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ON THE COVER

When is a fixed wing aircraft NOT a fixed winger? Answer, when it's a CL-84 Dynavert 'tilt-winger'. In this issue Ken Sheppard tests Flyzone's fascinating little electric powered foamie ARTF that's a challenging bit of fun and distraction from more mainstream, serious Scale.

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Editor: Tony Dowdeswell
Publisher: Alan Harman
Design: Peter Hutchinson
Website: ADH Webteam
Advertising Manager: Sean Leslie
Admin Manager: Hannah McLaurie
Office Manager: Paula Gray

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Tel: 0870 870 1670; Fax: 0870 870 1675

CONTACT

A FUNNY THING HAPPENED ON THE WAY TO ...

Well, in this case, it was a very recent trip to my nearest model shop. I had broken off from passing-for-press the pages of Ken Sheppard's review of the Flyzone Canadair CL-84 Dynavert tilt-wing that appears in this issue. I had timed the journey to avoid the dreaded afternoon 'school runs' that clog up the roads around that time!

The CL-84 first flew in 1972 and was the subject of a two-year test program using four prototypes. This experimental aircraft was designed to provide the vertical take-off/landing capability of a helicopter, with the speed of a fixed wing propeller driven aircraft. The target customer was the US Marines/Navy, and the test program, that included ship-bourn trials proved highly successful. But despite the success of the trials, the type never went beyond the prototype stage and the two surviving examples are now museum exhibit testimony to adverse circumstances.

Airborne aircraft movements that catch my eye while I'm on the move are a bad habit of mine that's hard to kick. Less than a mile from my 'essential supplies' destination, I still had my head full of 'Dynavert', when I spotted two low flying aircraft, unmistakable for their unique shape, between breaks in the ribbon of houses along the route, doing slow, lazy and wide circuits. They were Boeing V-22 Ospreys, the much later tilt-wing type that carried the technology proven in the CL-84, into operational use for the US Marines/ US Air Force. It's a type that's rarely seen in UK air space, so imagine the surprise and the coincidence!

Some time after the closure of the CL-84 program, Boeing acquired the Canadair Company, including the technology that went into the CL-84, which was a good background for the development of the later and much larger tilt-wing Osprey, of which some 400 examples are now in service.

The attitude of scale modellers to ARTF 'foamies' tends to be to love-'em-or-hate-em'! Such attitudes are personal, but one cannot but appreciate the ingenuity that has gone into Flyzone's little sport-scale fun flyer, the electronic master mixer board and physical mechanism of which, provide the gyro stabilisation and vertical-to-forward-motion transition.

I wonder what the next odd coincidence will be when I'm on the move to somewhere!

- MASTER MODELS
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SCRATCH BUILT Storch

Alex Whittaker admires Derrick Lane's immaculate hand-crafted military STOL

In peace and war, there can have been few more versatile aircraft than the famed Fieseler Fl 156 Storch. It was an essay in creative thinking, and introduced a number of practical advances on existing technologies. Other aircraft, individually, had flaps, slats, folding wings, and long-travel undercarriages. However, it was the masterful Storch that brought these features together in a harmonious whole. The result was to deliver an outstanding Short-Take-Off-and-Landing (STOL) performance.

The Storch first flew on the 24th May 1936, and was intended as a communications and liaison aircraft, a Wermacht co-operation type and a medical evacuation aircraft. It excelled in each role, and often was used in very tight military situations. For example, when Hitler wished to rescue his imprisoned aly Benito Mussolini from the mountain fastness of Grand Sasso, the aircraft of choice for the rescue team was the Fieseler Storch.

Very late in the War, female Nazi pilot Hanna Riesch flew a Storch into an improvised strip at the Tiergarten, not far from the Fuehrerbunker in Berlin. Her outgoing cargo was Generalfeldmarschall Robert Ritter von Griem, whom Hitler had just appointed as the last commander of the wartime Luftwaffe.

Storch aircraft served in the tropics as well as the snows of the Alps. The Storch was very light and could even be towed behind the German equivalent of the jeep, the Kubelwagen. Almost 3,000 Storches were built, some in France by Morane -Saulnier under license. A number of Storches are still airworthy, and may still be seen at air shows. More than eighty years on, the Storch is still an impressive performer, and a technical milestone in aviation history.

The Model

Derrick Lane is a scale modeller based in the Midlands who possesses excellent technical skills. Now 87, he was a

1: Front underside has much detailing. **2:** The stabiliser is adjustable like the full-size example. Note tail wheel assembly. **3:** Model looks like an in-service example. Beautiful detailing on fuselage. **4:** Rear view show the flat slatted and flapped wing, and large elevator surfaces. **5:** Shapely elevators have large area for power. Note tabs and simulated rib tapes and stitching. **6:** Note strut fixing and terminations.

Wide track, well triangulated long travel undercarriage is a prominent feature of the Scorch.

toolmaker before retirement, so technical perfection is second nature. His completely scratch-built Storch has a wingspan of 93", is built to 1/6th scale weighs in at14lbs. and is powered by a Laser 120 glow twin, driving an 18"x8" prop. Derrick fitted eight digital servos to control the usual functions of aileron, elevator, throttle, and flaps, as well as the Storch's trade mark scale stabiliser attitude control.

The whole model is fastidiously detailed. Wherever the full-size example has a feature, fixture, fitting, latch, catch, hatch, hinge, or handle in metal, Derrick has done his utmost to exactly reproduce it and the model is full of functional scale mechanisms. These are evident in every detail from the wings and pedals, to the door handles, and window operation. This consistent attention to detail yields an incredibly convincing flying scale model.

Plan and documentation

Derrick already had a battered plan from the old *Svenson* kit. However, he decided to draw up his own plan when his researches indicated the shortcomings of the *Svenson* plan, and the extent of the folding wing mechanism on the original. Derrick tracked down two full-size examples which informed his thinking, one at RAF St. Athan, and another at Booker airfield. He based his model on the latter, which is actually a licence-built French example of the Storch. This was called the Criquet / Cricket and the example Derrick has modelled was then owned by noted racing driver, The Hon. Patrick Lyndsay.

Derrick warns that, when taking photos of full size examples for scale models, you have to have your wits about you. The other (St. Athan) example turned out to have Spitfire wheels! Incidentally, the Booker example is now in a museum in Berlin, while the St. Athan example later went to Cosford Museum.

Construction

The whole model is traditionally built with lots of balsa and ply. However, Derrick had to depart from wood for significant structural aspects of the folding wing mechanism and the glazed area of the fuselage. Essentially, he put a tough plywood platform in the fuselage, which allowed him to then bolt on - and blend in - a metal simulated tubular structure. This itself was stressed and tensioned with metal components and metal brackets, as per the original.

Derrick mimicked the full-size tubular metal fuselage structure with piano wire members, sleeved in aluminium tubing. These are held by Derrick's faithfully hand-crafted metal bracketry. Fuselage torsional strength comes from tensioned and functioning piano wire cross-bracing which simulates the original, but also allows scale-like materials of the the appropriate scale dimension and cross-sectional area to be used. A wooden structure would necessarily have been bulkier and far less convincing. This is especially true around the folding wing mechanism, and the fuselage tubular metal members, exposed as they are by the Storch's massive `glasshouse' cockpit glazung. That huge cockpit framing is very open and unintrusive on the original.

The magic of Derrick's model depends on this important and crisply modelled cockpit area.

Engine & propeller

Derrick chose a Laser 120 Glow twin for the Storch. For starting convenience and reliability, he has fitted a commercial electronic glow ignition system. Propeller is 18" x 8".

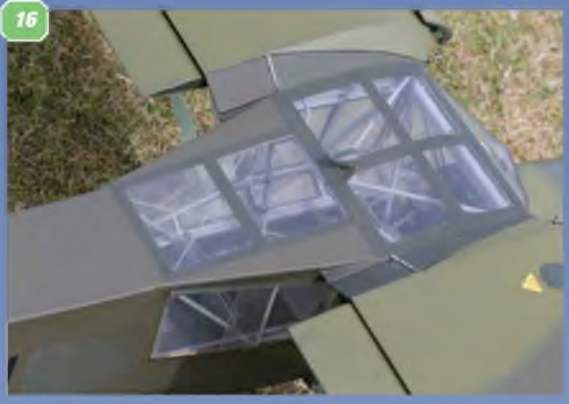
Exhaust

Derrick wished the Laser's exhaust to exit in the correct scale position so, naturally, with his advanced workshop skills, he elected to shape and fabricate his own

7 & 8: Note wing leading edge slat section necessary to retain the wing boundary layer for good STOL performance. 9: Note leading edge slats, and pitot tube. 10: Note Fuel filler cap, retained by a magnet. 11: Note scale wing locking mechanism. 12: Lots of careful detailing visible in this view. 13: Note scale termination and nuts and bolts for the wing strut. 14: Aileron servo tabs operate in opposition to main surface. 15: Convincing trim tapes - drawn on with a pencil.

16: The extensive glasshouse on the Storch.

17: The cockpit and dashboard are exquisitely modelled. Feels like a full-size example.



18: The door locks up as per the French version, the Criquet / Cricket. German Storch doors open forward.

19: A favourite view of the Storch - so much detail going on! Note triangular quarter windows.

metal exhaust system. However, he farmed out the tricky aluminium welding to a friend!

Undercarriage

This long-travel undercarriage is a significant part of the Storch's appeal, so Derrick spent many happy hours getting it just right. He has followed the original oleos very closely, using aluminium tubing, and then fabricating all the hard points and fittings. He has kept the scale pistons in the correct place at the bottom of the undercarriage, not on the top, as in most kits and plans. The convincing scale brake pipes are thin plastic tube with aluminium fittings. If you look closely, there are even bleed nipples on the brakes.

Wheels

The centres of the 3.5" diameter wheels

A light aircraft in warpaint. Note tail struts.

were turned up from aluminium on the lathe that Derrick inherited from his Dad. and use commercial 3.5" rubber tyres. There are even Schrader valves on the wheels, complete with caps.

Radio

The Storch uses eight digital servos for the following functions:

Elevator	1
Flap	2
Aileron	2
Stabiliser	1
Throttle	1
Rudder	1

Covering and finishing

The airframe is covered in *Solartex*. The top surfaces are painted with fuelproof *Flair* paint but a different paint was applied to the lower surfaces because he could not get a suitable colour match. This paint was the fuel proofed with Solartext / Solarfilm Clearcoat.

Scale Details

Since Derrick has followed full-size practice and construction in most parts of his Storch; it makes better sense to describe the functions and mechanisms in full-size terms, rather than treating her as model aircraft.

So, the working door opens upwards, unlike German-built Storches, which open forwards. When the door is opened it needs restraining, so Derrick has reproduced the complete full size mechanism, with a prop/stay to hold it in place. The door latching is absolutely as per the full-size, with two plain metal bolts driven by a single rod.

The two opening, plastic, frameless front quarter-windows are exactly correct, with working hinges, and their scale catches at the bottom. The big square side windows slide as they did on the full size for aerial reconnaissance, and such duties. Derrick ran his hands around the edges of the windows on the full-size example, and could not detect any frame, rivets, screws, or bolts holding these plastic items in place. Therefore, he concluded that they were held in by fabric tapes, so his model does the same.

In front of the windscreen are two functional triangular hatches which give access to the dashboard on the full-size. The Storch's celebrated roll-down window blind is fully functional. It can be held in the closed position where its still allows the pilot to see the compass via the scale notch. The full-size Storch has an unusual triangular panel instrument which indicates the selected angle of the adjustable Stabiliser. (On the full size, this is useful for the pilot in selecting the correct angle for a steep STOL take-off). The actual angle is set by a small wheel. On Derrick's model the wheel adjusts the needle on the instrument dial!

The pilot's pedals work in synchronicity with the control surfaces. The scale toe-brakes have working linear pistons as on the full size, and the execution of the whole dashboard is as per the full-size. The radio wiring is hidden by in the scale fuel pipe and the scale locks for the authentic folding wing mechanism twist and locate exactly as on the original.

On the top of the wing there is an inboard yellow fuel filler cap, which is held closed by a hidden magnet. On each aileron there is a servo tab, which moves as per full-size so that, as the aileron goes down, the servo tab goes up. This reduces the control column load felt by the pilot in flight. Surface mass balances are fitted underneath and are built exactly to scale, each being held with two bolts, as per full size.

There are two metal trim tabs, ground serviceable, on the rear of the elevators. These are held on with simulated rivets to allow the easy removal of each elevator, as does the full size example. There is even a small access flap in front of the door, which opens like the full-size to give access to the Storch's electric instruments.

The more you look on this hand-crafted marvel, the more there is to see. It exceeds museum quality, and yet it is flying model.

Pilot's Notes

At the time of writing, the Storch was yet to be flown. This is because Derrick feels that the fuel delivery to the glow engine could be improved. Engine tests have indicated a few areas for improvement, possibly due to the positioning of the tank. The engine is installed inverted and the scale tank position is very low and Derrick is currently experimenting with an intermediate chicken hopper tank.

FSM hopes to catch up with her initial flights later this season. All-in-all, one of the best Fieseler Storch models ever scratch built! ■

SPECIFICATIONS:

Fieseler Storch

Scale:	1/6th
Span:	93"
Weight:	14lbs
Engine:	Laser 120 Twin glow engine
Exhaust:	Home fabricated aluminium
Prop:	18"x8"
Servos:	8 digital

20: Derrick's Storch exudes character and has a myriad of crisp scale details. 21: No shortage of undercarriage or wing struts. 22: True scale tubular construction visible beneath the fabric skin. Note extensive detailing. 23: Wings in the folded position.

TACTIC ANY LINK 2 RADIO ADAPTOR

Take any 2.4GHz Radio!

The Tactic ANY LINK2 Radio Adaptor allows SLT Rx compatibility - and full Tx flexibility...

Hobbico released their Tactic 2.4GHz radio system to the market a couple of years ago and are marketing quite a few products featuring this radio system in the popular BNF format, using their SLT (Secure Link Technology) receivers. Up until now, you could only use a Tactic transmitter with these receivers, but now with the innovative ANY LINK 2, 2.3GHz Radio Adaptor, you can make virtually any brand of 2.4GHz radio compatible with the Tactic SLT receivers. This means that if you have SLT

1: The 6-channel Tactic TR624 Rx used with the ANY LINK2 during testing. 2: The ANY LINK2 unit is powered by its own 1S x 450mAh lipo cell. 3: The battery can be charged using the USB charger supplied. 4: An LED on the back of ANY LINK2 confirms the brand of Tx being used (F for Futaba, in this case). 5: Binding the Tactic Rx to the Tx fitted with ANY LINK2.

receivers, you are no longer restricted to using a Tactic Tx and can use your preferred Tx and all its features!

Full range Tactic SLT receivers are now available in six and eight channel formats - and there's also a four channel micro unit, so are suitable for even moderate to large fixed wing models - at competitive pricing, too.

For this review we tested the Any Link 2 radio adaptor with a Tactic SLT TR624 six-channel Rx. To check its flexibility with different Tx units, we used three different brands to test the installation and flying capabilities of this new system - a Futaba TG7, a Spectrum DX7 and the Graupner MZ24 - and in short, it worked just fine as applied to a .90 size full-house warbird test aircraft.

ANY LINK 2

The Radio adaptor is a little unit that clips to the back of your chosen Tx (or use a strip of Velco) and is linked to the Tx via a cable (there are cables available for various Tx brands) that connects into the trainer plug or the DSC jack socket of the Tx. The ANY LINK 2 unit is powered by its own 1S x 450mAh lipo cell (supplied) that can be charged via your computer via a USB charger (also supplied).

Three leads are supplied that suit most of the popular brands of Tx, with extra cables available from Hobbico to suit most other transmitters not listed in the instruction pages. Changing between the different transmitters was straightforward with no complications. The supplied lipo battery is used to power the ANY LINK 2 unit, so the Tx is used, switched off, power being supplied via the connecting lead.

FITTING/TRANSMITTER ALIGNMENT

As the photos show, installation couldn't be any easier. Charge the supplied lipo pack with the supplied USB charger (it takes about an hour), fit the battery into the ANY LINK 2 unit (the back panel hinges open and clips shut) - and then make sure the unit is correctly aligned with the brand of Tx you are using. This is a simple procedure - just connect the lead into the Tx and use the 'mode' button on the face of the ANY LINK 2 unit to move the illuminated red LED to opposite the letter appropriate for your Tx brand i.e. 'F' = Futaba; 'S' = Spektrum; 'J' = JR/Graupner; 'H' = Hitec; 'A' = Airtronics/Walkera.

It should be noted that the ANY LINK2 unit can be custom configured to other brands as well, so the instructions are given to facilitate this, although it was not tested in this review - we used just the three brand samples mentioned above.

BINDING TO THE SLT RECEIVER

The only task to do now is bind the Tx to the Tactic SLT receiver in the model. Do not switch on the Tx; just connect the ANY LINK2 unit Lipo, close the unit door to hold the lipo in place, close the throttle stick, and plug the lead into the transmitter port.

The transmitter is now powered by the ANY LINK 2 unit, so switch on the receiver battery - or connect the flight battery in the model and, using a thin blade screwdriver (or a piece of small diameter wire), hold down the bind button located under a hole in the face of the receiver next to the 'BIND' LED, until the LED blinks twice; then remove the probe and the LED should remain continuously lit up, indicating that the receiver is now bound to the transmitter (and the

SPECIFICATION

Manufacturer: Tactic (Hobbico)
UK Distributor: Revell.de (UK Division)
Modulation: FHSS spread spectrum
Flight range: Full range
Input power: 3.3 - 4.2V 150mA
Power control: Automatic with incoming signal recognition
Power on indicator: Red LEDs with audible tones
Low voltage alarm: Audible tone at 3,25V
Inactivity Tone: Sounds after 5 minutes Tx inactivity
Weight: 1.62oz (46g)
Price: £25.99 (ANY LINK 2 adaptor, 1S x 450mAh lipo, USB charger and three connecting leads)

Detail of the Futaba TX installation.

throttle failsafe set).

A range check should be carried out at a distance of 30 metres after which, programming the model can continue in the normal way for your chosen transmitter. There is a built-in low-voltage audible tone warning (3.25v) for the ANY LINK 2 built-in Lipo and in addition, if the transmitter is inactive for more that five minutes, the audible warning sounds.

To switch off the Tx, remove the cable from the Tx connector, open the unit door and disconnect the ANY LINK 2 Lipo.

SUMMARY

The ANY LINK is eminently practical for adapting any Tactic SLT receiver to your favourite brand of transmitter, so if you take advantage of the great Hobbico range of models that feature a Tactic SLT receiver already installed, you can use your preferred transmitter, without having to substitute a same-brand receiver; simply use using ANY LINK 2.4GHz radio adaptor. However, the competitive pricing of the separately available Tactic 6 and 8 channel SLT receivers, makes this little unit a very flexible addition and of course, if you use several different transmitter brands, you don't need identical branded receivers! ■

The ANY LINK 2 unit fitted to a Graupner SJ HOTT Tx (note the different lead).

The ANY LINK 2 unit fitted to a Spectrum Tx .

BELLANCA SKYROCKET

A 36" span electric powered model designed by Peter Rake, with the prototype built and flown by Pat O'Donnell

While hunting around for suitable subjects to draw up as plans I happened upon a rubber power design for a Bellanca Skyrocket. Although cabin monoplanes aren't really my sort of thing, this one is just gawky enough to appeal to my slightly perverted sense of the aesthetic.

Sleek and elegant may not appeal to me but boxy and angular does; besides, I've been rather taken with this type since I saw the David Boddington model many years ago - without actually managing to build one. So, with all the right boxes ticked, it was just a matter of deciding what scale at which to draw it and how complicated the model should be.

At the time I was in a period of 'going back to my roots' in terms of electric powered models. Retaining modern power systems, but attempting to recreate simple-to-build models of around 36" wingspan - much like my first successful electric scale models some 20 years ago. As a result, I've tried to retain the simplistic approach of the rubber power model, but combined that with my usual style of construction. I think the blend works quite well, and certainly makes for an eminently flyable model. Now I just have to hope you agree with that.

As is usually the case with these models, I offered the design for prototype building through one of the on-line modelling forums and Pat O'Donnell was kind enough to volunteer to do the honours. As you can see, the result is the rather pretty (in an ugly sort of way) model you see here.

POWER

The key to success with these models, apart from building them straight and light, is not to over power them. Originally Pat enquired about a set-up capable of 150 Watts, which is just a tad excessive for a model that should weigh very little more that 12 ounces. Okay, it's more than three times as much power as required.

Despite what many will tell you, there is such a thing as too much power, especially when coupled with the wing section I favour on my models. It's pretty much a one-speed section, so all that too much power does, is to make the model climb like a thing possessed. Reducing the throttle isn't always enough because it gets imprecise at the tiny inputs that would be required.

Although I suggest a power-to-weight arrangement of around 50 Watts/lb, that is the maximum you are going to have available, not what you'll actually require for most of the flight. In keeping with the prototype, slow and stable is the name of

Swooping in for another low pass for the camera the model demonstrates just how well boxy and ungainly can work.

the game, not a scale version of Mach 2.

Pat ended up fitting an E-flite Park 300 outrunner and 800 mAh, 2S LiPo and a seven minute flight used all of around 400 mA. Even so, the take-off run (on grass) was around 10 metres and the model climbed out well.

With a wing loading of around 10.5 oz/sq.ft. the model will fly nice and slowly for leisurely cruising around.

WINGS

The only thing you really need to know about the wings is that these airframe components rely on the spars for their strength, so don't be tempted to replace them with anything less strong than spruce. Bass is fine, but even hard balsa is not a good idea. The reason is that the spars, and where they fit into the fuselage and glue against F3/F3A, is all that stops them folding during more spirited flying.

The struts themselves do nothing other than add scale appearance. Don't let this put you off, I've designed (and built) several models using the same style of wing fixing and have yet to have a wing fold in flight - despite performing consecutive loops.

The reason I'm so fond of this system is that it provides a nice, neat wing-to-fuselage joint (the panels simply glue to the fuselage sides as the spars are glued to the former assembly) and automatically sets equal dihedral (and the correct dihedral) at the same time. Those little 'locating dowels' aren't load bearing. All these dowels do is ensure that the wing panels both go on at the correct incidence with the minimum of effort, while the spars set the dihedral. In fact, there should be no effort at all required to get the wing on correctly, just a little care taken to ensure a square fuselage and the F3/F3A assembly accurately glued in place.

With that proviso made, it's simply a case of applying a thin coat of 30-minute epoxy to the former and wing roots and sliding the spars/locating dowels into their prepared position.

You don't really want me to tell you how to build these wing panels, do you? Oh all right then, but wings don't get much simpler than this.

Begin by pinning down the wing tip (WT) packed up by the amount indicated in the section, leading edge pieces and trailing edge (TE) over the plan, gluing as required. Now cut the spar to length, notch it to fit over the tip as shown and pin that down too, gluing it to the tip piece. Sort out which wing rib goes where and glue them into place. All but the root rib are upright and the angle guide should be used to set the root rib to the correct angle for dihedral. Fit the strut plates flush with the bottom of the ribs and add the root bay sheeting, then allow the glue to dry. You see, easy isn't it? Now build the second panel in the same manner.

Once all the glue is completely dry remove the wing panels from the board, shape the leading and trailing edges, sand a radius onto the extreme tips and shape the tip trailing edge to match the trailing edge. Sand overall and your wings are ready to cover.

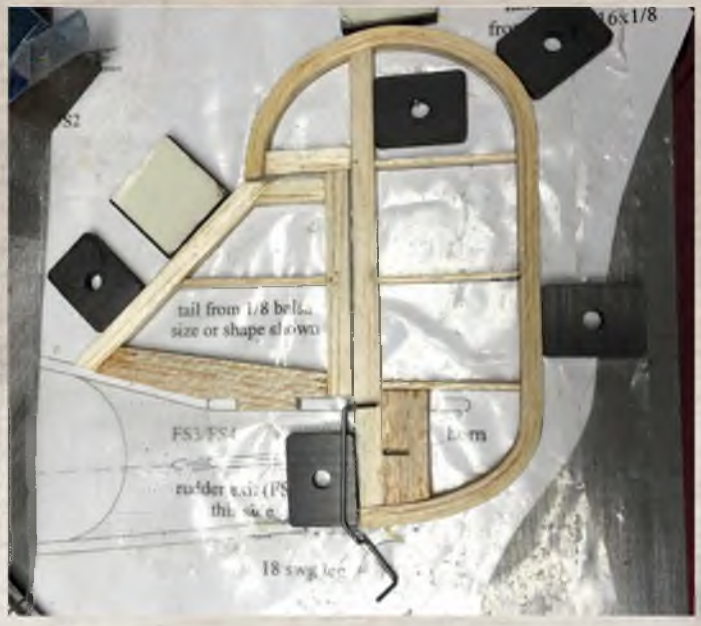
I don't fit the locating dowels until my wings are covered, but these can be fitted now if you prefer - or even fitted to the fuselage. Just try to get them all straight. It isn't vitally important because parts R1 and FS2 can't but align correctly when they meet properly. It's just easier if you aren't having to wiggle the wings about to get the dowels into their respective holes.

TAIL SURFACES

Absolutely the only slightly complicated part of building the tail surfaces is laminating the curved outlines. The wood you use for the outlines doesn't need to be any more than medium soft balsa. Anything much harder will only make curving it more difficult. The softish balsa will curve easily and gain a lot of strength from the laminating process. Firmer balsa doesn't curve as well and is likely to crack around any tighter bends. If you do have to use firmer wood, or are in any doubt about your 1/16" balsa strip, use twice the number of strips of 1/32" balsa as an alternative.

The important things about laminating outlines are that the strips are thoroughly soaked and how they are formed. Many people form the outlines around a fence of pins, but I don't like that method because the pins are likely to kink the inside of the curve and cause weak spots. When laminating I like to get the strips thoroughly soaked, glue them together and, while everything is still nicely soggy, pull them into shape around a solid former. This former can be cardboard, depron or whatever else you have available. Apply tape around the edges to prevent sticking, tape the glued-up strips at one

Wings really don't get a lot easier than this. A little shaping to do and the wing panel is complete.



Here you see the laminated rudder outlines built into the rest of the vertical tail assembly.

A basic fuselage side drying. Note how Pat avoids pushing pins through the strip wood.

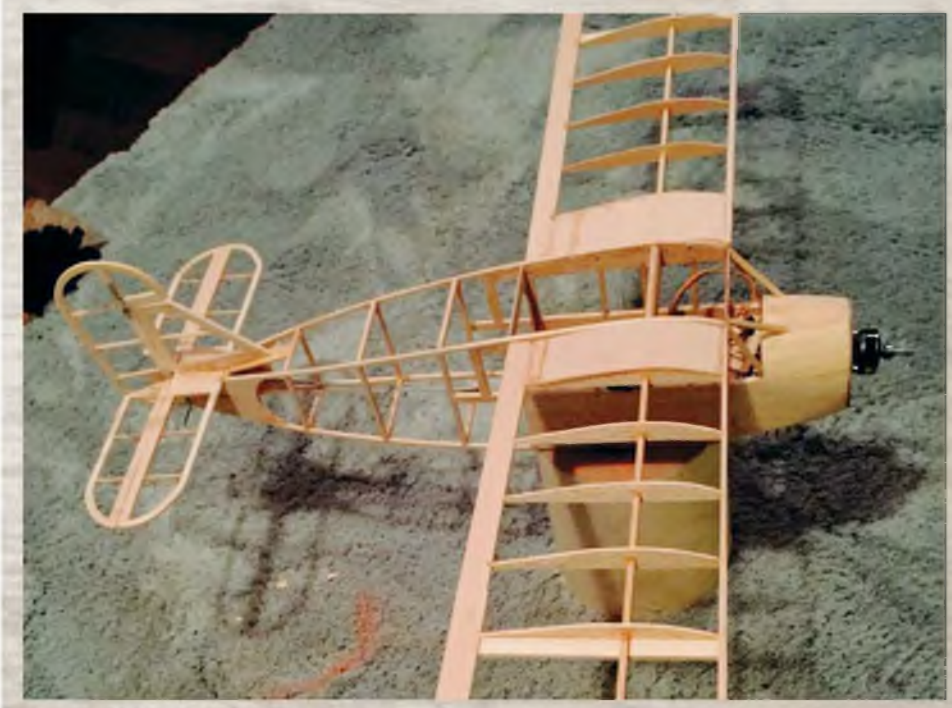
With formers in place, nose and tail pulled in and cross braces fitted it begins to resemble a fuselage.

> "As is usually the case with these models, I offered the design for prototype building through one of the on-line modelling forums and Pat O'Donnell was kind enough to volunteer to do the honours"

Rather than use expensive block balsa Pat made his upper nose section from thick sheet balsa, a perfectly viable option.

After a bit of planing and sanding the nose starts to take shape.

Notice the shaped wedge Pat used to set the thrust lines on his model, without obstructing the holes for the motor leads in F1.



Because of the way Pat builds this is as close as we get to a naked model shot. However, it shows off the simple structure nicely.

end and PULL them around the former, before taping the other end in place. The reason I stress pulling the strips around the former is that it keeps them under tension and helps prevent any cracking.

So, with outlines laminated, the glue completely dry and the pieces trimmed to the correct size, it's time to build some tail surfaces. As you can see from a brief look at the plan, this really is a very simple task. Just pin the parts over the drawings, gluing as you go. Allow to dry, remove from the board and sand overall, rounding off any edges that require it. Then, securely glue in place the tail wheel leg and elevator joiner.

An aid to getting the elevator halves accurately aligned, and precisely the right distance apart, is to make the elevator leading edge a continuous piece from tip to tip. Leave the centre portion in place while you fit the wire joiner and then cut out the unwanted bit once the joiner glue is fully cured.

FUSELAGE

With the easy parts out of the way it's time to move on to some slightly more complicated building; nothing too arduous mind you, just more complicated than we've seen so far.

Fuselage construction begins in the time honoured fashion by building two identical side frames over the plan; or, to be more precise, build one over the plan and the second one over the first. Bearing in mind the variations possible within balsa strip (not all 1/8" square is created equal), I've developed my own slight twist on this.

Because some pieces may be of a slightly different thickness to others, I like to turn over the first frame before building the second directly over it. Now, assuming all the parts were pinned down properly, you'll have two side frames that each have one perfectly flat surface, rather than the second frame further increasing the inaccuracies caused by the wood. If these two flat surfaces become the inside faces, any unevenness in the outer faces can easily be sanded off during the finish-sanding stage, an added advantage being that any glue fillets, that will almost certainly be harder than the balsa, are where the least sanding is required - well away from the outer surface. Just make sure you get the tail pieces (FS3 and FS4) in the correct side frame. The first frame you build will end up as the near side, so it needs the part FS3 building into it.

Since I mentioned hardness, although the uprights and cross braces need only be medium balsa, the longerons should be the hardest balsa you have. Hard, but evenly matched so that they'll curve equally as the rear end is pulled in during the side-frame joining process. Bear in mind that any box-fuselage is only as strong as its longerons and you'll see why I suggest hard balsa for those parts.

With the side frames removed from the board, mark the former positions accurately onto the inner face of each and score (inner face again) where the nose needs to break inwards. Don't cut all the way through, just a half-depth vee to allow the side to be bent. Make sure that when you do bend in the sides, this vee-shaped groove is filled with glue. Whether you do that now, or as assembly proceeds

is a matter of personal preference.

Assemble F1, F2 and BT, ensuring all is square, and glue the assembly to the inside of one fuselage frame. Please note that the small hole in F1 isn't central. It should be offset to the left (right when viewed from the front) to allow for down and right thrust. It indicates where the motor should centre. Add assembly F3/F3A (paying particular attention to getting it in precisely the correct location), together with UC and F4. Ensure these are perfectly square to the fuselage side before allowing the glue to dry.

Now, taking the time to keep everything square and accurately aligned, glue on the other fuselage side frame. Pull in the nose and glue to F1 and BT. BT will ensure that the sides can only pull in evenly. Pull in and join the tail and fit the cross braces. Once again, pay attention to keeping the fuselage straight and square. Banana shaped fuselages usually do fly, but they look awful.

Trim the top nose block to fit around F1 and glue that in place. Similarly, glue on the side cheek pieces. Only tack glue the lower block in place because that will be your battery access hatch. Note how it fits and glue part N in place, making sure you don't glue it to the lower block. Tack glue the nose block in place (you'll need to remove it again to fit the motor) and prepare for the messy task of shaping and sanding the nose to shape. Remove the nose block and hollow it out to clear your motor.

You may notice from the photos that Pat used a tapered wedge to set his thrust lines, but washers under the motor's mounting lugs works just as well and is probably easier to get right. Fit the motor to F1 using small screws, but just make sure the sharp ends aren't going to put your battery pack at risk in a heavy landing. The nose block, complete with dummy cylinders may be retained either by spot gluing, or using rare earth magnets and locating pegs to hold it in place.

Personally I like to cover the lower fuselage area around the undercarriage legs before binding them in place (its easier and neater) so the radio gear and linkages will need to be installed through the top of the cabin area before that gets covered. Whichever way you decide to go, binding the wire parts in place, soldering up the landing gear and gluing the bindings is about all that's left to do on the fuselage.

COVERING AND FINISHING

What covering you choose is very much a matter of personal taste. I like Litespan, but tissue or So-Lite are both alternatives. Cover the entire model EXCEPT the top of the cabin area and install your radio and linkages. Make sure everything works properly before completing the fuselage covering and fitting the windscreen.

I like to cover everything before I assemble a model, but you'll notice that Pat prefers to do some assembly steps before covering. I think my method is easier, but we all have our own way of doing these things. It would end up a horrible mess if I tried Pat's method.

Glue on the wing panels as discussed earlier and use that assembly as a guide to alignment while gluing the tail surfaces in place. Connect up the rudder and elevators to their pushrods, fit the struts, fair the undercarriage and you have a completed Skyrocket.

All that now remains is to make sure the model balances just a hint nose low at the point indicated and to commit aviation.

FLYING

As intimated earlier, the model has proved to be a fine flyer. Ample power is available from the stated set-up and Pat says the model is a pleasure to fly. Take-off is fairly brisk, climb-out is good and the model can be flown very slowly with no tendency to drop a wing thanks to its low wing loading.

Pat likes it enough that he built a second model based on this design, so I suppose that says it all really. ■

A simple but attractive colour scheme sets off the model nicely and the cowl ring free dummy engine lends an air of realism.

AND NOW FOR SOMETHING COMPLETELY DIFFE

CANADAIR CL-84

Ken Sheppard tries Flyzones EP Tilt-Wing from Hobbyco that gives a whole new dimension to fixed wing scale flying!

The Canadair CL-84 Dynavert, designated by the Canadian Forces as the CX-131, was a V/STOL turbine tilt-wing monoplane designed and built in Canada between 1964 and 1972. Only four of these experimental aircraft were produced with three entering flight-testing. Unfortunately, despite the fact that the CL-84 was very successful in experimental and operational trials carried out between 1972 and 1974, the aircraft did not go beyond the experimental proof-of-concept stage.

The wing and engines of the aircraft could be tilted hydro-mechanically (recirculating ball actuator) so that the wing incidence changed through 100° from a normal flight angle to those for STOL and VTOL. The incidence of the tailplane was automatically altered to deal with trim changes as the wing-incidence varied. The two sets of props were locked in a fore and aft position in conventional flight. At the time of the CL-84 project, Canadair was a subsidiary of General Dynamics and the parent company christened the new aircraft, the *Dynavert*. Canadair project personnel typically referred to it simply as the *'84'*.

Contra-rotating rotors on a vertical axis in the tail provided fore-and-aft (pitch) control during hovering and transitional flight. The propulsion and lifting propellers were contra-rotating and were interconnected by shafts through a central gearbox from which the tail rotors and accessories were also driven. The thrust from the propellers was matched automatically except when over-ridden by the pilot for lateral (roll) control in slow or hovering flight, while a mechanical 'mixing' unit was used to adjust the functions of the various controls in the different modes of flight and the flap/ailerons gave yaw control when hovering.

In the cockpit, fore-and-aft stick was always pitch, side-to-side was always roll and the rudder pedals were always yaw irrespective of the wing position through its full range.

Two 1,500hp Lycoming T53 shaft-turbines were used to drive the two 14ft (4.3m) four-bladed propellers. The engines were interconnected by cross-shafts, so that in the event of the failure of one engine, it would automatically disconnect (through torque spring clutches) and both propellers would be driven by the remaining engine.

The propeller disks extended slightly beyond the wingtips, so the whole of the wing (except for the portion above the fuselage) was immersed in the propeller slipstream. This, together with full-span leading edge and trailing edge flaps, which were programmed with wing tilt angle, ensured that the

DYNAVERT

VTOL TWIN FROM FLYZONE

Crisp moulding throughout the kit, with a good painted finish.

The tail end flying surfaces. One bolt holds on the tailplane; fins need gluing.

Ready-to-connect-up and bolt-on wing nacelles. Note the black painted prop nut - it's a left hand thread, not mentioned in the instructions!

The heart of the VTOL, the wing lift mechanism as supplied ready assembled, based around an electric retract unit.

"A fully factory-assembled wing-tilt mechanism is supplied as part of the one-piece wing using, at its heart, what looks like an electric retract unit. Due to the low parts list, assembly is pretty quick and well-covered in the comprehensive instructions"

wing was never stalled, while trim changes were minimised by programmed tilting of the tailplane. All programming was based on extensive testing in the wind tunnel and on an outdoor mobile test-rig.

Engine power was controlled by a single 'power lever' in all flight regimes. To provide crisp thrust control during hover, movement of the power lever caused a direct adjustment of blade angle, analogous to the collective pitch control of a helicopter, with the propeller CPU (Centra Processing Unit) governor making a follow-up adjustment of blade angle to maintain the selected rpm. The direct adjustment of blade angle was faded out automatically as the blade angle increased with increasing forward speed.

The only unfamiliar control function the pilot had to deal with was the wing tilt control, which was a switch on the power lever (and took the place of controlling the flaps). The combination of smooth aerodynamics and simple power control made it easy for fixed-wing pilots to perform transitions between hover and wing-down modes on their first flight in the CL-84.

Several factors worked against the '84. The first and most crucial was the 'NBH' (not built here) factor. It was also "a prop job in the age of jets" and, lastly, the CL-84 tilt-wing concept did not have a 'grand champion' who would fight for it in boardrooms and military procurement offices. Canadair had tried to sell the Dynavert to others - Germany, Holland, Italy, Scandinavia and the United Kingdom were all courted, but, in the end, the Canadair CL-84 project died in 1974 for lack of interest.

(Eventually, the concept was successful in the Boeing V-22 Osprey ... which had the advantage of being 'Built Here' - Ed.)

THE MODEL

Flyzone's EPO foam moulded ARTF model (Rx-R or Receiver Ready) represents CL-84 402, which took part in aicraft carrier trials for the US Navy/Marines and later flew onto the White House lawn in Washington DC.

The flying characteristics of the original are reproduced in the model by a pre-installed three-axis gyro flight controller. Transition from vertical to horizontal flight and vice versa, motor control and stabilisation are managed by the on-board flight controller, so that a single switch can be used to initiate the transition from vertical flight to straight & level and vice versa. True-to-scale fore/aft pitch control is assisted by a horizontally mounted propeller at the tail which is also managed by the flight controller. Yaw is also managed by the rear rotor, which rotates left or right on a shaft, but only when the model is in 'vertical' mode (i.e. wing up), while in 'forward' mode (wing down) the tail motor is inoperative and control reverts to three channels (aileron,

elevator and throttle).

A fully factory-assembled wing-tilt mechanism is supplied as part of the one-piece wing using, at its heart, what looks like an electric retract unit. Due to the airframw's low parts count, assembly is pretty quick and well-covered in the comprehensive instructions, so the review sample CL-84 Dynavert was soon ready for flying, needing only a six-channel Rx and Tx and a 4S x 2200mAh Lipo pack. However, a few points which became apparent during the assembly, that weren't explained in the otherwise excellent instructions are worth noting and emphasizing here.

BUILD NOTES

As previously stated, the model went together quite easily and quickly (one afternoon, in my case) and the instructions cover the build, set-up and initial flying very well; just few points let down what otherwise would have been perfect presentation.

Nowhere in instructions does it advise that the prop adaptor on the right hand motor is the opposite thread direction to the left hand motor adaptor. The right hand prop nut/spinner is painted black, which might be a clue, but it isn't made at all clear in the instructions. Needless to say, if you don't realise this before attempting to remove the RH prop nut (it's supplied screwed onto the prop adaptor shaft), when you come to fit the supplied contra-rotating props, you may damage the aluminium threads.

Wishing to fly the model in the conventional 'forward' mode as well as in the 'vertical' mode, I opted to fit an additional servo for the nosewheel steering (the option is covered in the instructions); however, there is no mention in the instructions of how to connect the steering servo lead. But of course, when the steering nosewheel is needed - in 'forward' mode - there is no tail motor yaw control, as the motor is inoperative, so I came to the conclusion that the solution was to join the 'rudder' labelled lead and the nosewheel servo lead with a Y -lead to the Rx rudder channel output. Some might say that it is obvious, but I feel it is an omission that could cause a bit of 'head scratching' (as it did in my case!)

Perhaps it was a one-off case, but the tube of glue supplied with the kit seemed to be old and pretty well dried out. I binned it and used five-minute epoxy instead.

SET-UP

Hobbico also distribute the TACTIC range of radio gear and as I had one of their 'ANY LINK 2' units and a TACTIC TR624 six channel receiver handy, I thought it appropriate to use these, coupled with my 'dedicated-to-foamies' Spektrum Dx 6 transmitter. Note that a separate review of the ANY LINK 2 unit features elsewhere in this issue, so I won't repeat anything here, except to say that if you have any Tactic receivers, then use of the ANY LINK 2 allows you to use your favourite trannie, rather than a TACTIC Tx.

I used a separate battery whilst setting up the control surface throws and neutrals. If you opt to use the lipo flight pack to power the Rx, don't fit the props at this stage, just in case. A safety factor is that you have to arm the motors before they will operate, but it pays to be careful, anyway.

The electronic board that carries the multi-gyro stabilisation system has to be calibrated and to do this you fit the supplied calibration cable (labeled 'RC neutral rudder correction' for some reason) and follow the step-by-step instructions.

Once this has been done, you need to check that the onboard gyros move the surfaces in the right direction – four steps denote what should happen. In my case, it worked perfectly, although there was no mention of what to do if, for example, the direction was reversed. If, in the slim chance that the gyros are reversed, Revell (the Hobbico UK distributor) tell me that you should reverse the throw at the electronics board (NOT at the Tx) by using the appropriate switch in the small four-switch block in the centre of the board (switches numbered 1 to 4 – see photo and diagram of the electronics board hereabouts).

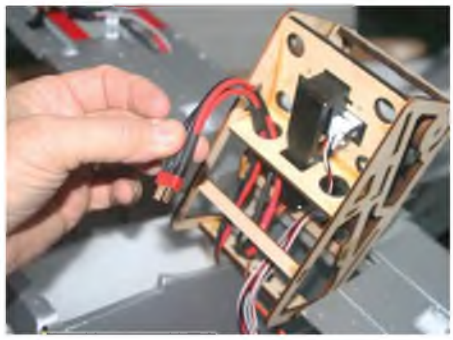
Whilst prepping for EACH AND EVERY flight, the motors have to be armed before they will operate - again, setting this up is described adequately in the instructions - together with a warning that if you disarm the motors and switch from 'vertical' to 'forward' mode - i.e. lower the wing, the rear motor may start briefly and then shut-off!

When setting the control surface throws, the instructions indicate that you should use the advised dimensions, because too much throw could make the model over-responsive and difficult to control. I have to say that I would have liked more 'up' elevator and more aileron throw for the first flight as the model seemed nose heavy even at the recommended CG position, although I must admit I tend to set up that way at the front end of the range; i.e. slightly nose heavy for the first flight.

As this is a flight transition model, I should have kept the CG spot on, in the centre of the range, which is what I would recommend. As regards aileron throw, this isn't exactly a 'throw about' model, so I was expecting aileron response to be a bit subdued, but in forward flight, aileron response was definitely soggy, which led to me reducing the exponential from my normal 30% to 10%, which seemed to remove the 'sogginess', but didn't improve the response. So the model is best suited to circuits and eights (this is backed up by comments in a *YouTube* video about the model).

Regarding the CG position, the advised location is 56mm back from wing leading edge; this is the advised starting point, with a range of 51mm-64mm being feasible to suit your fling style - again, only after initial flight testing - but do start with it in the middle of the range. In order to achieve this, even with the recommended battery as far back as possible in its moulded 'slot', it needed a fair bit of lead at the end of the tail boom which I taped it in place with clear sticky tape.

Satisfy yourself with the wing transition operation and the motor arming, checking, once again, the direction and size of the throws - and you are ready to go! But before actually going to the field



Before installing the wing assembly in the fuselage, run the battery hook up lead through the hole in the former; difficult to do afterwards!

The fit is tight, but very positive.

Make sure the top edge of the wing lift unit lines up with the top edge of the fuselage sides.

View of one of the aileron servo linkage and the motor nacelle wiring.

The electronic auto stability board mounted aft of the wing.

The battery bay. Even with the battery placed as far back as possible in the bay, the model was still nose heavy.

Lead taped to the end of the tail boom to achieve correct fore'aft balance.

The Tactic receiver wired to the control board, before fitting into the fuselage. Note all the leads are clearly labeled.

for that first flight, do read the flying section in the instructions very carefully. In fact, as the envelope of the model is radical by normal standards, it pays to read through them carefully several times!

Another source of great info on the CL-84 is via *'YouTube'* on the Internet - just type in Canadair CL-84 and you will get several videos of this model flying, including one that takes you through the build and set-up.

SPECIFICATION:

Manufacturer: Flyzone, Hobbico
UK Distributor: Revell GmbH
Wingspan: 950mm
Length: 1050mm
Height: 340mm
Motors: 2 x 900KV Outrunner (Wing); 1 x 850KV Outrunner (Tail)
ESC: 2 x 40A brushless (wing); 1 x 20A brushless (Tail)
Functions: 6-channel Tx and Rx needed.
Aileron, Rudder, Throttle, Wing tilt, Tail rotor tilt (rudder), Steering nosewheel (optional)
Battery: 4S x 2200mAh lipo recommended
Flying weight: 1700g
Price: £276.99

Something I found a little disconcerting is that the Flying section in the instructions commences with a cautionary note about flutter! The caution ends with the warning that the most common cause of flutter is an overpowered model flying at excessive speed - I hope this isn't the case with the CL-84! Equally important is that when initiating the power to the model at the field, make sure the model is flat and level (stood on its undercarriage) so that the three-axis gyro can self-calibrate correctly.

My plan was to fly the CL-84 first as a conventional aeroplane, to trim it and get used to its handling in that mode, land it in that mode and THEN try out the vertical take off and hover trimming. As a 'fixed wing' man, I anticipated that this would be the most difficult part. I have had a little experience in flying small drones, but the CL-84 is something else!

Finally, provided that the model survived up to that point, I would try the transition from one mode to the other and then back again. It would be true to say that I felt a little apprehensive, but nevertheless, very excited, with the prospect of putting the CL-84 through its paces!

FLYING THE CL-84

I love it when a plan comes together! (Alright, I admit I was an 'A' Team fan in my youth!) - except in this case, it didn't!

The plan was to get the photos first - the number one rule of reviewing -but my regular cameraman wasn't available on the day that promised good flying weather, so I made the maiden flight on my own! Having checked it all out thoroughly at the field, I prepared for a conventional flight i.e. wings down and lined her up into wind. The take off run was straight but she needed quite a bit of elevator to get her to lift off.

The climb out was quite shallow - but steady - and I realized I was holding in some elevator, so waited until I had some height before adjusting the elevator trim for level flight. I was flying on high rates, but the aileron control response was very sluggish - turns felt ponderous and seemed to take forever. The CL-84 definitely isn't an aerobatic machine!

After a couple of circuits to get the feel, I must say my overall impression was that she still felt nose heavy, even with full 'up' elevator trim clicked in. I decided to bring her in and so lined up an approach dead into wind, only to find that the rate of descent, when slowed down to a decent landing speed, was somewhat high. The lack of available up elevator, due to all

True VTOL! Fancy something different that's a challenge to fly smoothly? This is the one!

the trim having been applied, resulted in a hard 'arrival' rather that a landing; level, but hard!

The main undercarriage was torn off, the nose leg fitting came away from the ply bulkhead, the fuselage split down the middle and two cracks were found in the fuselage sides at the rear edge of the rear hatch opening. Sounds bad, but actually meant about an hour's repair time - the longest job being to make a replacement nose bulkhead from some 1/8" lite-ply scrap.

Second outing, and still no cameraman! However, having added a little more lead to that fitted to the tail, a second conventional flight was made and things were a lot better; not only did she get off smartly, she felt a lot better and responded more to elevator - still not very agile, but in the meantime I had seen a video on *YouTube* that confirmed that the CL-84 wasn't exactly 'throw-aboutable', so at least I knew someone else out there shared my initial impressions.

This time I made the landing approach a little faster and brought her down without a repeat of the original 'dump' and decided to try a vertical take off immediately from rollout. At this point, there was a bit of a breeze and the model wasn't dead into wind when I opened the throttles after the wing was lifted - two things that just don't help the CL-84 as it goes into VTO mode!

Now I'm not a heli or drone flyer - I've dabbled, but only minimally - and so the take off wasn't tidy or instantly controlled, but I managed to keep the climb vertical and the wings and tail reasonably level. It was rotating in yaw somewhat, but correction using the rudder stick was immediate and over the top - very sensitive use of the stick is required and so I watched as the CL-84 got higher and then hit the 'wing lower' switch.

I still don't know what happened next, I have no memory of the gyrations of the model, only that it seemed to do a twisting back flip - and then settled down into normal forward flight! I had nothing to do with it until I made the first turn! I did not try a transition into a vertical landing!

I must say at this point, that I have subsequently seen an identical CL-84 being flown by a 'well-known-in-the-trade' fixed wing and heli pilot - and he seemed to make it look easy, with none of the above unexplained gyrations that I experienced. In his case, the transitions were smooth and initiated quite a bit downwind (there shouldn't be any, of course!) and I have to say, the model looked very impressive - again, no wild aerobatics, but looked very stable. It has to be said that the Flyzone CL-84 is different!

In hindsight, it is obvious that when the wing position transition is taking place, at some point, the aileron control for forward flight is lost as the onboard stabilisation system for vertical control takes over. So effectively, at some point, you have no roll control at all, which may explain the reactions of the model on that first transition.

After this fact had been pointed out to me, a ground test showed that the aileron control was lost when the wing was only approximately 15° from the horizontal and only kicked back in when the wing was vertical - hence the recommendation - no, in fact, the mandatory stipulation - that calm weather is crucial. You can see that the wing, when vertical, acts like a barn door in any strength of breeze at all above a whisper, and if not exactly into wind, positional control is very hard to maintain. So it's a challenge!

Having seen one perform in the hands of a skilled pilot (perhaps more so than your average club flier), it can be flown very effectively. The challenge, as ever, is to achieve that level of competence without wrecking the model. I would advise that, unless you are really competent at both fixed and rotary wing flying, you get someone who has that experience to make the initial flights, trim the model out - and give you some instruction, before putting the Tx into your hands!

The Flyzone CL-84 really is something completely different, so if you are a bit jaded flying your hack heli or foamie fixed wing fun-fly, get yourself one and enjoy the challenge of VTOL! ■

Conventional flight. Not the most responsive of fixed wing machines, so don't expect an aerobatic schedule! But then, the full size was never intended for that either.

Hovering, about to land - takes a bit of practice!

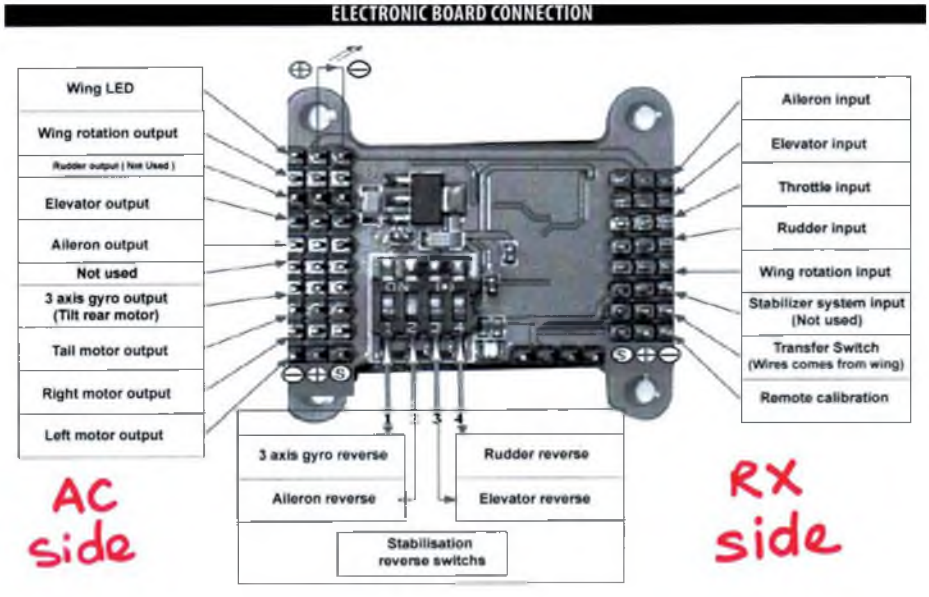


Diagram of the board wiring connections.

FAIREY FIREFLY

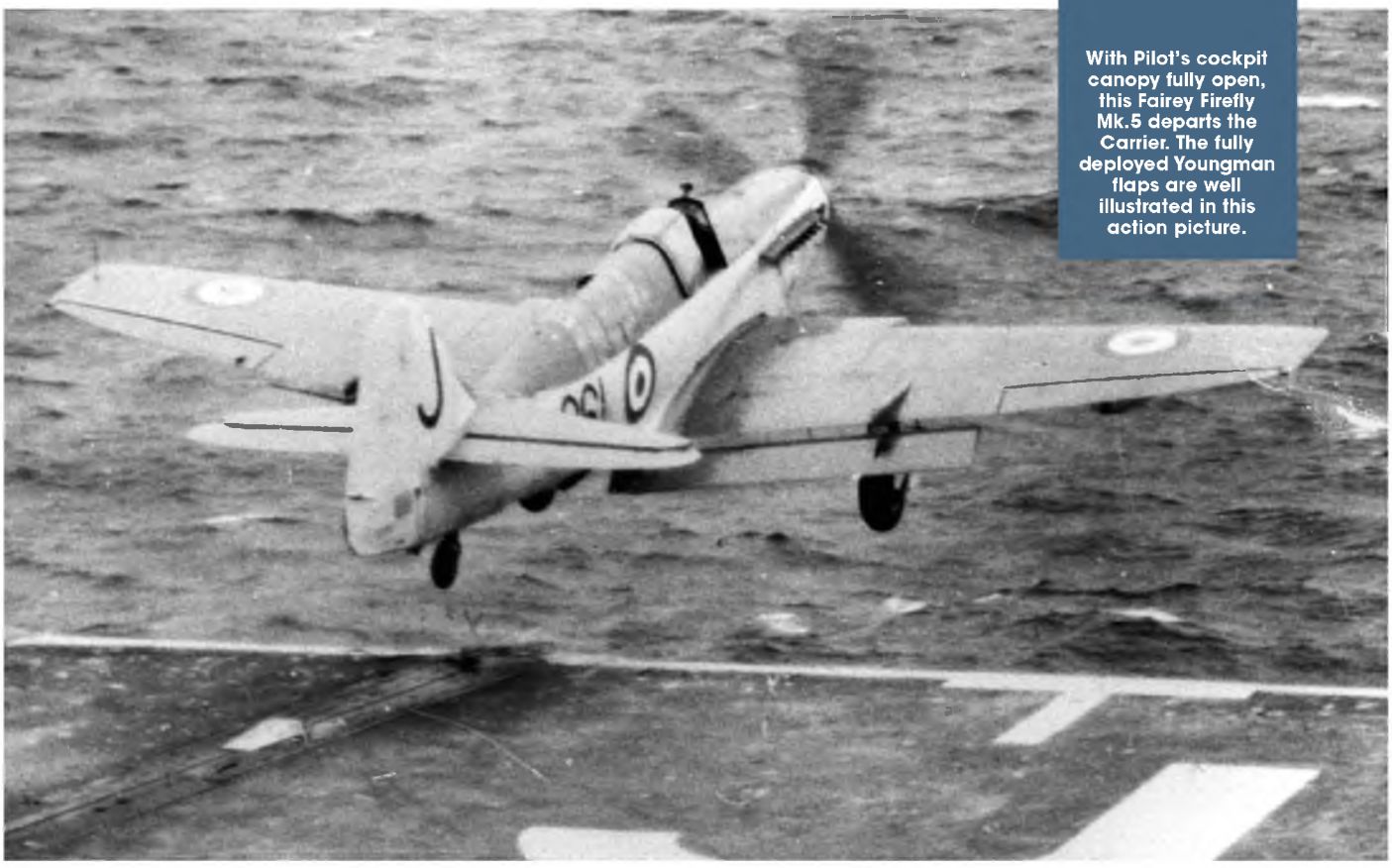
CREATED AS A FLEET DAY FIGHTER, THE FIREFLY PROVED READILY ADAPTABLE FOR OTHER COMBAT TASKS AND ACHIEVED A LONG SERVICE CAREAR

It could be reasonably asserted that the Fairey Firefly had its origins in the R.A.F's Fairey Battle bomber, which resulted from an Air Ministry specification issued back in 1932 and first flown in early 1936 - no rush then! Regarded, at inception, as an advanced design, it's ponderous performance with its single Rolls Royce Merlin engine and defensive armament of a single rearward firing rifle calibre machine gun made it obsolete by 1939 when the type formed much of the day bombing element of the R.A.F.'s Advanced Air Striking Force that went to France immediately after the declaration of war in September that year. During the German Blitzkrieg advance across France in May-June 1940, the Fairey Battle crews paid a heavy price for those deficiencies.

Such shortcomings had already been recognised in the1934 specification P.4/34, also for a day-bomber for which Fairey Aviation's response was a rather smaller, more sleek airframe with a wide-track, inward retracting main undercarriage. Two prototypes were built, the first flying in April 1937 but the design was progressed no further as a day bomber, having lost out to the competitor Hawker Henley.

Meanwhile, the Royal Navy had finally wrested control of ship-borne military aviation from the Royal Air Force and was working to replace its motley collection of biplane combat types. In 1938 their specification O.8/38 called for a two-crew fleet defence fighter and Fairey lost no time in the adaption the second of the P.4/34 prototype airframes to the naval spec. fighter with folding wing configuration. Thanks to the inclusion of a dive-bombing capability, the P.4/34 airframe possessed sufficient strength to allow adaption to aircraft carrier based operation. With the original Merlin III engine its

Fine airborne study of a Fairey Firefly Mk.1 from the fifth production batch. The example was later converted to T.Mk.1 trainer configuration with raised rear cockpit for necessary pilot's view over the nose.



With Pilot's cockpit canopy fully open, this Fairey Firefly Mk.5 departs the Carrier. The fully deployed Youngman flaps are well illustrated in this action picture.

> "In any case, the operational requirements for the new Fleet fighter included the task of Fleet Reconnaissance that dictated an operational range well in excess of land based types like the Hurricane and Spitfire"

top speed of 230 mph was poor but substitution of a Merlin VIII engine delivered 265 mph, an improvement that was considered good enough in the light of urgent need in the pre-WW2 rearmament drive and the aircraft was given the name *Fulmar*.

In any case, the operational requirements for the new Fleet fighter included the task of Fleet Reconnaissance that dictated an operational range well in excess of land based types like the Hurricane and Spitfire, resulting in an aircraft that was bigger and heavier than the RAF's newest front-line fighters.

The quick adaption of an existing prototype ensured that the Fleet Air Arm received their first monoplane fighter type with a minimum of delay, the first example flying in early January 1940 and a total of 600 Fulmars had been delivered when production ended in 1942.

ENTER THE FIREFLY

Having delivered to the Royal Navy their first monoplane fighter aircraft, Fairy Aviation Co. were, in 1939, well placed to respond to Specification N.9/39 for a much harder-hitting naval fighter aircraft, still with a two-man crew. Although officialdom was heavily in favour of a turret-armed fighter, Fairy's design team stressed that the weight of the turret compounded with its drag, would put a severe handicap on the fighter's agility. It was on this line of thinking that the company proposed instead a low-wing monoplane somewhat similar to its predecessor, the Fulmar. A significant step forward however, was in the weight saving planned into its design, resulting in an aircraft that had an empty weight barely less than the loaded weight of the Fulmer.

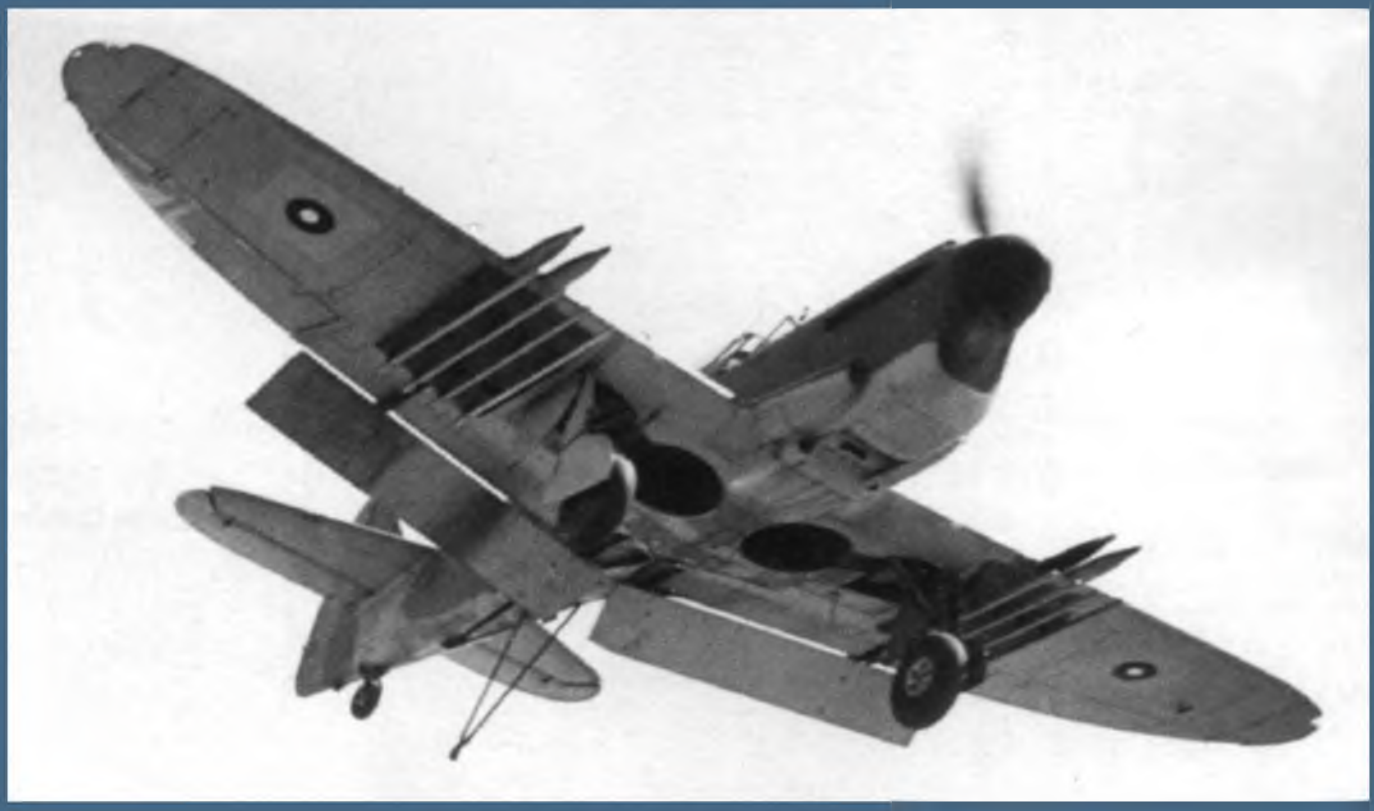
This design found favour with their Lordships at the Admiralty and another specification, N 5/40, was written around the design which received a preliminary production contract for 200 examples. No prototypes were requested and the entire project subsequently became known for the rapidity with which the design was turned into reality. The first drawings were issued on 16 November 1940 and by 22 December of the following year the first example took to the air.

The new design replaced Merlin power with the new Rolls Royce Griffon IIB engine mounted in a quickly detachable 'power egg' and included such other innovations as Youngman wing area-increasing flaps and a basic fuselage constructed in two halves - left and right - split along the vertical centreline. *(It might have been devised by an aeromodeller!)*. In shape at least, the lineage from the Fulmar was obvious, although the far more powerful Griffon engine needed the cooling of a much larger blunt 'chin' air intake below the propeller spinner, which imparted a far more aggressive appearance.

The Firefly F Mk I was intended for the daytime Fleet fighter role and Carrier trials were performed from HMS Illustrious towards the end of 1942 as a matter of urgency. Performance of the new fighter was not particularly spectacular, although it marked a considerable improvement over the Fulmar. The increased agility of the Firefly combined with the punch it could deliver from the four Hispano cannon wing armament, ensured that its mass production would enjoy the highest priority and although it was criticised in some circles for the weight penalty of the second crew member, the Firefly was destined to become one of the most outstanding aircraft to emerge from the Second World War.

One of the most important features of the Firefly was the use made of the Youngman area-increasing flaps. These were fully retracted for high-speed flight or extended aft on tracks to increase wing area for cruising. Also, they performed the normal function in take-off and landing and helped to radically reduce the aircraft's turning radius. It was in fact, the presence of these flaps that made the Firefly such a supremely manoeuvrable aircraft.

Extension of Firefly mission capability proceeded in parallel with the build-up of production deliveries, resulting in the NF Mk II night fighter which differed from the daytime type primarily by the introduction of AI Mk 10 radar, housed in two small radomes, mounted at the wing leading edges close to the fuselage, but the introduction of a more compact radar without the necessity for structural alterations meant that the development of the NF Mk II was cancelled, as was the Firefly Mk III which, with two-stage Griffon 61 engine, was found to be



Flaps down; wheels down; hook down ... ALL DOWN! A Mk.1 Firefly approaches the rear round-down of HMS Indefatigable, with underwing rocket rails empty after a rocket strike against the Pangkalan Brandan oil refinery in Sumatra, circa Dec 1944/Jan '45.

A brand new Firefly FR. Mk.4 in the national markings of the Royal Netherlands Navy (Kon. Marine) awaits delivery. This is one of the first batch supplied and carries the Extra Dark Sea Grey upper surface colouring.

This T.Mk.5 supplied to the Royal Australian Navy was converted from FR.Mk.5 configuration and well illustrates the raised rear cockpit with semi-bubble rearward sliding canopy.

aerodynamically unstable.

By that time radar development had progressed rapidly and both the daytime and night-time fighter versions had radar installed as standard equipment to become FR Mk I and NF Mk I, with the former becoming the most prolific production variant of the Firefly.

INTO ACTION

Firefly Mk.1s entered front-line squadron service in October 1943, going into action for the first time in April 1944 during Operation Tungsten, against the German pocket battleship Tirpitz, holed up in Altenfjord in Northern Norway, followed by further Tirpitz strikes in August that year. Fireflies performed reconnaissance missions and the strafing of gun positions protecting the battleship. Attempts to sink the Tirpitz were unsuccessful at that stage, and these operations did not provide the Firefly with the right opportunity to show its mettle in air-to-air combat.

However, Firefly Mk.1s were part of the air-strike complement when, in late 1944, HMS Indefatigable sailed for action in the Indian Ocean and the Far East with the British Pacific Fleet and it was in that theatre that the Firefly was to earn its spurs.

The first Firefly air-to-air kill was registered on 4 January 1945 during raids on the Japanese enemy held oil fields in the East Indies - a combined operation with aircraft from HMS Illustrious that also involved F4U Corsairs, Fairey Barracudas, Grumman Avengers and F6F Hellcats and within a month of their arrival in that theatre of operations, the Fireflies had established a reputation for sturdiness

and reliability. Their next major task was the type's participation during the invasion of Okinawa where Firefly units formed part of Task Force 57.

On 24 July they gained the distinction of being the first British aircraft to fly over Tokyo. By the time Pacific combat theatre hostilities ceased, concluding WW2, the Firefly had shown what it was worth, it had fired its guns in anger and it had conclusively demonstrated its value.

MORE DEVELOPMENT - THE LATER VERSIONS

The next - peacetime - variant was the Firefly Mk IV, the first to which was applied the revised fuselage nose shape that became the distinguishing physical feature to the later Firefly variants. This served in two roles; as the FR Mk. IV, it was used for fighter reconnaissance and as the NF Mk. IV it had the role of night fighter. The first flight of a production Mk. IV was made on 25 May 1945 but when WW2 ended in August that year, the sense of urgency reduced, so delivery of the new versions did not take place until September 1946.

New operating techniques for the detection of submarines from the air were added to the Firefly's roles, and the dedicated anti-submarine warfare Firefly AS Mk. 5, FR. Mk.5 and NF Mk.5 evolved.

The first flight of a Mk. 5 took place in December 1947, the first production example being delivered to the Fleet Air Arm in January 1948, marking an important milestone when it was one of these variants that marked the 1,000th Firefly to leave the Fairey works on 16 July 1948. In the anti-submarine role, the aircraft proved to be highly successful.

TO WAR AGAIN

During the three-year Korean conflict (June 1950-July 1953) Firefly Mk.4s and Mk.5s were mainly employed in the close-support role in conjunction with land forces, although mine laying missions and shipping strikes were also undertaken. Operations continued until the end of October 1952 during which time the Firefly squadrons flew a total of 1,907 sorties, totalling 3,243 flying hours. 1,948 deck landings were made suffering only four deck accidents. During this period 16,868 rockets had been fired and 96,5001b of bombs dropped.

IN FOREIGN SERVICE

The first foreign interest in the Firefly came from the Netherlands with an order for 30 F Mk Is. These were earmarked for No. 860 NAS that had been formed within the FAA in 1943 by Dutch pilots that had managed to escape from their country during its German occupation. Delivered on 18 January 1946, No. 860 was reformed at Royal Naval Air Station (RNAS) Ayr and transferred to Kon Marine for operations from the light fleet carrier HMS Nairana loaned to the Dutch navy and renamed HrMs Karel Doorman. With the completion of the production order a second unit was formed, No. 861 in September 1946.

This was followed up by a second order, this time for 40 FR.4s, several of which were later converted to Mk 5 standard.

A final order for 14 NF.5s was placed in March 1949, bringing total Dutch procurement to 84 Fireflies. Four AS.5s

> "Carrier trials were performed from HMS Illustrious towards the end of 1942 as a matter of urgency. Performance of the new fighter was not particularly spectacular, although it marked a considerable improvement over the Fulmar"

Superb air-to-air view of two Firefly Mk.4s, the first of the line with the more shapely nose profile. Colour scheme indicates these were among the first deliveries that commenced in September 1946.

The nose-down stance of this Firefly Mk.5 during a landing mishap collision with the 'safety' barrier on HMS Triumph during 1952 tends to indicate at least a partial main undercarriage collapse, although the arrestor hook has clearly failed to engage the wire.

The wing-fold geometry is well illustrated in this view as its port side outer wing panel is craned into place.

A further view of the fully folded outer wing panel on a Firefly Mk.5.

were later acquired from surplus RCN stocks while on retirement of the type, seven surviving airframes were converted into target tugs, while ex-Els were converted to T.l and T.2 trainers by Fokker from kits supplied by Fairey.

Fireflies served for a long time with the Netherlands' naval air arm (Marineluchvaartdienst -MDL) seeing action in the Netherlands East Indies (NEI) from 1947 against the Indonesian independence movement until cessation of hostilies at the end of 1949, after which the MLD re-established its NEI base on Baik Island off West New Guinea from where operations continued against Indonesian 'infiltrations' in West Papuafrom WW2 era airfields and air strips. Firefly operations there did not end until December 1961.

Canadian manned units of the Royal Navy's Fleet Air Arm transferred to the newly formed Royal Canadian Navy in January 1946, taking their Firefly Mk.1s with them. These were subsequently supplemented by Mk.5s in 1948 and a further 20 FR.Mk.5s a year later.

Australia received two ex-Royal Navy WW2-era aircraft carriers, re-commissioned as HMAS Sydney and HMAS Melbourne, operating FR.4s and then FR.5s starting in 1948 and AS Mk.6s

A bit big for a fighter, compared to the RAF's contemporary Hurricane and Spitfire, the Fairey Fulmar's two-crew fighter concept was one generated only by the Royal Navy and was the Fleet Air Arm's first monoplane fighter in early 1940. Within a year, the FAA also received single-seat Grumman F4F Martlets.

Gate Guardian to a breakers yard! Firefly AS.Mk.6 rests by the Australian Returned Serviceman's League H.Q., at Griffin, New South Wales.

Government Health Warning required! The shape of the Fairey Battle bomber reveals the basic outline and shape that led, progressively, to the Fulmar and finally, the Fairey Firefly. Battle crews suffered terrible losses during 1939/40 actions as part of the RAF's 'Advanced Air Strike Force' in France.

in 1951. RAAN Fireflies saw action from these two Carriers during the Korean War.

Sweden took 14 Mk.1s, modified for target towing duties, two of which were passed on to the Danish Air Force. In recent times, a few of the Swedish Fireflies, were privately acquired and transferred back to UK. One at least was on show prior to intended restoration at the Imperial War Museum airfield, Duxford.

A further batch of ten Mk.1s and a couple of T.2 trainers went to the Royal Thai Air Force and the Imperial Ethiopian Air Force received ten Firefly Mk.1 fighters and Mk.1 trainers.

FINAL EVOLUTION

The final step in the evolution of the Firefly was the AS Mk 6 exclusively tailored for anti-submarine operations. This version differed from the AS Mk.5 in that it had its cannon removed. The T.Mk 7 was a trainer aircraft used to train anti-submarine observers.

Fireflies ended up as radio controlled target drones designated U.Mk.8s & 9s and with the delivery of the last Firefly of this type on 20 April 20 1956, production finally came to an end.

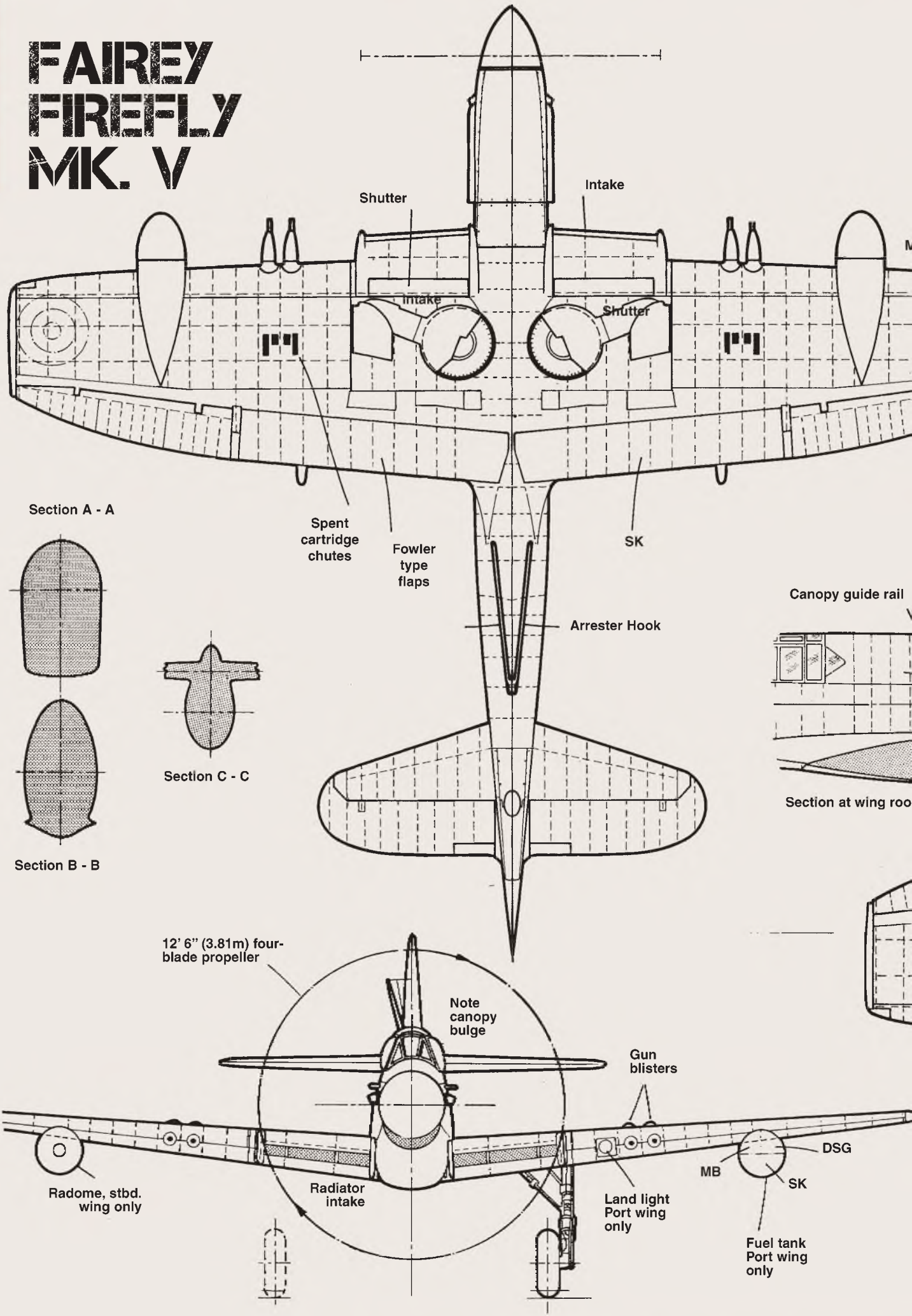
FINSHED WITH ENGINES

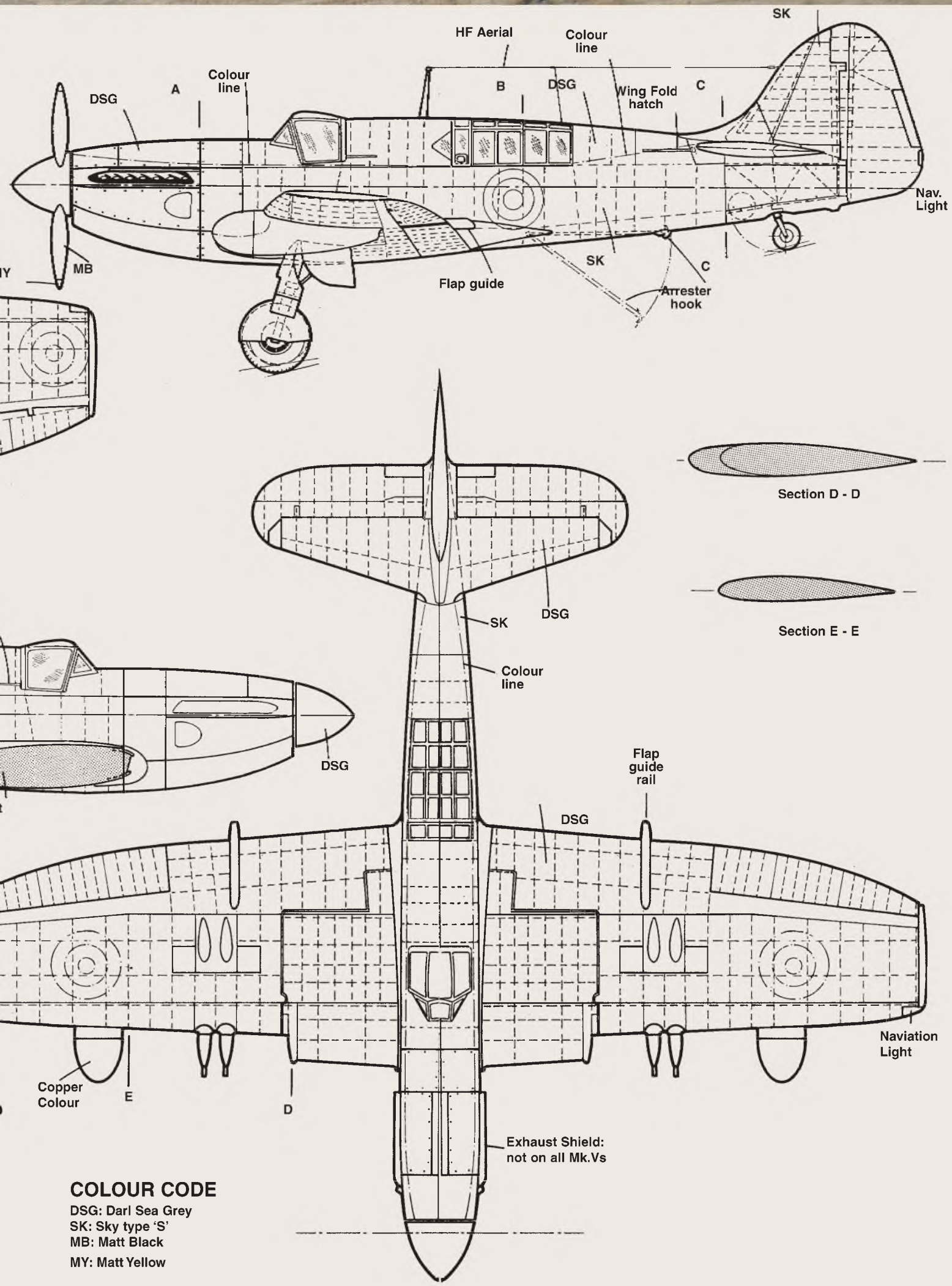
For a fighter conceived in the late 'thirties, withdrawn from production in the mid-fifties and finally retired in the mid-sixties, the Firefly was without doubt one of the most versatile warplanes ever to be launched from a carrier deck. Over a twenty-five year timespan the Firefly proved that its performance, manoeuvrability, handling qualities and firepower was something that had hitherto been completely unapproached by previous shipboard aircraft, and even as late as1960, in response to Indonesian territorial demands and threats, the Netherlands deployed Firefly AS.Mk 4s to Dutch New Guinea. As Indonesian forces began to infiltrate the territory, the Fireflies carried out a few attack operations in early 1962, before a political settlement was negotiated. ■

Moment of 'Arrestment': Firefly AS.Mk.5 about to collect the third wire as it lands on HMS Vengeance during exercise in 1952.

SCALE 1:60

FAIREY FIREFLY MK. V





COLOUR CODE

DSG: Darl Sea Grey
SK: Sky type 'S'
MB: Matt Black
MY: Matt Yellow

Fairey Firefly NF Mk.1, No.814 Naval Air Squadron, HMAS Venerable, 1946. Extra Dark Sea Grey/Dark Slate Grey upper surfaces, Sky undersides. White spinner, codes and flash on cowl. Black serial; blue/white national markings on fuselage sides, above port and below starboard wings.

Fairey Firefly FR Mk.1 of No.825 Squadron Royal Candian Navy, 1946. Extra Dark Sea Grey/Dark Slate Grey upper surfaces, Sky undersides; 'C1' roundels on fuselage sides, 'B' type on wing upper surfaces, 'C' type underside. Spinner and lettering white; 'N' outlined black.

Fairey Firefly FR Mk.1, Ship's Flight, HMS Illustrious, 1951. Extra Dark Sea Grey/Sky finish; national markings in six positions. Ship's crest on both side of nose cowl.

Fairey FiRefly FR Mk.1, Royal Netherlands Navy. Extra Dark Sea Grey/Dark Slate Grey upper surfaces with Sky undersides. National markings in six positions (white section facing aft and red segment pointing toward wing tips). Lettering in white, black spinner.

Fairey FiRefly FR Mk.1, Royal Thai Naval Air Service. Extra Dark Sea Grey upper surfaces/Sky undersides. National markings in six positions; serial black, repeated below wing reading from leading edge (port) and from starboard. reading from trailing edge.

Fairey Firefly TT Mk.1, Royal Danish Air Force. Golden yellow overall, with black spinner and serials; '630' repeated on wing undersides, reading from wing leading edge under starboard. wing/ from trailing edge under port panel. National markings in six positions.

Fairey Firefly T Mk.1, Imperial Ethiopian Air Force, 1952. Dark Earth/Middlestone upper surfaces, Azure Blue undersides and spinner. Serial on tail and below wings in black. National markings in six positions.

Fairey Firefly FR Mk.1, Royal Thai Naval Air Service, 1951. Extra Dark Sea Grey with Sky undersides. National markings in six positions. Serial in black, repeated below wings, reading from leading edge under port and from trailing edge below starboard wing.

Fairey Firefly AS Mk.4, 737 Naval Air Squadron, 1950. Extra Dark Sea Grey/Dark Slate Grey upper surfaces with Sky undersides. 'Ci' type roundels on fuselage sides, 'C' type above and below wings. Spinner and serial black, codes white.

Fairey FiRefly FR Mk.4, Royal Netherlands Navy. Extra Dark Sea Grey/Dark slate Grey upper surfaces with Sky undersides. National markings in six positions, with those above and below the wings having the blue segment facing the wing tips. Codes in white, serial 'Kon Marine' in black.

Fairey FiRefly FR Mk.4, Royal Netherlands Navy, New Guinea 1955. Exta Dark Sea Grey/Sky finish; all lettering black. National markings on fuselage side, above port and below starboard wing panels (blue segment pointing toward wingtips). '008' in black below port wing/ white above starboard wing. Red spinner.

FIREFLY FLYING COLOURS

Fairey Fiefly FR Mk.5, No.825 Naval Air Squadron. Extra Dark Sea Grey upper surfaces, Sky undersides. National markings in six positions. All lettering black; unit crest in fuselage nose both sides.

Fairey Fiefly FR Mk.5, No.825 Naval Air Squadron, HMS Ocean, Malta, 1952. Extra Dark Sea Grey upper surfaces, Sky undersides. National markings in six positions. All lettering black; red spinneres.

Fairey Fiefly AS Mk 5, No.880 Squadron Royal Candian Navy, 1951. Extra Dark Sea upper surfaces with Sky Grey lower fuselage and undersides; yellow/red spinner. National markings on fuselage sides and wing upper surfaces. 'VG' below stardboard and 'BDK' below port wings in black, reading from trailing edgE (inboard of wing pods). All lettering in black.

Fairey FiRefly AS Mk.6, No,826 Naval Air Squadron, HMS Glorious, 1953. Extra Dark Sea Grey upper surfaces, Sky undersides. National markings in six positions All lettering black. Recorded at Malta with unpainted replacement engine cowl.

Fairey FiRefly TT Mk.6, No.725 Squadron, Royal Australian Navy, 1958. Aluminium upper surfaces, with yellow/black taget tug stripes on undersides. National markings in six positions. Yellow/black spinner; black anti-dazzel panel and lettering. Yellow rear fuselage band and similar yellow band on wing upper surfaces.

Fairey Firefly U Mk.9, No.7288 Raval Air Squadron, RNAS Hal Far, Malta, 1958. Deep Cream BS 383CI/353 upper surfaces, Post Office Red Cherry BS381CI/538 undersides. National markings in six positions. Serials in black, code on cowl in white. Wing top pods aluminium.

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No authentic example now exists, but the accurate replica photographed in extensive detail in this collection is as good a guide as can be found of this elegant 1930s RAF fighter. Includes some general arrangement pictures authentic to the period. (55 Images)

Grumman FM-2 Wildcat CD58
First of Grumman's highly successful line of prop-driven 'Cats', the Wildcat, in guises from F4F-3 to FM-2 held the line after the Pearl Harbour attack and served from then until the end of WW2. It was idea for operations from the small escort carriers. (90 images)

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Hottest of Grumman's prop-drive fighters – it arrived too late for action in WW2 but was standard ship-borne fighter equipment in the immediate post-WW2 era. (90 images)

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The awesome twin engine long range fighter of the late WW2 era operated by US Navy and US Marines. (60 Images)

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Grumman F3F CD54
A study of the faithfully replicated example of the 1930s U.S. Navy biplane as seen at the 2001 Flying Legends Show. (34 images)

Gloster Gladiator CD53
The Royal Air Force's last biplane fighter, star of late 1930s air shows and flown in combat during early WW2, including Battle of France, Battle of Britain, Mediterranean operations and North Africa. (50 images)

Fokker D.VIII CD52
The Fantasy of Flight Museum's example of the late WW1 Imperial German Air Service monoplane fighter, in full detail. (69 images)

Fokker D.VII CD51
The most famous of all the German fighter aircraft of WW1. The collection depicts the RAF Museum, Hendon's authentic, restored example. (44 images)

Focke Wulf FW 190A CD50
Germany's 'butcher bird' fighter of WW2, active on all combat fronts from 1941 onwards.

Fieseler Storch CD49
Arguably the first military STOL aircraft, this storky looking aircraft has long been a modellers' favourite. Two examples are represented. the machine at the Fantasy of Flight Museum in Florida and the RAF Museum Cosford's example. (90 images)

Fairey Gannet ASW1 & T.2 CD48
The Royal Navy's post-WW2 anti-submarine workhorse, that also served with a number of other air-arms. Most images are of Mk.T.2, that was more-or-less the same as the ASW.1. (110 images)

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Elegant U.S. high wing light aircraft in full detail. Two examples shown. (60 images)

Erco Ercoupe 415 & Avalon Ercoupe CD46
The elegant twin finned light/sport aircraft. Both original Type 415 and later Alon resurection examples. (115 images)

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A bumper bundle of images that provides a vast array of detail pictures, plus photos of examples in both RAF trainer and civil colours. (70 images)

DH Tiger Moth CD44
Much close-up detail of civil register example, plus further detail of the IWM Duxford's example in Royal Navy trainer colours, showing the blind flying hood. (110 images)

De Havilland DH89 Dragon Rapide CD43
Graceful twin engine biplane airliner that saw service from pre-WW2 through to the mid 1950s. Several are still flying and three are shown in this picture collection. (100 images)

De Havilland DH84 Dragon CD42
Forerunner of the more famous DH 89 Dragon Rapide, this collection depicts a superbly restored example. (40 images)

DE Havilland DH 60 CD41
The aircraft that set the British 'club' flying movement on the road to success during the 1930s. (140 images)

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1920s lightweight low wing sports aircraft designed to a low-power specification. Machine illustrated is the sole remaining example. (60 images)

Curtiss P-40M CD39
One of the later versions of the famous Curtiss Warhawk, the WW2 fighter aircraft that saw service in just about every combat theatre of operations. (100 images)

Curtiss P-40B Tomahawk CD38
Rare, full restored example of the early version of the Curtiss fighter aircrfaft that was at Pearl Harbour on Dec. 7th 1941 – and survived the attack! (130 images)

Curtiss Jn-4 'Jenny' CD37
An authentic, restored example in full detail. (130 images)

Curtiss Hawk 75 CD36
The 'export' version of the Curtiss P-36 that saw service in durng WW2 with Finland and during the 'Battle of France' in May/June 1940. Example shown is a combat veteran. (130 images)

Comper Swift CD35
1930s racing aircraft. Example depicted is the radial engined example at Shuttleworth Mussel (91 images)

Cierva C.30 Autogiro CD34
A study of the example hung in the Fantasy of Flight Museum, finished in RAF WW2 colours. (35 images)

Christen Eagle CD33
The spectacular, stylish aerobatic biplane revealed in close-up. Example shown is the two-seat version. (90 images)

Chrislea Super Ace CD32
Late 1940s civil light aircraft with distinctive twin fins and nosewheel type undercarriage. A fully restored example. (123 images)

Chilton DW1 CD31
Original upright engined version of this diminutive British low wing sports/racer. (90 images)

Chance Vought F4U-1D Corsair CD30
The famous 'bent wing bird' in super detail. (132 images)

Bucker Jungmeister CD29
Radial engine version. Example from Fantasy of Flight Museum. (79 images)

Bucker Bestmann CD28
Authentic example as exhibited at the Fantasy of Flight Museum, in WW2 Luftwaffe colour scheme. (43 images)

Bristol M.1C CD27
Early WW1 fighter monoplane. Example depicted is the faithfully authentic replica built by the Northern Aero Works and operated by the Shuttleworth Trust museum. (100 images)

Bristol F2B Brisfit CD26
Full close-up detail, including photos of engine cowls for both Rolls Royce Falcon and Hispano-Suiza engines. (28 images)

Bristol Bulldog CD25
This collection depicts the example assembled from two donor airframes and restored to superb standard by Skysport Engineering. It can now be seen at the Royal Air Force museum, Hendon. (60 images)

Boeing Pt-13/17 Stearman CD24
Subject aircraft is a current British civil register example used for air-show displays. (54 images)

Bleriot Monoplane CD23
The Shuttleworth Museum's machine, the oldest original example still flying. Much close-up detail showing all the exposed rigging, structure and the "bedstead" main undercarriage, plus Anzani engine. (74 images)

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Superbly restored example of this much-maligned WW2 fighter aircraft that was used with great success by Russian forces in the ground attack role and with saw much action in the south Pacific, from where this restored example was recovered. (130 images)

Beech D18 Staggerwing CD21
The distinctive back-staggered 1930s biplane with retracting undercarriage. (45 images)

Avro 504k CD20
The Shuttleworth Museum's superbly maintained machine, in full detail. (140 images)

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EDITOR'S NOTE ...
Contrary to the editorial faux-pas in our February issue, our author is alive, well and happily bashing balsa as ever ...

TAMING A VICKERS WALRUS

John Ralph relates his conversion of a free flight Vickers Supermarine Walrus to radio control for rise-off-water flight

A year or so ago I met up with an old ex-Glevum (Gloucester) club member who now resides in the little town of Lochgillphed in Argyll. Bryan Passy is one of the few remaining members of my old club who is still very actively building traditional vintage models of all types from Indoor to Control-Line pulse jets and multi-engined powered scale models.

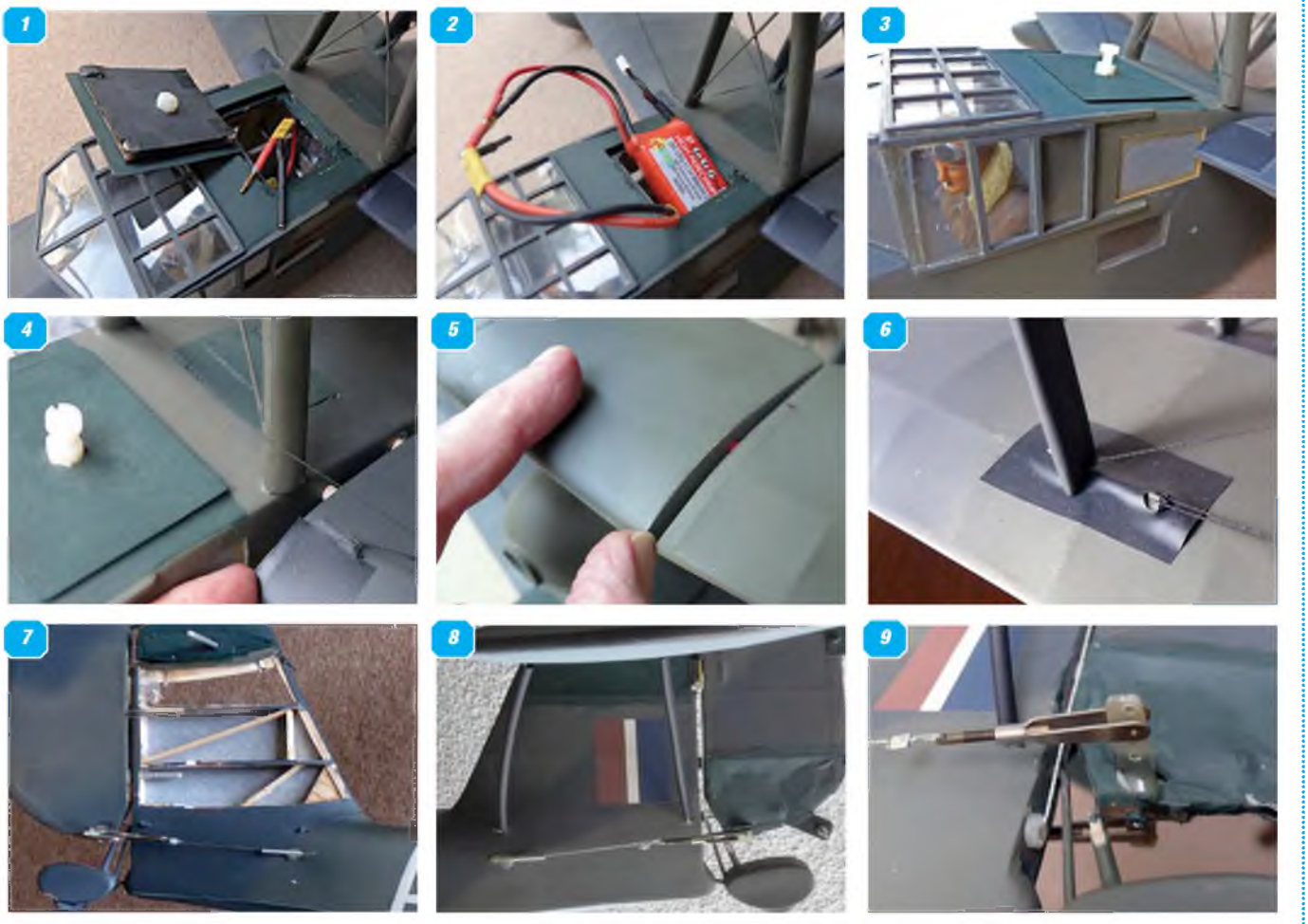
In his modelling den, Bryan had a diesel powered free flight scale Vickers Supermarine Walrus, the second that he had built from the the *AeroModeller* plan first published with the May 1957 issue. He had achieved no success trying to get his first Walrus to fly and this second one, he told me, also appeared to be a 'Do -Do'.

Bryan was sure that I could succeed in getting the beast airborne if I took it away and worked at it! So I accepted the challenge on the understanding that I would convert it to electric powered radio control.

THE FULL SIZE AIRCRAFT

Now the Walrus is a strange old bus and you either like it for being so, or simply dismiss it as an 'ugly beast' *(So ugly, it's beautiful - Ed.!)* . Surprising then that the man who designed it for Vickers Supermarine in 1930 was no less an aircraft designer that R.J. Mitchell who, only a few years later, came up with the Spitfire!

The aircraft, which entered service with the Royal Navy in 1935, was unique for the time in being the first British squadron aircraft to have a retracting undercarriage and completely enclosed crew accommodation. Folding wings were another innovation and the experience of water spray problems on tractor engines prompted the choice of



1 - 4: The battery being installed through a hatch with magnetically held down cover. The grey side panel is litho plate bonded to the fuselage and the internal speed controller for cooling of the latter . 5: The flex that is possible for the plug-on wings. 6: Detail of one of the interplane strut anchor points. 7: Extra fin bracing was added after the first flight damage. 8 & 9: Closed loop rudder horn and tailplane operating line.

engine location. (Not many people know that!)

There is a nice example of the full size aircraft in The Fleet Air Arm Museum, Yeovilton, Sommerset.

However, back to the model.!

FREE FLIGHT TO R/C CONVERSION

I was starting with a fully finished model built as per plan and I will deal with my mods while suggesting alternative ones if starting from scratch. (Full size copies of the plan for the model, shown here at 1/3rd full size, are still available.)

The structure is very robust for a free flight model and only a few things need beefing up to take the strain which might result from the addition of R/C equipment.

The wing joining dowels etc. were changed to plastic tubes, but kept fairly short to allow for 'knock-off-ability', with rubber bands pulling the wing halves onto the locators.

The model weighed in at just under 2lbs without its engine, so I chose a FUSION 2829/10 brushless motor, matched to a 3SP Li Po 850mAh battery, plus a couple of 7gm servos and a 2.4 GHz receiver to fly the beast. The wing loading of around 10ozs/ sq .ft , based on the total wing area, of the 38" span wings was nothing to get worried about, I felt!

The model was so well finished that I wanted to minimised any butchery to it, so decided to use rudder and all-moving tailplane as primary controls, in much the same arrangement that I had used to convert my free flight Miles Kestrel *(See Feb. 2007 AMI)*. Briefly, what is done is that the tailplane is made 'all-flying', with tension provided at the leading edge so that only a pull is required on a line to the servo.

The Kestrel was easy, since the tail was already pivoted for trimming, but not so the Walrus. The tail halves had to be cut from the centre bay and the latter glued to the top of the fin. A 1/8" root rib was added to the tail halves at the T1 position. Two full-depth spars were added 1" from the L.E. between T3 and T1, spaced to take a tube for the tail mounting rod. I used a aluminium knitting needle of about 2mm diameter for the rod, but carbon fibre would be a good alternative . A matching tube was fixed into the centre bay on the fin, allowing the tail halves to be plugged on, ready for the control line. The latter is attached to a 16g wire which is located in a tube in the tail halves at the back, to cross a few mm behind the rudder post. The photos of the set-up should make it clear (I hope!).

The operating line for the tailplane passes down the fin and through a nylon bush at the base to the operating servo . Both the latter and the rudder servo were positioned just below the rear gun hatch. The line to the tail is always under the tension provided by rubber bands that pull down on the leading edge of the tailplane halves.

The rudder was cut free and hinged to the fin post without too much trouble and then connected to its servo by closed loop wires.

BUILDING FROM SCRATCH

If you are starting from scratch, you can build in the elevators to scale outline. In that case, you will then need to use a couple of bellcranks/snakes or perhaps a mini servo in the fin to operate them. Some may go for 'full-house' control and incorporate ailerons. That would enable the dihedral to be reduced to the true scale angle and probably deal with the 'Dutch Roll' tendency at low speed (I'll comment further on that later). A servo in each wing would be my choice for that approach.

MOTOR ETC.

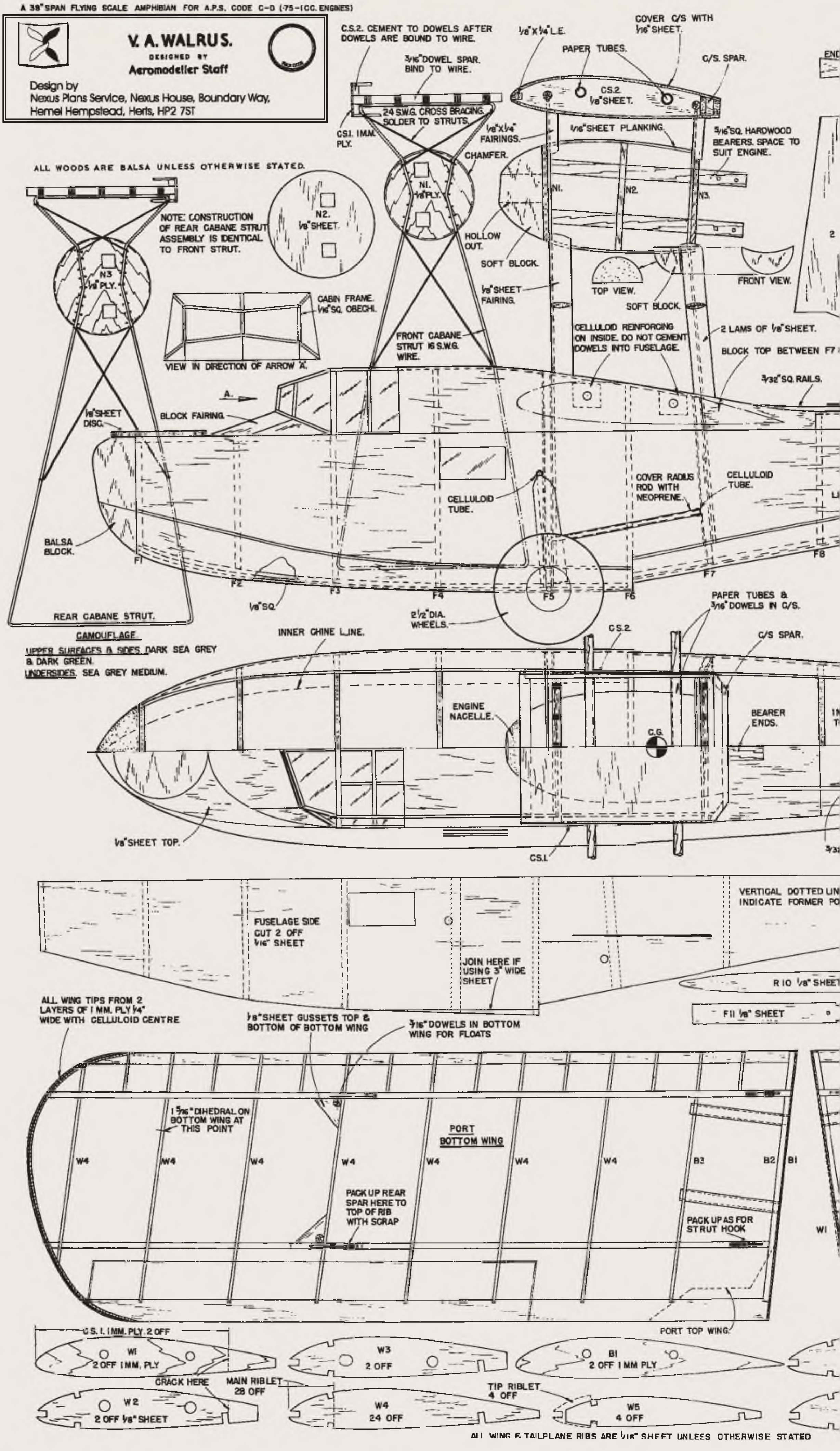
The outrunner electric motor was relatively easy to mount, requiring only the engine bearers to be sawn off flush with the pylon mount and for the motor to be screwed on. However, some thought was given as to what the thrust line should be. The most important consideration is the angle that the propeller slipstream meets the tailplane, which appears to be at about a zero angle on the full size machine. So I decided that I would set the thrustline to

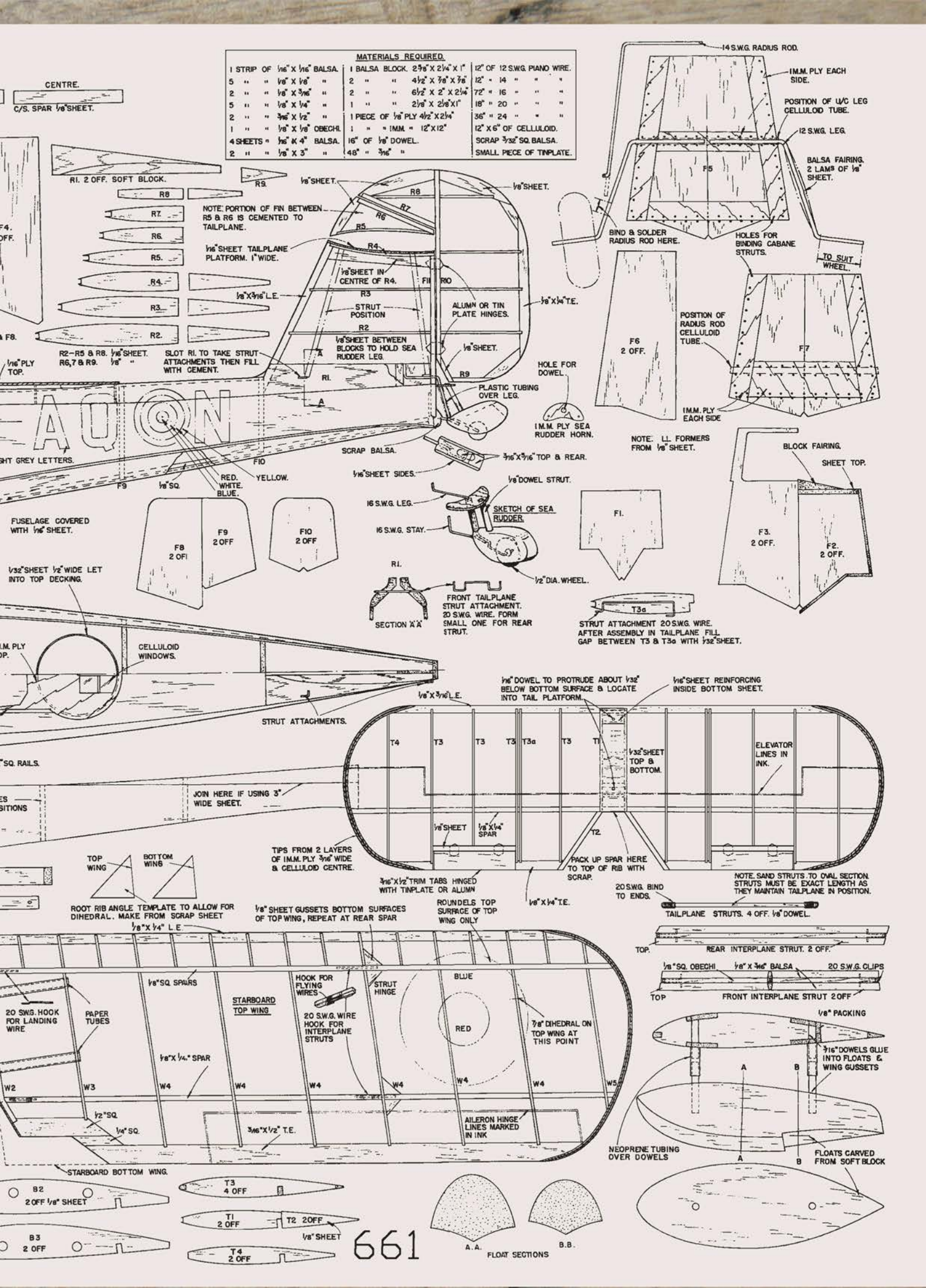
SCALE 1:3

SUPERMARINE WALRUS

A full size digital pdf file of the Vickers Supermarine Walrus that originally appeared in the May 1957 issue of AeroModeller (shown here at 1:3 scale) can be dowloaded free of charge from the OUTERZONE web site at:

http://outerzone.co.uk/plan_details.asp?ID=61




MATERIALS REQUIRED.
1 STRIP OF 1/16" X 1/16" BALSA.
5 " " 1/8" X 1/8" "
2 " " 1/8" X 3/16" "
5 " " 1/8" X 1/4" "
2 " " 3/16" X 1/2" "
1 " " 1/8" X 1/8" OBECHI.
4 SHEETS " 1/16" & 4" BALSA.
2 " " 1/8" X 3" "
1 BALSA BLOCK. 2 3/8" X 2 1/4" X 1"
2 " " 4 1/2" X 3/8" X 3/8"
2 " " 6 1/2" X 2" X 2 1/4"
1 " " 2 1/8" X 2 1/8" X 1"
1 PIECE OF 1/8" PLY 4 1/2" X 2 1/4"
1 " " 1MM. " 12" X 12"
16" OF 1/8" DOWEL.
48" " 3/16" "
12" OF 12 S.W.G. PIANO WIRE.
12" " 14 " " "
72" " 16 " " "
18" " 20 " " "
36" " 24 " " "
12" X 6" OF CELLULOID.
SCRAP 3/32" SQ. BALSA.
SMALL PIECE OF TINPLATE.
CENTRE.
C/S. SPAR 1/8" SHEET.
R1. 2 OFF. SOFT BLOCK.
R9.
R8
R7.
R6.
R5.
R4.
R3.
R2.
F8.
1/16" PLY TOP.
R2-R5 & R8. 1/16" SHEET. R6,7 & R9. 1/8" "
SLOT R1. TO TAKE STRUT ATTACHMENTS THEN FILL WITH CEMENT.
1/8" SHEET.
NOTE: PORTION OF FIN BETWEEN R5 & R6 IS CEMENTED TO TAILPLANE.
1/16" SHEET TAILPLANE PLATFORM. 1" WIDE.
1/8" SHEET IN CENTRE OF R4.
1/8" X 3/16" L.E.
STRUT POSITION
R2
1/8" SHEET BETWEEN BLOCKS TO HOLD SEA RUDDER LEG.
R1.
A
A
R10
R9
ALUMN OR TIN PLATE HINGES.
1/8" X 1/4" T.E.
PLASTIC TUBING OVER LEG.
HOLE FOR DOWEL
1M.M. PLY SEA RUDDER HORN.
SCRAP BALSA.
3/16" X 3/16" TOP & REAR.
1/16" SHEET SIDES.
1/8" DOWEL STRUT.
16 S.W.G. LEG.
16 S.W.G. STAY.
SKETCH OF SEA RUDDER.
1/2" DIA. WHEEL.
F9
1/8" SQ.
F10
RED. WHITE. BLUE.
YELLOW.
FUSELAGE COVERED WITH 1/16" SHEET.
F8 2 OFF
F9 2 OFF
F10 2 OFF
F1.
1/32" SHEET 1/2" WIDE LET INTO TOP DECKING.
CELLULOID WINDOWS.
STRUT ATTACHMENTS.
SQ. RAILS.
JOIN HERE IF USING 3" WIDE SHEET.
R1.
SECTION 'A' 'A'
FRONT TAILPLANE STRUT ATTACHMENT. 20 S.W.G. WIRE. FORM SMALL ONE FOR REAR STRUT.
T3a
STRUT ATTACHMENT 20 S.W.G. WIRE. AFTER ASSEMBLY IN TAILPLANE FILL GAP BETWEEN T3 & T3a WITH 1/32" SHEET.
14 S.W.G. RADIUS ROD.
1M.M. PLY EACH SIDE.
POSITION OF U/C LEG CELLULOID TUBE.
12 S.W.G. LEG.
BALSA FAIRING. 2 LAMS OF 1/8" SHEET.
F5
BIND & SOLDER RADIUS ROD HERE.
HOLES FOR BINDING CABANE STRUTS.
TO SUIT WHEEL.
F6 2 OFF.
POSITION OF RADIUS ROD CELLULOID TUBE.
F7
1M.M. PLY EACH SIDE
NOTE: LL. FORMERS FROM 1/8" SHEET.
BLOCK FAIRING.
SHEET TOP.
F3. 2 OFF.
F2. 2 OFF.
1/16" DOWEL TO PROTRUDE ABOUT 1/32" BELOW BOTTOM SURFACE & LOCATE INTO TAIL PLATFORM.
1/16" SHEET REINFORCING INSIDE BOTTOM SHEET.
1/8" X 3/16" L.E.
T4
T3
T3
T3
T3a
T3
T1
1/32" SHEET TOP & BOTTOM.
ELEVATOR LINES IN INK.
1/8" SHEET
1/8" X 1/4" SPAR
T2
PACK UP SPAR HERE TO TOP OF RIB WITH SCRAP.
TIPS FROM 2 LAYERS OF 1M.M. PLY 3/16" WIDE & CELLULOID CENTRE.
3/16" X 1/2" TRIM TABS HINGED WITH TINPLATE OR ALUMN
1/8" X 1/4" T.E.
NOTE. SAND STRUTS TO OVAL SECTION. STRUTS MUST BE EXACT LENGTH AS THEY MAINTAIN TAILPLANE IN POSITION.
20 S.W.G. BIND TO ENDS.
TAILPLANE STRUTS. 4 OFF. 1/8" DOWEL.
TOP WING
BOTTOM WING
ROOT RIB ANGLE TEMPLATE TO ALLOW FOR DIHEDRAL. MAKE FROM SCRAP SHEET
1/8" SHEET GUSSETS BOTTOM SURFACES OF TOP WING, REPEAT AT REAR SPAR
ROUNDELS TOP SURFACE OF TOP WING ONLY
1/8" X 1/4" L.E.
TOP.
REAR INTERPLANE STRUT. 2 OFF.
1/8" SQ. OBECHI
1/8" X 3/16" BALSA
20 S.W.G. CLIPS
TOP
FRONT INTERPLANE STRUT 2 OFF
1/8" SQ. SPARS
HOOK FOR FLYING WIRES
STRUT HINGE
BLUE
STARBOARD TOP WING
20 S.W.G. HOOK FOR LANDING WIRE
PAPER TUBES
20 S.W.G. WIRE HOOK FOR INTERPLANE STRUTS
RED
7/8" DIHEDRAL ON TOP WING AT THIS POINT
1/8" X 1/4" SPAR
W2
W3
W4
W4
W4
W4
W4
W4
W5
1/2" SQ.
1/4" SQ.
3/16" X 1/2" T.E.
AILERON HINGE LINES MARKED IN INK
STARBOARD BOTTOM WING.
1/8" PACKING
3/16" DOWELS GLUE INTO FLOATS & WING GUSSETS
A
B
NEOPRENE TUBING OVER DOWELS
FLOATS CARVED FROM SOFT BLOCK
B2 2 OFF 1/8" SHEET
B3 2 OFF
T3 4 OFF
T1 2 OFF
T2 2 OFF
1/8" SHEET
T4 2 OFF
A.A.
B.B.
FLOAT SECTIONS
661

give a few degrees of down wash onto the tail to help compensate for unavoidable down pitching due to the high mounted motor.

The battery box was positioned down in the fuselage just forward of the pylon and an access hatch was provided for the battery and the BEC/ motor speed control which fed the system. The motor speed controller (SC) must be cooled, which requires a bit of thought if models are going to be flown from water and I was optimistic enough to plan for such, so I sealed the SC into the side of the fuse. The same optimism prompted me to fit the access hatch with a rubber seal and small magnets to hold it down. Photos 1 to 4 show the set up.

Once all was complete, the system check showed the motor was turning a three-blade 8"x 6" prop at about 9,000 rpm, clearly giving more than adequate thrust to get the beast aloft!

READY TO FLY WITH C.G. AS SHOWN ON THE PLAN

Now for the more interesting (I hope) and important lessons for anyone tempted to build a WALRUS from the *AeroModeller* - plan or any other plan for that matter.

The fore/aft balance (CG) was clearly shown on the plan and it only required a bit of nose ballast to achieve it. I should have known better at my age than to blindly accept the position shown - but I did!

So I was now ready for the first trial flight. This would be made over land even though past problems with another scale waterplane had shown that water is a lot softer than the ground! I thus made and fitted the undercarriage to the model.

I must say that I had enjoyed converting the model and had started to like its unique look, so I made sure I had a few photos for the record, some of which are included here.

WEATHER OK, SO NO EXCUSSES

A suitable day with a light easterly wind was chosen for the maiden flight from short grass on the shores of Stithians Reservoir near Redruth, Cornwall, (our local water plane venue).

Under full power the model leapt into the air, but I cut the power quickly and landed, as it was clearly under-elevated. A few degrees of up elevator were added to the tail and a second take off attempted, after I had taken another tranquilliser! This time, although the model needed full power to get airborne, it did start climbing, although flying at about ten times scale speed, so at about seventy feet I reduced the power. Bad move! The next few seconds taught me that even R/C control can't deal with a grossly incorrectly balanced model.

As soon as the power was cut, the nose reared up and the model snapped into a spin followed by several others in opposite directions. The gyrations were too fast for me to correct and the model plunged down, thankfully into a patch of scrub grass. The only damage was to the fin, which proved the effectiveness of the flexible wing mounting system.

"Best hang it up in your workshop", was the advise from one of the onlookers, but kinder advice was to have a check on the CG position in particular, as that seemed to be the likely trouble .

BACK TO THE DRAWING BOARD. You may skip this part!)

The first thing to do when estimating where to set the CG on any model of which you (or others) have no previous experience, is to do a calculation to find the so called 'Neutral point' (NP) for the aircraft. This is the point where the respective forces acting on the wing and tailplane balance out in steady flight. The CG must be set IN FRONT of this point for stable flight to be resumed after any disturbance.

Historic early experience showed that lifting surfaces have their 'Aerodynamic Centre' (the point at which the lift force acts), close to their quarter chord points. This fact can thus be used to approximately calculate the NP. from:-

Aw x a = At x b

(where a+b = L the distance between the tail and wing quarter chord points and

10: Plug-on wing floats; note locking wire. 11 & 12: Wheels can be fitted easily for land use. 13 - 17: The electric motor positioned on its pylon. 18: The power pod, supported by the interplane struts, viewed from the front.

Aw and At are their respective areas.

It then follows that the NP is located at C + a from the leading edge of the wing at the location of the 'EFFECTIVE' quarter chord.

The wings on the Walrus are not staggaerd and of constant chord, but are swept. So again, as an approximation, the effective quarter chord location was taken at mid-span .

IS THE CG SHOWN WRONG THEN?

The answer is YES and dangerously so. The position shown on the plan (see *http://outerzone.co.uk/plan_details.asp?ID=61)* is BEHIND the effective NP. The latter was calculated as 1.8 in. from the wing leading edge at mid-span. The CG position shown is a further 0.5 in BEHIND this estimated NP or at 38% of the chord at mid-span.

There are two things causing the forward NP on the WALRUS :-

The small-area tailplane (13%) and the short moment arm (2.3 Chord). For those familiar with tailplane *'Volume Coefficients'* (Vc), the Walrus has a value of about 0.3 and since the plan shows a scale tailplane, this is also the model's Vc and is very bad news!. A very forward CG is needed to deal with such a low value of Vc as is known by experienced scale enthusiasts.

The *AeroModeller* team in 1957 should have been more careful. I understand that the original model was seen being flown successfully the previous year by a modeller which prompted the *AeroModdeller* staff to produce their own plan.

WHAT TO DO?

A bigger tailplane was considered but rejected mainly out of laziness, so the obvious alternative solution was adopted .

I would set the CG at 13% (THATS RIGHT-THIRTEEN PERCENT) from wing leading edge, at the midspan. So lead was added as far forward as possible to achieve this.

WHAT ABOUT THE THRUST LINE?

The fact that the model had been flyable under full power, indicated that the considerable down-couple from the motor had permitted this and it would need reducing further with the new forward CG. I thus re-set the motor to provide more down wash on the tail. The angle can be seen in the photograph and is about ten degrees. Now this is in the opposite direction to that suggested on the plan published by NEXUS for a large (68 in span) R/C Walrus designed by a D.J.Gray. So I thought long and hard before making my decision.

THE SECOND FLIGHT.

With the repairs complete and the CG and thrust line changed, it was back to the flying field again. There was a bit more wind this time and as before, full power had the model airborne in a few feet. I kept the power on until the Walrus was a couple of hundred feet up and still climbing into wind before I throttled back . This time the model responded OK and settled into level flight, so I then came around for a few circuits, each one a little slower.

WOW IT FLIES!

Well , yes it did, but it had a tendency to 'DUTCH ROLE' as the speed was reduced, which was a bit unnerving for an old man. However, I managed to land the model without mishap at not too high a speed, so I was well pleased.

WE NEEDED A FILM TO SEND TO BRYAN

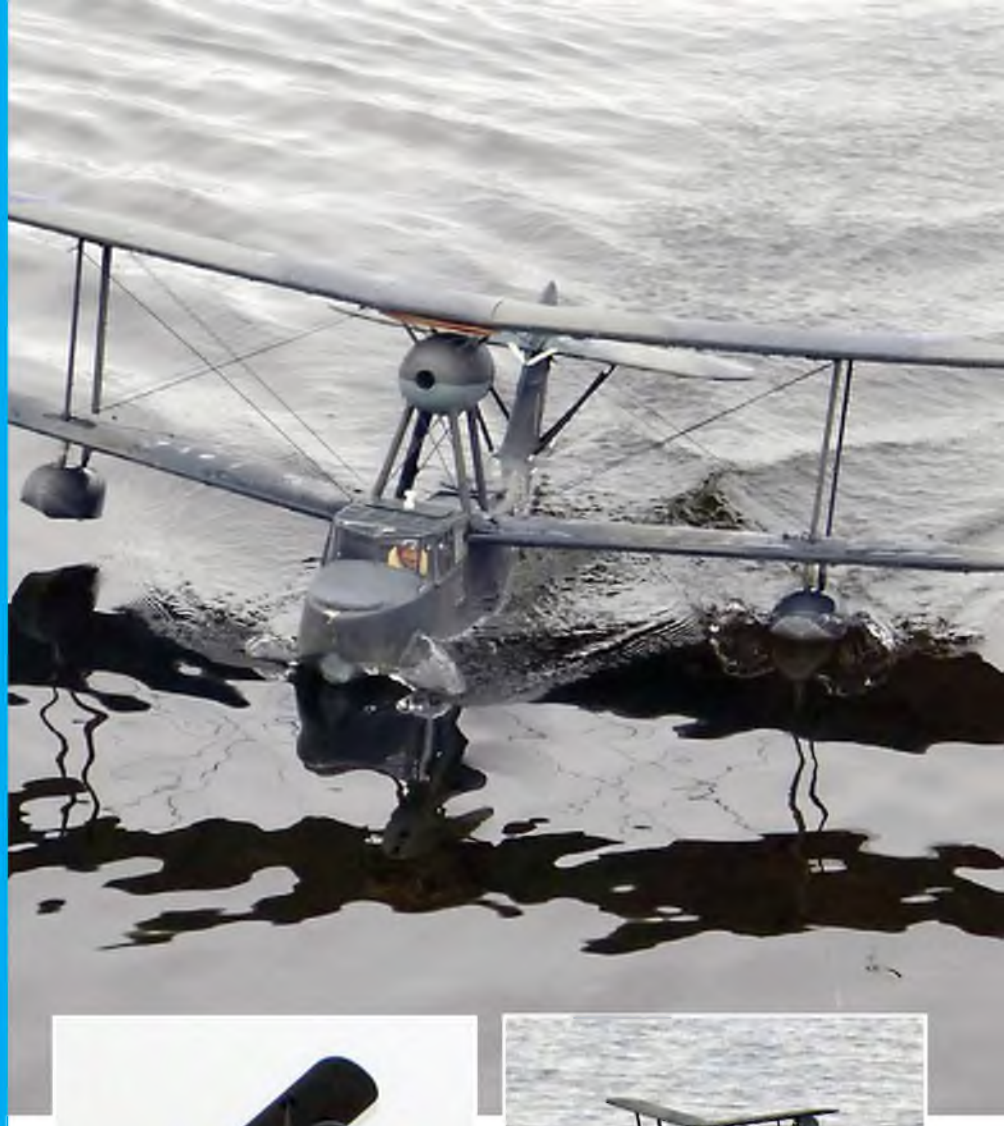
For the next couple of times out, I made sure that I took my camera and now have videos of off-land AND off-water flights. Yes, that's right, the undercarriage has

19: The aluminium alloy tailplane mounting rod.

20: The tailplane in position.

21: The spruce strip shows the motor thrust line in relation to the tail plane incidence.

22 & 23: the ball joint attachment for the tailplane operating line.



been removed and the WALRUS is now back flying as it was intended, as can be seen in the water shots. It handles well when on the water, aided by a retractable extension to the rudder made from thin polycarbonate which you might be able to see in the photographs. It is probably bigger than it needs to be though.

Even though the model is tissue covered, the finishing coat of matt polyurethane that Bryan applied, keeps the water out and, surprisingly, the covering stays taut. Plastic film covering of choice might be used by scratch builders I am sure .

When airborne, the roll oscillations need to be kept in check by keeping the speed up, but smooth water landings are still achievable and the model has now become a favourite of the Stithians 'Fleet Air Arm' down here in Cornwall.

The plan is now in the open domain at:-http://outerzone.co.uk/plan_details.asp?ID=61

So that is one route to start you off if you can't get hold of the full size plan.

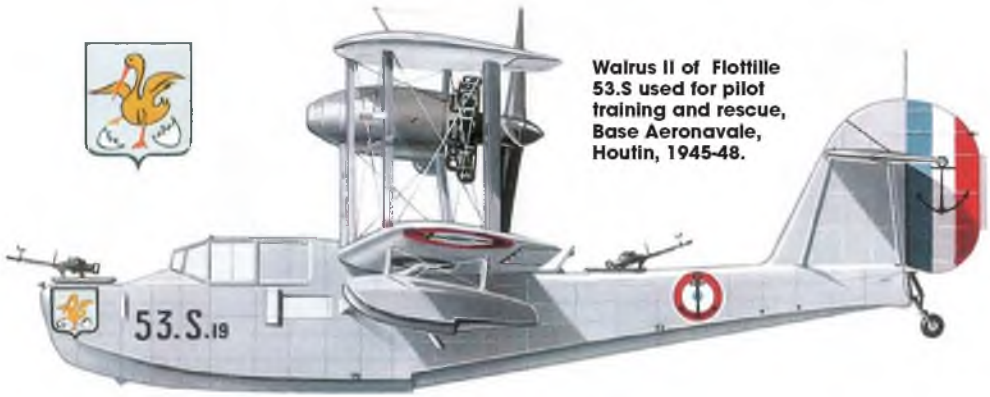
HERE ENDETH THE LESSONS!

And they are :-

(1): Never trust the CG position shown on plans particularly on models with scale tailplanes; or the motor thrust line.
(2): Even strange old aeroplanes can be made to fly with a bit of thought regarding the rigging.
(3): Don't be afraid to use a bit of theory
(4): Radio Control can't work miracles.
(5): Don't assume a modeller is dead just because you haven't seen articles from him in a while!

Best Wishes and happy flying from an 'Old timer' who is still enjoying the hobby which started, for him, in 1943. ■

SUPERMARINE WALRUS FLYING COLOURS



Walrus II of Flottille 53.S used for pilot training and rescue, Base Aeronavale, Houtin, 1945-48.

The seond production Seagull V, (variant of Walrus supplied to Australian Navy, embarked on HMAS Sydney.

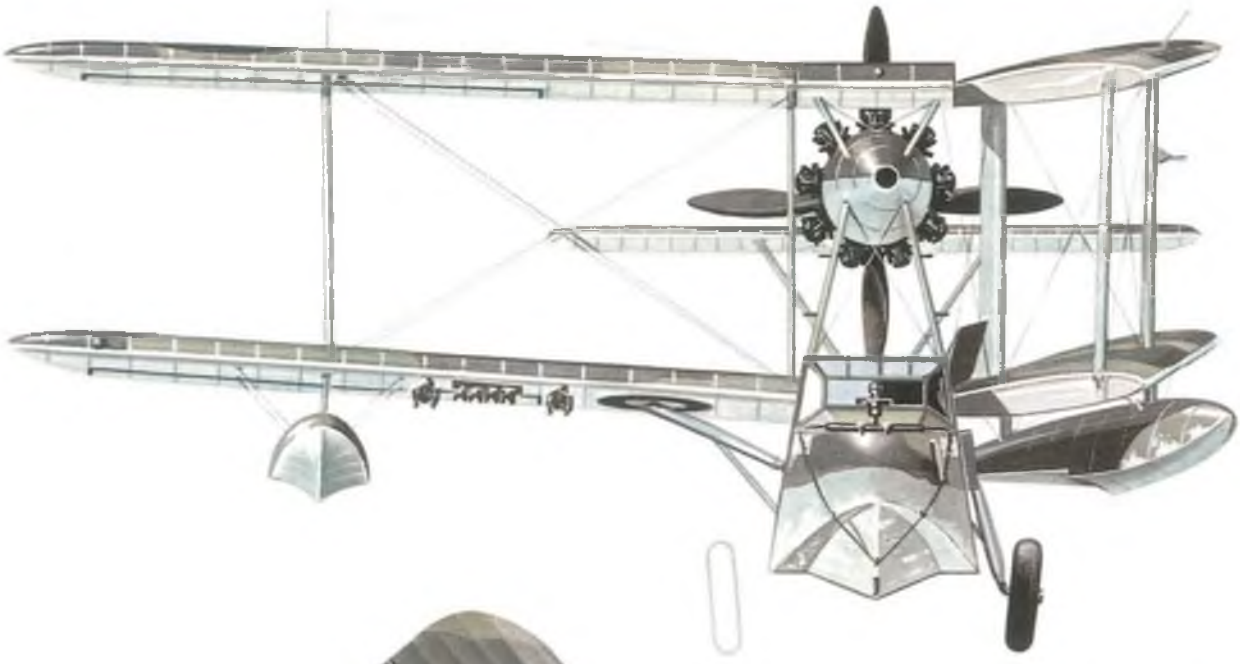
Walrus on HMS Victorious; Far East operations Palembang, Okinawa, Japan; 1945 flown by Flying Officer B.L. Ada, R.A.A.F; 1945.

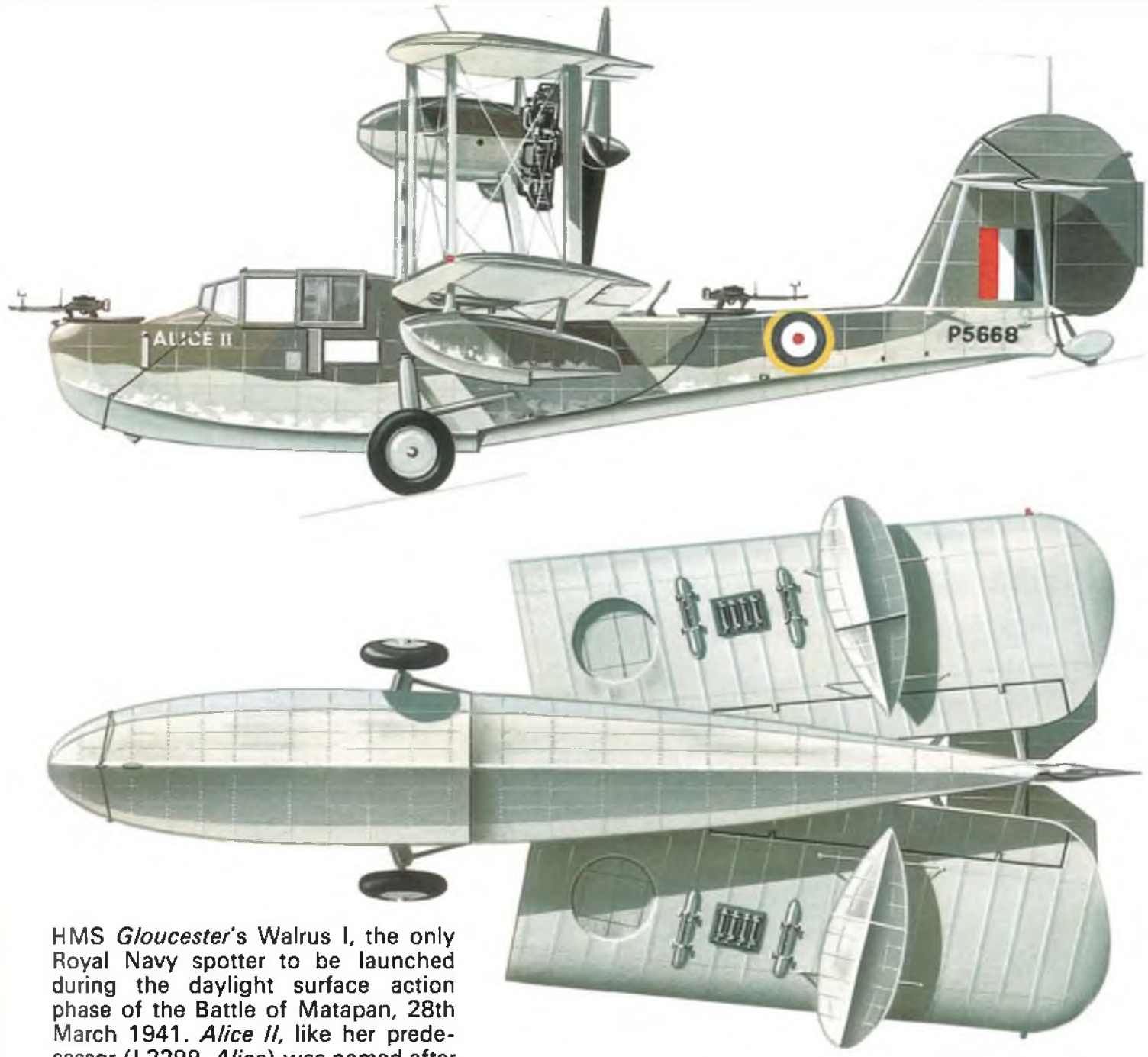
Walrus embarked on HMS Birmingham, Fourth Cruiser Squadron, East Indies and China Station; 1938-1940

Civil Register Walrus used for whale spotting, from S.S. Balaena, Antarctica, summer 1946-47.

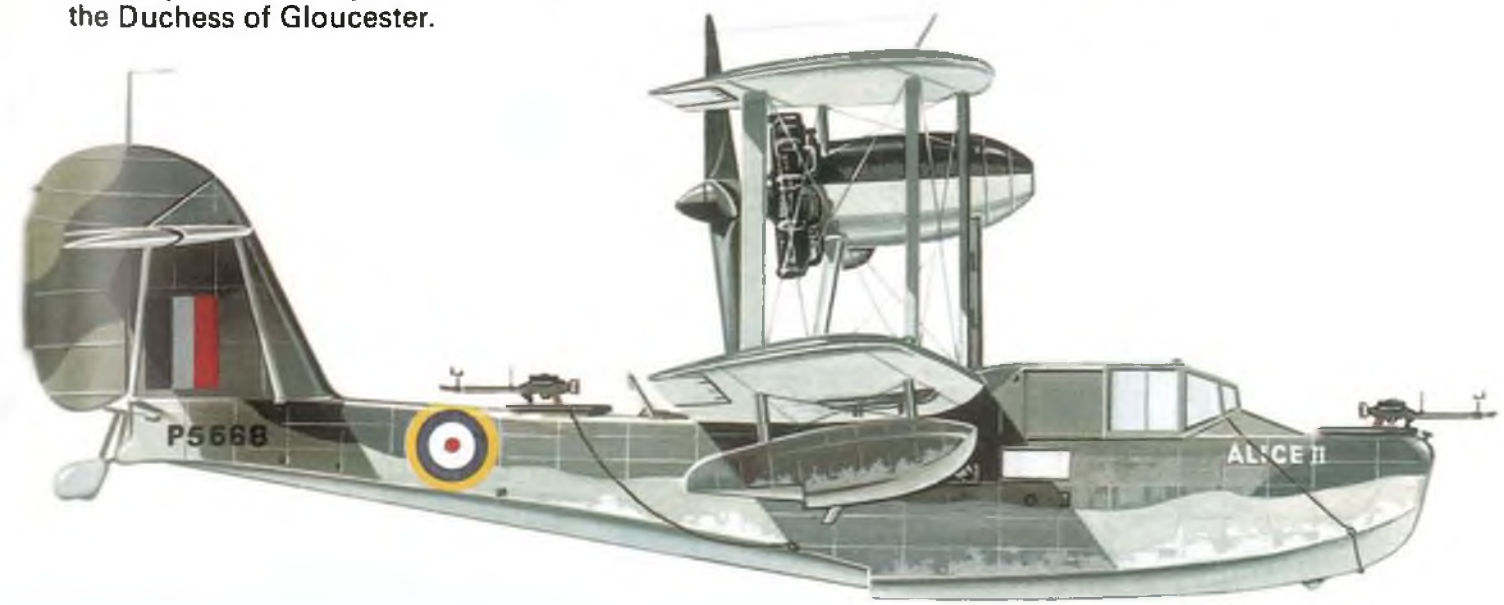
Walrus flown from HMS Belfast, 18th Cruiser Squadron, Home Fleet, 1943

SUPERMARINE WALRUS FLYING COLOURS



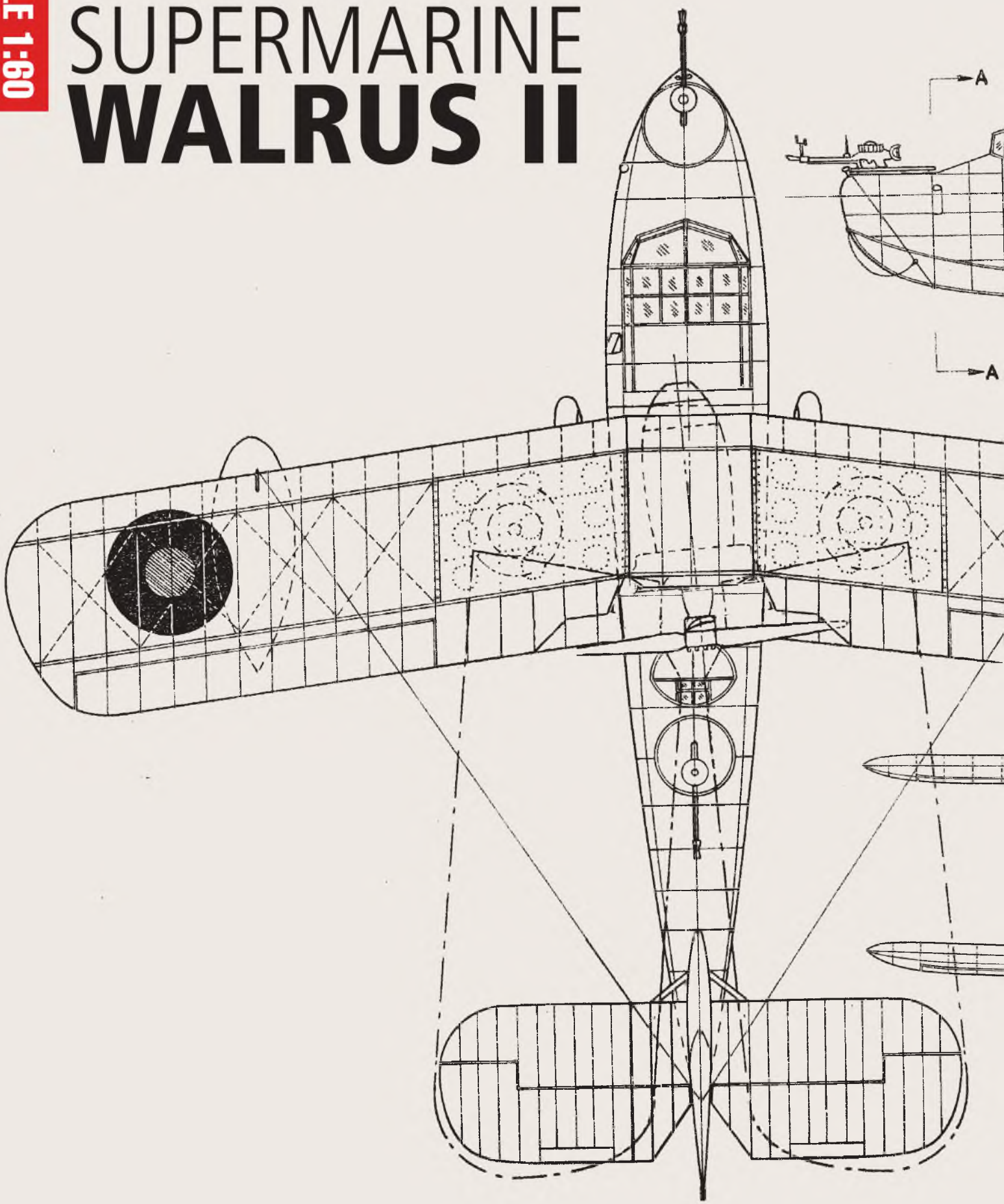


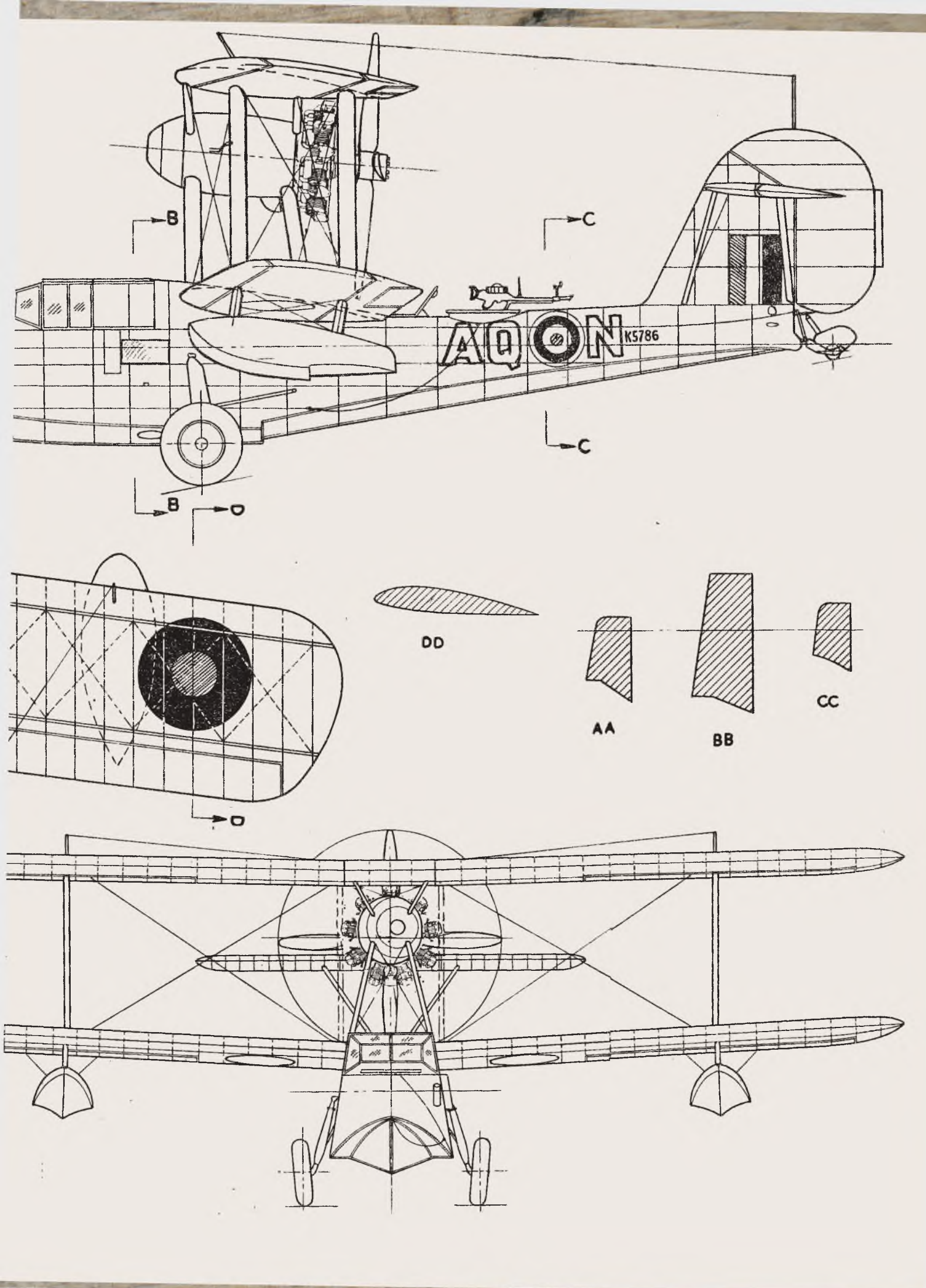
HMS *Gloucester*'s Walrus I, the only Royal Navy spotter to be launched during the daylight surface action phase of the Battle of Matapan, 28th March 1941. *Alice II,* like her predecessor (L2299, *Alice*) was named after the Duchess of Gloucester.



SCALE 1:60

VICKERS SUPERMARINE **WALRUS II**

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On Silent Wings by Chris Williams

SCALE SOARING

The 1:3.5 scale Slingsby Dart airframe, ready for covering.

Inside the Dart's cockpit: The pilot and instrument panel are easily removable.

MORE MAIDENS...

Last time around I described my adventures with the electrification of the Slingsby Dart 17R. Now, is there anything more embarrassing than building two identical wings? The answer is yes, because in that case you only have one more wing to build! When it came time for the first rig of the Dart's newly constructed wings, it was, with a fair degree of horror, I saw that the dihedral had doubled and now the model resembled a glider that had passed through VNE during a loop and come out of the other side!

It transpired that setting up the wing as two panels in the wing plotting programme and setting the thickness for the first, short panel as parallel, before transitioning to a thinner section at the tip, had created the effect of doubling the dihedral. It was a sad and difficult moment indeed when the pristine wings were sawn up and stuffed into a large plastic sack. *(My therapist says it's all just a matter of time and to keep taking the tablets).*

A quick recap as to the model's raison d'être might be in order here. Climate change, as many will have noticed, has played havoc with the old certainties regarding flying weather. Living, as I do in rural Dorset, I am surrounded by hills, many of which are suitable for the operation of large scale gliders. There is a certain set of conditions whereby a light wind blows on the slope, and this is ideal for glider operation. The smooth air and light lift allow for much more scale flying speeds, with the added bonus that you hear the airflow moving over the model's flying surfaces, just like the full-size. (This ghostly whistle adds an extra frisson of pleasure to a situation already redolent with the stuff.)

Alas and alack, these occasions have become as rare as hen's teeth in recent years, so we are forced, in our desperation, to venture out in conditions we would heretofore have spurned. The big risk is that, on occasion, there is a good chance the lift will desert you and an out-landing at the bottom of the hill will be your only option. This happened quite recently with my heftily-sized Minimoa during one of the wettest winters on record. I had a camera on the airframe and the long fight to the

Brakes out, wheel down, no propeller: the Dart in glider mode.

Author with the newly completed Dart.

The Dart, wheel up and with the propeller fitted.

bottom was recorded in minute detail.

Driving to the main road at the bottom of the hill, I entered the field to discover it was little more than a lake of sucking mud. Having fought my way back to the road, there was only a narrow slippery verge to walk on as the heavy traffic whizzed on by, and the model had to be carried with the wings in the vertical plane, ideal for the trees lining the road to snag the wing tips at every step. Later, sitting in my car, covered in mud and exhausted I thought to myself, there must be a better way! As it has become full-size practice to fit an electric 'sustainer' in the nose of modern gliders, the idea of electrifying the Dart shouldn't immediately attract the attentions of the Scale Police, but perhaps there was a way to get the best of both worlds?

Rather than cut off the glider's nose and bolt the motor to the front of it, with some sort of cowl and spinner to reassemble the profile, it seemed to me a better idea would be to fit the motor to the bulkhead inside the fuselage and extend the shaft through to the front, with a bearing embedded in place for support. The front of the Dart is mostly solid car body filler, so drilling a 10mm hole through to the bulkhead proved not to be as formidable a task as I had feared.

With the bearing in place, and a short length of 10mm aluminium tube glued in place to hide it, the scene was set. It just so happens that the full-size Dart has three ventilation holes in the nose cone, ideal for my purposes in cooling the motor, and it even has a metal tube protruding at the front, matching up my 10mm Ali tube nicely. Now, in decent conditions I can leave the prop off and no one will be any the wiser!

With the model finished I resigned myself to a long wait for the maiden flight, and decided one day, when there was no wind, to take her up to the nearest hill to take the formal photographs. When I arrived, well stap-me-vitals, there was a light but definite breeze blowing on the hill, just the conditions for which she was designed. To pile on the irony a bit, this was the very same spot to which the Minimoa had failed to return some time previously.

Nervously, for I hadn't come mentally prepared for a 'maiden', I fitted the batteries and tentatively thrust her out into the void. All was well for a couple of passes, at which point the lift ran out of

No wonder Arnie looks annoyed! The big Minimoa heads for the mud.

Smallpiece (Barry Cole) with his West Wings Skylark.

The Mobius HD video and stills camera.

enthusiasm, and she started to descend toward the muddy field below.

Hah! Nonchalance vied with smugness for dominance, as I let her sink towards the trees. Right, I though, take this! I flicked the motor switch with a satisfied smile. Nothing happened. (We don't call this the Brown Zone for nothing). Wrong switch, dammit! It's all very well having sixteen channels on your transmitter, but does it need so many switches?

With the frantic fumbling that speaks volumes as to the lack of opportunities to fly these days, the correct switch was located, and with a muted buzz she rapidly gained altitude. I did this a couple of times, then landed with no desire to do any more without at least one of my trusty henchmen present to take photographs.

The chance came a few days later, just before the first of the White Sheet Club's scale fly-ins was due to be abandoned due to inclement weather. On this particular day, a robust breeze blew steadily on White Sheet's North Westerly slope, the sun shone, spirits were high, and all things seemed possible. The Dart was launched and

Looking down into the cockpit of the 1/4 scale Bergfalke 4.

> "There will be a resultant video in due course, but meanwhile, should you wish to see the camera in action, just Google ONE HILL 2 FLAMINGOS and see the fun on YouTube..."

proceeded to fly very nicely indeed in glider mode, as electric-assist was not required at all. As I hope you can see from the photographs, with the prop removed, the model's scale appearance is not compromised at all by the presence of the motor.

With the trims sorted, and well satisfied with the Dart's flying qualities, we now await a quiet spell to try her out properly in the light conditions for which she was built...

SKYLARK

At the time of the Dart's outing to White Sheet, fellow idiot Smallpiece (Barry Cole), had just completed the work on his diminutive semi-scale Slingsby Skylark. Spanning 72", this kit from *West Wings* completely bucks the trend towards ever-larger models, and as he carried her to the slope edge we enquired as to whether he needed any help with the launch, to which we received a haughty silence in reply. With its rubber-banded wings, the little Skylark seemed to hark back to a bygone age, but there was no doubting the alacrity to which it responded to the robust conditions, although the numerous attempts at landing showed the necessity for a good set of brakes...!

LIGHTS, CAMERA ETC...

For some years now I've been using the excellent *GoPro* action camera to record the adventures of my various airframes. You might have thought that this could never be bettered until the *Mobius* camera came along. At half the size and weight, and a quarter the price, the HD video from this little beast is of very comparable quality, and I have spent the first part of this year trying it out on several of mine, and other, models. The big advantage of the smaller weight and

size is that more extreme camera angles can be tried out before pole-wobble takes over, ruining the video.

The first chance to properly evaluate it came when Motley and I found ourselves one day on a Wessex Soaring Association slope with our two 1:3.5 scale HW-4 Flamingos. One thing became obvious with video from the camera mounted above and in front of the wing, looking down into the cockpit, which was that the pilot was in pretty much full view. I have a pilot figure whose face looks a lot like the ex-governor of California, the head of which has been mounted on a servo buried within the torso. This gives a pretty realistic effect, except that you can see that although the head turns in concert with the movements of the rudder, the hands stay still. So, as if the Dart cockpit wasn't already full enough with electronics, I have mounted a servo on the floor with a joystick attached to it. The joystick passes rather neatly through one of the pilot's hands. This servo has its own channel, in order to allow the movement to be realistically restricted because as anyone who has poled a full-size around knows, small movements can have big results!

There will be a resultant video in due course, but meanwhile, should you wish to see the camera in action, just Google ONE HILL 2 FLAMINGOS and see the fun on YouTube... ■

c_williams30@sky.com

Pilot's hands clearly visible in the Dart.

The home-made camera mount can be seen in this shot of HW-4 Flamingo.

The diminutive Skylark in action.

SCALE AT GREENFIELDS 2015

Alex Whittaker looks back at his visit to the Midlands to some relaxed scale action

Richard Ginger's Tempest II is built from the Jerry Bates' plan.

It was my first visit to this popular 'modeller-to-modeller' meeting near Birmingham. It is not an exclusively scale meeting as such, but almost all of the models in the air were scale designs and the event attracted a number of individuals who had designed and built their own scale flying models.

I must say that I really enjoyed the laid-back 'Clubman' atmosphere. Flying was continuous, with a complete absence of fuss and the weather was co-operative too. The Club has a very pleasant grass field, and for such show weekends, camping is allowed. So, if you brought your tent, caravan, camper, white van, or igloo, then you had the luxury of sleeping just a few steps from the flightline.

Sea Fury?

At first sight, I thought that Richard Ginger's fine, hand-crafted model was a Hawker Sea Fury. Then, there was an irritating niggle in the back of my head. Richard quickly informed me it was in fact a Hawker Tempest Mk.2! He obviously gets asked that question many times in an afternoon. The Tempest Mk.2 was one of the last piston engined fighters to serve with the RAF, and went on to form the backbone of the newly independent Indian Air Force. The Mk.2 has that 'big radial' feel, which was more often seen in US WWII Pacific Theatre fighters, though of

Like all Jerry Bates' plans, the Tempest II flies very well indeed. She weighs 20lbs.

Good look at the struttery as John Dimond's Barracuda comes in to land.

Own design in foam, John Dimond's interesting Barracuda.

Scale flaps on the Barracuda.

Lovably British, but you could not say that the Fairey Barracuda was a sleekly harmionised design!

course we must not forget the formidable Focke Wulf 190.

Sadly, the full size Tempest 2 had lingering teething problems, particularly with its 18-cylinder Bristol Centaurus engine. Frankly, this meant that the Tempest II more or less missed the War.

Nevertheless, it is a striking design, and of course it is a Hawker. Richard's highly practical model has a number of appealing features. I particularly liked the chopped-off wing tips, the bubble hood, and the racks of exhaust stubs. The air intakes on the leading-edges are a nice touch, too. She was hand-built to the *Jerry Bates* Plan (USA) and spans 87". She weighs around 20 lbs, and is fitted with a Laser 300V Twin, driving an 20"x8" prop. That particular combination of prop and engine sounds very nice, too. Note that she is fitted with Sierra Retracts.

Whilst considering the build, Richard consulted the well-known Arthur Bentley drawings amd finished the Tempest in a very simple and fresh Indian Air Force scheme of a basic all-over silver with the livery of serial HA623, of No.16 Squadron. As is now the fashion with many canny traditional modellers, Richard used CNC-cut parts supplied by *Belair*, the surface finish being traditional tissue-and-dope finish.

The Tempest really is a radial-engined beauty, but pugnacious and powerful and the Laser Twin engine used, though not a multi-cylinder radial, does not jar. She flies with appropriate authority and Richard is a thoughtful pilot being careful to keep her within the 'scale' envelope. Note also that Jerry is masterful designer, and Mister Bates has cleverly decided on a handy 1:5.5 scale. Such is her impressive presence, I think she actually looks bigger. Over the years I have noticed that all Jerry Bates designs fly very well indeed.

> "So, if you brought your tent, caravan, camper, white van, or igloo, then you had the luxury of sleeping just a few steps from the flightline"

Fairey Barracuda Mk II

When I beheld a fine own-design Fairey Barracuda Mk II in the pits, I was very impressed, because the Barracuda is a rarely modeled subject I have a tenuous second-hand childhood connection with Fairey Barracudas (and Fireflies). When I was a nipper, my neighbour Tommy Jones was a teenager in the Royal Navy serving on Carriers (In the days when we had more than one).

On one shore leave he gave me some great action photos of carrier operations which included a really huge aircraft called a Barracuda. It wasn't until thirty years later I actually saw one. I must say is a lovably hulking and quirky British design. John Dimond's self-designed-and-built version of the WW2 Fairey Aviation design does not quite follow the hallowed Trad. Brit. formula of balsa construction. It was designed and built with blue foam (skinned with lightweight glass fibre) as its main constructional medium.

John says this a quick method of getting scale shapes. I found its sports-scale

Nice SPAD XIII spotted in the Pitts. Could not catch up with its owner.

Not often you see a radial-engined Pitts. This is the Pitts Python. Would fly better with pilot at the controls!

Mike Watts' Christen Eagle wafting by with on its 3W 220cc petrol engine and MT Smoke System.

Richard Harris with his nifty own-design 80" span Pitcairn PCA-2 Beech Nut Autoyro. Tim Hooper steadies the blades.

A bad gust tried to uspset Richard Harris's Beech Nut Autogyro, but all was well!

Martin Barrett's hand crafted electric Piper Pawnee. 60" span, weighs 5.5 lbs. NTM328 motor; 11x8 prop; 4 cell lipo.

appearance appealing and its construction is both intriguing and instructive.

John's Barracuda is 1700mm in span, weighs 8.5lbs, and is electric powered. It uses a 750 Watt motordriven from a five-cell lipo pack and is a great scale model, that looks very impressive in the air. The only bit John would change is the undercarriage, which he says has become a bit wobbly. I think he was being a bit picky - I would be delighted to have designed and built such a pleasing scale model. It may prompt me to get out my DIY foam bow, complete with guitar Top E-string hot-wire.

The Fairey Barracuda is one of those scandalously under-modelled British scale subjects that only come to light every now and again. John has other models planned on his blue foam odyssey, so I have asked him to keep me in the loop.

Bristol M1C Scout

This was another beautifully executed model by Richard Ginger. It spans 94", weighs 16lbs, and is powered by a Laser 180 driving an 18x8" prop. Like his Hawker Tempest, this too was built from the Jerry Bates plan using Belair CNC-cut parts. It models the Shuttleworth Collection exhibit at Old Warden and is a very accurately built model with superb flying characteristics. On low passes she particularly excelled.

Although not too popular with the those in military authority at the time, who seemed prejudiced against monoplanes, the M1C out-performed such contemporaries as the Fokker Eindekker and the Morane Saulnier Type N by some margin. Sadly its potential remained unfulfilled, and only 130 examples were built.

Piper Pawnee

I rather like the jaunty, upright 'tractor-cabin', agricultural air of American crop dusters, and Martin Barrett's hand-crafted Piper Pawnee was very attractive in its unashamed utilitarianism. She is built from a free plan on the internet *Outer Zone* website, and spans 60". She weighs 5.5 lbs, is powered by an NTM 328 motor, driving an 11"x8" prop. and uses a four-cell lipo flight battery. Martin has added a proper aerofoil to the tailplane, instead of the plan's original sheet flat-plate.

Racey stuff!

Pylon Racers are a tribute to the human spirit. There is no reason on earth for these tiny thoroughbreds to exist, but because Americans adore them, they do. I love

Richard Harris tweaks the needle on the PCA-2's Magnum .91 Four stroke engine. Note neat dummy engine.

Nicely executed scale undercarriage on Richard Harris's Pitcairn PCA-2 Beech Nut Autogyro.

Good attendance all weekend at Greenacres.

them too, but they are often overlooked as serious scale subjects. This is a pity since they are colourful, agile, and incredibly pretty. If you ever get to see a real one, you cannot believe how large the pilot's head looks through that tiny windscreen! Anyhow, I looked in the pits and saw a beautifully formed little racer that I thought was a Cassut. It was owned by 'Waesel' Carr, and was actually a Peter Miller designed Miss Demeanour. This is a very crisp rendition, of the Pylon Racer genre: 32" in span, and OS .25 FP powered. A very accessible scale project, her Solarfilm covering exactly mirrors the original's highly polished finish.

Scale Autogyros

Now this was different: a 1930s Pitcairn PCA-2 Beech Nut Autogyro. This was built by Richard Harris who also markets his own plans and autogyro goodies as Coolwind. In particular, I liked the PCA-2's blend of fixed wing and autogyro rotor,

Very laid-back 'Clubman' atmosphere at Greenacres with and lots of flying.

The Bristol M1C Scout Monoplane did not find favour with the Air Ministry.

Cockpit detail on the Bristol Scout.

and the look of its dummy radial. The undercarriage was work of art, too. It flew magnificently. Really stable and assured, with steep slow forward landings - if you so wished. It spans 80", Magnum .91 FS powered, and weighs 10 lbs. Really out-of-the-rut scale modelling!

http://www.coolwind.co.uk/R_Harris_Designs/cat2253307_2119278.aspx

Christen Eagle

In a solo slot, Mike Watts gave his 50% scale aerobat Christen Eagle a damn' good thrashing. I am old enough to remember the first Christen Eagle scale R/C kits many moons ago, all sporting a very similar colour scheme. There was even a smaller Pilot Kits version, I believe. Mike's model is from the huge Modelbau kit, and weighs 28kgs. She is fitted with a 3W 220cc petrol engine and an MT Smoke System. A very impressive scale model, that just needs a pilot in the office!

The Verdict

A very friendly and well run event, with lots to see all weekend. The convenience of the camping arrangements cannot be overstated, but a day visit would be equally satisfying. Since the site is not too far from the M6, getting there is easy. I was delighted to attend because I saw models at Greenacres MAC that have never popped up on the usual Clubman and scale event circuits. This was quite a treat. ■

GREENACRES MAC CONTACT DETAILS:

www.greenacresmac.co.uk/J/

Greenacres Fly-In Dates 2016
The GMAC Fly-In dates confirmed for 2016 are:

Greenacres May Fly In: 21st & 22nd May 2016

Greenacres July Fly In: 9th & 10th July 2016

Greenacres August Fly In: 13th & 14th August 2016

Richard Ginger's Bristol Scout slips by on a Laser 180 driving an 18x8" prop.

AeroDetail series

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Stinson 105 CD95
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Steen Skybolt CD94
Attractive U.S. aerobatic biplane, presented in full detail. (89 images)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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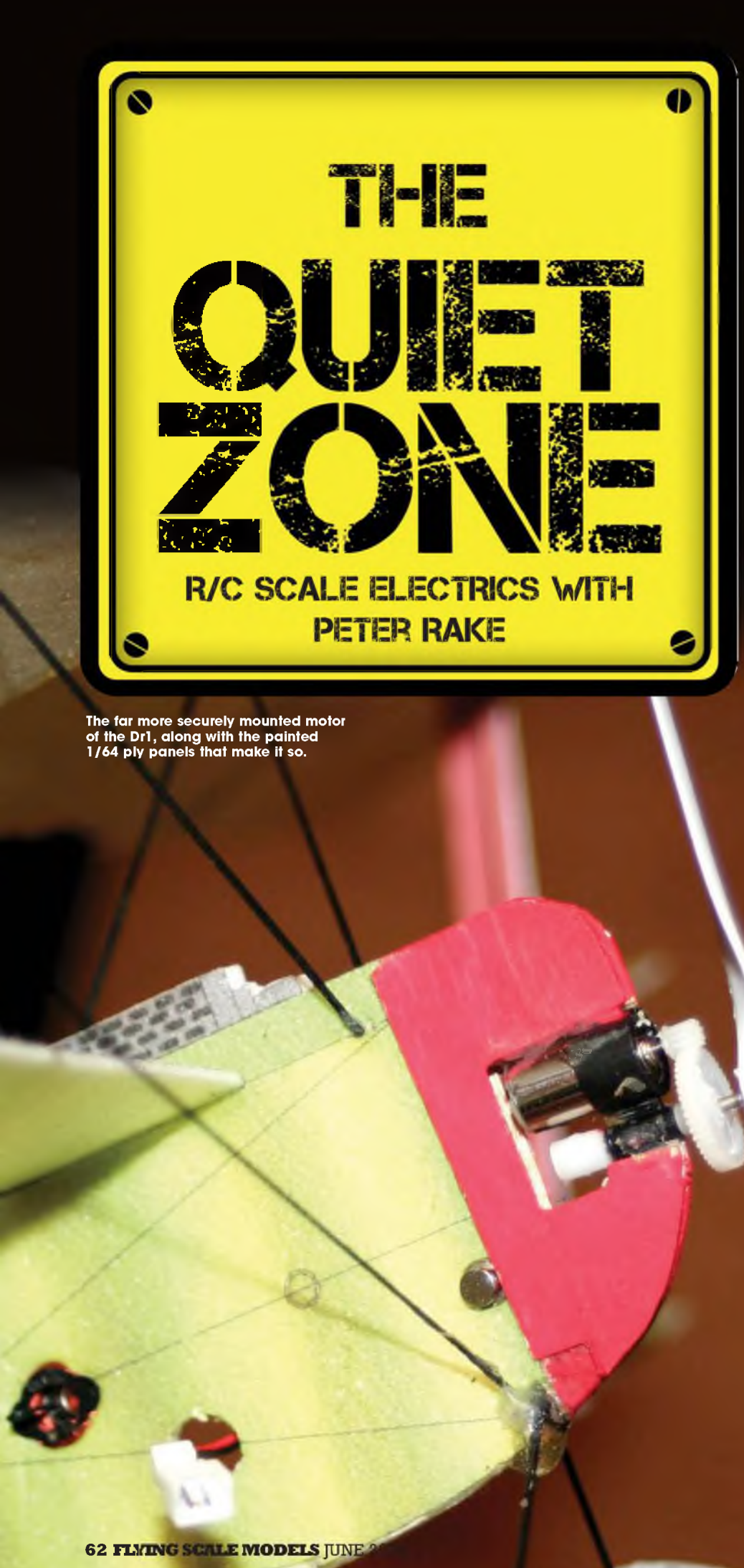
THE QUIET ZONE

R/C SCALE ELECTRICS WITH PETER RAKE

WITH THE INDOOR FLYING SEASON ENDING, PETER RAKE OFFERS A PRIMER OF WHAT HE MAY PRESENT LATER IN THE YEAR WHEN IT'S 'BACK-INDOORS' FLYING TIME AGAIN



The far more securely mounted motor of the Dr1, along with the painted 1/64 ply panels that make it so.

In case you were unaware, Summer is fast approaching (so they tell us) and a young, or not so young, man's fancies turn to .... flying models. However, as you read this, I will be looking forward to the final session of indoor flying for this season.

I've built several more of those little indoor profile scale models, but have been progressively refining the idea. As such, I thought it might be worthwhile to pass on my findings for you to consider and possibly incorporate into your own models for next season. There, you can't exactly accuse me of springing this one on you. You have months to build a whole fleet of just such little models.

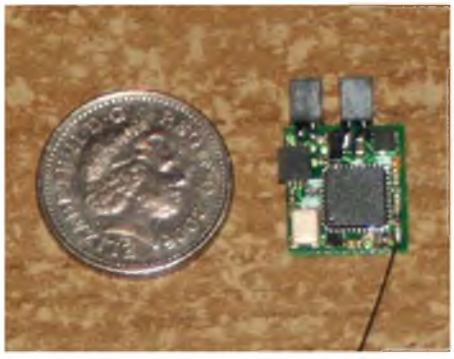
Considering that you can print, cut out and assemble one in two or three evenings, that gives you plenty of time to build dozens of the perishers between now and the start of the next indoor season. You can rest assured that there are plenty of them lurking on my computer, all ready to inflict upon a poor, unsuspecting public. Okay, maybe not quite so unsuspecting now I've let the cat out of the bag but you know what I mean.

BASIC STUFF

Just in case you have managed to avoid previous articles on the subject, the models are built using hot wire sliced Depron, roughly (very roughly with my wire cutting technique) 1 mm thick. The foam is then coated with a substance called *InkAID* and printed using a conventional inkjet printer prior to cutting out the parts and assembling the model.

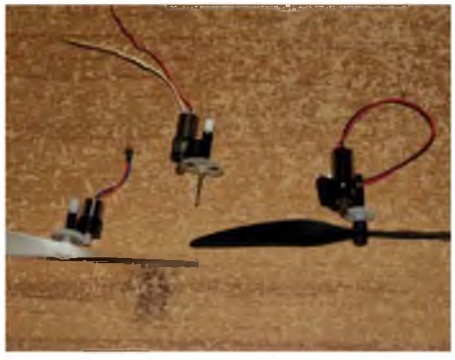
The first thing I've discovered recently is that, despite appearances, Depron is really quite a variable material. At least, the release agent used during manufacture can vastly alter the way it accepts *InkAID* and how the ink dries. In fact, I had some Depron Aero on which certain colours refused to dry at all, despite a nicely even coat of *InkAID* between the ink and the Depron. Obviously it was penetrating the coating and affecting the ink.

Here you see the carbon bracing that prevents the wings gaining dihedral in flight.



A Del Tang 2 channel receiver next to a 5p piece for size comparison. The two sockets match both Plantraco actuators and PZ motor connectors.

Talking of connectors, note how much smaller the plug on the Nano Stik motor is, compared to that on the Plantraco remote actuator.



Three eminently suitable motors. From left to right, Nano Stik, PZ Vapor and an extremely cheap Chinese 7 mm unit from the HiSKY RTF.

I've had similar results using Depron from other sources, but to a much lesser extent. In those instances it simply slowed the ink drying, but that allowed darker colours to bleed slightly into neighbouring light colours. Either way, I'm sure you can see that it isn't a desirable state of affairs.

So, the first piece of advice I can pass on is that after you've sanded the cut face of the foam, to relive tension and help the sheet flatten out a bit, thoroughly clean the upper face using Isopropanol and kitchen towel. I've tried other methods, but nothing else seemed to touch the release agent at all. The Isopropanol I use is 99.9% pure according to the label, and was bought from a certain auction web site. Here in the UK, chemists can only (so I'm told) supply 60% pure. Anyway, it's simply a matter of spraying some on (a good all-over coat) and then gently scrubbing off with a fresh kitchen towel.

However, I must stress that this is definitely not a job to attempt in the house. It's quite smelly stuff and the fumes, which I'm sure can't do you any good, hang around for ages. If in any doubt, wear rubber gloves while carrying out this step. I don't but I doubt anyone would notice if I start behaving strangely, they're used to that by now.

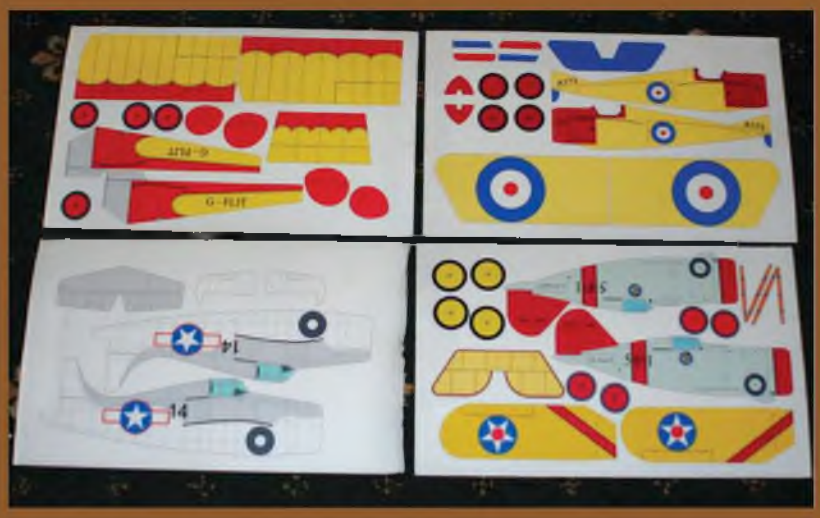
MORE BASICS

As far as applying the *InkAID* to the cleaned foam is concerned, I like to use a piece of sponge to apply it; nice, soft baby sponge actually, so that it's kind to my delicate skin. No, of course that isn't the real reason, good grief, what are you like?

The soft sponge does a nice even job of smoothing out the *InkAID*, which is already thinned about 60/40 with water. I've tried coarser sponge, but found it tended to leave lines in the *InkAID*. Even the soft sponge leaves it a little thin in places, so two applications have proved to be the order of the day. While it's wet it's very difficult to see these thin areas, but they show up clearly once it has dried to its' matt finish. Oh yes, did I forget to mention that it's the matt white pre-coat that we need.

Some people spray on the *InkAID* but I'm not keen on that. I've seen examples where the spray has 'pulled back' from certain areas, leaving bare patches. As I'm sure you can imagine, this does nothing at all to improve the printing stage. Using a sponge means you can 'scrub' such areas until the coating takes. Just gently rub over it a few times and it's obvious when you've done enough - no, not because there's a big hole in the foam, it's obvious because the coating no longer pulls back from the area,

The printed parts for the Aviatik Berg. Yes, that lozenge finish did take a lot of getting right.



Some of the other models I have ready to build, including yet another Wildcat and some parts I fitted onto the F3-F3 sheet. That is the tailplane for another N11/16.

but coats it evenly.

So, it's just a case of applying one coat (scrubbing as required), then allowing that to dry so you can see any missed or thin areas and then applying a second coat, paying particular attention to those areas. Once that's dry, (thoroughly dry) your foam is ready to print.

SIZE DOES MATTER

As you may recall, I've built these models at various sizes. The 10" span models (around 6 grams ready to fly) are perfect for our indoor venue but are awkward to make. It's also difficult to find really reliable gearboxes for this size of model, not to mention propellers that don't cost a small fortune. Personally I think there's something immoral about paying as much for a single propeller as for three or four printed and assembled airframes.

However, the real limiting factor in these very small models is the radio gear. It weighs precisely the same whether the model is 10 inches span or 15 inches. A Plantraco, Nano Stik or Del Tang receiver, 30 mAh LiPo and either a remote or hinged style actuator weigh the same no matter what size model into (onto?) which you fit them. So, if your Club meeting-hall is big enough, and you can persuade the model to turn within those confines (always an issue with our venue) the bigger model is going to fly better because it's less heavily loaded.

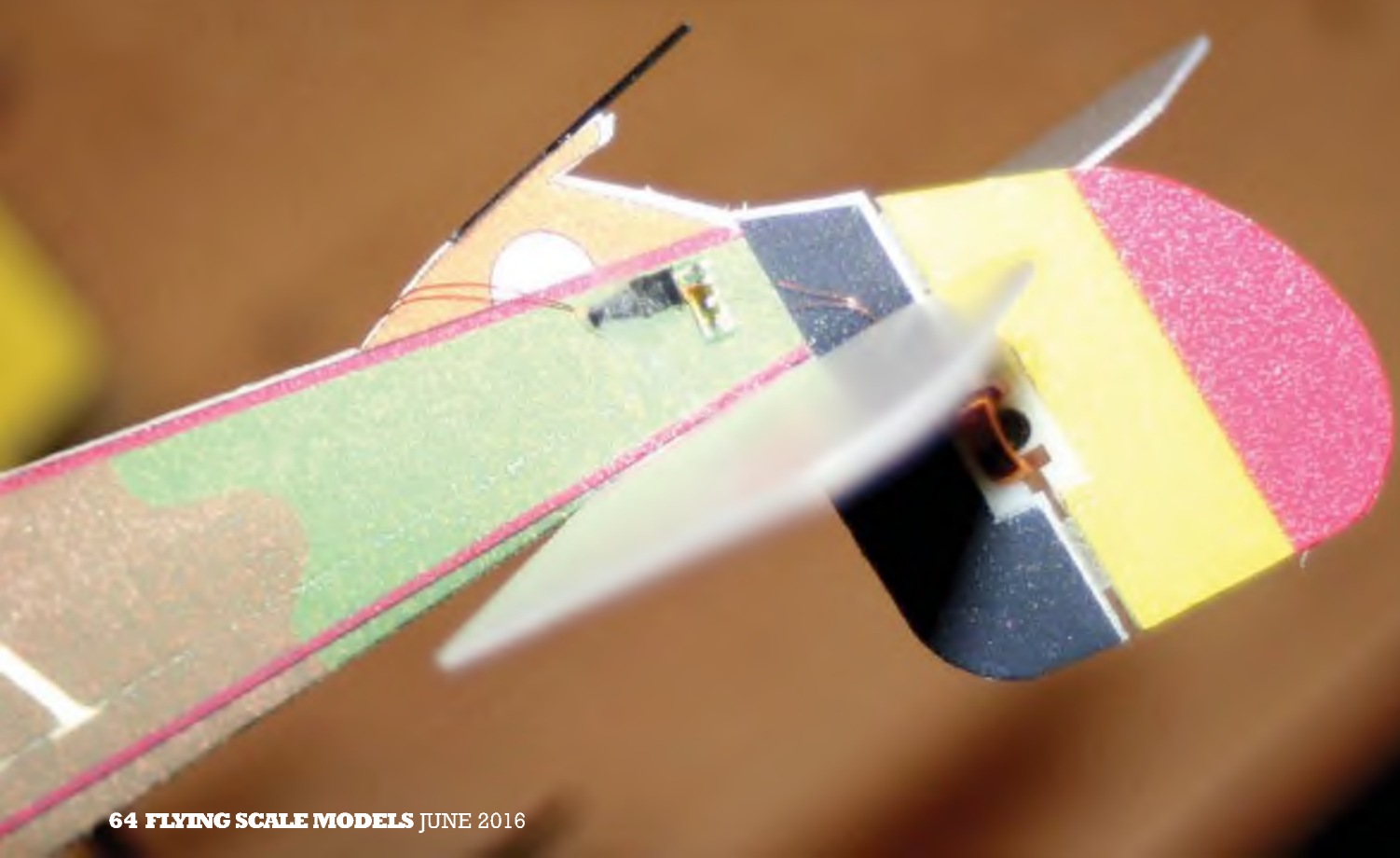
Given that I like relatively inexpensive equipment, and that a cheap, reliable gearbox/motor/prop combination is readily available as Nano Stik spares (under a tenner for the whole lot) such considerations pretty much decided the size I build to. In this instance I'm having good success with roughly 12 inch span models. Although the Nano Stik motor unit is heavier, you still get 20% more wing area to carry the same weight of radio gear as on the 10-inch model. It's surprising how much easier to build that extra couple of inches makes these models and flying weight (if you get it right) is still only around 8 grams.

The next thing I want to try is a 15 inch span version of my Nieuport 11, but still use the same equipment. Just maybe, given a larger flying area, this size would be large enough to take something like a Vapor or Mini Vapor receiver brick and become three-channel instead of just rudder and throttle.

BRACE YOURSELF

Well, okay, maybe not yourself, but these

The Nano Stik hinged actuator is very good, just as long as you have that little plug you see hiding beneath the tape. Unfortunately it isn't available as a spare.



models do benefit from a certain amount of bracing. This was revealed only too clearly while flying my Fokker Dr1 for the first time in about a year.

It started out flying just fine, but gradually became more twitchy in turns and finally flicked into the ground. They're light, so there was no real damage and I tried again. This time I got a head on view during the circuit and was horrified to see that the dihedral had more than doubled during the flight. No wonder those turns were becoming perilous. Also, when the inevitable contact with the floor happened again, the motor moved out of alignment - the bare foam nose proving just too soft to hold it firmly enough.

So, upon my return home, the first thing I did was to add some carbon rod braces to hold the wings at the desired dihedral. The next job was to sort out that motor mounting and make it somewhat more secure. To this end, two cowl-size pieces of 1/64" ply were cut out and opened up so that the motor unit fitted snugly into them. With one piece glued each side of the nose the motor was replaced and lightly epoxied to the ply parts. Once cured the ply was painted to approximately the same colour as the printed cowl had been.

For this model it worked fine, but not all cowls are so obliging as to completely swallow the motor unit. Since it would seem to be a shame to cover up all that nicely printed foam, a slightly different solution was adopted on the next models - a 13 inch Grumman Wildcat and 12 inch Nieuport 16 (exactly the same as an N.11, but the original had a larger engine). Before you ask, yes that did simply mean changing the colour scheme on my N.11 drawings.

Whilst the cowl shaped reinforcement firms up the area around the motor, it could (in the event of a severe impact) allow the nose itself to bend out of alignment. The solution was to make up a single shaped 1/64" ply mount that fits between the laminated foam sides and extends back beyond just the cowl area. This way not only is the motor mounting more secure, but it also helps stiffen the nose of the model.

Remember, although we need to keep the models as light as possible we are only talking about small pieces of very thin ply. Even that extra weight is offset to some extent by the fact that less glue is now required to secure the motor simply because of the firmer mounting.

My latest design, an Aviatik Berg D.1 carries the ply idea even further. Not only does it have the shaped ply motor mount plate, the undercarriage assemblies and struts are also from 1/64" ply. True, I have yet to build that one but I think it should work out quite well. The ply weighs no more than carbon rod struts/undercarriage, looks better and can easily be painted to the correct colour before installation. This, combined with a laminated foam wing seat and the aforementioned carbon bracing, should make for a much more rigid assembly that will be much less inclined to distort in use.

EQUIPMENT

In the past I've suggested, and used, the receiver and hinged actuator sold as Nano Stik spares. However, I'm becoming less impressed with those simply because the plugs used are not commonly available and don't match anything made by either Del Tang or Plantraco. Don't get me wrong, it is good equipment, it just needs those plugs.

The hinged actuators are delicate, but admirably useable as long as you change the receiver end plug to the more standard type that fits both the other types of receiver. I know my limitations with a soldering iron and changing a plug is fine. Soldering new sockets onto tiny receiver pads is an entirely different matter.

So, these days my choice of receiver would be either a Plantraco four channel item (for which you need a dedicated Plantraco transmitter) or the super little items from Del Tang (DT). Not only are these extremely small and light, they are also DSM2 compatible, so work with Spectrum based transmitters - including those supplied with many of the Parkzone RTF models. Since I'm trying to improve the neatness of my installations, I see more Del Tang receivers in my very near future. Less than half the size and weight of the Plantraco items, they should be much easier to hide on these little models.

THE PLUG

No, nothing to do with electronics this time. If you'd like to have a go at this type of model, but aren't sure about slicing foam, drawing graphics and printing your foam, I may be able to help out there. I'm sufficiently comfortable with slicing and printing foam that I could be persuaded to supply a small number of parts sheets. These will be printed onto roughly 1 mm foam and all ready for you to cut out and assemble.

I have a selection of models available from which to choose, including some non-scale types. These include a 13 inch span Grumman Wildcat, and 12 inch versions of the Nieuport 11/16, Fokker D.VII, Fokker Dr.1, Aviatik Berg D.1, Grumman F3F-3, Morane Saulnier Type N, Albatros D.III and Nieuport 28.

These models will include the foam sheets, an assembly drawing and templates for any ply parts required. Price will vary according to type (number of foam sheets), but should be around £10-£15 each. If you're interested, or would like to contact me for any other reason, you'll find me at the usual place - PETERRAKE@aol.com ■

My Nieuport 16 which is fitted with a HiSKY motor unit. The larger motor eased balancing the model. Like the Wildcat, the ply reinforcing is internal.

The 13 inch span Wildcat in just one of the schemes I have drawn for it. What can I say? I just like Wildcats.

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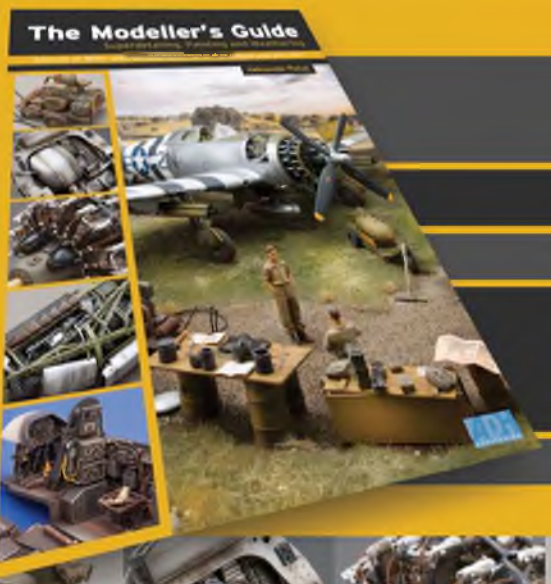

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