building starts.

THE HISTORY

The Martin MO-1 was a 'Golden Age' observation/spotter plane. In the early 1920s the United States Navy became interested in a thick airfoil section, cantilever wing. In response to the Bureau of Aeronautics specifications for an all-metal monoplane, the MO-1 was designed by the Glen L. Martin company's engineer George Madelung as a shoulder-wing, cantilever monoplane, with a slab-sided fuselage and a fixed tail-wheel landing gear. It had an all-metal structure with a fabric covering.

The initial six of a total of 36 were delivered to the USN in 1923. The MO-1 had a wingspan of 53 feet and a length of 37 feet 9 inches with a crew of 3 - pilot, navigator/observer and gunner. It was powered by a 375 hp Curtiss D-12 and had a maximum speed of 104.5 mph. Armament consisted of one flexible 0.30 cal gun in the rear cockpit. A historically important aeroplane, the MO-1 was the USN's first monoplane. In 1924 a MO-1 was fitted with float landing gear for evaluation and another was successfully launched from the forward turret of the USS Mississippi (BB-41) by use of a catapult. NACA Langley using a MO-1 performed one of the first in-flight, flow visualisation studies.

joiners are assembled over the plan. Once the spar is ready, then it can be put in place over the wing plan. R4 must be opened to allow it to slide over the spar/joiner combo. (It is drawn to allow a one-piece spar, only being opened up if a joined spar is used).

Because of the forward spar's taper, I first assembled the root wing section which includes the 12mm carbon fibre tubes, 1/8" ply plates and the TE piece. For added strength and piece of mind, I epoxied the carbon fibre tubes to the root ribs. When the root section is complete then the outer edge of the spar is lowered to the plan and the outer wing section is built. Since the rear spar is angled, it is built as two separate pieces on the plan and then joined together when the wing is finished. The trailing edge pieces are slotted which helps immensely with rib alignment. The 1/4" x 3/8" balsa leading edge is glued into place and shaped.

The aileron servos are attached to 1/32" ply plates so hardwood rails need to be glued between R11 and R12. Make sure the rails are offset 1/32" upward so the servo plates end up flush with the bottom of the wing. Before covering the wing, I installed pull strings for the aileron servos cables and extensions. Give it all a good going

The basic front fuselage section showing the substantial motor mount, radio/battery tray, joiner tubes and brass wing retaining straps.

over with a sanding block, cut the ailerons loose and the wing is done.

(Whilst there are several methods of attaching the aileron servos to the ply plates I wouldn't recommend servo tape. Some swear by it but I usually end up swearing at it. Hardwood blocks glued to the plate, and the servo screwed to them works well. A method Pat Lynch has used many times is to wrap the servo in masking tape and securely glue it to the plate. When you want to remove the servo, just cut through the masking tape and peel it back to release the servo. PR).

Tail

The rudder, elevator and horizontal and vertical stabilisers are mostly built from 3/16 in strip balsa. The oddly shaped pieces; tailplane tips, gussets tailplane centre, etc are included in the cut parts and shown shaded on the plans. Lay everything over the plans and apply some CA and you're all set. Bend a piece of 14 swg wire into a U-shape and join the elevator halves. Shape, sand smooth and move on. During final assembly I used CA hinges on the elevator and rudder.

The concluding part of this construction guide will appear, along with the second two plan sheets, in next month's issue of Flying Scale Models.

Miles M.13 Hobby

An air racer that never raced! Yet it was a truly elegant example of its kind

F. G. MILES' mount for the 1935 King's Cup Race had been the first M.5 Sparrowhawk, an ingeniously extemporised design by Mrs. Miles with standard Hawk components, cleverly modified to produce a most pleasing aircraft that recorded the fastest time in that year's Eliminating Contest and placed 11th in the Final.

In January of 1937 Miles determined to build a small, really fast aeroplane that would retain the excellent qualities of the Sparrowhawk, test a number of his theories and provide him with a mount for the 1937 Race. The new aircraft was to embody several aerodynamic improvements, including a semi-monocoque fuselage of oval section, fully enclosed cockpit and retractable undercarriage. Top speed was to be over 200 m.p.h. using the 140 h.p. Gipsy Major Series II engine turning a De Havilland 1000 variable pitch propeller. As this, the M.13 was purely experimental, F. G. and Mrs. Miles completed the basic design in their spare time and just two craftsmen began its construction. Named as usual after a member of the hawk family, the M.13 became the *Hobby*, a small, agile falcon fast enough to strike down a Swift in flight.

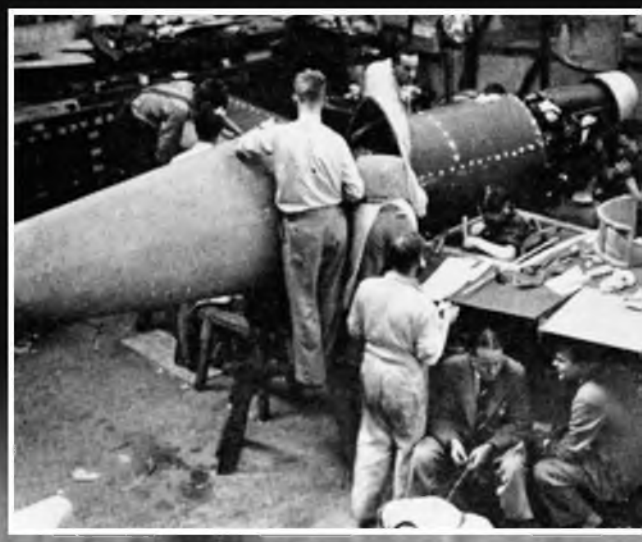
Panic stations!

Several weeks before the date for receiving its C. of A. it was realised that the Hobby would not be finished in time, so a number of enthusiastic assistants were recruited and a week before the race, all hands began working night and day. During assembling of the main components of the machine, with only two days to go, it was discovered that the undercarriage would not retract into the wells in the wing provided for it. Since design and construction of a retractable undercarriage is a specialist undertaking, this had been sub-contracted, but somehow the essential liaison between Miles and the sub-contractor had broken down (it was never discovered where or how).

Redesigning and rebuilding the wing within forty-eight hours was impossible, but on the night before its anticipated certification, the Hobby, its improvised undercarriage without cover doors and with retracting jacks outboard of the Oleo legs, was rolled out onto Woodley Aerodrome and F. G. Miles was only prevented from taking off in total darkness by the arrival of Mrs. Miles.

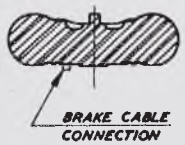
Air test

For its first flight on 4th September 1937, the Hobby retained the improvised undercarriage and was largely unpainted, with red oxide primer on the forward fuselage, wing and rudder. Miles found his aircraft *"satisfactory*



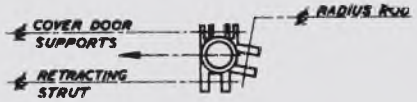
Everyone in on the act and getting in each ohers' way! A clearly posed photograph which may well have ben an attempt to include all who had a hand to building and preparing the Miles M.13 Hobby

Panic stations! Miles factory people work round the clock to make the one and only Miles M.13 ready for the 1937 Kings Cup Air Race.

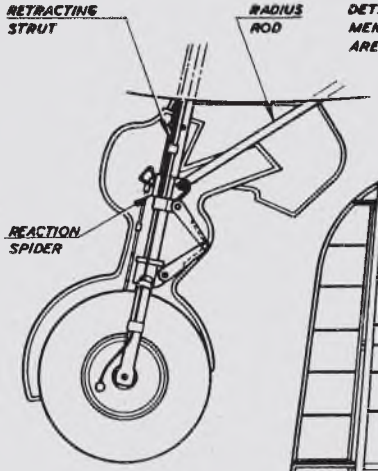


BRAKE CABLE CONNECTION

SECTION OF WHEEL & TYRE
FIVE 'SPOKES' ¼" WIDE
TWICE GIVEN SCALE

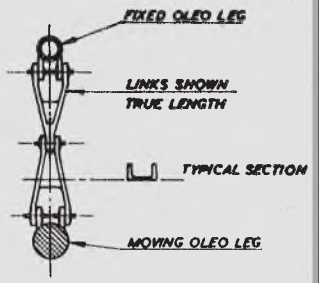


PLAN OF REACTION SPIDER
THREE TIMES GIVEN SCALE

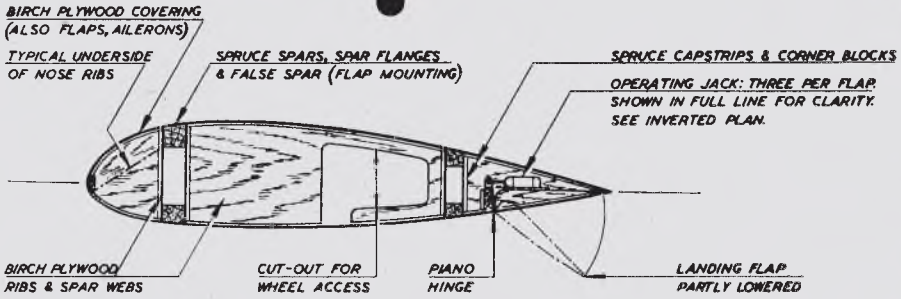


DETAILS OF UNDERCARRIAGE MEMBERS WITHIN THE WING ARE UNKNOWN.

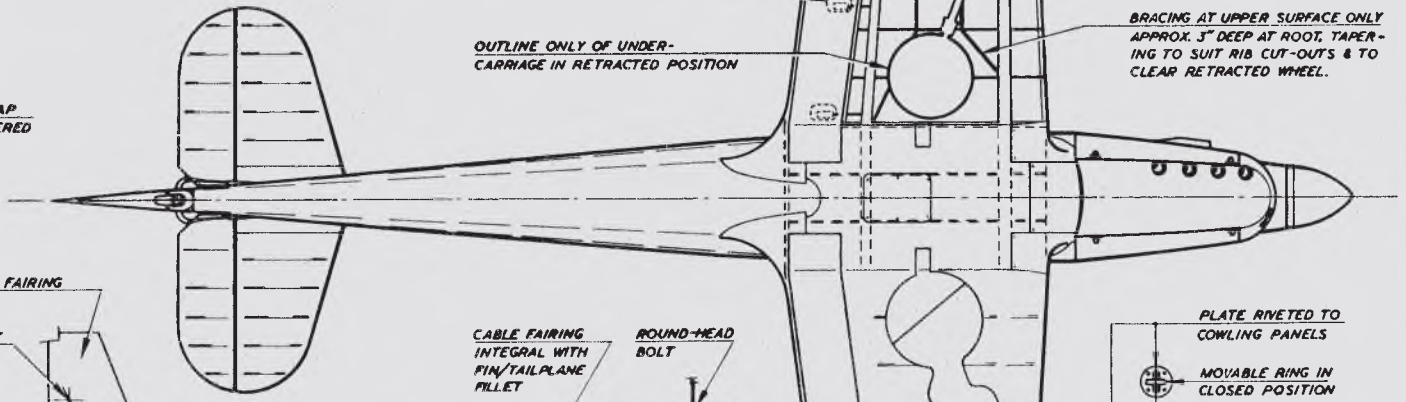
STARBOARD UNDERCARRIAGE FULLY EXTENDED: NO LOAD.
TWICE GIVEN SCALE.



UNDERCARRIAGE ANTI-TORQUE LINKS
THREE TIMES GIVEN SCALE

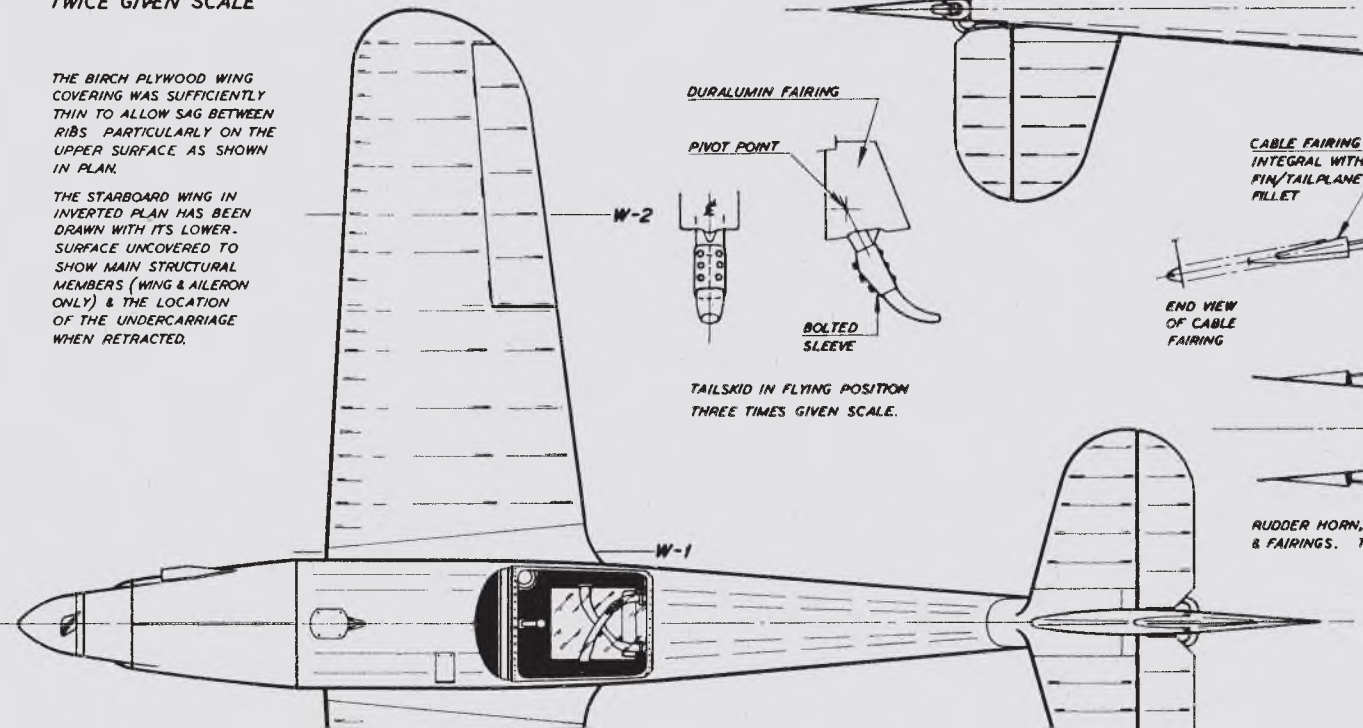


WING SECTION W-1
TWICE GIVEN SCALE

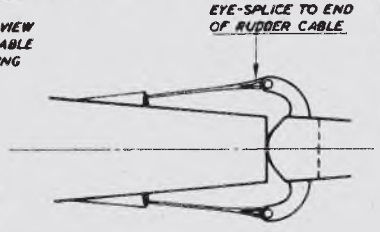


THE BIRCH PLYWOOD WING COVERING WAS SUFFICIENTLY THIN TO ALLOW SAG BETWEEN RIBS PARTICULARLY ON THE UPPER SURFACE AS SHOWN IN PLAN.

THE STARBOARD WING IN INVERTED PLAN HAS BEEN DRAWN WITH ITS LOWER-SURFACE UNCOVERED TO SHOW MAIN STRUCTURAL MEMBERS (WING & AILERON ONLY) & THE LOCATION OF THE UNDERCARRIAGE WHEN RETRACTED.

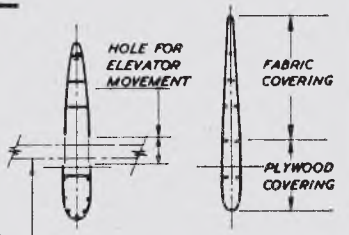


TAILSKID IN FLYING POSITION
THREE TIMES GIVEN SCALE.



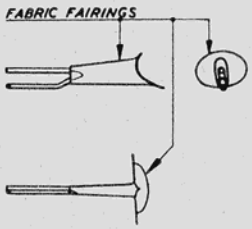
RUDDER HORN, WITH CONTROL CABLES & & FAIRINGS. THREE TIMES GIVEN SCALE

QUICK-ACTION FASTENERS TO MOVABLE PANELS OF ENGINE COWLING.
THREE TIMES GIVEN SCALE

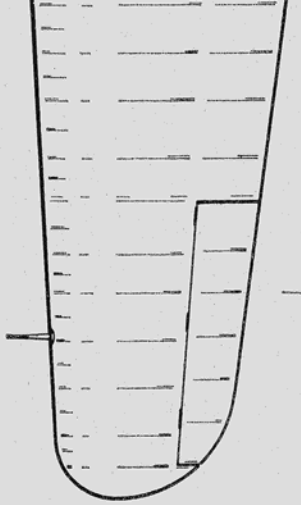


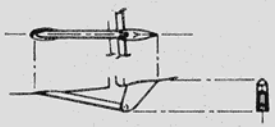
ELEVATOR SPAR IS CONTINUOUS & UNTAPERED

F-9 F-10



AIRSPEED PITOT TUBE
THREE TIMES GIVEN SCALE





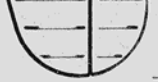
AILERON HORN WITHOUT FAIRING
TWICE GIVEN SCALE

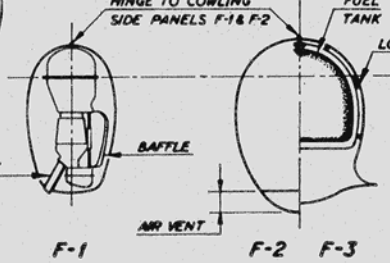
DETAILS OF SPARS, RIBS & COVERING ARE AS SHOWN IN SECTION W-1

AILERON MASS BALANCE INCLUDED FOR CONVENIENCE EXACT LOCATION IS SHOWN ON INVERTED PLAN

SECTION W-2

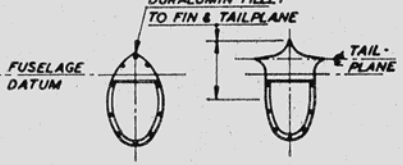
TWICE GIVEN SCALE





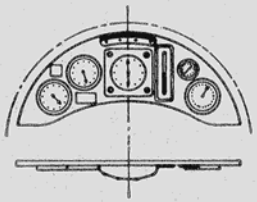
F-1 F-2 F-3

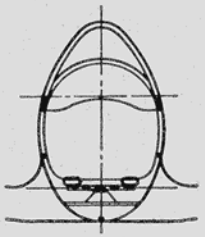
F-6



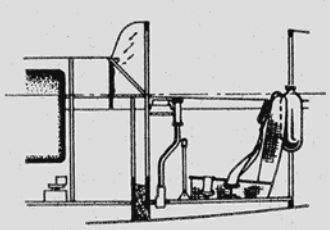
F-7 F-8

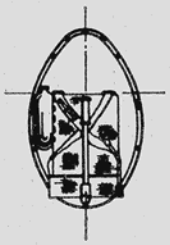
IN SECTIONS F-4 & F-5 SOME EQUIPMENT AHEAD OF THE SECTION PLANE HAS BEEN INCLUDED FOR CONVENIENCE.





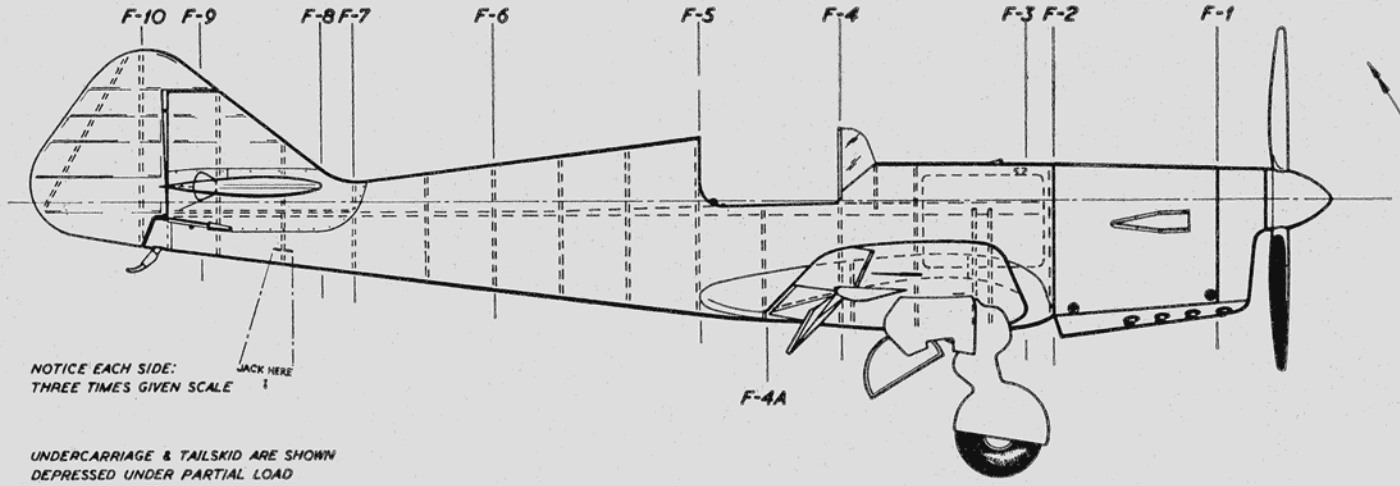
F-4





F-5

F-10 F-9 F-8 F-7 F-6 F-5 F-4 F-3 F-2 F-1

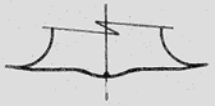


NOTICE EACH SIDE:
THREE TIMES GIVEN SCALE

F-4A

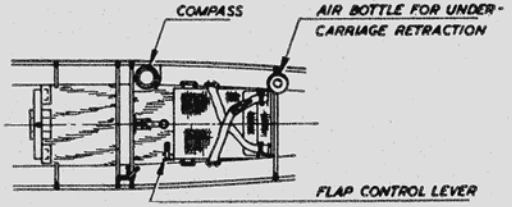
UNDERCARRIAGE & TAILSKID ARE SHOWN DEPRESSED UNDER PARTIAL LOAD

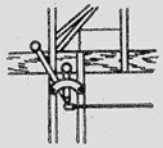
INSTRUMENT PANEL SHOWN ABOVE AT TWICE GIVEN SCALE



F-4A

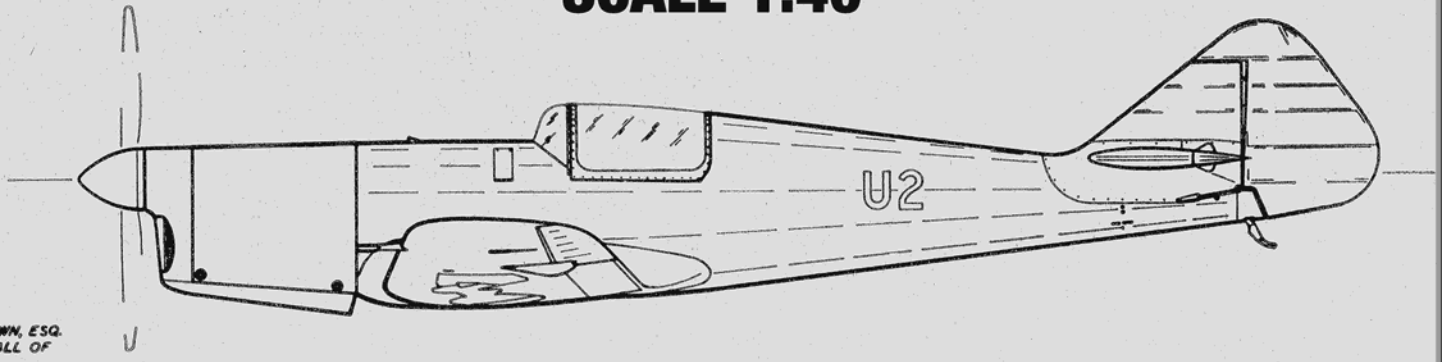
TO AVOID CONFUSION ALL FUSELAGE STRINGERS HAVE BEEN OMITTED FROM THE COCKPIT VIEWS ABOVE





ENGINE CONTROLS ON PORT SIDE OF COCKPIT
TWICE GIVEN SCALE

SCALE 1:40



COLOUR SCHEME

ENTIRE AIRCRAFT, INCLUDING INNER FACES OF UNDER-CARRIAGE COVER DOORS — DEEP RED

'U2' REGISTRATION & 'JACK HERE' — CREAM

UNDERCARRIAGE STRUTS, CANOPY FRAME, COWLING FASTENERS & PROPELLER BLADES — NATURAL METAL

REAR FACES ONLY OF PROPELLER BLADES — MATT BLACK

TAILSKID, BRAKE CABLE & REACTION SPIDER — BLACK

ALL SURFACES OF COCKPIT — LIGHT MATT GREEN

INSTRUMENT PANEL — MATT BLACK

INSTRUMENTS — BLACK WITH WHITE MARKINGS

CONTROL COLUMN, RUDDER PEDALS, ENGINE CONTROLS, ETC. — BLACK

SEAT & SAFETY HARNESS — BUFF FABRIC

DATA

WINGSPAN	21'-5"
OVERALL LENGTH	22'-8"
TAILPLANE SPAN	6'-9"
WHEEL TRACK	8'-6"
WING AREA	78 ft²
EMPTY WEIGHT	1140 lb
LOADED WEIGHT	1527 lb
WING LOADING	19.5 lb/ft²
DIHEDRAL	6°

GRATEFUL THANKS TO D.L. BROWN, ESQ. & MESSRS E.E. STOTT & A.W. HALL OF R.A.E FARNBOROUGH.

ABOVE & BELOW: Two views of the Miles Hobby on ground test prior to the first test flight at Woodley airfield, nea Reading, Berkshire in September 1937.

and very comfortable", although the landing speed was higher than anticipated. Later it was painted crimson overall with the experimental registration 'U2' in cream. By then the undercarriage had been modified with actuating struts fitted inboard of the Oleo legs and cover doors added. The aircraft never received its C. of A. and hence the allotted registration G-AFAW was never carried, nor the racing number '2' applied.

The airframe in detail

Although the Hobby's wingspan was less than its overall length, wing area remained adequate for its weight. With an extremely thick aerofoil at the root, the one-piece wing tapered in both

plan and thickness, with sharply dihedralled outer panels and a short, flat centre panel almost buried in the fuselage. Two box-spars of spruce flanges and birch plywood webs were joined by plywood ribs with spruce cap strips, corner blocks and uprights, while additional nose ribs were fitted to the upper surface between the front spar and the spruce leading edge. Vacuum operated landing flaps were carried on a short, false spar of solid spruce and the entire wing was covered with birch plywood.

Each aileron was constructed on a spruce spar with plywood ribs and covering, with a mass-balance weight mounted off the front face of the spar and housed within the wing, where a hole in the lower plywood covering allowed passage of the weight and upward movement of the aileron. Control was by cables operating through a large external horn at the inboard end of each surface.

The gracefully tapering fuselage was built about two tapered spruce longerons set immediately below the cockpit canopy and a number of oval plywood formers. This basic structure was reinforced by spruce stringers and covered with birch plywood. Formers were paired about each wing spar to form a slot, with both formers and spars suitably reinforced and bolted together. Between these two sets of double formers, the fuselage space was occupied by the fuel tank. The steeply sloping windscreen was typically Miles, and the large transparent cockpit canopy was a well-contoured one-piece moulding.

Tail surfaces were constructed of spruce spars and plywood ribs; plywood covered except for the fabric covered upper section of the rudder. The fin was integral with the fuselage and the balanced rudder cable operated through external horns. The tailplane was mounted in line with the top of the fuselage, and the entire fin/fuselage/tailplane junction was faired with a large duralumin fillet. Both elevators were mounted on a single spar that ran through a hole in the fin. The curved steel tailskid was hinged off the rear face of the rudderpost and sprung by bungee cord in tension.

The Gipsy Major Series II engine was carried on a mount of welded steel tube. Side panels of the tapered cowling were

hinged along their upper centre line for engine access and held in place by quick-action fasteners.

Each wheel of the wide-track undercarriage was carried in a forked Oleo leg, raked forward when extended and swung aft by the radius rod during retraction to lie between the wing spars. Pneumatic retracting jacks were finally located inboard of the Oleo legs and operated from an air bottle mounted behind the pilot's right shoulder. The central portion of the cover door was pin-jointed to the moving Oleo leg, with inner and outer sections hinged from the underside of the wing.

In the original undercarriage design, a single cover door was mounted on the Oleo leg with a hinged flap covering the lower half of the wheel. The early, improvised arrangement was retained until after the aircraft was fully painted with the experimental registration 'U2'.

Missed the boat

The Hobby had been built principally for the 1937 King's Cup Air Race and as this was now past, F. G. Miles was happy to dispose of her to the R.A.E., for the purpose of evaluating their new 24 ft. wind tunnel at Farnborough to analyse its drag and investigate ways of reducing it. Lift and drag were measured between - 2 deg. and + 10 deg. angles of attack, first with the undercarriage retracted, and with wheel wells and cooling openings covered and gaps to control surfaces and cowling panels sealed. Covering and sealing reduced drag, but it was decided that the main source of drag was the 22 per cent thick wing root aerofoil. Nevertheless, airflow at the wing/fuselage junction was good with negligible drag rise. In flight tests the top speed was 196 m.p.h., well below the anticipated maximum.

All over and done with

After the test programme, the Hobby was bought by Miles' Assistant Test Pilot, H. V. Kennedy, who wanted only its Gipsy Major engine. This was removed and the airframe scrapped. Miles considered the Hobby to be *"...not one of our best aeroplanes..."*, but with no opportunity to prove itself, this wholly delightful little aircraft scarcely deserved such an inglorious end. ■

SPECIFICATION

Length:	22 ft 8 in (6.91 m)
Wingspan:	21 ft 5 in (6.53 m)
Height:	8 ft 5 in (2.557 m)
Wing area:	78 ft² (7.25 m²)
Empty weight:	1,140 lb (517 kg)
Gross weight:	1,527 lb (693 kg)
Powerplant:	1 x de Havilland Gipsy Major 2 four cylinder inverted inline air-cooled, 145 hp (108 kW)
Performance	
Maximum speed:	196 mph (314 km/h)

LEFT: Engine running up ready for air test, without the main undercarriage covers.

BELOW: The M.13 installed in thenewly commisioned R.A.E. Farnborough wind tunnel, where it was used to test the functioning of the facility.

LEFT: Roundel national insignia and a military registration number of L9706 tend to indicate that this photographg was taken while the M.13 Hobby was on charge at the Royal Aircraft Establishment, Farnborough.

BELOW: The miles Hobby accelerates across the grass at Woodley airfield for at test flight.

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Flea Bitten!

Richard Crosley traces the origin of the Pou du Ceil and reflects on the improvised construction techniques that the 'Flea's' designer developed to make it a truly practical home-built

In the autumn of 1935, *Practical Mechanics* magazine ran a series of articles on how to build the revolutionary 'Flying Flea'. The articles were direct translations of Henri Mignets's famous book from the previous year entitled *Le Sport de l'air*. I was lucky enough to pick up two out of the three issues concerning the Flea a few years ago at a Secondhand Shop - it all made fascinating reading.

In 1933, Mignet first flew his little HM.14, the original *Pou du Ceil* and demonstrated it to the press and public. His book, and the *Practical Mechanics* articles, prompted hundreds of people to build their own 'Flying Flea'.

Mignet's original aircraft was powered by a 17hp Aubier-Dunne 500cc two stroke motorbike engine. It had a span of about 19ft, a length of 11.5ft and a gross weight of 450lb. The speed range was 25 -62 mph. Mignet was looking to revolutionise flying for the masses and therefore, the aircraft was designed from the outset to be affordable, easy-to-build for the novice with no previous airframe experience and, most importantly, easy to fly - even for someone with no flying experience and without access to a flying instructor.

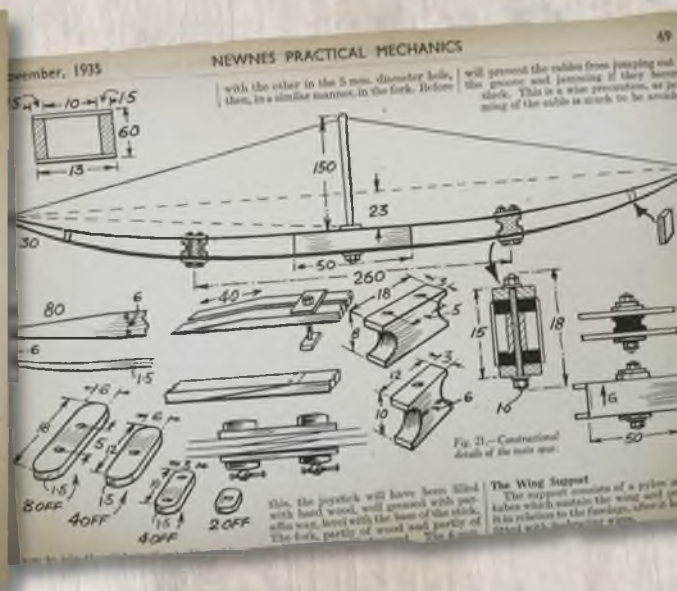
The aircraft's controls were simple, it had a conventional control stick; fore and aft movement of the stick controlled pitch, but instead of moving elevators, the front wing pivoted about the main spar, changing the angle of attack. Side-to-side movement of the stick controlled the large rudder. This not only caused the aircraft to yaw, but also produced a rolling motion due to the substantial dihedral. The rudder had to be big, as the flea's fuselage/moment arm was short, reducing the leverage action of the rudder.

As the Flea had no ailerons, it could not be taken off or landed in cross-winds. This was not considered to be a problem however as, when the Flea was conceived, most small aircraft were flown from grass fields, allowing take offs and landings to be made directly into wind.

Mignet's famous claim was that *"anybody who could drive a car and build a packing case could fly a Flea!"*

Fatal Flaw

The Flea's reputation never really recovered from a series of fatal accidents in the 1930s. A flaw was discovered in the system of pitch control used: typically, when landing, a pilot would push the stick forward to drop the nose, entering a shallow dive. When the stick was pulled back, to flare out, the rear of the front wing, which was higher and overlapped the top of the rear wing, would lower, decreasing the size of the slot between the two wings, and funnelling fast flowing air over the top of the rear wing. The



The 'Appleby Pou' with Carden Ford 28 h.p. engine, announced 'Ready to Fly Away' for £198, from Heston airfield, west London in October 1935.

Another example, 'The Cantiliver Pou' in which the struts were replaced with bracing wires and unbraced rear wing.

result would be that the rear wing would generate more lift, raising the tail and causing the nose to pitch down even more.

Mignet never encountered this problem on his prototype, as it was very low powered. However, when individual builders started fitting larger, more powerful engines, and hence increasing the wing loading and speed, the problem surfaced.

Build it yourself for £75!

The fascinating *Practical Mechanics* articles ran through three editions in 1935 - October, November and December. All were written in a charming, quirky style, no doubt due to their translation from French to English. The design is ingenious, and doesn't rely on full size plans. Instead, the various component outlines are pencilled onto the correct gauge of ply sheet etc, cut out and glued together in correct order, similar to a *Keil Kraft* all-sheet *Ezee-Bilt* model. At the heart of the articles were a series of splendidly detailed sketches, showing exactly what you need to do at various stages of the build.

Reading through the article, it is clear that the basic wooden structure is simple to build and would indeed be within the ability of many experienced D.I.Y. enthusiasts.

The tricky bit however, seems to be the metalwork. As well as numerous brackets, clamps and fastenings (all home made) there are the two rear tailwheels that form the bottom of the rudder post, and turn with the rudder. These are strange devices, being domed in the centre, and pinched in to a sharp section at the edges. I presume these are intended to 'bite' into the grass runways that the Flea was designed to fly from, and offer a degree of steering control. The instructions say *"...the wheels are made out of two discs in 1.5 mm material, which are embossed by a hammer and joined along their circumference by 12 rivets, taking care they are centred on the tube".*

It the goes on to say... *"You can do this quite easily by hammering a sheet of 200 mm x 200 mm on a piece of wood which has been hollowed out, using a round-faced hammer. After you have hammered out the material you can then describe a circle".*

Choice of wingspan

The wings of the Flea are one of its unique features. In the instructions there is mention of wings of varying span. Mignet says... *"The wing span should be adapted to the space in which it is to be constructed. The ideal is a room or apartment three metres x 4 metres. The machine itself is small, but this room should suffice for it.*

The plane was first tried with a 5.5 metre span, but it was decided to try 4 metres as a test. It showed itself perfectly stable, but it did not lift well. The machine meandered across country, but it wanted the full power of the motor, and it scarcely climbed at all".

Mignet then goes on to say... *"If you are light (10 stone/140 lbs/63.5 kg) and are only thinking of short journeys, then a span of 5 metres will suit you very well, but on 6 metres, you can weigh 12 stone/168 lbs/76.5 kg), and you can carry with you enough petrol for three or four hours flight!"*

A characteristic of the wing is its curved dihedral. The reason for this is nothing to do with good looks, it is purely for ease of construction. Put simply, the bottom of the spar is laid down, then a cord is attached to each tip and tightened until the correct dihedral is pulled up at the tips. The top of the spar is then positioned, and the spar webbed with ply. This ingenious method of obtaining the dihedral also meant that variations showed in each individual Flea. Some Flea wings seem to have a fairly flat centre section, with curved up tips, whereas others have a single continuous curve along their span.

Whilst designing and building my successful 1/12th scale Flea (plans in this edition) which I did with the aid of these Practical Mechanics articles, I could easily picture myself building the full size version. My model is ultra-stable in the air and I can see how the full size would have burbled around quite contentedly on a calm summer evening.

Back in the 1930s, way before television and tweeting, people did real stuff, hobbies were king, and building your own aircraft was surely the king of hobbies.


LIST OF MATERIALS

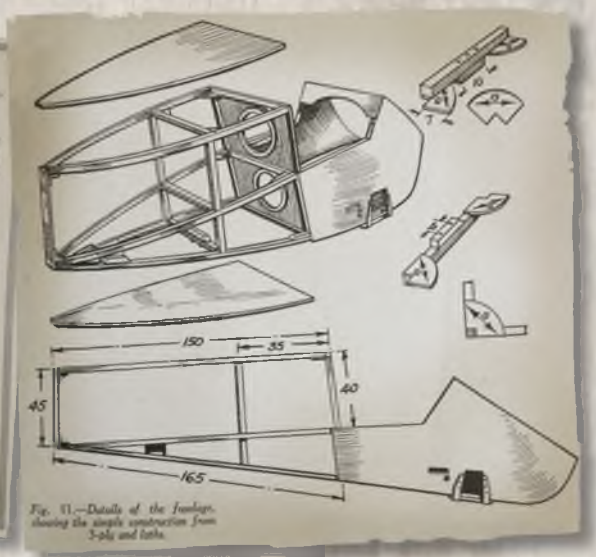


Fig. VI.—Details of the fuselage, showing the simple construction from 3-ply and laths.

THE FLYING FLEA

Richard Crossley presents the first of a two-part construction feature for his 1/12th scale 19" (483mm) wingspan replica of the 1930s 'Flying Flea' for electric or Co2 power free flight, with full size plans

Fancy a Pou?

With its unique shape and interesting history, most scale modellers will have been aware of Henri Mignet's 'Flying Flea' or 'Pou du Ciel' from a young age. The first model of the type that I saw fly was at Old Warden; I guess I would have been about 10 years old, so we are going back to 1977. The model was the large one built from F. G. Longbon's *Aeromodeller* plan and it burbled around the aerodrome in a most realistic fashion. Many years later, and at the other end of the scale, I remember being captivated by one of Peter Smart's tiny 'palm sized' Fleas, powered with a microscopic Gasparin CO2 engine.

Well, it took a while, but at long last, here is my offering. Designed to a sensible 1/12th scale, it comes out at 19" wingspan. I researched the 'Pou du Ciel' extensively, as I intended my model to be a competitive Indoor Scale creation, so I am happy that this plan is pretty accurate. On its 3rd attempt, my Flea finally won the electric class of the UK Indoor Scale Nationals is 2012. The model flies superbly and you can see a video of its competition winning flight here on Youtube: *http://youtu.be/K0RK66VyHNs.*

'The Crosley Flea' was built in 1935 for Cincinnati businessman Powel Crosley Jr. It was flown briefly, but 'Fleas' soon went out of favour after a flaw was discovered with the design that led to a number of fatal crashes. The Crosley Flea still survives, and can be seen perfectly preserved in the Smithsonian National Air & Space Museum, Washington D.C. Although designed for free flight electric power, this model would fly well using CO2 power, or would convert superbly to a mini R/C flyer.

In this first installment of a two-part article for the Flea, I will talk you through building the fuselage and rudder assembly.

Also included here are the printwood patterns for the remaining components, so you can cut out all of the extra 1/16" sheet parts, including the wing ribs, so you will be ready to carry on building when the next edition of FSM arrives. Alternatively, you can buy the laser-cut wood part set advertised at the end of this article.

Before you start...

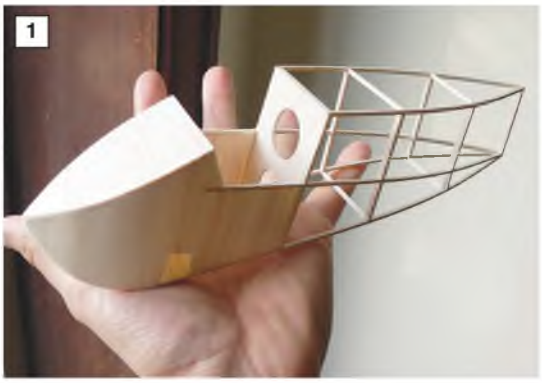
Although not for the beginner, this is quite an easy model to build, particularly if you have previous modelling experience.

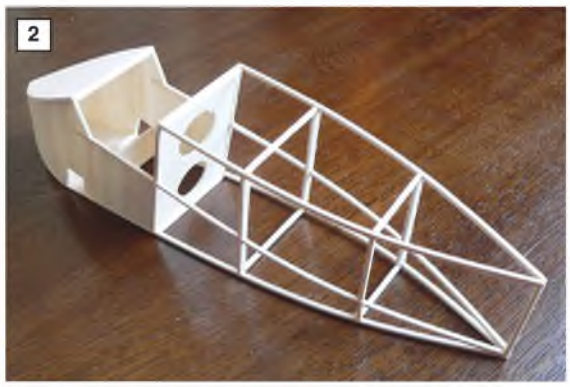
Read these instructions through carefully before you start and make sure that you understand what is required at each stage of construction.

Here's a run-down of extra things that you will need to build your model:

- A flat building board, about 1ft by 2ft and soft enough to press pins into (insulation board or rigid foam such as Floormate is good)
- A modelling knife (I like to use a 'Swann Morton' with a 10A blade)
- Pins, small pliers
- Adhesives, dope and thinners, soft dope brush
- Sandpaper (180, 360 and 800 grit wet and dry are best), a short steel rule.

Begin by pasting the paper wood templates to the correct grade of balsa sheet. Use Spraymount for this (spray the paper, not the wood). There is also a non-permanent type 'Pritt' stick that will do the job. Carefully cut out all of the balsa components and store safely, a little extra effort spent cutting





out the parts and building will pay off when it comes to flying your model.

Use a steel rule when cutting straight lines. Rub the areas of the plan to be built over with a wax candle; this will prevent the balsa parts from sticking to the plan.

Remember, build your model as accurately and lightly as you dare and you should end up with a beautiful performer.

Right then here we go...

Fuselage

This is a simple structure. Start by building two identical fuselage halves using 1/16" balsa strip and the sheet parts as noted. The centre longeron should be from either very hard balsa or, preferably, basswood. Reinforce the two uprights that are bisected by the centre longeron with extra strips of 1/16" balsa on the inside face (make sure you end up with a left and a right half!)

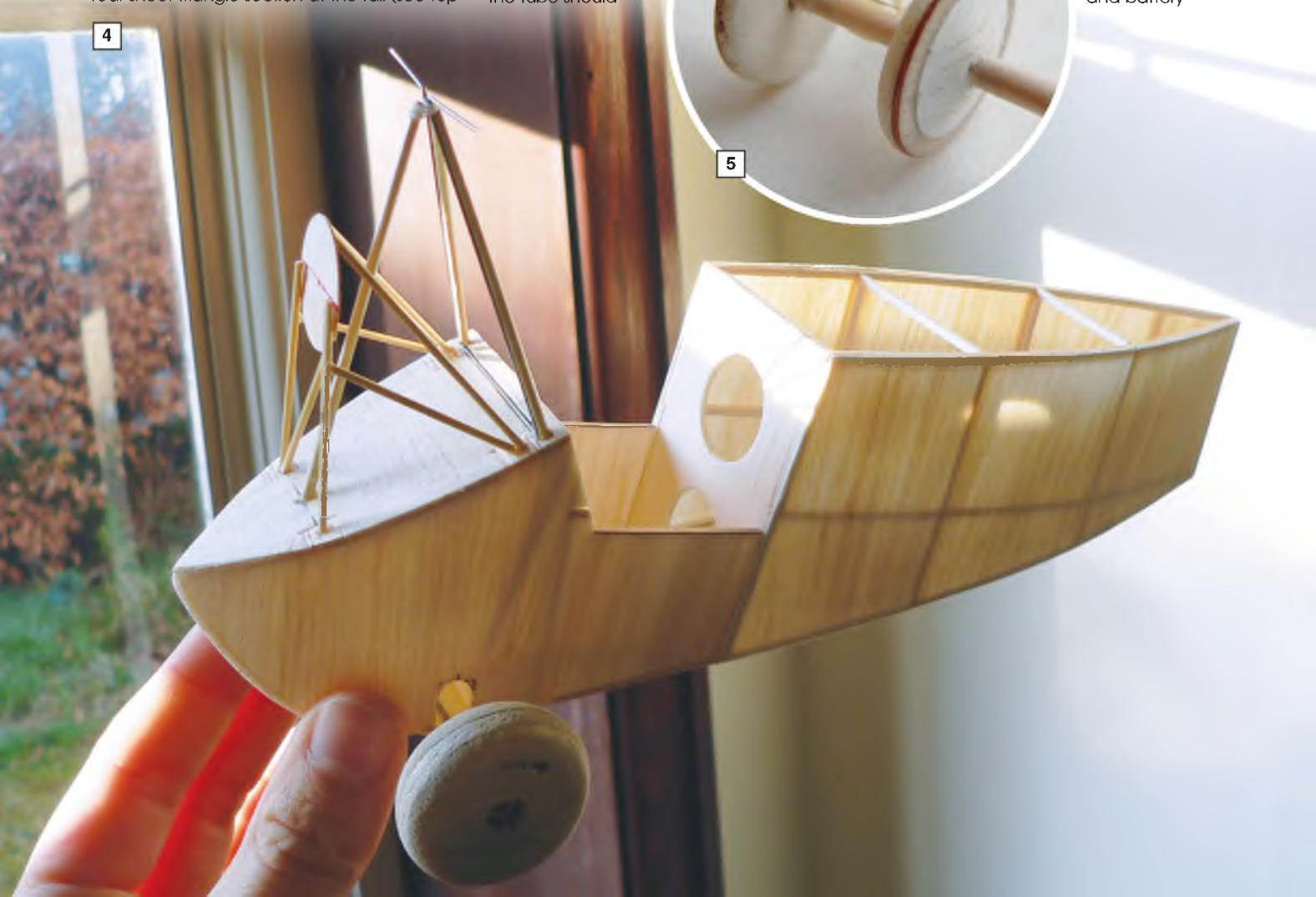
Join the fuselage halves over the top view using the two formers F1 and F2. Pull in the tail and glue the sternposts together and clamp with a clothes peg until dry. Add the rear top and bottom cross-braces and the rear sheet triangle section at the tail (see top view). You may find it easier to dampen the outer edge of the longerons to help these curve into the right profile.

Temporarily glue in place the balsa undercarriage platform. This will be removed later when we cover the undercarriage installation in the next installment. Glue together the nose top-deck parts N1 and N2. Moisten the outside faces of S1s to help them bend inwards and glue around the N1/2 assembly to form the characteristic pointed Flea nose. You may need to insert a cross-brace at the bottom of the nose to keep the sides upright and parallel.

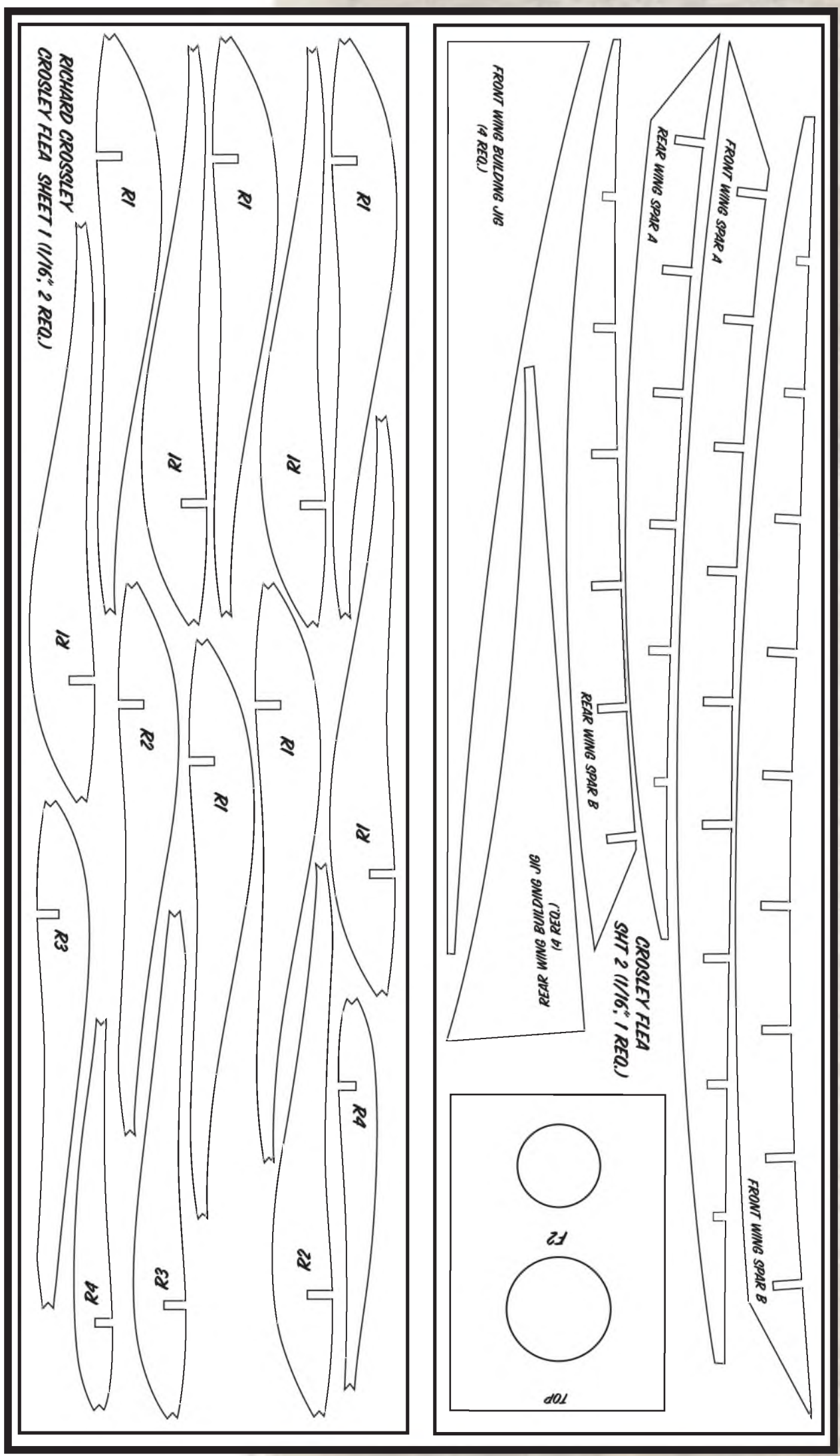
Now sand and seal the upper deck smooth, ready for paint. (You will soon be applying struts etc. to this area, and it will be impossible to get a good finish here once they are on). Glue in place the 1/16" sheet balsa platform at the top of the fuselage behind F2, after first fixing the alloy tube to take the wire wing stay to the underside. Note that the tube should pass through a small hole in the top of F2.

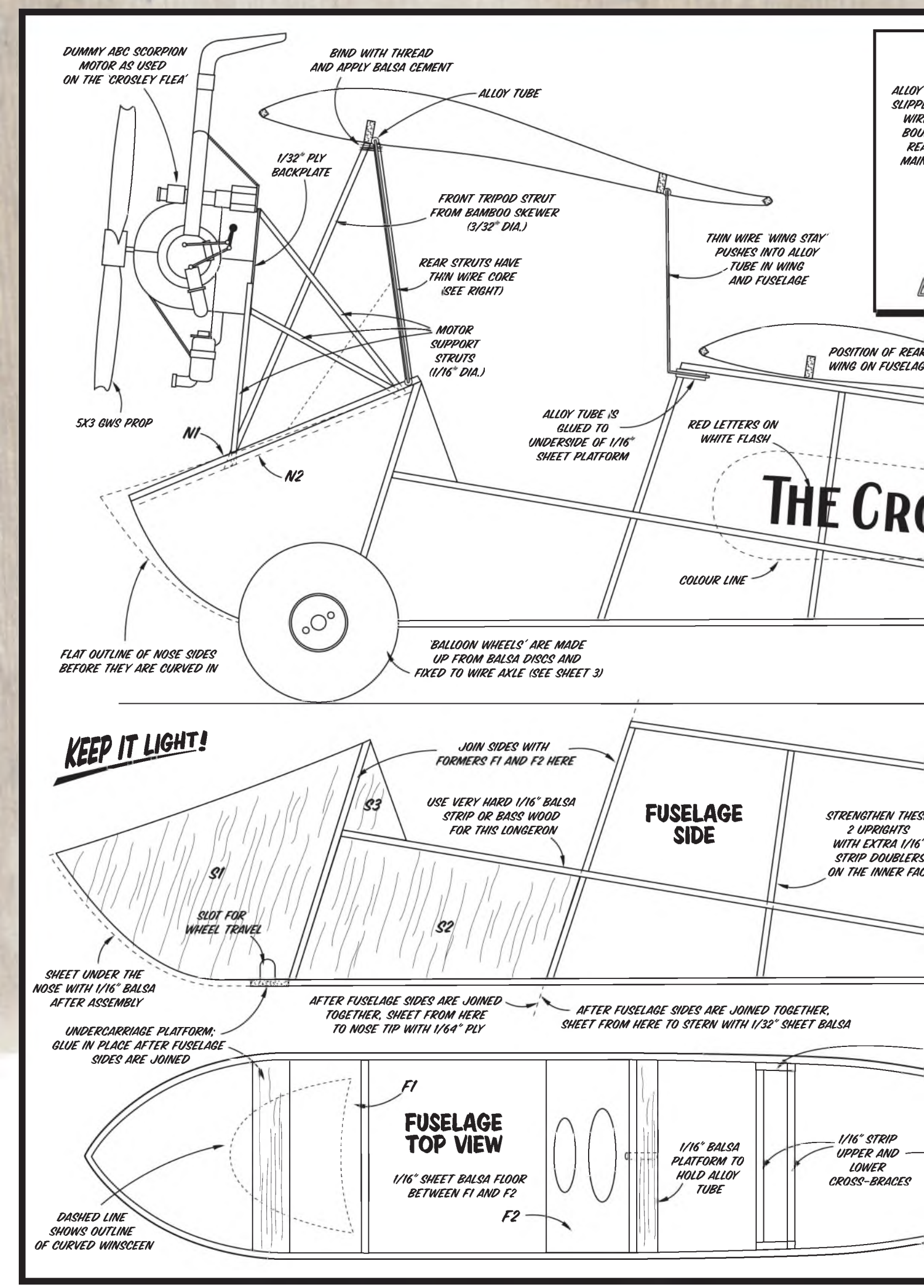
My Flea performed perfectly using the *Atomic Workshop Voodoo 25* motor, 200 mAh cell and *Zombie* flight profiler. It did need full power though for a sedate climb out, so make sure you keep the weight as low as possible. Wire-up the system according to the instructions supplied with the *Zombie*. Now is the time to install the Cell and Zombie in the model (we will deal with the engine later) I made a little balsa box to hold the cell which should be placed as far forward in the nose as possible, because this model needs nose ballast.

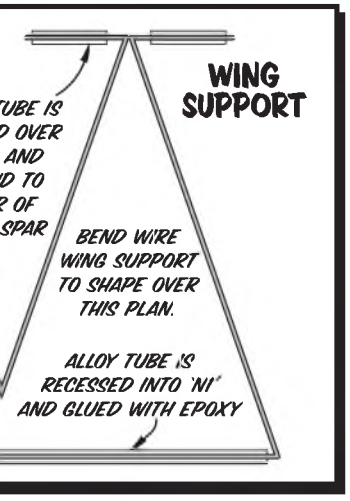
The *Zombie* controller was positioned on a false floor and was accessed through a hatch in the fuselage bottom sheeting. The motor leads should be extended and pass out of the upper deck on the right hand side (see photos of model). The entire electric system can be purchased from ATOMIC WORKSHOP, including magnets and battery

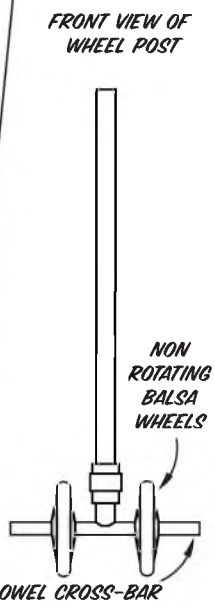


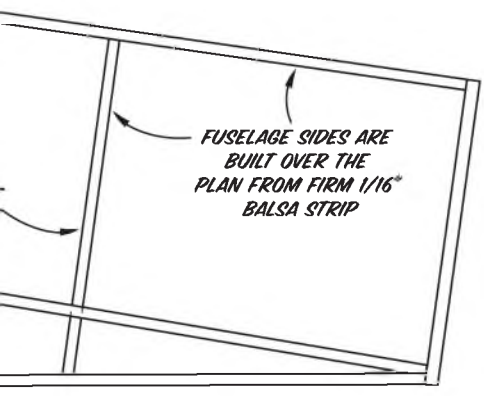
1: Here is the basic fuselage structure, before application of the external side sheeting. The sides of the front section shown sheeted here are overlaid with 1/64" ply sheet. The rear section back to the stern is sheeted with 1/32" balsa (with the grain running vertically)
2: Another picture of the basic fuselage from the front. Note the 1/16" square balsa 'doublers' on the inside of the rear uprights.
3: The big fin temporarily pinned in position. The forward part is very soft 1/8" balsa sheet sanded to shape. I later added 1/16" square balsa vertical uprights between the ribs about 30mm from the trailing edge (not shown in this photograph) to prevent the tissue distorting the structure when it was water shrunk.
4: You can see the tripod wing support clearly in this photo. Note the wire frame of the rear legs. I faired the wire with grooved balsa dowel. The front leg is bamboo, bound at the top and glued through N1/2 to complete the tripod. The protrusions at the top of the tripod will be sleeved with alloy tube and epoxied to the wing. The engine mount and undercarriage shown here will be covered in the next installment of this two-part article.
5: The curious twin-wheeled tailskid. This was made up from scraps of bamboo, ply and balsa. The cuff detail is from paper strips wound and glued. I used epoxy for the main 'T' joint, and it has proved to be perfectly strong enough. This assembly should be fixed to the stern post using thin metal straps.

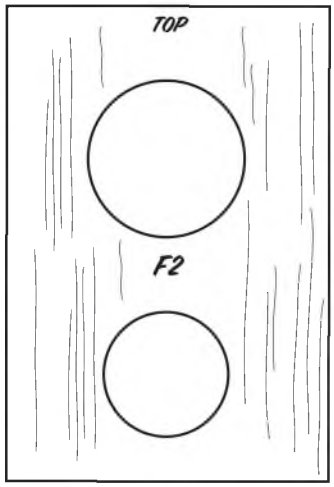


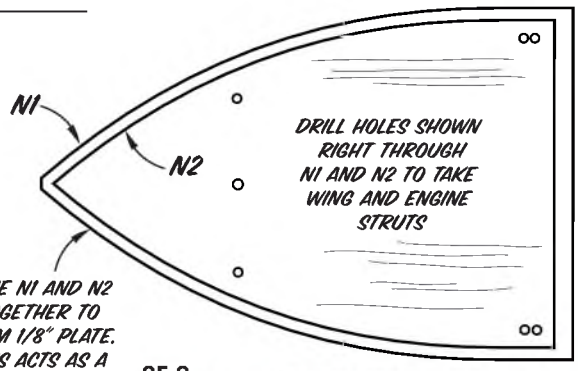

DUMMY ABC SCORPION MOTOR AS USED ON THE 'CROSLEY FLEA'
BIND WITH THREAD AND APPLY BALSA CEMENT
ALLOY TUBE
1/32" PLY BACKPLATE
FRONT TRIPOD STRUT FROM BAMBOO SKEWER (3/32" DIA.)
THIN WIRE 'WING STAY' PUSHES INTO ALLOY TUBE IN WING AND FUSELAGE
REAR STRUTS HAVE THIN WIRE CORE (SEE RIGHT)
MOTOR SUPPORT STRUTS (1/16" DIA.)
POSITION OF REAR WING ON FUSELAGE
5X3 GWS PROP
N1
N2
ALLOY TUBE IS GLUED TO UNDERSIDE OF 1/16" SHEET PLATFORM
RED LETTERS ON WHITE FLASH
COLOUR LINE
FLAT OUTLINE OF NOSE SIDES BEFORE THEY ARE CURVED IN
'BALLOON WHEELS' ARE MADE UP FROM BALSA DISCS AND FIXED TO WIRE AXLE (SEE SHEET 3)
KEEP IT LIGHT!
JOIN SIDES WITH FORMERS F1 AND F2 HERE
S3
USE VERY HARD 1/16" BALSA STRIP OR BASS WOOD FOR THIS LONGERON
FUSELAGE SIDE
S1
S2
SLOT FOR WHEEL TRAVEL
SHEET UNDER THE NOSE WITH 1/16" BALSA AFTER ASSEMBLY
AFTER FUSELAGE SIDES ARE JOINED TOGETHER, SHEET FROM HERE TO NOSE TIP WITH 1/64" PLY
AFTER FUSELAGE SIDES ARE JOINED TOGETHER, SHEET FROM HERE TO STERN WITH 1/32" SHEET BALSA
UNDERCARRIAGE PLATFORM; GLUE IN PLACE AFTER FUSELAGE SIDES ARE JOINED
F1
FUSELAGE TOP VIEW
1/16" SHEET BALSA FLOOR BETWEEN F1 AND F2
F2
1/16" BALSA PLATFORM TO HOLD ALLOY TUBE
1/16" STRIP UPPER AND LOWER CROSS-BRACES
DASHED LINE SHOWS OUTLINE OF CURVED WINSCEEN

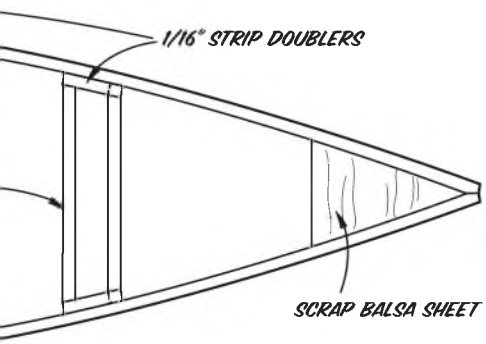


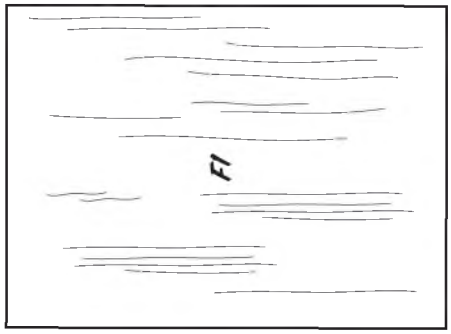












SHEET 1 OF 3

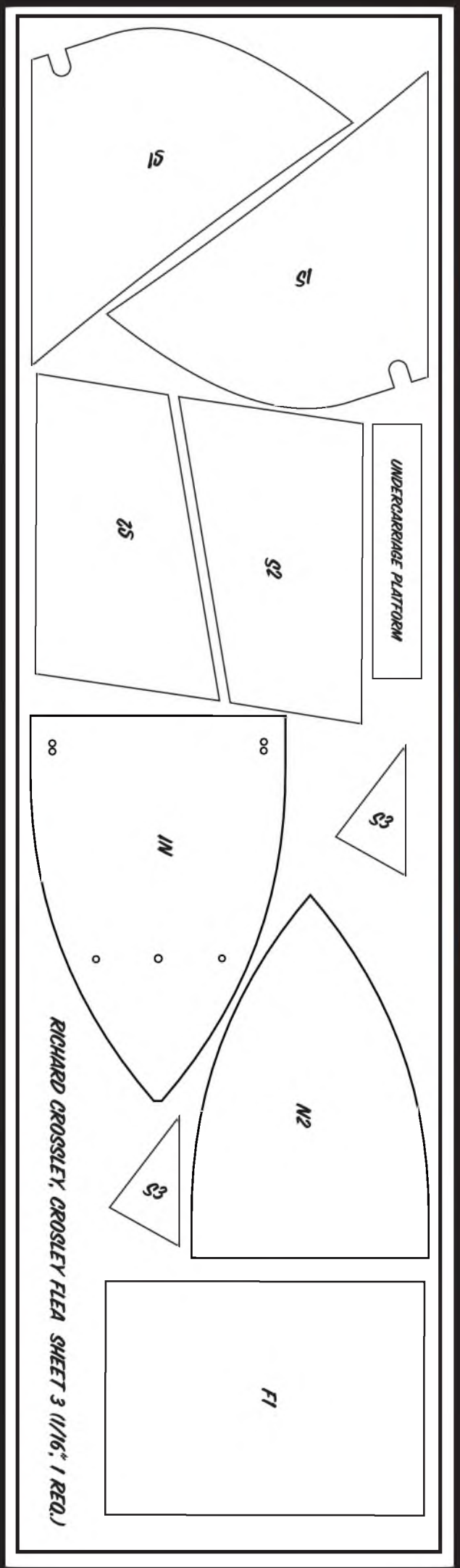
1/12 SCALE

MIGNET POU-DU-CIEL

THE FLYING FLEA

DESIGNED & DRAWN BY

Richard Crossley



Superb photo of the Flea flying into second place in the electric class at Interscale 2010, in Nijmegen, Holland. (Photo courtesy of M Gasparin).

chargers. They have a web site full of hints and tips: www.atomicwork-shop.co.uk, or call Jonathan on 01493 369317 (evenings).

Next, sheet the lower part of the fuselage back to the F2 position with 1/16" sheet balsa, this portion needs to have a hatch cut into it to access the Zombie controller if you are using this system. Now pack the nose section forward of the battery with clay and lead shot, before adding the 1/16" sheet lower nose sheeting. The forward fuselage of your Flea needs to be really strong (trust me, I had to build a second fuselage after the first one didn't make it through flight testing!).

Next, sheet the rear of the fuselage sides with light 1/32" balsa sheet, from the F2 position to the stern (keep the grain vertical here). Similarly, sheet the forward fuselage sides from F2 to the tip of the nose with 1/64" ply. The fuselage should now be bullet proof at the front!

Sand smooth and dope on tissue to the sheeted sides to obtain a smooth finish. If you are going to rig your model, the best way is to bend up metal tags (use an old drinks can - good time for a beer break perhaps?) and epoxy these in place to the lower fuselage and upper nose as shown on the plan. If the tags are bent into a 'U' shape these can be hooked and epoxied under the lower longerons - see plan and model photos. Tissue cover the top and bottom of the fuselage, shrink and dope.

Rudder

This design uses laminated balsa outlines to obtain the curves. The main benefit of laminated parts are strength with light weight.

We can't use bamboo on the rudder, as this model needs to be built very lightly at the rear so as to avoid excessive nose ballast.

Cut three strips, 1/16" wide from a piece of 1/32" sheet balsa (they need to be long enough to go around the entire rudder outline excluding the leading edge). Whilst these are soaking in water for 10 minutes, cut out from balsa the former, which needs to be the same as size as the inner line of the fin outline. Wax the edges of the former and pin it to the building board. Dab the strips of wood dry and apply white glue between them, sticking all three together. Using a pin at the start point, you should now be able to wrap the wood around the former, using pins to hold it in place.

When dry, remove from the board and re-pin in place, adding 1/32"

balsa shims to raise the outline from the plan slightly. Build the rest of the rudder in the usual way and when set, sand to shape, making sure you taper the ribs (see cross-section on plan). Cover the rudder, making sure that the grain of the tissue runs vertically.

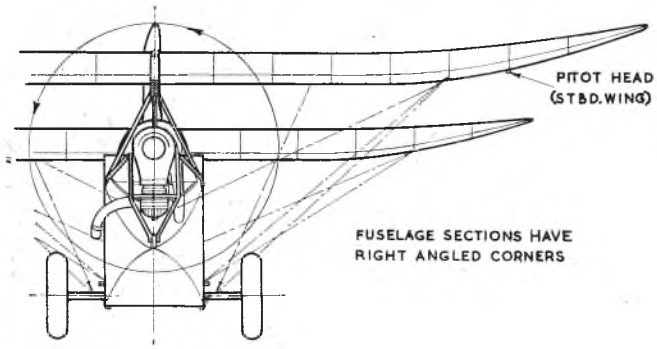
Make up the rudder/wheel post as suggested on the plan from bamboo and balsa. Make up some metal straps (use metal from a bean can or similar, drinks can is too flimsy here) and fix these around the post, gluing through slots in the sternpost where shown - use epoxy glue here, as this assembly needs to be really strong.

Epoxy the completed rudder to the sternpost, making sure that it is dead straight when viewed from above. My free flight Flea was very critical to minor adjustments of the rudder - not surprising really, as the rudder is huge. I found it best to fix the rudder as suggested, this way you can still bend the metal straps slightly for minor adjustments.

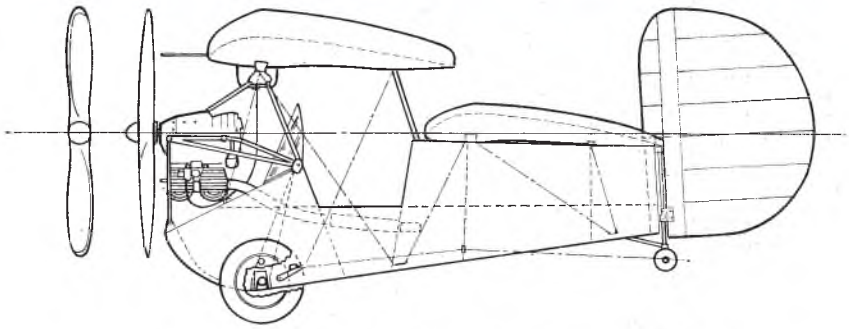
Wing support

Bend the wire wing support, remembering to slip the longer length of alloy tube in place before bending the lower section. Cut to length the forward wing strut from 3/32" bamboo, wrap thread around the top end a few times and seal with balsa cement. Sand 3/32" balsa strip to a circular section, groove, and stick over the wire wing support uprights to thicken them. Epoxy the wing support assembly into a groove in N1, then glue the forward bamboo strut into position in N1, and bind the tops together to form a tripod.

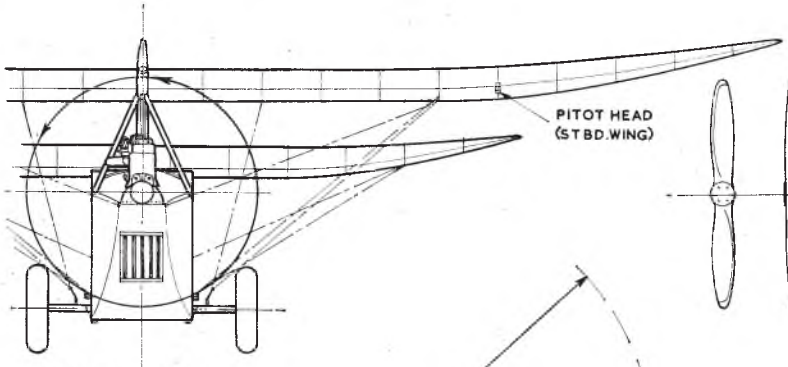
Well, that's it for the first part of this two-part plan feature. Next time I will talk you through the completion of the model, and give some tips on flight trimming ■



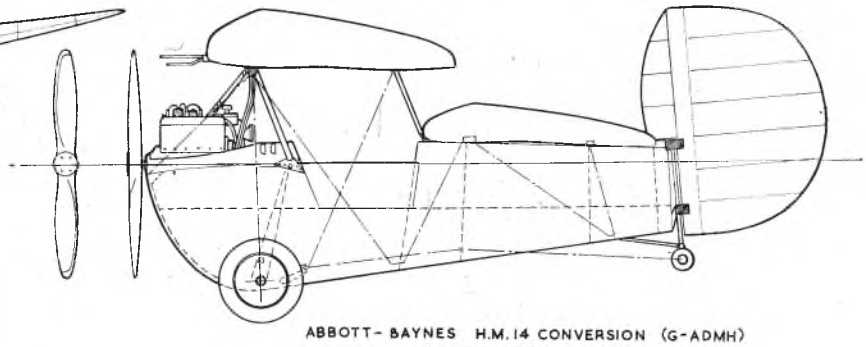
H.M. 14



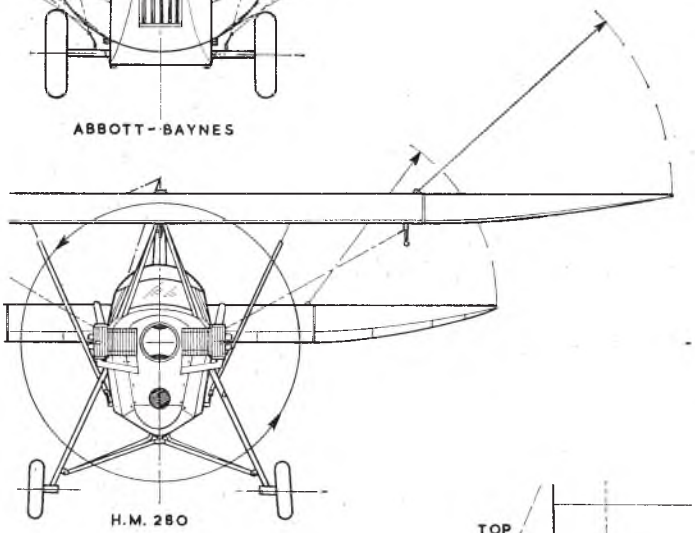
TYPICAL H.M. 14. – SCOTT SQUIRREL ENGINE (G-ADXS)



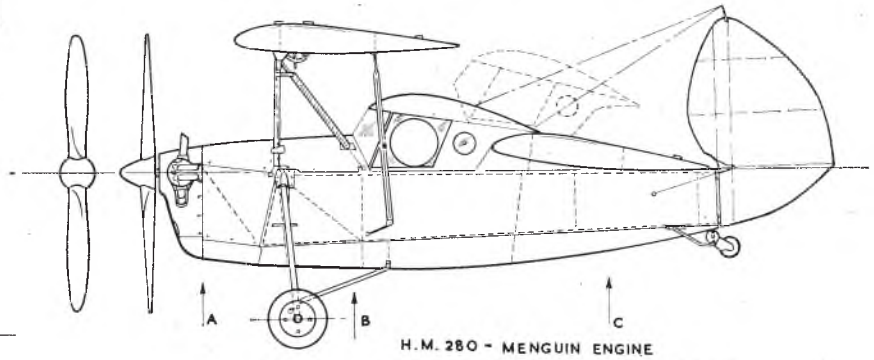
ABBOTT-BAYNES



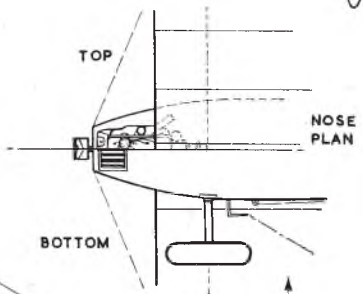
ABBOTT-BAYNES H.M.14 CONVERSION (G-ADMH)
CARDEN-FORD ENGINE

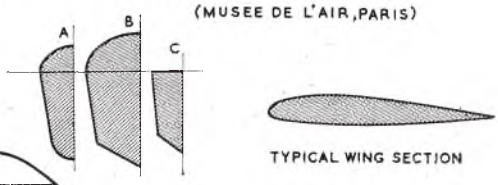


H.M. 280

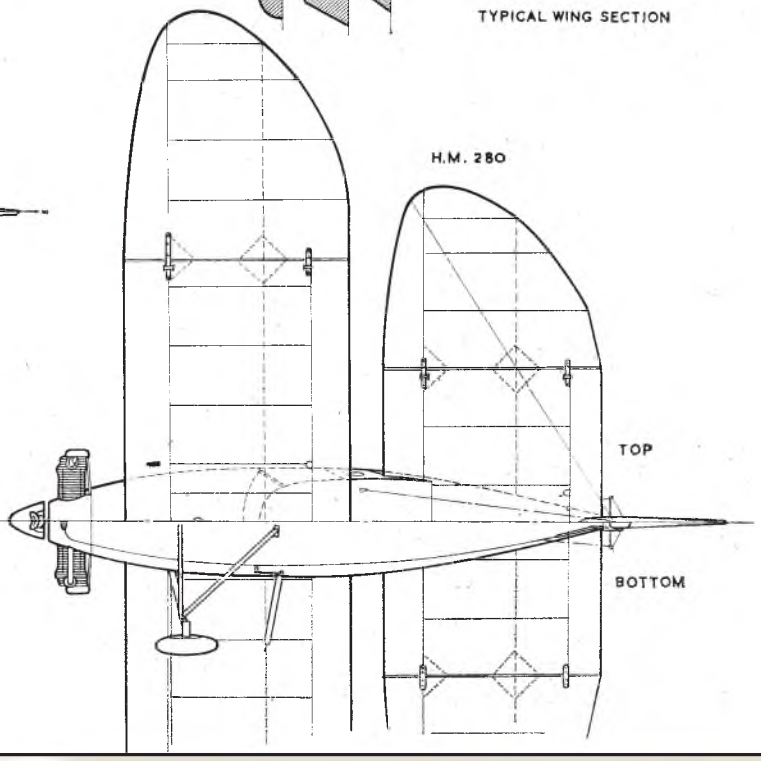


H.M. 280 - MENGUIN ENGINE
(MUSEE DE L'AIR, PARIS)





TYPICAL WING SECTION



AeroDetail series

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

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

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

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

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

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

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

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

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

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

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

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

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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 out-standing workmanship. Extensive detail. (120 images)

Sopwith Pup CD92
The charismatic Sopwith Scout (to give its correct des-ignation) 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 Collec-tion, Old Warden.

Republic P-47D CD89
Bubble-canopy version of the much loved 'Jug', photo-graphed 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 illus-trated 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 dur-ing 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-insur-gency 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 de-tail, 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 re-stored 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)

Monocoupe CD108
The Monocoupes were side-by-side two-seat light-planes of mixed wood and steel-tube basic construction with fabric covering. A braced high-wing monoplane with fixed tailskid landing gear, and the reverse curve rear fuselage lines that were to become one of the signature identifier features of the Monocoupes. 55 photos

Miles Magister CD73
A firm favourite with scale modellers, this extensive collection of images depicts two examples in different Royal Air Force training colour schemes. (100 images)

Messerschmitt ME109G CD72
The 'Gustav' saw Luftwaffe service from late 1942 on-wards. Subject version of this collection is a tropicalised G-6. (110 images)

Messerschmitt Bf109E CD71
The 'Emil' was the version of this WW2 fighter that was the mainstay of the Luftwaffe fighter force during the Battle of Britain in 1940. (150 images)

Me 410A – 1/U2 CD107
For those who fancy a twin, but something outside the 'normal' favourites, consider the Luftwaffe's final 'destroyer' heavy fighter that packed a powerful punch 79 photos

Martin B-26 Marauder CD70
The Fantasy of Flight Museum's example, photo-graphed pre-restoration, soon after it was flown into the Museum site, thus in original, unrestores condition. (100 images)

LVG C.VI CD69
The sole survivor of its type from the WW1 era, photo-graphed in extensive detail. This is the machine house at and flown from the Shuttleworth Collection airfield, Old Warden and now in storage, awaiting display at the RAF Museum. (110 images)

Luton Minor CD68
Just one example of this light aircraft, to which the owner has added many mods and variations. (32 images)

Luscombe Silvaire CD67
The elegant late 1940s U.S. light aircraft. Several examples provided, with much close-up detail for modellers. (74 images)

Kawasaki Ki100 CD66
A study of the late WW2 radial engined 'emergency' development of the Japanese Ki 61 Hien (Tony) that provided an unexpectedly superior performance for the squadrons of the Imperial Japanese Air Force during the closing stages of the Pacific war. (60 images)

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PROPELLER CARVING FOR LARGE SCALE MODELS

PART 1: Ian Turney-White takes you through all the steps of designing and carving really big wooden propellers, tailored to the needs of really big scale models

My interest in propellers dates back to 1990. Prior to that, I used to buy and fit whatever was commercially available and what seemed appropriate.

The change of interest was brought about after flying my Hanriot HD-1 WW1 biplane. With its 60cc engine and a very standard 24" x 8" prop. the performance was satisfactory. I was then encouraged to try one or two other commercially available propellers, which, it was suggested, might fly the model better.

I hooked on a spring balance to the rear of the model and tried an AMT 26" x 8" scimitar shaped prop. The engine lost about 300 rpm, but the static thrust pull on the spring balance increased by 1/3rd and it sbounded much nicer. This prop transformed the handling. Climb and general control were much better and the model somehow just seemed to improve the flying.

It was from that moment I started to make my own propellers, initially copying, but gradually developing my own. I tend to be very critical and the critical assessment has led me to try various shapes, pitch and thickness of blades. On my Avro Triplane, the 4th propeller was the best and the difference in climb and general controllability was significant.

As with everything, a compromise has to be made between what is

best for the model and the engine, but here is how I go about making propellers.

Motor tools and elbow grease

This article is split into two parts, the first being a description of my procedure and tools used to actually produce a propeller. This will be followed by some suggestions on how to make a similar prop with less equipment. I would be the first to admit that there are different ways of doing each case of prop. Construction and my own development methods are not necessarily the easiest, but they do work for me.

Propellers can be made from a variety of materials. For larger engines, a wood prop. offers many advantages, not the least of which is that it is better and less expensive for the prop to break rather that the engine! You can use a good grade of mahogany, beech, walnut, ash etc. although my choice is beech, which I source as Romanian steam dried white beech from my local timber importers. The timber is rough-cut and I look for flat, untwisted planks with a good grain and no knots or flaws, amply big enough for the intended prop(s).

Before detailing the work, I would like to make some important and pertinent warnings: -

1) Hardwood dusts can damage your lungs and nasal passages, including beech and balsa (!), so you need to minimize the production of dust and wear a dust mask. I tend to shape the prop. completely with 'sharp' tools and only sand the prop. out of doors to remove any small marks.
2) The machinery and tools used are both sharp and dangerous, so due care and attention is required. The use of safety gloves is recommended.
3) Whilst using machinery, I also protect my eyes with a pair of safety glasses.
4) The centrifugal forces on a propeller are very considerable and the prop must be sound, fit for purpose, reasonably well balanced and securely fitted to the engine.

The diameter and pitch of a propeller is a compromise with regard to the engine's capacity, power and torque output, plus the model's size, weight, drag and intended flight characteristics. It is not readily calculable and is often based on experience and trial-and-error. A model will sometimes fly better on a prop. that does not provide the maximum power, but gives the most effective thrust.

It is important to avoid overloading the engine with too big a propeller, otherwise damage or increased wear may occur. One way is to decide what size prop. is required for a particular model and then look for an engine, which will happily cope with that size prop.

Propellers can come in many different shapes; square-ish tips, double curved and variations. The shape does have an effect on the prop's performance and the noise ouput. It is interesting to note that the scimitar shaped propeller in use pre-WW1 has made a comeback, offering good thrust and lower noise levels. My own experience is that the scimitar shaped prop. does work well, especially on my vintage type models.

The tools for the job -quite basic, but must be sharp.The draw knife is bottom left.

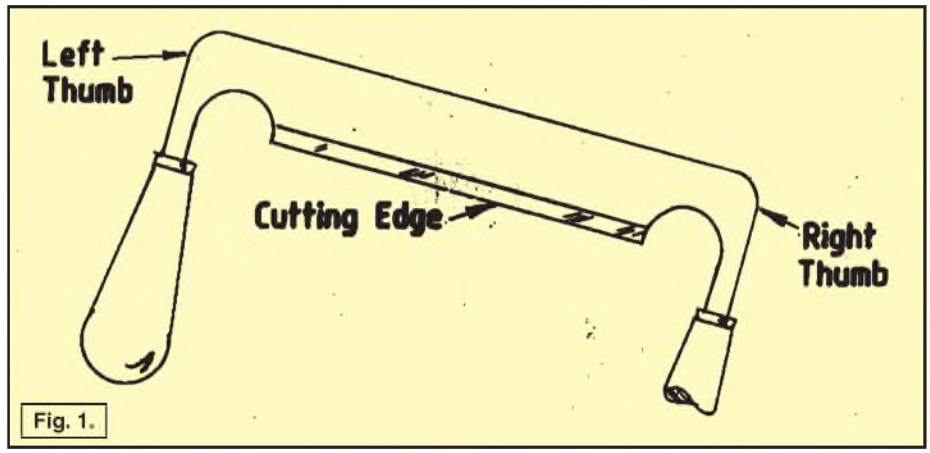
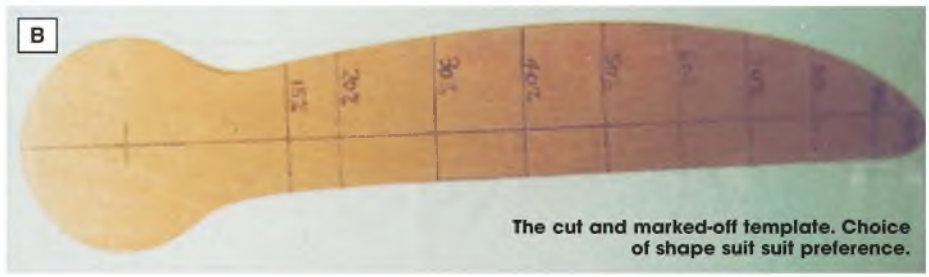


Fig. 1.



The cut and marked-off template. Choice of shape suit suit preference.

The machinery I use is an *Electra Beckum Bandsaw*, which will cope with up to 5" deep cuts in birch, plus a *Dewalt Planer/Thicknesser*. I prefer to use these outside, to limit the wood dust and shavings, which would otherwise end up in my workshop.

The hand tools (shown in **photo A**) are fairly obvious, possibly with the exception of the two handed 'draw knife' that I use the most for carving the wood blank to shape. It is held as shown in **Fig.1** and the thumbs are used to help govern the depth of the cut. I use it inverted for the final light cuts. The drawknife does take some time to get used to and if you buy one, I suggest you practice, first, on some wood offcuts.

The glue for joining the laminations can be either *Aerolite 306* or *Cascamite*, which in my preference. Also note the Oilstone; it is essential that the tools are kept very sharp to have a reasonable effect on the hardwoods.

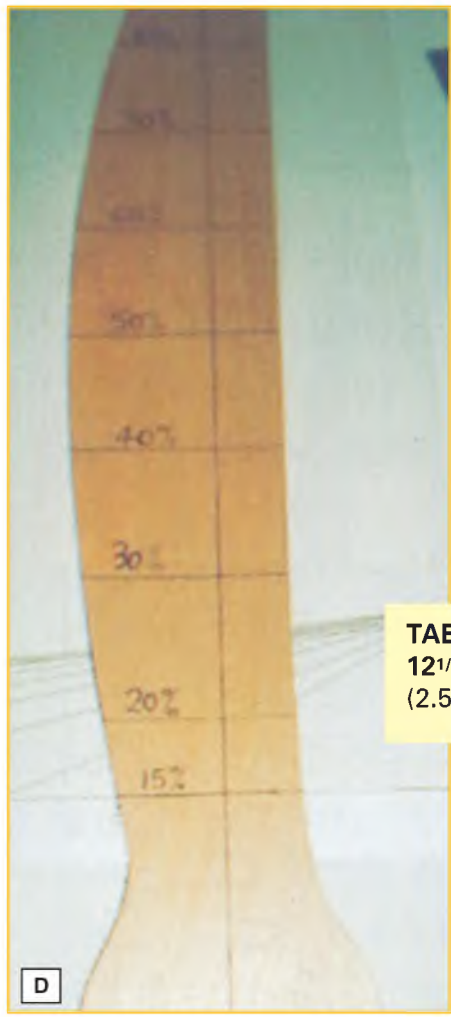
Preparation

I wanted a propeller for my half-size Nieuport 28 (342cc Westlake) and thought that a size of about 41" x 11" might be suitable (based on prior experience). I drew out the shape of one blade on card **(Photo B)** and adjusted the shape, partly to look right and be similar to my other successful props. An alternative is to copy the shape of an existing propeller, scaling it up or down to suit. The half template is then used to provide a full template on a piece of 1/16" plywood, marking a straight line on the ply and ensuring that the prop. is symmetrical. Do not repeat what I did once; I turned the half-template over and marked out a prop with one curved leading edge and one straight leading edge - and it was only when I was ready to cut the blank that I discovered the error!

The next stage is to draw out a pitch graph. This is a horizontal line, the circumference of the prop and the vertical line the pitch. On my prop, at 41" diameter, multiplied by Pi (3.142),

TABLE 1

12½%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	100%
(5.13)	(6.15)	(8.2)	(12.3)	(16.4)	(20.5)	(24.6)	(28.7)	(32.8)	(36.9)	(38.95)	(41)



gives a length of 128.8". I wanted a workable graph, so I divided 128.8 by four, which gave 32.2". The pitch (11") was also divided for four, giving a figure of 2.75". The factor of four could have been any number in the range three to five, to produce a reasonably size graph. The horizontal line was then marked off at the following distances/percentagesas set out in Table 1. (See **Photo C**).

A line was then drawn from the pitch height 2.75" to each point on the baseline (see **Fig 2**). The propeller template was then marked out as per **Fig.3**, one half blade was marked with the same percentages as above, but this time 100% = 20.5" (half the propeller diameter) Table 2:-

To read off the pitch, or in our example, the height of the leading edge at a certain point along the propeller blade requires the use of the pitch graph and the marked 'prop template'. For example, to read off the height of the leading edge at the 15% station on the template, to the right hand side of the 15% mark on the graph. (See **photo D** 15%). Mark the edge of the width of the blade on the graph and draw a vertical line upward until it touches the 15% inclined line. (See **Photo E**). This height is the height of the leading edge, measure it and write it next to the 15% station on the template.

TABLE 2

12½%	15%	20%	30%	40%	50%
(2.56)	(3.075)	(4.1)	(6.15)	(8.2)	(10.25)

Continue with each station, gradually moving across the graph and obtaining the height of the leading edge for each station. **Fig.4** shows 15% and 60% leading edge heights being obtained, other stations require the prop. template, positioned at the correct points on the horizontal line, i.e.: 15%.

Photo F shows the 20% marking, while **photo G** shows 20% height.

The thickness of the propeller blank is then the maximum height of the leading edge, plus an allowance for the blade thickness. (On this prop, an

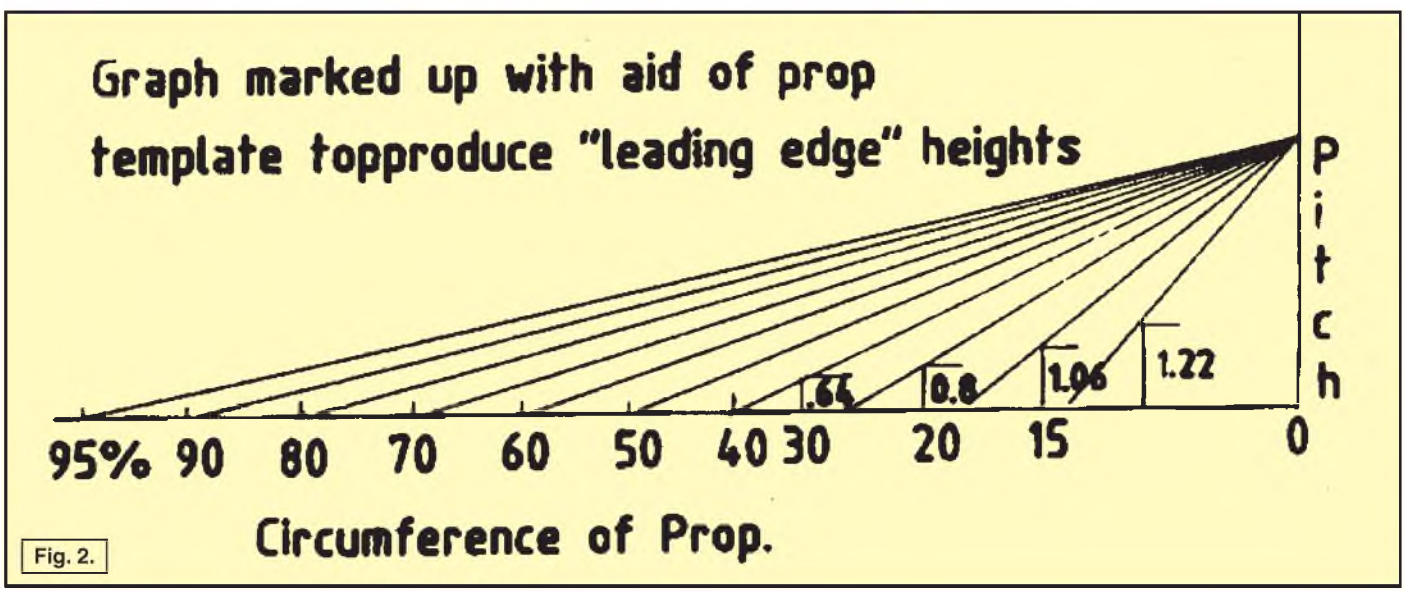
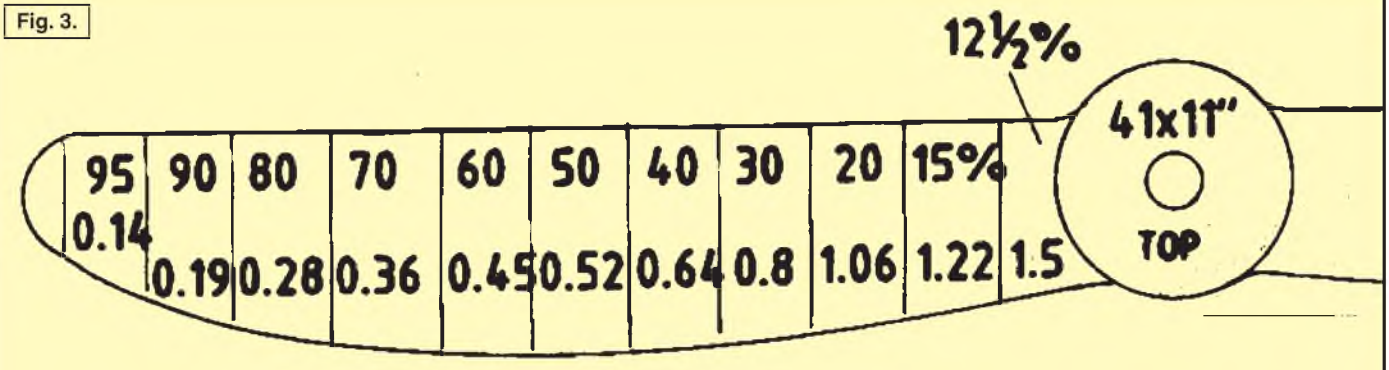


Fig. 2.

Fig. 3.



Marked template

Height of Leading edge at each station i.e. 15% Leading edge height is 1.22"

extra 0.2" THICKNESS i.e. 12.5% = 1.5 height + 0.2" =1.7 THICK.

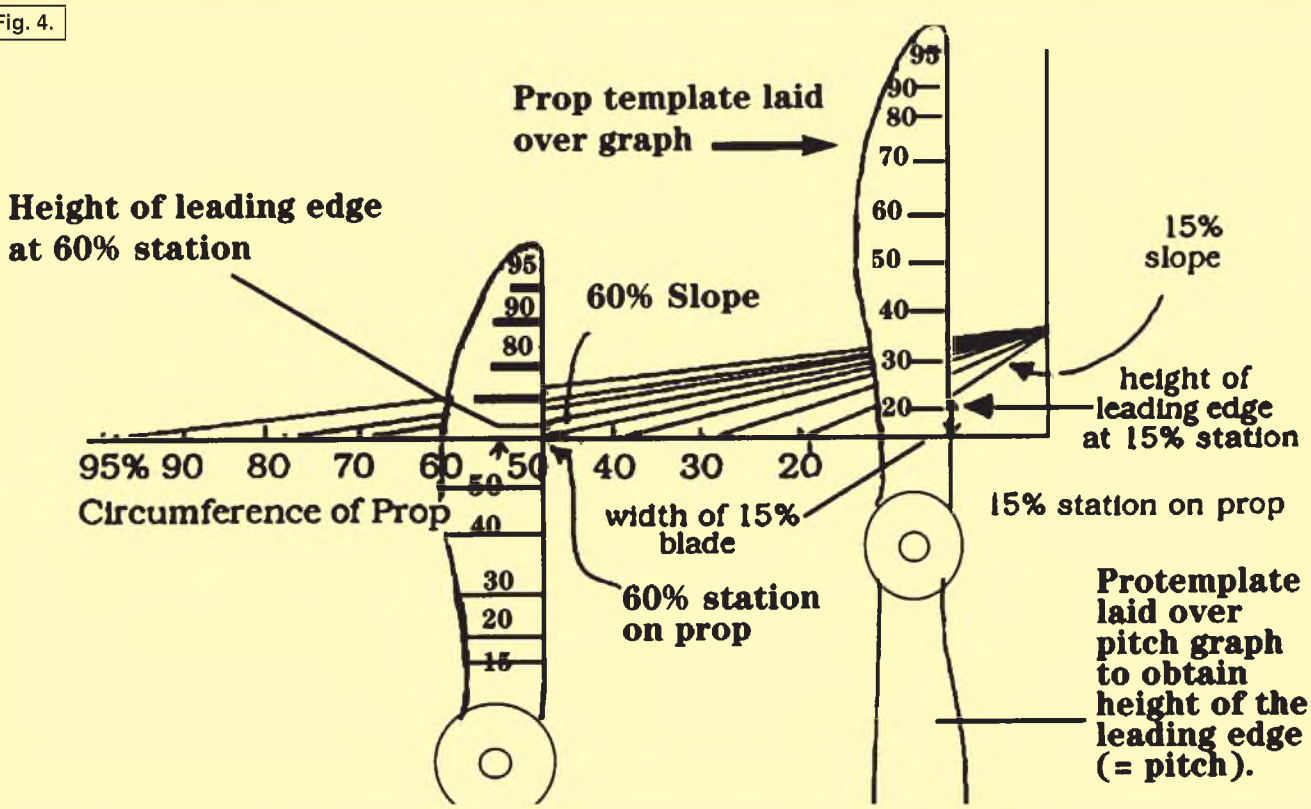
I selected and purchased a piece of beech which was about 2.5 x 6 x 84" long, cutting out a piece about 42 x 4.5 x 9/16" thick. This was then reduced on my thicknesser/planer to give smooth planks just under 0.5" thick.

NEXT MONTH:
The gluing of the wood and carving the propeller.

F

G

Fig. 4.



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Plan price £16.50 Plan No.146
Component Pack £95.00
G/F Cowl price £17.50
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In the 1930's, following on from the success of the Bü 133 Jungmeister. Bücker designed a trainer aircraft, the Bü 180 (later named Student) a low-wing cantilever monoplane. The wing was of wooden construction with a mixture of plywood and fabric covering. Mike Hawkins superscale model is 100" span for .90-120cu.in. power and four channel radio.

050/12

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On Silent Wings by Chris Williams

SCALE SOARING

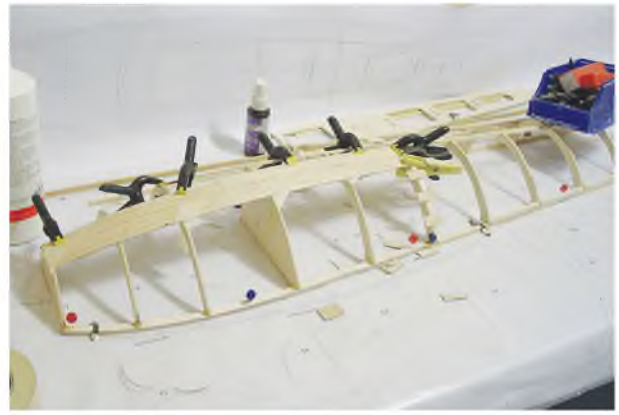
Last time around, I ended with these immortal words:

"...two maidens on New Year's Day seems an excellent way to start the year, and I hope it continues along similar lines..."

Hah! I really should have kept my keyboard shut, because it was nearly two months before any sort of aerial perambulation could recommence, due to factors such as rain, snow, unhelpful winds and freezing temperatures. The upside to bad flying weather is, of course, that conditions were ideal for project construction, so during this period I set to with a will in my cramped, bijou, but centrally heated workshop.

You wouldn't know it, after last year's summer of Olympics, but in 1935 it was

Authors' 3rd scale Rhonsperber (Steve Fraquet pic).



1st half of the Rhonadler fuselage on the building board.

Adding the second-half formers.

proposed that gliding should be a part of the festivities. In a manner that will seem too familiar to modellers, a standard class was proposed, which would be simple to build, without any frills, such as a landing wheel or flaps, the idea being, of course, to make piloting skill rather than sailplane performance the deciding criterion.

The eventual choice was the DFS Meise/Olympia, but there were many more gliders in the design competition. One of them was the fully aerobatic DFS Habicht which, reputedly, flew down into the stadium during the opening ceremony, performed aerobatics, and presumably flew away somewhere to land, a pretty confident feat of airmanship on the part of the pilot!

Two other candidates were the Rhonsperber and the Rhonadler, the latter being the latest subject of my attention. At seventeen-and-a-half metres, the Rhonadler was designed for the, then, growing interest in cross-country flying, and the Schleicher concern built some sixty-five examples, the Rhonadler going on to be the most popular high performance sailplane in Germany at that time. Sadly, none seem to exist today, save for a non-flying replica that is on display in the Wasserkuppe museum.

Fred Slingsby, the British sailplane manufacturer, was much taken with the Rhonadler, and went on to produce the Type 13 Petrel based on this design, the most striking similarity being in the shape of the tail surfaces. (There appears to be some sort of linear progression here, as I have designed and built models of the Habicht, Rhonsperber and Petrel).

There also seemed to be a satisfying synchronicity, as it was only in the previous year that I had built another version of the Petrel, so it was decided to build the Rhonadler to the same 1:3.5 scale, and to utilise similar construction methods. To this end, the fuselage was constructed by means of the half-shell method, which is to say, one half of the fuselage was made up directly over the plan and when enough stiffness had been obtained, the half shell removed from the board and the remaining formers, longerons and planking added.

For some time now I have been building similar monocoque fuselages using whole formers and a purpose-made jig, and it is quite interesting to note the differences between the two methods. Use of a jig ensures that the fuselage remains absolutely straight, but

Making up the wing centre-section fairing.

Author with completed Rhonadler airframe, ready for covering.

in the design and wood cutting stages you need to make up the jigging supports, which adds to the workload. At the same time, whilst the fuselage is in the jig, you can add the tail surface and wing mounting arrangements in the knowledge that everything is square in relation to the reference line that is the jig bed. The half-shell method then requires more care, both in keeping the fuselage true, and fitting the flying surfaces correctly. Having said that, at least half of my current fleet of gliders has been made this way, so perhaps practice makes perfect.

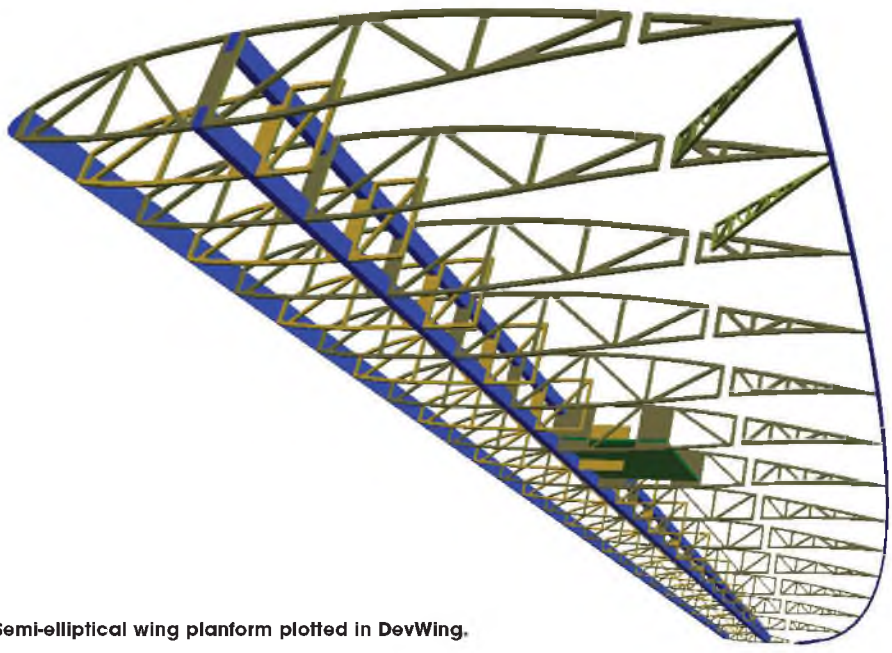
There are also two sorts of gliders of monocoque, i.e. all-sheeted, construction from this period: some like the Petrel and the Rhonsperber have wing root fairings built in to the fuselage while others, like the Rhonadler, have the wings mounted on a pylon on top of the fuselage, with a removable fairing to cover the gap. It is here that scale fidelity and hardnosed practicalities have a head-on collision.

There are some CNC kits of gliders of this period, such as my pal Motley's Minimoa, that mimic the full-size wing mounting arrangement with rigid bolt-on metal fittings. There are two reasons why I would never go down this road: firstly, unless it looks as though it definitely won't rain on the day, the Minimoa stays in the van due to the enormous amount of fiddling about to get it rigged and de-rigged. Secondly, due to the exigencies of slope-based operation, a heavy landing is liable to bend some of those metal fittings to the point of writing the model off, proving the principle: 'that which bends, doesn't break.' It is the latter principle that impels me always to design my models with flexible wing retaining methods, usually powered by rubber bands. (Easy to buy, cheap, and simple to replace).

Looking at the narrow gap between the Rhonadler's wings, it was obvious at the design stage that there simply wasn't enough room to fit the usual hook-and-band system. The compromise reached was to increase the gap, but taper it at the rear to follow the shape of the pylon, and then make up a flush-fitting fairing with a fake scale fairing to fool the uneducated.

There was more than one compromise to be made at the design stage, and the most important was one of aerodynamics. The Rhonadler has a very thick wing section at the root, the shape of which is very evident in its overall appearance. It may seem to power-oriented modellers that we glider hounds spend too much time faffing around with wing sections, but there's no whirly thing on the front of our gliders, so efficiency is of paramount importance. My usual trick is to take my prefered high-performance model wing section and thicken it up to match the depth of the full-size at the wing root, and then taper the thickness down to 12% at the wing tip. However, so distinctive is the camber of the Rhonadler's Gottingen section, that it was decided to push the boundaries this time and utilise the scale section (-ish) at the root, and transition to my favourite Quabeck section at the tip. This is easily accomplished on the PC in *Compufoil*, the wing-plotting programme, and a very handy tool is the 3D preview panel. (My first thoughts were to transition to halfway along the wing, but the resultant shape in the 3D view caused me to hastily change my mind!) So, as the model nears the finishing post, it seems that the wing joining arrangements have worked out satisfactorily, but the question of the aerodynamics won't be answered until the first moments of the maiden flight...

The Rhonadler wing in Compufoil 3D view.



Semi-elliptical wing planform plotted in DevWing.

Eating my own words

In the previous piece I wrote: *"...but there's no whirly thing on the front of our gliders ..."* but I have to shamefacedly admit that in the case of the California Sailplanes Duster I have rather made an exception. As I mentioned a couple of

Author's 3rd scale Habicht (Steve Fraquet pic).

issues ago, the enlarged one-fifth scale version of my original 1/6th scale model has been built and successfully flown. Since than, I've had a chance to fly her a couple of times in the circumstances for which she was originally conceived, that is to say from the flat in calm conditions. Both models will travel fully rigged in the back of my estate car, and my original thoughts have been well and truly confirmed: this is a very quick and convenient way to fly a scale-ish glider in circumstances when the larger stuff is ground-bound i.e; when the tug pilots are all on holiday and there is no wind on the slope. I haven't seen much in the way of the thermals in recent years (other than the ones I'm wearing) but I'm confident that both models will know what to do if one should come our way...

More on wing design

It was some time ago that I wrote briefly about *DevFus*, the fuselage plotting programme from the *DevCad* concern. Now they have brought out a new product. *DevWing,* which as the name might suggest, does pretty much the same thing for wing design. What caught my attention was the ability to design a wing with a semi-elliptical planform, that is to say, a wing with a straight leading edge and an elliptical trailing edge. This is a configuration to be found on the outer panels of many vintage gliders, and the ones I have designed in the past have been quite problematic in this respect.

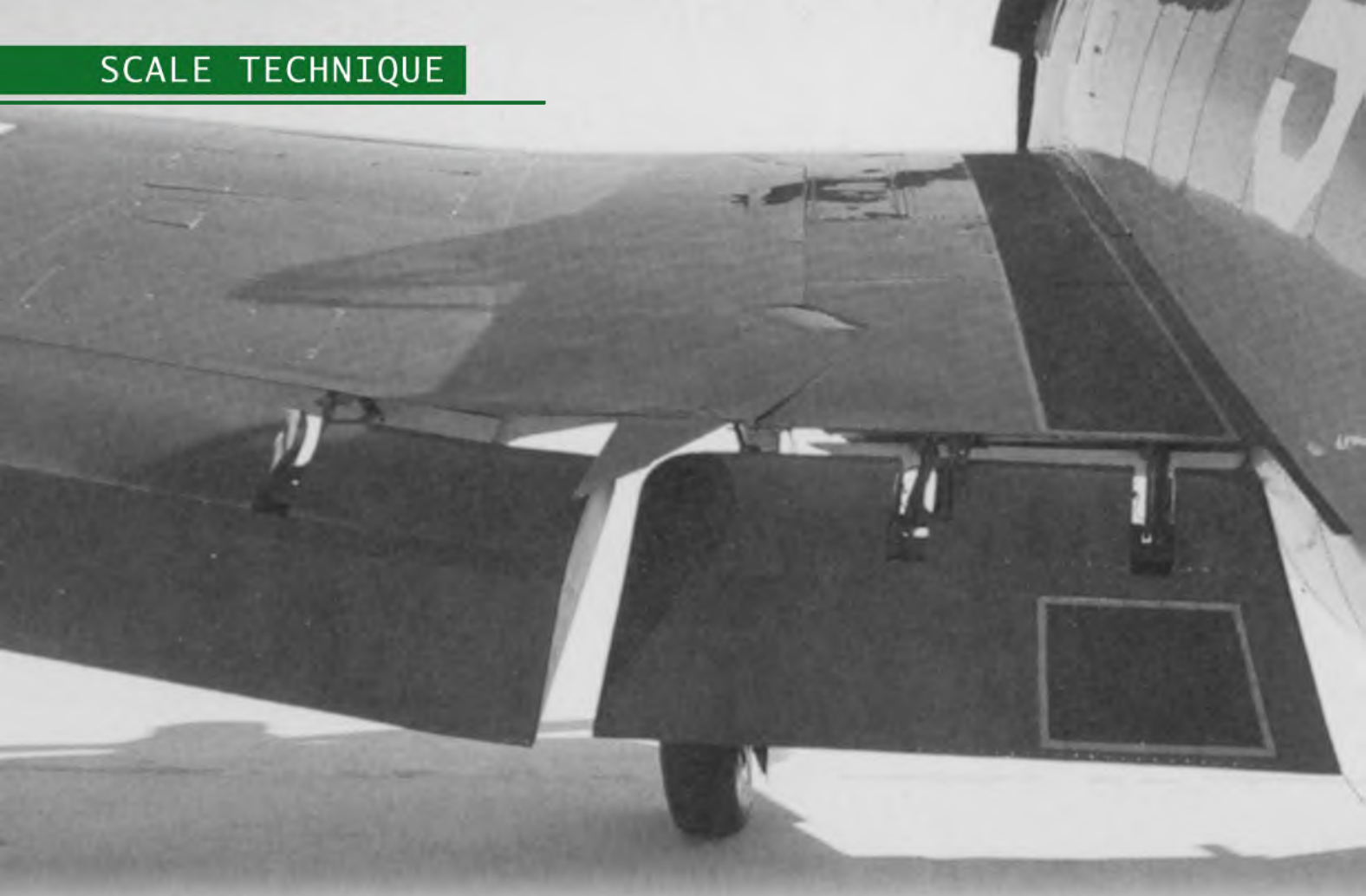
As usual with any new programme there's a lot to take in, although previous experience with *DevFus* is quite helpful. In the space of one evening I was able to come up with a generic semi-elliptical wing, although forcing it to fit predetermined parameters would obviously take a lot longer. When the next project has been decided upon, I will give DevWing a test drive and we will see what we will see...

(You can download a free trial programme from: *www.devcad.com*) ■

Simplicity of operation: author launches the latest version of the California Sailplanes Duster (Geoff Crew pic).

The Duster dirtied up: Brakes down, ailerons up (Geoff Crew pic).

Rigid mounting on Geoff Crew's CNC Modellbau Minimoa.



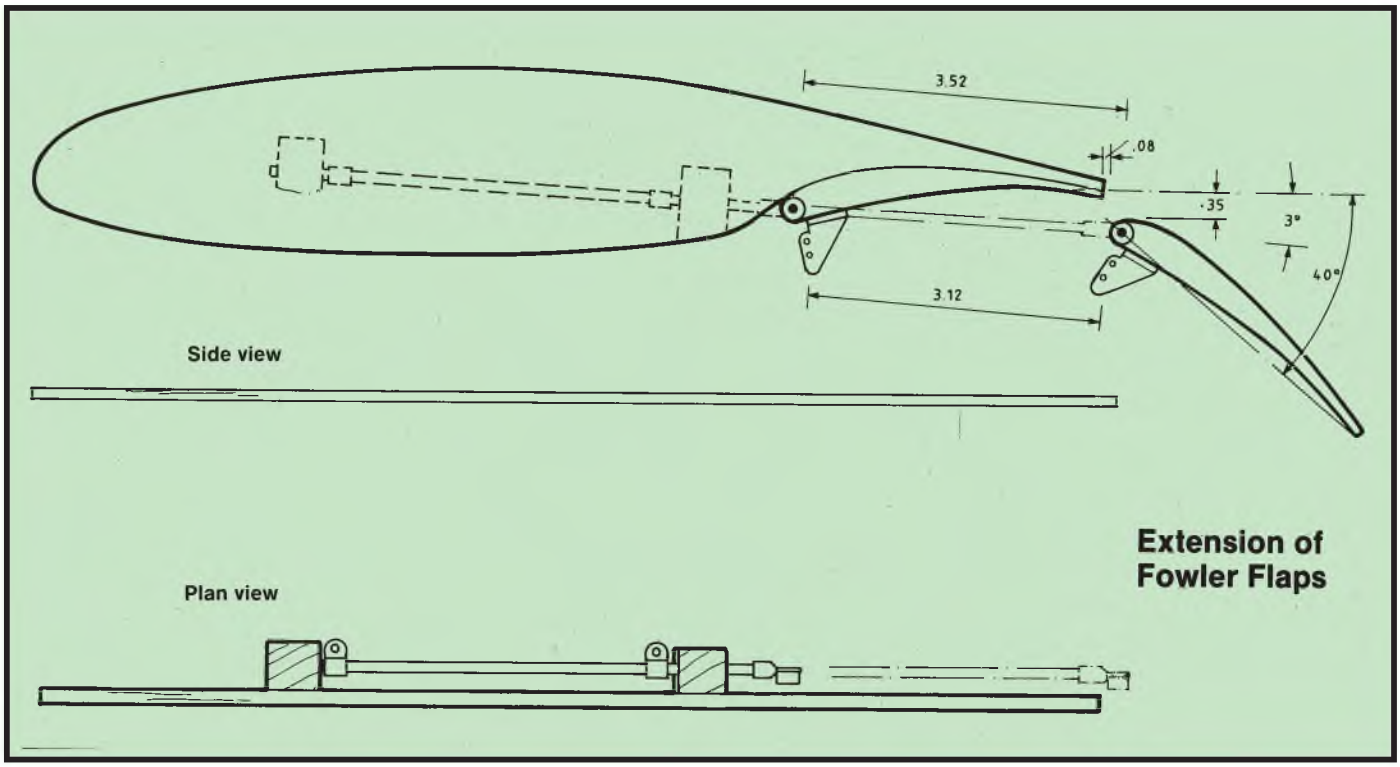
GIVE US A LIFT!

The Fowler Flap and other similar devices are designed to provide a high speed aircraft with low speed, high lift characteristics for take off And landing. The mechanism, shown here can be adapted to suit a wide variation of examples that do the same job of turning a small wing into a bigger one...

This discourse on the subject of Fowler-type flaps of model aircraft originally appeared in John de Vries' column in *Model Aviation* magazine. Curiously the person who developed the mechanisms shown here is a Mr. Charles H. Fowler, but HE was no relation to the original Mr. Fowler (inventor of the flaps), it just made the coincidence more interesting.

Fowler flaps have been around since before WW2 and are now a vital part of the lift armoury of modern high-speed jet aircraft. They act both as wing extenders and as conventional flaps. The slotted flap effect can clearly be seen when sitting to the rear of the wing in an airliner - quite disconcerting when you see the ground through gaps in the wing!

Charles Fowler has been working away at devising suitable mechanisms for the reliable and simple operation of Fowler flaps on models. Not only has he successfully and cleverly achieved this aim, but he is now augmenting the flap mechanism with a wing leading edge droop system, as commonly found in airliners. John de Vries



tested out the C.H.F. flaps and reported:-

"Charles' simple mechanisms are very functional, having handled them, I know that they work smoothly and well. I would suspect that they would be limited to scale models of '60-size' and larger, because of the weight of the additional servos required. The extra push rods, guide blocks and bellcranks pose a negligible weight penalty."

It should be noted that included is the caveat that Charles Fowler's drawings do not represent a specific installation of the mechanism. Although it is directly applicable to any scale model usage, anyone contemplating the adoption of the mechanism must adapt it specifically to his model.

Home grown Fowler flaps; a mechanism for models

If we are to build genuine scale models of sophisticated modern aircraft we have to find a way of sensibly reproducing 'flappery' and 'droopery'.

The drawings shown are not for a specific aircraft, therefore, there are no dimensions. They are used to illustrate a method to make flaps that actually slide out from under the wing's trailing edge and deflect downwards - which is what Fowler flaps do.

How do they work? The rods of the flap supporting 'rams' travel further than the flap tilting push-rods, though all are extending, or retracting, at the same time and direction. This is because the 'ram's' push rods are connected further out on the bell cranks arms than the push rods to the flap's horns. (Two per flap.) This creates a difference in travel and a 'pull' or a 'push' action on the flap horns even though they are all moving fore or aft together. The rod assembly slides out, and the flap hinges downwards.

It's just as firm an action as if the flap were conventionally attached and hinged at the wing itself, and received a 'flaps up' or 'flaps down' signal from your transmitter. Yet this F.F. increases effective wing area, and also causes more (and thinner) air to flow over of the upper surface due to the overall camber increase. As a result it will greatly increase lift for slow/short landings! Or, with partial extension, for take off with a model load - such as a camera!

The pair of sliding rods that support the flap at each end are made of stock (piano wire) rods. The rods are each supported. by two beechwood blocks attached to an adjoining rib. The holes to accommodate the rods are brass bushed from stock tubing. The fitting for the clevis is rolled from brass sheet, fashioned into a P-shape, a hole for the clevis pin drilled on the leg of the 'P', and the fitting is silver soldered to the ram. The fitting to attach - and to hinge - the flap is made of stock brass tubing, flattened at its end and silver soldered to the rod. A wheel collar is silver soldered to the flat area and a hole is drilled through the brass. A short piece of piano wire rod is held by the collar's set-screw and inserts into a brass bushed hole at the flap's outer - forward edge.

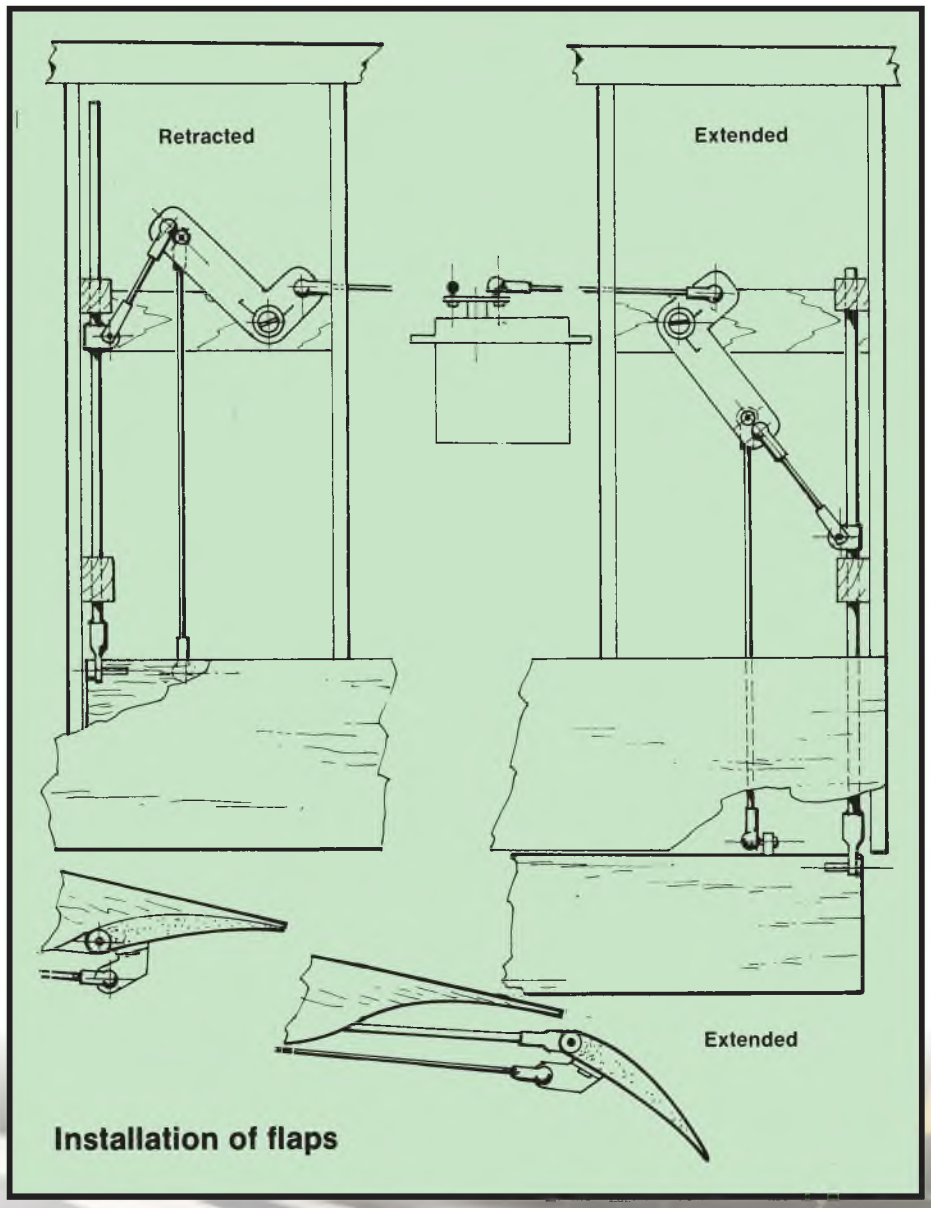
The bellcrank shown, for illustration purposes, is a modified commercial item - just select any example that fits the geometry illustrated. To increase the rod's travel for larger wings/wider flaps, an extension of this bell crank arm can be made by bolting on a piece of ply. Or you can build up your own bell cranks from ply, as there is very little stress on them if all the mechanism is sturdy and properly aligned.

(Now don't run away yet. .. You can do it!)

On the prototype liteply was used for the load bearing ribs and Beechwood for the leading portion of the flap (to obtain rigidity over a long flap span) with glass cloth wrapped and epoxied around the

TOP LEFT & LEFT:
The Grumman Hellcat features flaps that extend rearward as they curl down to slow the aircraft down to aircraft carrier deck landing speed.

RIGHT: The flaps on the Lockheed P-38 Lightning extend rearwrd and curl down so that the flap leading edge is in line with the wing trailing edge.



Installation of flaps

bushing area.

To design a Fowler Flap for a particular aircraft you may have in mind, it would be best to carefully draw out the entire mechanism's movements on paper first. You'll need to determine the correct movement of the ram rod and all push-rods, the best bellcrank size, location, and amount of movement, the servo arm movement, etc. Allow enough threads at all connecting push-rods to make final adjustments. All this can be accomplished with just a compass, protractor, and a small scale (ruler) with fine divisions. Properly built, aligned, and adjusted, the friction will become almost negligible.

Drill the holes completely parallel to the inner edge of the beechwood blocks, two at a time, and cut them apart. This will keep the distance from rod-to-rib equal and prevent binding. It's also very wise to epoxy, or SLO-ZAP, the ram mounts to the rib with

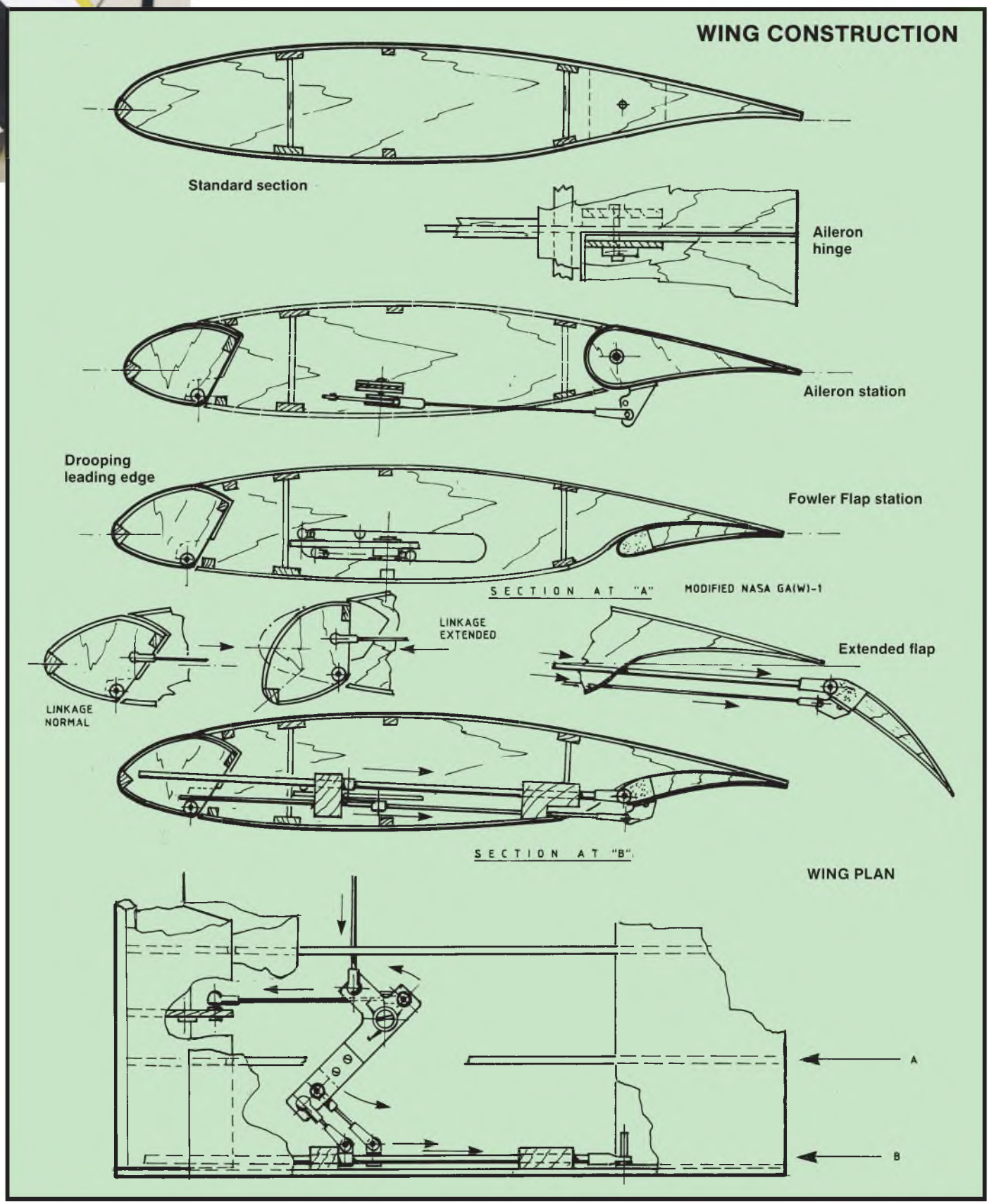
ABOVE & BELOW: Another example of flaps that don't simply droop as they are deployed. The Republic P-47 Thunderbolt has flaps that partially extend rearward as they lower

the rod in place to get a non-binding line up - so have all your solder work done first! Also, install the ram bearing ribs as parallel to each other as you can. You don't want the 'hinge pins' spreading, or pinching at the flap connection.

The length of the flaps, the size of piano wire, and other materials are up to you, because your choice (and size) of aircraft to employ Fowler Flaps will determine these factors. When in doubt, go strong. You'll have compensating lift galore.

It is most effective to have a flap chord in the order of 25% to an ideal 30% of the wing chord. Most airfoils used for slow-flight/high lift have a thickness of around 15% or more of chord where the servo action will be, so you've got some room. But be sure to calculate servo arm clearance between the upper and lower wing surfaces - early! Do not trim the horn down until you see how it flies at different hole settings and adjustments. Lift should decrease at around 40 degrees deflection and drag increase.

When "the penny droped" for my method, I did quick major surgery on a wing in progress to test the mechanics of my idea. Fortunately, they did the job. With care, you should get a smooth operating, rock solid Fowler Flap - something a number of you have wanted to have without it costing a real bundle. ■



Deeside Scale 2012

Alex Whittaker attends this delightfully low-key Clubman Scale Event

Tarheel Jack, Robert Griffith's P-47 Thunderbolt II.

The 2102 Deeside 'Philip Kent' Scale Day was blessed with superb weather and great flying conditions. The wind was gentle, the skies were bright, and the air temperature was unseasonably warm; difficult to believe it was winter, especially after the dire 'summer' of 2012. Here, down on the Dee Marshes, on the borderland between England and North Wales, all was sublime. We had a healthy turn-out of pilots too.

Philip Kent Rules

These Clubman Scale Comps are run to Philip Kent's well established 'Flying Only' rules. This means that ARTFs may compete alongside 1,000 Hour scratch-built models, which are not 'Static Scored' for their appearance. Marks are awarded solely for how well pilots fly their chosen scale schedule.

A welcome feature of these comps is that they are designed to get people competing, and a good deal of 'mentoring' takes place between the Judges and the Pilot, and also between the pilots themselves. This means that if you attend as a 'first-timer', you will not be left all at sea. People will be friendly and supportive, and will go out of their way to help you. This friendly, inclusive atmosphere gives these events a very positive tone. Most of all it is good fun, with good company, and lots to natter about in the pits.

Team Griffiths! Young Robert flew well all day.

Entries

There were 14 entries. All pilots who entered flew, with most getting in two rounds. The final scores were surprisingly closely grouped, in a range from 120 to 152 points.

Models in flight

I'll let the photos tell their own story, but a few notes may help you better understand the day. The first model I saw in the air was Andy Bowman's still

MAIN IMAGE: Alan Glover's superb Tiger Moth, on an unhurried low pass. INSET: Alan Glover, well known pilot on the scale circuits. Good bloke, who will always lend a hand. RIGHT: Keith Fear carries out his Chipmunk ARTF. BELOW: Keith Fear's Chipmunk on a low pass.

startling-white and blue Stampe SV4B. Readers will remember this fine model from last year's Nats coverage. The dramatic cloudscape complemented this sharp colour scheme just perfectly.

Another 'Phil Kent' regular, Alan Glover, also flew a bipe. Like Andy's model, this too was a proper hand-built winter project: in this case a lovely DH 82 Tiger Moth. There was even the obligatory yellow Cub present too. This was the clipped wing variant, flown by Howard Parker.

Local scale man Colin Bostwick was flying his hand-built and most

Colin Bostwick's FW 190 coming in on full flap.

Dominic carries out Colin Bostwick's Focke Wulf.

Andy Bowman, about to fly his Stampe.

Andrew Bowman's lovely bench-built Stampe SV4B up there in her element.

impressive FW 190. All Colin's aircraft are traditionally crafted scale models, and this one flies a treat. Dominic Brassey-Williams was flying with his beloved granddad, Brian Brassey. Dom was also flying a Focke Wulf, though his was the long-nosed D version. As usual Dominic flew very well indeed.

Besides this Granddad and Grandson Team, there was a 'Dad-and-Lad Team' too, the Flying Griffiths. Young Robert was flying his Thunderbolt Tarheel Jack.

Keith Fear flew his 1/5th scale SC120FS powered DHC-1Chipmunk. Keith is a popular pilot on this circuit, and

Jonathan Davies' all-foam Parkzone, electric powered Albatros D.Va crossing the boundary hedge!

Howard Parker's clipped wing Cub. It would not be a scale day without a Cub!

Howard Parker points his Cub into wind before take-off.

scored a place, so everyone was happy.

Colin Campbell's North American P-51B in well known 'Bald Eagle' colours made a refreshing change from all those bubble-canopied P-51Ds.

Ian Bottell flew a tidy ARTF Ryan STA, in a bright white and red scheme, not a million miles away in inspiration from Maxie Hester's famous steed. Brian Wood flew a lovely Harvard, from the famous Brian Taylor plan. Brian Taylor models always look exactly correct to my eyes. Real classics. Look at the photos and see what you think.

Grateful thanks to the Deeside Club's super efficient John Lee for sending me the Club's Official Scores within hours of the end of the comp. His little ipad must have been red hot!

Dennis Hughes Memorial Trophy

Besides being Runner-Up, Colin Bostwick also was also awarded the Deeside Club's Dennis Hughes Memorial Trophy, as the Best Placed Deesider. This was very welcome, since Colin is a well-respected local scale modeller, and a very nice bloke, too.

Dominic Brassey-Williams' Focke Wulf just after take-off.

Official results

The Deeside Club scores it Scale Competition down to Sixth Place:

1. Andy Bowman	Stampe SV4B	(152)
2. Colin Bostwick	FW 190	(146)
3. Alan Glover	Tiger Moth	(136)
4. Ian Bottell	Ryan STA	(132)
5. Howard Parker	Cub	(130)
6= Dom Brassey	FW 190D	(120)
6= Keith Fear	Chipmunk	(120)

Brian Brassey and grandson Dominic - a great team.

Delyn Scale 2013

My own Delyn Club holds its own Phil Kent Clubmans' Scale Meeting every year. Ours is to be held on the 8th September 2013. You are all most cordially invited, whether flying or watching. It is free to attend, and to park your car. Our Singing Kettle International Field is right alongside the A55 Expressway, at the Caerwys turn-off. Rhyl, Llandudno, or Conwy are but twenty minutes away, so you can make a family day of it.

A corner of the pits.

One of my favourite scale ARTFs, the Ryan STA, flown by Ian Bottell.

Brian Brassey's fine, bench-built Thunderbolt II.

The Black Horse Westland Wyvern as reviewed in last month;s FSM is an impressive ARTF.

Colin Martins' neat Corsair F4U. Colin always flies well, but dropped a round this year.

Brian Wood's meticulous Harvard from the celebrated Brian Taylor plan.

Techno Scale

Mike Evatt er

SAMS have been in the model business for over 35 years and have built up a formidable fount of knowledge regarding small model aircraft, especially of the free flight variety. They also have access to the latest developments in micro radio control, which, with the latest reduction in size and weight is now suitable for many of the smaller models listed on their website at www.samsmodels.com

What drew me here were their **'Easy Built Peanut Kits'** such as the delightful Ryan ST12 and the Rearwin Speedster shown in the screen-shot.

Fast, agile and armed to the teeth, Willy Messerschmitt's Bf109 dominated European skies at the outset of World War II and remained a formidable foe even after the Mustangs and Thunderbolts arrived. Now anyone can experience the thrill of flying the Messerschmitt on a smaller scale with this fully-aerobatic, brushless-powered Bind-N-Fly™ reproduction from **ParkZone.** The ParkZone(r) Messerschmitt Bf-109G comes out of the box with a realistic Luftwaffe paint scheme inspired by the markings of a Bf-109 flown by Erich Hartmann-Germany's leading WWII ace. Check it out at King Lynn Model Shop at www.kingslynnmodelshop.co.uk

Graupner Tangent Model Sport has a web presence at www.tangent-modelltechnik.com

They produce high quality model aircraft which are designed in Germany and subject to ongoing development and testing by a team of highly competent model pilots. The f ull-size ASH 26 was developed and built by the Schleicher company in Poppenhausen. The machine is available both as a pure glider and as a powered version with retractable engine, in which form it is known as the ASH 26 E. Emulating the full-size aircraft, their model of the ASH 26 constitutes a sweet-handling machine with an extraordinarily wide flight envelope coupled with an impressive scale appearance.

If you are looking for an **Aero-Tug** for your soarer than look no further than **Frisch-Modellbau** at www.frisch.flugmodellbau.de Owner Alexander Frisch has been in the aeromodelling business for more than 25 years and has produced in excess of 2000 kits. His main product is a range of the PZL 104 Wilga, the famous Polish towing aeroplane. These are available in 1/4, 1/3.5 and 1/3 scales.

Glenn Torrance Models has a web presence at www.flygtm.com Started in 1990, their business has concentrated on the scale WW1 radio control modeller by offering scale r/c model kits and related accessories. Gathering documentation from historians and museums worldwide has guaranteed the scale fidelity and accuacy found in GTM products. Each product stands behind the company's motto *"Quality without Question"*. The Fokker D.VI, shown in the screen-shot, is a little known bi-plane that has not often been modelled. The D.VI fuselage is similar to a Dr.1 and the wings are basically shortened D.VII. These two features combined together create a marvellous flying plane.

Stewart Aircraft, with a web address of www.stewartaircraft.com, is an unusual company as it embraces both full size home builts and also models. Don Stewart formed the company in 1961 when he designed the 'Headwind' The prototype 'Headwind'

Delightful 'peanuts' from SAMS.

The ParkZone(r) Messerschmitt Bf-109G is available from the King Lynn Model Shop.

Graupner Tangent Model Sport produce a very classy ASH 26.

Alexander Frisch has produced in excess of 2000 kits!

The Fokker D6 is a little known bi-plane that has not been modelled often.

Don now stocks a fine range of model kits by Balsa USA.

ters cyberspace for more TechnoScale Topics...

was built over a period of 5 months and was first flown on March 28, 1962. The airplane flew well right off the drawing board but in the intervening years, many structural and aerodynamic improvements have been made to the design. This is a worthy subject for a model in its own right! Don now also stocks a fine range of model kits by Balsa USA.

Perfect-Pilots at www.perfect-pilots.co.uk is a small family-run operation specialising in hand made scale model aircraft pilots. Like you, they are R/C modellers and this initiative was born out of their need for pilots for their planes. They specialise in bespoke, individually crafted pilots particularly for scale models. Perfect-Pilots offers a range of pilots, including fully articulated figures clothed in leather and fabric clothing as well as a number of fully-moulded one piece pilots. Perfect-Pilots started in a very small way with a need for a pilot for a 1/4 scale Tiger Moth in 2008 and their range has grown since then to include a growing range of pilots in 1/3, 1/4, 1/5 and 1/6 scale.

Spotted on **Pete Tindal's website** at petetindal.co.uk is a Smoke System, just the thing to add a bit of fun to your flying! This smoke pump is probably the lightest device on the market weighing just 58gms complete with super lightweight purpose built electronics. The pump is fully proportional and switchable and can be linked to the throttle for automatic volume control at all engine speeds. The system is suitable for 4 stroke .91 size and above and for all petrol engines

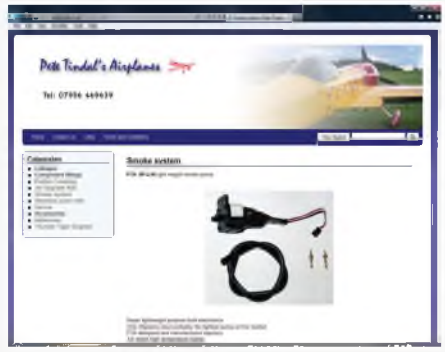
The **Hergt 1918 Monoplane**, a delightfully obscure model airplane from 'The Great War', has been the subject of many a model aircraft scratch-builder. With docile handling and ease of construction, it's no wonder that the Hergt is so favoured by builders and pilots alike. The **StevensAero** Hergt, 1918 Monoplane kit is no exception, and has been engineered to readily accept ParkZone Ultra Micro DSM2 electronics, includes a full hardware complement, and bonus profile pilot figure. With Stevens AeroModel's quick build laser cut format your Hergt kit and you will likely be on dawn patrol the day after beginning construction! Delightful! See for yourself at www.stevensaero.com

The **Amman Valley Radio Control Club** is a small, friendly, radio controlled model club, situated in South Wales. AVRCC was established several years ago, and has managed to halt the decline in the hobby in our locality and over the last few years has been experiencing a steady increase in members. The aim of the club is to promote the sport of Model Flying. This is achieved by encouraging people of all ages to experience, hands-on, the thrills and excitement of Radio Controlled Model Flying.

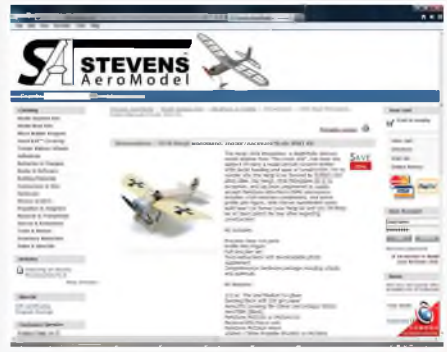
Full details may be found on their first-rate website at www.radiocontrolclub.co.uk where some excellent scale photos may be found.

Not only does the **Swindon Model Aero Club** have probably the best primary flying site in the country but it also has an excellent alternative flying site as well. Wroughton Airfield is owned by the Science Museum in London. During the year several days are lost to the SMAC as it is used for corporate events and open days. To remedy this SMAC have acquired an Alternative Site that is located on an adjacent field. Many members have an interest in large scale models and the LMA holds one of its annual events at Wroughton. Check them out at www.smac2000.org.uk ■

Perfect-Pilots specialise in bespoke, individually crafted pilots, for scale models.



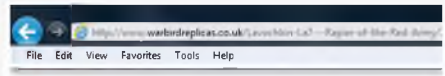
Pete Tindal's lightweight smoke pump.



The StevensAero Hergt, 1918 Monoplane is a sheer delight.

The AVRCC has many excellent photos on its website.

Swindon Model Aero Club have probably the best primary flying site in the country.



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

mikeevatt@hotmail.com

THE QUIET ZONE

R/C SCALE ELECTRICS BY PETER RAKE

Here we go again, with the further adventures of an electrophile - otherwise known as *The Quiet Zone*. As I sit down to write this, the weather finally appears to be taking a turn for the better. Sub-zero temperatures are absent and the trees are barely moving ... all-in-all, an ideal day to go flying.

What am I doing on such a tempting Sunday morning? Sitting here writing your favourite electric flight column of course. Come on now, how else do you think it gets written? The sacrifices I make in the name of literature! Yes, so maybe 'literature' isn't quite the way to describe my ramblings, but let me assure you, writing such rubbish is an art form in itself. Any fool can write good stuff, it takes real skill to be this bad.

So, where did we leave you last time? Oh yes, discussing my take on suitable structures for electric powered models. That theme will continue this time too, so that means this is another column aimed at the electric novice. You more experienced electrolytes can either read along, or mill around aimlessly until I'm finished. I'm sure there are other articles within these hallowed pages that will grab your interest.

A quick recap

Yes, I really do mean quick. Much as I'd like to copy and paste swathes of last month's column, somehow I don't think I'd get away with that. Oh well, such is life.

If you are following this (If not, why not?) you'll recall that we are trying to guide the new electric flier towards creating their own models, rather than just buying another RTF - or buying yet more spare parts for the one they have. Since most RTF models come with perfectly acceptable radio gear, motors and batteries, it only makes sense to use that equipment in other models.

Last time around, we looked at model styles suitable for gear salvaged from what are known as Ultra Micro models. Although not actually ultra anything, they are amongst the most common RTF models you're likely to see. I've just finished exactly such a conversion and if I can keep the flying weight of a three-function model to well below two ounces so can you. As you can imagine, to achieve that, a lightweight structure is essential. Use just enough wood to do the job and don't be tempted to 'beef up' the structure to make it crash proof. You'll just make it heavier and more prone to damage.

Although at the time those comments were specifically aimed at very lightweight models, much of the same advice carries through into large (and MUCH larger) models. That, is what we'll be taking a look at this month.

Going up

Yes, I know that's what models are supposed to do, but I am here referring to the size of the model. Just thinking about the next size up from the Ultra Micros, I suppose that puts us in the realm of the Speed 400 motor (Mabuchi 380).

Now this is a VERY useful little motor, but not without its limitations. Once upon a time, when I first started designing for electric power (yes, just after the Dinosaurs became extinct) it was THE motor to use in small models. However, perhaps a word about the term 'small' is required here. Compared to the UM models, 400 size models are big

ALTHOUGH THIS MODEL IS ONLY 18 INCHES SPAN, IT DEMONSTRATES THE TYPICAL CONSTRUCTION I LIKE TO USE.

A much bigger model, the 48" span DH6 shows that size is no object with regards the build style.

and heavy. Biplanes of around 36-38 inch span and monoplanes spanning as much as 48 inches were the norm. Since these were invariably powered by either Ni-Cad (Nickel Cadmium) or NiMH (Nickel Metal Hydride) batteries, a flying weight of more than 20 ounces was to be expected. Most of my early electric models fell into this category and were really successful flyers.

The power train

Before we get onto structures, a closer look at the equipment is in order. The radio gear you have in front of you will probably consist of a direct drive Speed 400 type motor, a minuscule prop (around 6" diameter), a receiver (probably four function), an ESC (Electric Speed Control) and two or three servos. If the servos are 'normal' examples they will have three wires connecting them to a plug that fits the receiver. These wires are likely to be either red, black and white, or red brown and orange.

Not surprisingly, the red lead is positive, the black or brown lead is negative and the remaining lead is the signal wire - along which the receiver tells the servo what to do. If that's the case it's great because it means you can use any servo with your receiver as long as the wires are in the same order in the plug. If there are more than three wires, I'm afraid you're stuck with using the servos that came with your model.

The advantage of the conventionally wired servo is that it can easily be replaced and, if it's a full size servo (around 2 ounces) can be replaced with a much lighter one. Absolutely the heaviest servo you really need with a novice style 400 model is 16 grams and 9 grams is perfect for slow flying types that don't exert much strain on the servo in flight.

Okay then, about that power train. The thing you have to understand about a direct drive (no gearbox) 400 size motor is that it is really best suited to faster flying models and gliders. For 'vintage' models, or scale models of the type you need to be considering, a geared motor is far more efficient. It will turn a much larger prop (10 or 11"), without drawing any more current and allow us to fit it into the size of model mentioned earlier.

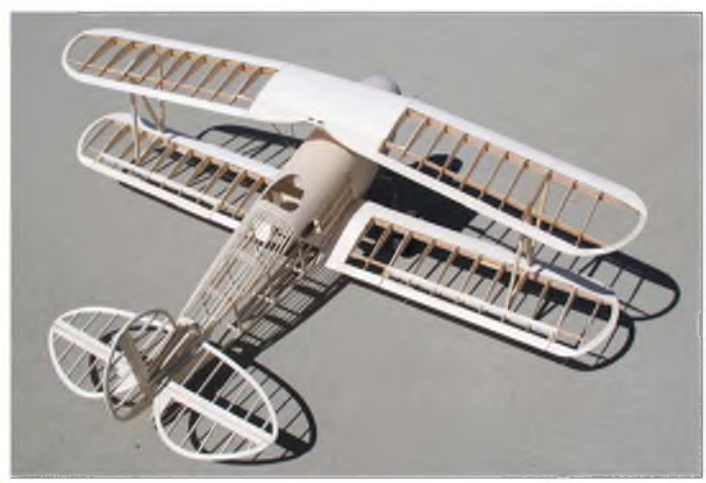
If your model came with a geared motor so much the better. If not, I'd strongly suggest you fit one to your motor because it makes it so much more versatile. Aim for a gear ratio of around 3:1 and you won't be too far out. There are some very cheap, open framed, clockwork looking gearboxes out there, but you need a fairly large fuselage cross section into which to fit them. Although more expensive, I'd strongly recommend a brand-named gearbox that has provision for mounting it in the model. I like the Graupner ones, but Permax, Aeronaut and MP Jet gearboxes are all good. Even the humble Mini Olympus (if you can get one) is highly useable.

So, with the motor side of things sorted out, lets take a look at that speed controller. If your model came with a brushless motor and LiPo battery, you have it made. If, however, it was a brushed motor (the type we've been discussing) combined with an NiMH battery pack, that doesn't mean you are restricted to only using a NiMH battery. True, you are stuck with a brushed motor because that type of ESC won't operate a brushless motor, but a change to LiPo power is possible. The ESC doesn't care what source it gets it's volts from, only how many of them there are.

Be careful if you do decide to opt for LiPos instead of the battery pack that came with your model. LiPos are more expensive than NiMHs and will require a dedicated LiPo charger. You can't charge them with the type of cheap charger included with a NiMH powered RTF so, unless you are heavily into arson, DON'T TRY.

As regards the ESC - that will work fine as long as you don't exceed the voltage it's supposed to run at and NEVER fly until the low voltage cut-off operates. Time you flights and land long before the voltage gets down that far. The reason why is pretty simple and involves the voltage at which LiPo cells can

Even more complex fuselages use the same basic structure beneath all the more curvaceous parts.



Although it's hard to tell this is the same fuselage as in the earlier photo. This time the model is a 54" span Great Lakes Trainer.

Once the GLT is covered nobody can tell how simplified the structure is.

The DH6 would make an ideal first biplane. It's simple to build and relatively easy to fly.

be damaged. They should never be taken below 3 volts per cell, 6 volts for a 2S pack, 9 volts for 3S, etc. However, most brushed, NiMH ESCs don't cut out until below 6 volts. Bad enough on a 2S LiPo, and fatal on a 3S pack.

It isn't all bad though. Because you can get so much more capacity from the same weight of LiPo batteries, despite the fact you never run them down flight times are actually likely to be longer than with the supplied NiMH battery. A 2,000 mAh LiPo will weigh around the same as an 800 mAh NiMH and fly the model nearly twice as long.

Getting back on track

Okay then. After that brief detour to look at power set-ups, I suppose I'd better get back to discussing what I was supposed to. Don't worry, given time you'll get used to these distractions.

Finding a model to suit your salvaged equipment isn't difficult at this size. There are literally dozens of kits and short kits available, covering every conceivable style of aircraft. Vintage models (old timers), cabin monoplanes, biplanes of every shape and size, low wing aerobats and WW2 warbirds abound. I must have published over 50 designs myself aimed specifically at the good old geared 400 motor - or a brushless equivalent. (Many of the plans are available from the publishers of this fine magazine.)

Finding something to suit every taste isn't the hard part; that comes with choosing a model to suit your flying skills. If you're still learning to fly properly, we can probably discount the aerobats and WW2 warbirds. Their life expectancy in the hands of a novice can be counted in seconds. Slow flying types are what we're looking for while you're learning to fly - those give you time to think about what you need to do next. A stable flying, slow model is even better, which discounts most low wing types. Biplanes are fine if you're prepared to put in the extra work and cabin monoplanes (Cessnas, Piper Cubs, etc) are pretty much ideal.

So, with our prototype selected, what do we need to look at next? If the model you are converting was originally intended for an i.c. engine, you'll find that the front end is much more heavily built than is required for electric power. The whole model will probably be stronger than we need, but particularly the nose area. The reason for this is that enormous stress is placed on our poor little model while an engine is being started. Either it will be rammed into the ground while an electric starter is applied, or it will be gripped tightly while the prop is flicked over. Add in resistance to a hydraulic lock (too much fuel in the upper cylinder, locking the engine solid) and you can see just how strong these models need to be. In addition to that, no matter how well balanced the prop is, engines vibrate a lot as they run. Since nobody wants a model to shake itself apart, additional strength is built in to handle said vibration. With electric power, and a balanced prop, none of these aspects are present in our models. No starting forces, no need to withstand the crush test and no vibration, so building to cope with them is just excess weight.

What we do need is a rigid, lightweight structure with a front end that won't allow the motor to go free-flight, or the battery to punch its way out every time we land our model. Radio gear that stays where we put it is never a bad thing either. Bearing all that in mind, let's take a look at how I set about achieving such a state of Nirvana.

I like to make a point of having the front section of the fuselage (the bit with all the gubbins in it) a solid, but lightweight box. On the type of model we are talking about that would typically be 1/8" balsa sheet sides, a 1/8" ply firewall or motor plate firmly glued to the sides and a 1/8" ply landing gear plate that, if at all possible, doubles as a battery tray. The latter point isn't so important with LiPos because there is less weight involved, but still remains a good idea. The sheet sides should extend back far enough to incorporate any wing mountings and provide something to attach the radio gear to. For a biplane, this will include 1/8" liteply (or birch ply, depending on how it's done) formers or plates to attach the centre section struts to. Liteply is fine for formers to which the struts are bound, or a continuous plate to which both front and rear centre section (c/s) struts are attached. If it's only possible to use small plates for the individual struts I use birch ply. Similarly, anything that gets screwed to a plate (saddle clamps, etc.) needs a birch ply plate to prevent the screws pulling out. The remainder of the fuselage is usually 1/8" square hard balsa attached to the forward box structure.

This forward box ties together all the vital elements of the model in a way that makes

You may have seen the bare bones shot of the He-51 last month. This is her fully clothed, but not a simple build and definitely too big for your average RTF equipment.

NOT INTERESTED IN CABIN MONOPLANES? THIS MOSKA MB IS A WW1 FIGHTER THAT HAS GOOD PROPORTIONS FOR AN EASY TO FLY MODEL AND IS NOT TOO HARD TO BUILD EITHER.

the strength of the whole greater than that of the elements involved. Having the landing gear mounting plate double as the battery tray really is a good idea. In a less than perfect landing, the sudden halt in descent is going to try to throw the battery, probably the heaviest individual item in the entire model, through the fuselage floor. However, it is also going to attempt to push the landing gear plate into the fuselage. This way, the two forces tend to cancel each other out and the model remains pretty much intact. If, however, you've spun in from fifty feet up, all bets are off. You simply cannot build to cope with that sort of disaster, so it isn't worth trying.

All of this applies if you want to convert an I.C. design, or have a bash at designing your own model. The surest way to succeed is, of course to choose a model already intended for electric power, using equipment not a lot removed from what you have in front of you. As I said, there are plenty of them around, but try to avoid the ones with glass fibre fuselages and foam veneer wings. These are heavy and there is virtually no way to safely remove any of that weight. These days, the difference in structure between I.C. and electric powered kits is becoming less and less since many are intended to be dual purpose. Unfortunately, there's nothing anyone can do about removing the toughness needed to cope with the aforementioned starting stresses without a major rethink of the forward fuselage. An I.C. model needs them, an electric one doesn't. That is why I would always suggest choosing a plan from which to build your model. Then it's a simple matter to omit the parts you don't need and replace others with much lighter material.

Whilst I could continue for pages about the finer details of design, there isn't any real need for it at this stage of your modelling career. You now have all the basic information needed to successfully make use of your radio gear. As the models get bigger, nothing much changes from the 400 size models. Yes, the wood sizes increase a bit, and the overall weight will increase, the principles, however, remain the same. The model should be kept light, be easy to build and have a naturally forgiving nature - radio interrupted free-flight. Once you master this type of model, the world is your oyster. By master, I mean fly the model where you want it to be, when you want it to be there for at least 95% of every flight. Not, as is so often the case during early flights, simply preventing the model from crashing. Sorry, but that doesn't count as being able to fly properly.

I'll leave it there for the time being. Should you have any queries or comments, feel free to contact me at PETERRAKE@aol.com. If I can I'll answer you personally, and may include that point in a future column. ■

A geared 400 like this would suit something like the Moska nicely. Not much different in size, the brushless motor is much more powerful.

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