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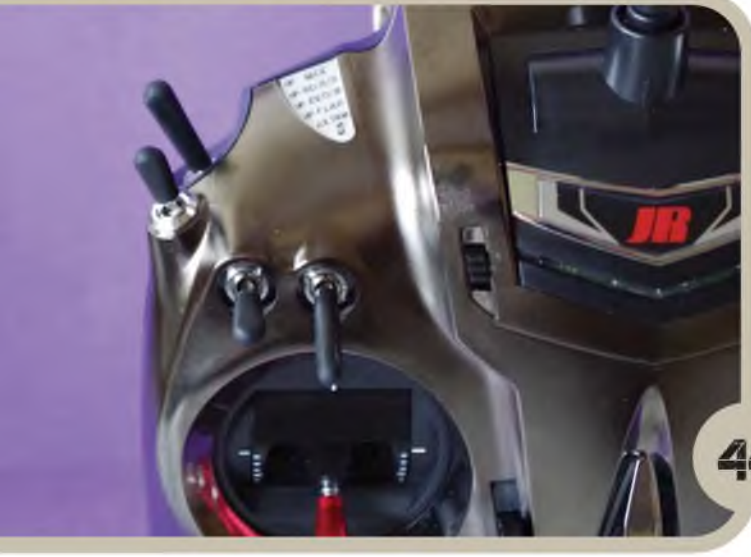

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ON THE COVER

Indoor scale modellers often seem to specialise in obscure aircraft to model. At the BMFA Indoor Scale Nationals back in April, John Valiant flew this Peanut Scale Doflug 3802 a Swiss WW2 era fighter, devoped from the French Morane Salnier MS 450 and later MS 504.

(Photograph::Alex Whittaker).

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CONTACT

I've only ever flown a multi engine scale model once in my life - and I've been flying R/C since 1959! In fact the only time I've ever flown a multi-engine anything was back in the early 1970s when I became the elected test flier for the kit review of a Svenson Britten Norman Islander twin.

The Islander (full size) was a private venture light passenger aircraft with a high, constant chord wing and fixed undercarriage designed to operate economically over short sector distances and to operate from rough and short landing fields.

It was - and still is - a nice, uncomplicated subject for scale modelling, thanks to boxy slab-side fuselage and 'barn door' wing shape.

At the time of that kit review, the reviewer made a really excellent job of the model and seemed happy to accept my lack of prior experience on twin engine models - back then we were limited (BMFA Insurance etc.) to 10cc (0.61 cu.in.) engine capacity, so the Svenson Island was twin 5cc. (0.30) powered.

So there we were, on a disused north Buckinghamshire airfield lined up with both motors running, secure in the knowledge that our nice docile twin engine scale model would be an easy flier. Only a few circuits later one of the engines was getting decidedly tired and half a circuit later the B.N. Island was a single engine model and strugg;ing to stay airborne. Thanks to full opposite rudder trim, wide constant chord wings and power reduction to idle as soon as the model was safely lined up into wind for a landing, the model survived ... but I never flew a multi engine model again!

All of which leads to the relevance of the above to this month's issue, with our construction feature for the 48" wingspan de Havilland DH 84 Dragon - the full size of which, did much the same in the pre-WW2 era, as did the Britten-Norman Islander - and still does even today.

It's electric powered, which obviates so much prospective drama from the business of flying multi engine scale models.

TONY DOWDESWELL

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PO

The Durafly Messerschmitt Me-163 EP RTF is a w
Ken Sheppard ventures into heart attack te

KO

The German Me 163 Komet was the world's first and only rocket-powered fighter - or at least, the only one ever to reach production and combat status. Later on, well into the 1960s, Saunders Roe produced their one-off S.R.53 experimental prototype for the RAF but it went no further that the flying prototype stage and the projected S.R.177, combined jet/rocket powered fighter never saw the light of day.

Like those later experimentals, the Me 163 was designed with emphasis on rapid rate of climb as a response to combat the US daylight bombing raids during WW2 from 1943 onward. In terms of climb rate and speed, the Komet was years ahead of anything the allies possessed, with speeds upwards of 600mph and an incredible ability to 'get upstairs fast' - albeit at the expense of combat radius and duration.

It took off using a drop-off two-wheeled dolly and featured a retractable landing skid for its return to terra firma. The Komet's volatile rocket system (quite a few were lost to on-the-ground explosions during fuelling, and also on landing) accelerated the Me-163 to an altitude of 39,000ft in minutes,

from which it then only had just three minutes of fuel left to attack its targets with its deadly 30mm canons.

Once out of fuel it became a glider and very vulnerable to fighter attack when returning to base for landing.

Although it can be considered a failure in operational terms, the Me 163 has gone down in history as a truly legendary aircraft of WW2, thanks to its groundbreaking design and blistering rocket performance.

THE MODEL

The Durafly Me-163 is in itself a truly innovative model. Not only does this electric-powered model feature a fully working scale 'dolly' style undercarriage, that drops off at the flick of a switch, it is claimed to have blistering performance, a high quality finish and, in addition, is designed out of the box to accept a model rocket engine!

In its Plug-and-Fly (PnF) form, Durafly's 950mm (37.5") span Me 163 comes with all electronics pre-installed and ready to hook up to a six channel receiver. A minimal parts-count allows assembly to be completed in just a few steps. The moulded EPO one-piece airframe has a highly detailed surface finish externally with indented panel lines and access panels, with carbon rod reinforcement internally for strength - and a colour matched hard plastic belly skid. The colour scheme is crisp and neatly done - in fact, it looks the 'bees-knees' straight out of the box.

It also has good access to all electronics via the large battery/canopy hatch, retained by an ali dowel at the front and magnets at the rear. Providing the power is a small 2200kv outrunner fully enclosed in the nose, the supplied spinner being very neatly moulded to represent the full-size air driven generator, in front of the black nylon 6" x 4" propeller (two are supplied). The red painted drop off dolly fits in a recess in the bottom of the skid and is held by a magnet, the polarity of which is reversed by a Tx switch (retract channel recommended) to allow the wheels to drop off. All in all, the Durafly Me-163 shows that quality is definitely the name of the game.

EQUIPMENT REQUIREMENTS

As already mentioned, You will need a SIX-channel receiver (to allow separate aileron channels) with a transmitter capable of elevon mixing, and several 3S x 2200mAh high discharge rate Lipo packs (65C recommended).

ASSEMBLY

Not a lot, but the control horns need to be fitted to both elevons and the rudder, the servos centralised via the transmitter and the wire pushrods fitted and adjusted. Note that when setting up the controls, the instructions advise some 'up' elevon at neutral for stability.

OCKET ROCKET

hizz...
ritory!

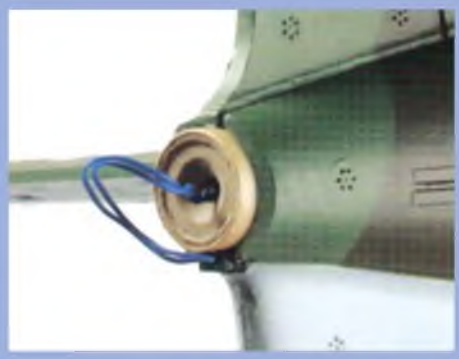
OME T!

The clever, switch operated magnetic jettisonable take off dolly slots into the landing skid moulding.

The access hatch removed adjacent to the scale-like moulded spinner.

The 3S x 1800mAh lipos used in the review model, in its CG balance position.

The rudder link and fin-mounted servo - needed for straight take off runs!



A scan from the instruction manual - the recommended rocket motor installation option. Not tried, though!

Every home should have one! A oxygen mask and goggles for our intrepid German aviator, fully factory fitted in the cockpit.

The only 'assembly' as such is that the fin needs to be glued in place in its deep slot on top of the fuselage - and the prop and spinner fitted (leave this until after the Komet has been set up). A radio antenna and pitot tube fitting are supplied, both needing a dab of glue to retain them in place.

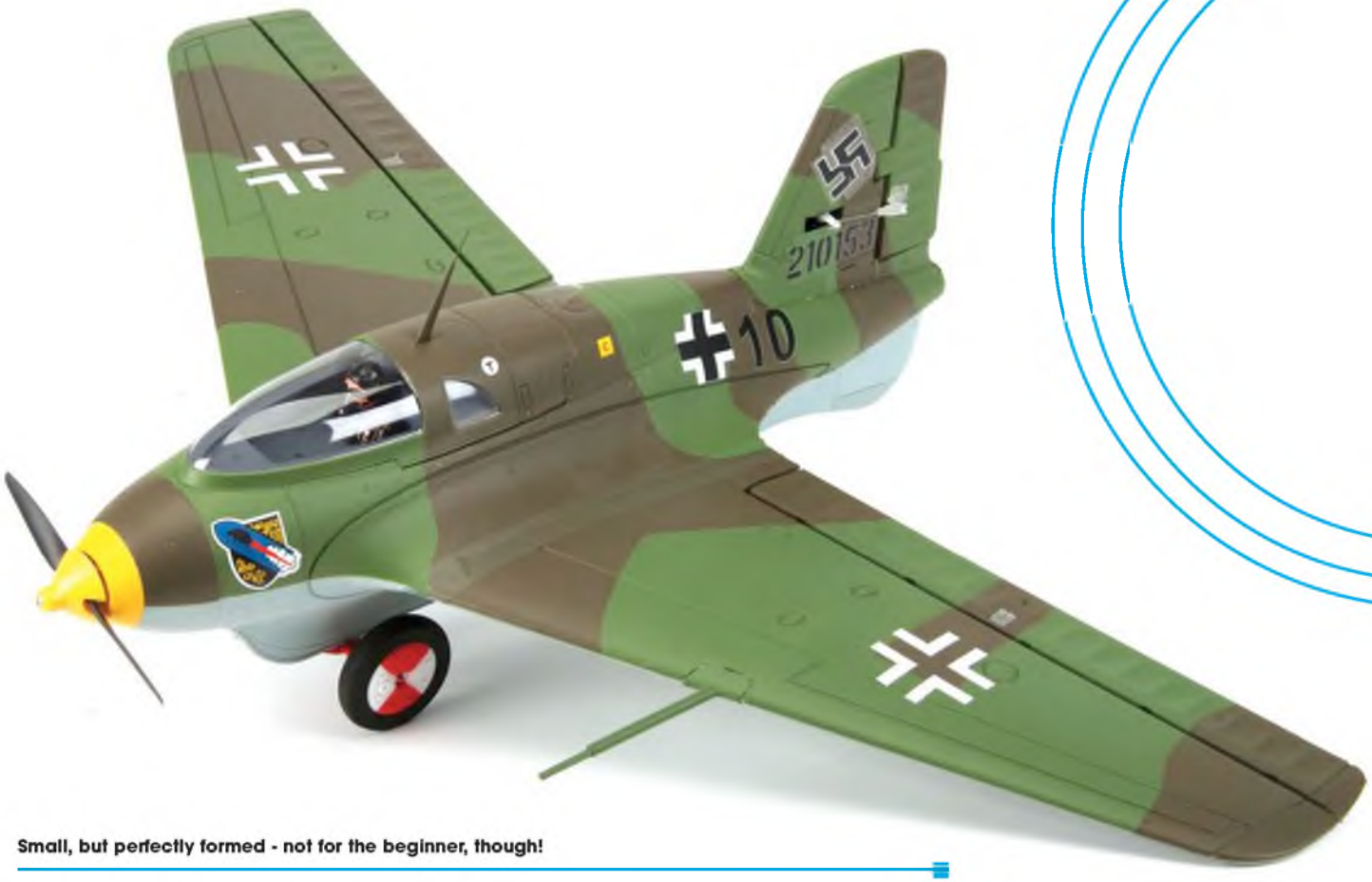
The dummy undercarraige just clips into place, the factory default being opposite polarity - it is important to note that the instructions specify that the dolly-release operating switch channel must not be set at more than 100% EPA (end position adjustment) in both directions.

SET-UP

As already mentioned, both the elevons need to be set up with a tad of 'up' reflex - 2-3mm at the wing trailing edge is recommended. This effectively means that the lower surface of the elevon should align with the centerline of the wing trailing edge at the wing root end. High and low rates are recommend and these were used for initial testing (although, in practice, the lower rate settings were quite adequate for 'scale' flying).

Balancing for-and-aft must be done carefully as the CG needs to be spot on - a

Climbout is fast on full chat - you can just make out the 'reflex' set on the elevon at the neutral position at the wing root.



Small, but perfectly formed - not for the beginner, though!

range of 8mm is given, but I would advise using the forward position (205mm back from the spinner backplate). I pushed a glass headed pin into the foam fuselage either side under the wing at this position to allow the model to be balanced on my fingertips. Moving the battery pack (towards the rear of the battery/radio bay) achieved the required position with the battery easily accessible. I then marked the battery tray with a permanent marker to show the position of the rear face of the Lipo pack, to ensure the battery went back into exactly the same place after re-charging.

ROCKET POWER OPTION

There is a moulded cylindrical recess at the rear of the fuselage, designed to accept a standard *'18mm class'* dry-fuel rocket motor (one of those used by the model rocketry people). If you want to try out this option (we didn't, so you are on your own!), you need to make sure you buy a 'capped' type 'single stage' rocket motor (take notice that some rocket motors have a forward facing charge to produce 'stage separation' when the main motor fuel burns out - the effect of this happening in your Me163, would be spectacular - and totally undesirable (unless you want to see your Me163 go down in flames!).

The wiring needed for igniting the rocket motor is already installed, but you will need an R/C switch that is rated for the required volts/amps needed to ignite the motor. A suitable switch is available from Hobbyking UK (Turnigy Rx controlled switch 9107000266-0).

NOTE: It is recommended in the instructions (and FSM endorses the recommendation - Ed.) that only those with experience of operating solid fuel rocket motors should attempt to fly the Me-163 with this source of power and always within the guidelines stipulated by the BMFA. It is important to remember that Model Rocketry is an aeromodelling discipline in it's own right, with very specialized techniques and safety issues which need to be respected.

FLYING

As already stated, we opted for the 'EP

Extremely attractive finish and detailing, the Durafly Me-163 flies as good as it looks.

It's fast and furious with good slow flying characteristics - but will get away from you all too easily, if not careful!

only' power set-up.

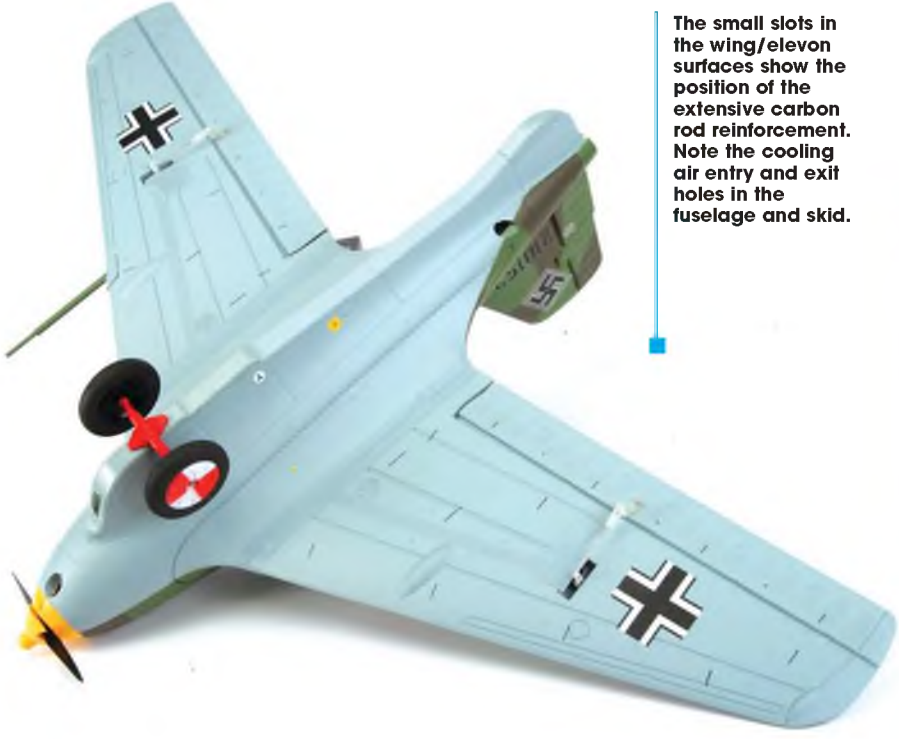
I would say from the outset that the Durafly Me-163 is designed only for pilots with some 'fast model' experience! It is true that it will fly very well at a fairly low speed, but to get it off the ground and trimmed out, you are going to need to fly it at high throttle - and it is fast! Add to that its diminutive size and there is the potential for the model to get away from you very quickly. Its layout (swept wing tailless) means that directional orientation can become an issue very quickly.

It does have incredible flight performance and stability throughout the speed range, although control inputs need to be introduced gently. However, you first have to take-off successfully!

The instructions do give a hand launch procedure, but to be honest, I don't think it will be that successful - we tried it and failed, several times, resulting in a bent prop (thank goodness a replacement is supplied).

We opted then for a dolly takeoff and, after several unsuccessful runs gradually increasing the throttle (the dolly track is very narrow), we opted for a 'put-on-ground, point-into-wind, hold-the-tail, power-up-to-full-throttle and release' type of launch! The acceleration was remarkable and the Comet leapt into the air after just a couple of metres! Climb-out was fast and steep and it was soon disappearing from sight - no time to jettison the dolly; just concentrate on orientation and pull it round in a gentle flat curve to get back into the circuit.

With throttle reduced to about 60% she was more comfortably manageable. This time, on the upwind pass, the dolly was dropped, with no noticeable trim change needed - and climb to a nice height to complete the trim out stage, but not a lot was needed to allow hands off-flying (not that you would want to do that for long!) - and so a few 'getting-the-feel' circuits, before opening the taps again.



The small slots in the wing/elevon surfaces show the position of the extensive carbon rod reinforcement. Note the cooling air entry and exit holes in the fuselage and skid.

Full power gives virtually unlimited vertical climb and huge loops on low rates; then flick on high rates if you dare, for blistering rolls - although on high rate, don't be tempted to reduce the diameter of the loops too much, or else you will find out just how difficult orientation is when trying to get out of a spin! (Yes, of course, I did - and didn't like it!).

Slow the Me-163 down however, and she's very stable and has no hint of a stall - but who wants to fly like that?

Using the recommended 2,200mAh 30-65C 3S Lipo and the 6" x 4" prop provided, with varying throttle (we had too, our nerves couldn't take it always at full chat), flight duration was well over six minutes, with more than enough power left to get it back onto the strip.

CALMING DOWN!

To sum up, it's definitely NOT for the inexperienced or faint-hearted, but for those wanting a real kick out of a fast flying, quickly disappearing, aerobatic mortar shell, the Durafly Me-163 is a real blast!

The instructions say that for those of you looking for the ultimate scale experience, the optional rocket system will give you a thrill like no other. We didn't try it, but would love to hear from anyone who does!

SPECIFICATIONS:

Manufacturer: Durafly
UK Distributors: Hobbyking UK
Wingspan: 950mm (37.4")
Length: 585mm (23')
Flying Weight: 850g (30oz)
Motor: Durafly 2836 2200kv Outrunner
Prop: 6" x 4" (2 included)
ESC: Durafly 40A brushless
Servos: 2 x metal geared 9g (aileron/elevator) 1 x 9g rudder
Functions: 6 channel - 'elevons' (aileron/elevator), throttle, rudder, gear (dolly), optional rocket switch.
Price: £84.03 (price varies with changes to exchange rate)

Additional items required:
6ch Tx/Rx with elevon/delta mixing
1300-2200mAh 11.1v 3S lipo battery (30C min, 65C recommended)

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Wingspan : 1100 mm /43.3 in.	Battery : 11.1V 1300 mAh Li-poly
Length : 765 mm / 30.1 in.	ESC : 20A Brushless
Weight : 695 g / 24.5 oz	Motor : DST-1100
Propeller : 8x6(Two blade propeller)	Servo : 9g x 4
Recommended radio system : 4CH	

Sopwith Swallow

PART 3: Concluding the construction article for the 1/6th scale model designed by Peter Rake and built and described by Charles Sherman.

Having promised myself to draw up this model, things kept interrupting the progress of actually getting the plans drawn - usually in the form of other plans in need of drawing. I'd drawn up plans, in various scales, for the Sopwith Monoplane number 1 (Scooter), but never for the Military Monoplane number 2. A little urging from others, Charles included, prompted the model you see here. That's it from me, I'll simply hand you over to Charles for all the details. ***PETER RAKE***

Before I continue, I have to explain why this may repeat some of what has gone before, or not quite join up correctly. As we all know, computers are wonderful things; when they work properly. Unfortunately, the one containing all the Swallow details has stopped working entirely, so I'm having to work from what I had saved elsewhere and from memory of how far we'd already progressed in Part 2. Computers may be good, but everything backed up onto memory sticks is an absolute must.

Personally, I blame our beloved editor (well

Cruising past overhead. Charles prefers the 3S set-up to the original 2S one because he doesn't have to spend virtually the entire flight at full throttle.

why not - Ed) for the problem, I'm convinced he talked it up by asking if I had all the material to complete the article. Everything was working perfectly before I assured him that I did have what was required. Although I have a new computer on order, time is short for getting this submitted for publication so I'm having to work with an old, VERY slow and somewhat clunky computer that only does what IT wants, when it wants - which isn't always what I want it to do, when I want it done.

So, bear with me on this and I'll hand you back over to Charles for the rest of the construction article. As I recall it, we left things with just the front of the cowling assembled and ready to attach to the remainder of the cowl.

THE COWL CONTINUED

The central section of the cowl is constructed from 1/32" ply. I used the front section of the cowl as a former. Just a little water was applied to the ply before rubber banding it to the cowl. 30 minutes later it was ready for the next step. (I like to use ply with the outer grain running fore and aft, even if that means joining strips. I find this not only makes it easier to bend around the cowl formers, but it also avoids any tendency for the ply to bow between the formers. Simply cut it to the correct width, glue it in place around one of the formers, the front one in this instance, trim the ends, join them and glue in place the rear former. PR)

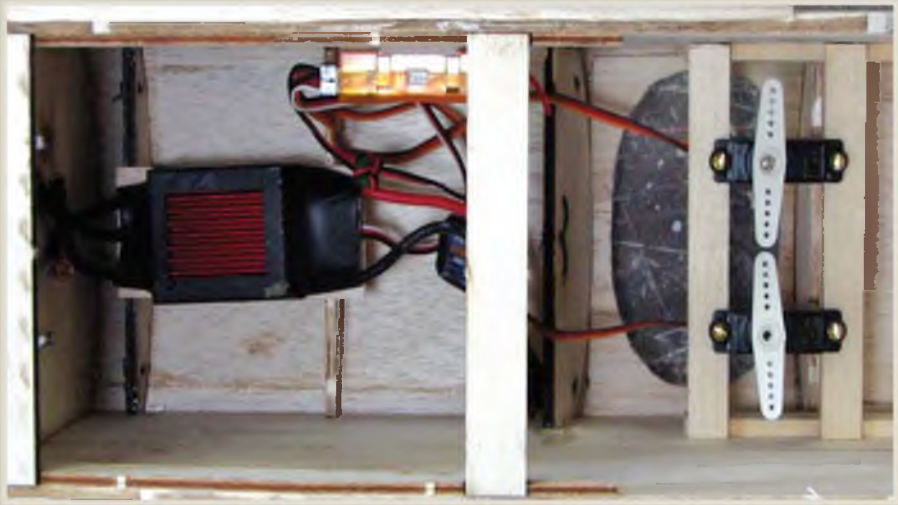
After gluing the ply to the ply ring on the front section of the cowl, I added three cross braces for added support for the rear ply ring. Before joining the rear ring to the rest of the cowl, I drilled holes for locating dowels and arranged for the cowl to be retained using small rare earth magnets.

I used the Park Flyer Plastics engine kit for this. The price is right and it is a little smaller than the Williams Brothers kit. I added an inner ring to the front of the cowl to enclose the engine better. (It isn't quite the right engine for the Swallow, but looks good and does a great job of filling the otherwise open void of the cowling. It does rather a nice job of hiding the electric motor too. PR) The cowl was sanded down further to round it off a little more and then covered it with one layer of glass fibre.

(I have a fairly specific method for preparing cowls for painting, one that avoids the use of anything difficult to sand completely smooth. It isn't a particularly quick process, but it does work well at achieving a metal-like appearance beneath the paintwork. It's also my preferred treatment of 'metal' panelled front ends. Once the basic structure is sanded to shape and sanded completely smooth I like to build up layers of rattle can automotive filler primer. This tends to be thicker that ordinary primer and fills any wood grain that much faster. So, it's a case of spray on a couple of coats, allowing to

Here you see the rear cowl former held in place while it, and the firewall are prepared for locating dowels and magnetic retainers.

With the cowl sanded and painted that dummy engine fills the gap nicely.



There's ample room for the radio gear but I would have positioned those servos further forward.

The simple jig u8sed to assemble the u/c wires, and how those laser cut wheel parts go together.

The cockpit area showing the styrene panels, cut outs for the guns, coaming and dummy instrument panel.

dry between coats, allow to dry completely and then use fine wet or dry abrasive, used wet, to sand off most of what you've sprayed on. Be careful not to sand right through though, otherwise you're back to square one. Continue to repeat the process until there is absolutely no grain left showing and then apply and sand a final light coat. The one thing we don't have to worry about on these short nosed types is adding weight at the front. Therefore, the same process is equally suited to use over the layer of glass cloth that Charles applied. PR)

FUSELAGE REVISTED

The fuselage is sheeted with 1/16" balsa. The only place I found to be tricky was the cockpit area and section behind it. The curves become very complex and I found that using separate pieces was the answer for me. I did it with the top sheet of balsa going from F1 to F5, with the cockpit hole cut out. I Then used a separate piece of sheeting to go from F5 to F6 and then finished the lower gap with a strip running from F4 to F6.

Slots were then cut for the Vickers Machine guns. I used a set of the William's Bros guns and these need to be recessed slightly.

(When I sheet top deckings around cockpits I prefer to use just one length of balsa, joined to make up the required width. Begin by carefully trimming the edges to clear any strut wires and then make an undersize cockpit opening. The section aft of the cockpit, where the curvature changes, is then slit. The sheet then gets glued in place as far back as the front of the cockpit and allowed to dry before attempting to fix the aft section permanently in place. To do this moisten the balsa to make it more pliable and then glue the edges in place at the longerons/sheet fuselage sides. Once secure, overlap the slit edges, cut through both and glue the resulting edges together and to the formers. Once dry, open up the cockpit to the correct size.

This is purely a personal thing because I find the single piece of sheet requires less filling and sanding to result in a smooth change of curvature. Some, like Charles, prefer to use sections while some even plank this area. If in any doubt about your ability to accurately trim around the struts and still end up with a piece that fits properly I would suggest a slight variation on the technique. Make the main piece about 1" narrower than required, fit that and then add strips that have been trimmed around the struts to the edges. PR)

0.10 styrene sheets were to simulate the metal cowling that covered the front of the fuselage. This was done in three sections. I wrapped the side sections around the fuselage to mark where the cuts should be. The top section was straightforward. These, and the cowl, were painted with Krylon Brushed Nickel spray paint.

FINISHING UP

Before starting covering the exit tubes for the control cables were added at the tail.

There is plenty of room in the fuselage for the electronics. Try to position the servos as far forward as you can and ensure that the control cables clear the former. I mounted the esc to the top of the fuselage so the batteries will mount against the firewall.

Although there isn't that much scope for detailing on this model what Charles has done brings it to life.

There is enough room to place two 3 cell, 2200 mAh batteries on each side of the esc. The landing gear and wheels were built. Wheel parts are in the kit and the wire was bent according to the plans. The axle is designed to absorb bounces you'll need to wrap elastic cord around each end of the axle and spreader bar.

The wire to the aileron servos can be concealed in the cabanes. I carved out a channel in the bass wood sections that fair the wire struts and built in the servo extension leads. The wires lead to the receiver and to plugs located between the ribs where the servos are located. I'll be able to swap servos out without too much fuss but not remove the wing for transport.

At this point it is time for filling, sanding, priming and covering. The plane is going to be very tail heavy so use the lightest covering you can and try to keep the coats of paint to a minimum. I used Parklite for the covering material and then applied one coat of Krylon paint to the whole thing.

The forward fuselage was painted a light grey and then the styrene panels were glued down. The carburettor intakes were then added and painted up.

I used a slit section of fuel line for the cockpit combing and found a photo of a Camel's dashboard that I altered a bit to fit into the Swallow's cockpit.

The wing and tail control surfaces were installed next and decals and rigging were applied. There are no commercial markings available that fit the model so you will have to have them custom ordered or make them yourself. I created mine using printable waterproof vinyl sheets.

(There is an amusing little story about the markings. Charles originally used some that he had for a Camel and they looked totally out of place. I mentioned that on a model where only one prototype existed it did really need the correct markings and Charles said that I must have sent out 'vibes' across the pond because all his vinyl markings had curled up and dropped off. PR)

THE IMPORTANT BIT

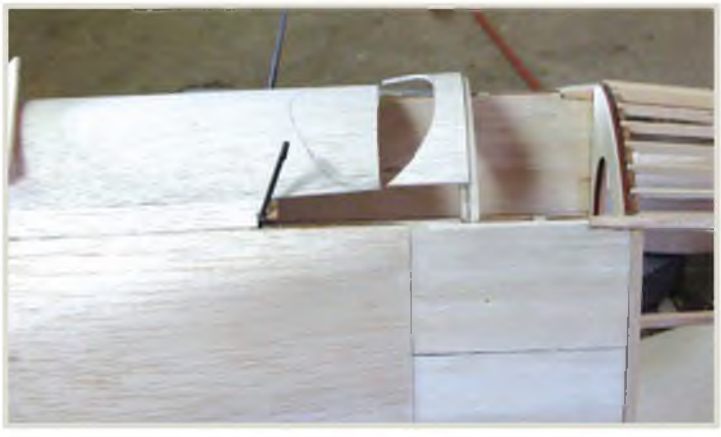
To prepare the plane for flight, 14oz of ballast was added to the front of the firewall to get the model to balance correctly. (Now you see why you need to take care over keeping the tail end as light as possible. 14 ounces of ballast, plus two LiPo packs is a lot of weight for the model to haul aloft. A single ounce of excess weight at the tail might easily need 8 ounces of nose weight to counter it. PR)

For the first flight, I used two 2 cell 2200 mAh packs wired in parallel which worked out to 43 w/lb. After a long take-off run the plane lifted off and cruised around quite nicely at full throttle. Turns required a lot of rudder input, used in conjunction with the ailerons. The model flew just fine like this, but needed virtually full throttle throughout the flight.

After quite a few more flights using different props and batteries, I've settled on a set-up of two 3 cell 2200 mAh batteries in parallel and a 12x6 prop. This combination gives me a little more than I need at full throttle at, producing roughly 74 w/lb. The extra weight of the batteries brings the total weight to 63 oz and seems to improve the balance. Cruise speed is just a hair over half throttle.

I have set up my radio so the ailerons have +30 and -10 mm of travel, with about 30% rudder added to the mix.

Ideally, I think a set-up that would provide 6065 w/lb would be ideal. Just enough punch to get you out of a bad situation if you needed it with plenty of throttle to work with throughout more of a scale range of speeds. The plane is a lot of fun to fly and quite a sight cruising around the field. ■



How Charles used different pieces of sheet to make up the decking around the cockpit area.

Techno Scale

Mike Evatt

BMJR's primary focus is in the development of laser cut Kits for the enjoyment of being assembled by the modeller. You will notice their site is divided into four areas of interest; Free Flight, Radio Control, Control Line and a Miscellaneous category. The Stuka, designed by Hi Johnson, appeared in the 1960 *Model Airplane News Annual* and was reported as one of the most spectacular scale-stunt aircraft ever designed. The BMJR Stuka is true to the original design with some construction changes allowed by laser cutting technology See more at: www.bmjrmodels.com

Looking for the unusual? Then look no further than **TEXAS RC PLANES** at http://texasrcplanes.com

The Blohm & Voss BV 141 was a World War II German tactical reconnaissance aircraft prototype. It is best remembered as the most asymmetrical aircraft to have ever flown. The three-piece wing is professionally covered and the GRP fuselage is pre-painted with scale colour scheme. An ideal size 81" span beauty for the scale modeller who loves Germen planes.

Since 2008, **RC Aerodyne** at www.scaleflying.com has provided customers around the globe with top quality scale RC aircraft, helicopter kits and an incredible selection of hobby parts and upgrades. Located in Kent, Washington, just south of Seattle USA, they offer a wide variety of great products from many excellent suppliers. Many of their scale products are officially licensed replicas produced with input and approval from major aircraft manufacturers such as Boeing, Bell Helicopter and Hawker Beechcraft. Marine One is the call sign of any United States Marine Corps aircraft carrying the President of the United States. RC Aerodyne's version of Marine One - VH-60N 'WhiteHawk' is finally here. Beautifully painted with automotive base coat and clear coat this model's fuselage a very durable and has a high gloss finish.

Phoenix Model at www.phoenixmodel.com have specialized in designing and manufacturing Almost-Ready-To-Fly (ARF) R/C model aircraft since 1991. Today, they are the largest and most experienced manufacturer in Vietnam producing R/C model aircraft. With over 20 years' experience in production and fly testing, Phoenix Model is committed to bring the best quality products and good service to customers. The screenshot shows their Lockheed Constellation affectionately known as the 'Connie'. This was a four engine propeller-driven aircraft built by Lockheed between 1943, and 1958, in its Burbank, California, facility. It was used as both a civilian airliner and U.S. military air transport plane, seeing service in the Berlin Airlift and as the presidential aircraft for President Eisenhower.

Giant Scale Twins was established in 2006. It is a reincarnation of Modaire Industries, producers of the legendary Aero Commander, Tigercat, F-82 Twin Mustang and P-51H Mustang.

Jim Oosterhuis has taken over the company and is producing the same kits that Bev and Charlie of **Modaire Industries** shipped, and promises that they will be of the same high standard! The screen-shot from Jim's website at http://giantscaletwins.com shows his 1/5th scale F-7-F Tigercat

'Modeler's Reference' at www.modelers-reference.com is dedicated to bringing you the modeller

The BMJR Stuka - designed by Hi Johnson.

The Blohm & Voss BV 141 was a WWII German tactical reconnaissance aircraft prototype.

RC Aerodyne's version of Marine One - VH-60N "WhiteHawk"is finally here.

The Phoenix Model's "Connie".

Giant Scale Twins is a reincarnation of Modaire Industries.

'Modeler's Reference' for detailed 'walk-arounds'.

walks hyperspace for more TechnoScale Topics...

exactly what you need by way of images of many different scale subjects. It features a collection of high resolution images (both detail and full subject photos) in their detailed 'walk-arounds', high resolution 3 and 4-views by leading model designers and/or artists on some subjects and cockpit image packs are also available for some subjects.

I always enjoy revisiting the **SAMS Models** website at www.samsmodels.com SAMS have been in the model business for nearly 40 years and have built up a formidable fount of knowledge regarding small model aircraft, especially of the free flight variety. They also have access to the latest developments in micro radio control, which, with the latest reduction in size and weight, is now suitable for many of the smaller models listed in their catalogue. The market for small scale models and their accessorises is particularly well covered. There are some quite special plans on offer such as the Peter Smart 1912 Fokker Spin. This is the first Fokker aircraft - Pistachio size for Gasparin G5 C02 motor (if you still have one!) or rubber power.

Aero Accessories at unsurprisingly www.aero-accessories.com stocks a range of superbly detailed 1/4 Scale WWII US Pilots. Each pilot has a full body. At only 5.5 oz clothed, they are the lightest articulating model figures available. Each body is made from 17 different moulds to enable lifelike poses in your aircraft. The shoulders are adjustable in width from 3-3/4" to 4-1/4". The shoes and legs may be removed to fit in limited space cockpits. The clothing has been sewn from actual cloth fabric. Warbird pilots have Khaki shirt and pants, brown belt with brown shoes. Included with each pilot are the following accessories: Crush cap, goggles, flying hat, oxygen mask with hose and harness, 4 Point harness and seat belts and Watch!

It is good to see companies producing models of modern prototypes such as the Altitude Radial Rocket by **Black Horse Model** at http://blackhorsemodel.com The Altitude Radial Rocket is an American amateur-built aircraft, produced by the Altitude Group of Overland Park, Kansas. The aircraft is supplied as a kit for amateur construction. The aircraft features a cantilever low-wing, a two-seats-in-tandem enclosed cockpit under a bubble canopy, fixed conventional landing gear or retractable tricycle landing gear and a single radial engine in tractor configuration. The Black Horse Model version has a wingspan of 1410 mm and weighs 3.2kg.

Horizon Hobby has a vast range of engines to power that next scale project. The Saito FG-33R3 engine shown in the screen-shot is the gas/petrol version of the existing FA-200R3 glow engine. Above and beyond the advantages of a 4-stroke gas engine, this is the engine for those who like to run clean and efficient engines. This powerplant provides easy starts and reliable performance as a result of the 2S LiPo compatible electronic ignition. The Saito designed carburettor is specially designed for 4-stroke engines, ensuring reliable fuel feed and outstanding performance at any attitude. Check out this three-cylinder delight at www.horizonhobby.com

RBCkits was founded in 1996 by Rob Bulk and is based in the Netherlands. Their goal is to make affordable kits which are fun to build and to fly. They have vast range of scale kits and RTF aircraft but I was attracted to their replica quarter-scale Anzani three-cylinder motor. This delight is of wooden construction with a number of vacuum-formed parts and allows for an electric motor to fit inside. Take a peek on Rob's website at www.rbckits.com ■

The Peter Smart 1912 Fokker Spin plan from SAMS.

Aero Accessories superbly detailed 1/4 Scale WWII US Pilots.

The Altitude Radial Rocket by Black Horse Model.

The Saito FG-33R3 engine is a three-cylinder delight.

RBCkits' replica quarter-scale Anzani three-cylinder motor.

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

mikeevatt@hotmail.com

INDOOR PERFECT

Alex Whittaker takes his camera to The BMFA Indoor Free Flight Scale Nats, at W

Nottingham, you are so last year! This year the BMFA F/F Indoor Scale National Championships caravanserai rested at Wolverhampton University Sports Centre in Walsall. Handily close to Spaghetti Junction on the M6, but I was still very grateful for the supplied postcode to punch into my 'phone. The Sports Centre facility is quite new, and of course, we have been here before for the previous BMFA Scale R/C Indoor Event, also organised by tireless Andy Sephton.

There is a mezzanine just above the flying area, as per Nottingham University, and there is more-or-less the same range of facilities. A comfortable new venue with one big advantage: the Pits area was huge, and the massed ranks of competitors' tables could face the action without any crowding whatsoever.

I set my folding photo table out of the way against the back wall, and was happy as a pig in muck. I noted the

The SAMS Travelling Emporium was very impressive. Good to see such Trader support.

ION

Valsall, April 19th

There was a very handy mezzanine floor from which to view the flights.

goodly number of 13A wall sockets - handy for electric models, F/F, or R/C, not to mention the ubiquitous 'leccy kettles carried by all hardcore F/F Indooristas.

The Competition

To be absolutely frank, as an unashamed scale anorak, I chiefly attend these indoor scale meetings to ogle the models, admire modelling techniques, and catch up with old friends. Consequently, my grasp of the actual competition was surprisingly light. I was too busy examining the flying scale aircraft and appreciating them in flight. However, I did not derelict my duty - full Official BMFA Results are attached.

Quality

You should be able to find a model you really like from the enclosed gazetteer of scale photos. Scale indoor models are very appealing, and as I know from direct

Space and grace. The extensive Pits area from the mezzanine floor.

RESULTS

PEANUT SCALE

1: M.Hadland	Bucker Jungmeister
2: R.Crossley	Junkers Ju87
3: N. Peppiat	Blackburn Bluebird

PISTACHIO SCALE

1: N. Peppiatt	BAT Baboon
2: R. Lucassen	Navy Wright NW-2
3: B.Stitchbury	Andreason BA-4B

OPEN RUBBER

1: M.Hadland	Stampe SV4
2: M. Stuart	Curtiss P-6E Hawk
3: R.Crossley	Brewster Bermuda

CO2/ELECTRIC

1: R.Crossley	Piper Tripacer
2: G. Banham	Cessna
3: P. Smart	Lancaster

GLIDER (No model details provided)

1: P.Fardell
2: I. Lever
3: P. Smart.

KIT SCALE

1: I. Lever	DH Puss Moth
2: T. Rushby	Taylorcraft
3: R. Lister.	SE5a

Czech visitor, Robert Pajas' Caproni Ca 97 Trimotor. Built to 1/32nd scale.

Another Robert Pajas multi. This time his Avia (Fokker) F-IDX, built to 1/35th scale.

Scale Maestro Mike Smart's incredibly fine Boeing P-26 Peanut Scale beauty.

Ken Bates' silver 1/20th scale Parnall Pixie, Open Rubber Class.

Nick Peppiatt's 1/35.5 scale Pistachio BAT Baboon

Gary Flack's Focke Wulf Ta 152 Pistachio Class. Totally own-designed and hand-constructed.

experience, they can prompt one to get out the balsa hatchet for larger scales with radio!

I noticed that Kit Scale entries have improved more than somewhat in quality. In addition, if anything, the top international scalistas now produce models of stratospheric excellence. To appreciate what I mean, take a gander at Czech visitor Robert Pajas' unbelievably good models, or cop our own Dave Banks' frankly incredible building standards.

Doflug D.3802

As usual, since this is a photo report, I will chop the chat let the photos convey some idea of the range and quality of the models. As usual, one or two caught my particular attention. First off, was John Valiant's very unusual Doflug D.3802. This had me baffled - never heard of it - these Indoor guys really like to sniff out the obscure types! At a casual glance it looked vaguely Messerschmitt. In fact it

Peter Fardell's Lilienthal glider.

has a complex heritage. The Doflug D 3802 / Morane Saulnier MS 540 was developed in Switzerland from the Morane Saulnier MS 450. Later, a Swiss subsidiary of Dornier developed this into the Doflug D3802. John's Peanut Scale model was built to his usual exacting standards, with his clever foam construction. The Doflug has a stunning scheme and is beautifully executed throughout.

Caproni Ca 97

In 2013, young Czech visitor Robert Pajas, wowed us all with his lovely Avia Fokker F-1XD Trimotor, built to 1/50th scale. This year, amongst his splendid air fleet, was an utterly stunning Caproni Ca 97 Trimotor. This is built to 1/32nd scale, and is powered by a Gasparin G-43 Co2 motor - the outboard props free-wheel. The fit and finish was utterly exquisite. I spent a long time adoring this impressive scale aircraft. The colour scheme was extremely attractive, too.

Brandenburg Seaplane

Noted scale modeller Paul Brigg brought his large and nicely modelled Brandenburg W-20. Paul claimed she was more sports scale than pukka, but I thought she looked superb. This is a chunky WWI pusher seaplane with a forest of struts, and bags of character.

Paul built her from the Mike Midkiff plan from U.S.A. She is electric powered, traditionally built, and spans 20".

Mitsubishi Claude

Amazingly, I have never met the modest but famed Dave Banks before. Like everyone else, I have been astounded for years by the quality of his scale pilots. (David makes them available commercially: david.banks62@gmail.com). However, today I was able to have a good look at his latest model, built from balsa with a mixture of techniques including a moulded balsa fuselage. This was his own-designed Mitsubishi A5M (Allied codename 'Claude'), 18" in span, rubber powered, and also designed for outdoor calm weather flying.

How can one describe indoor scale perfection? Well I can't. Just look at the snap to get some idea. A scale education in itself.

SAM35 are coming

Ye Samites of 35 are making an impression on F/F Indoor Scale. Even Brian Waterland, whom readers might more readily associate with The Bowden and BMFA outdoor F/F Scale, was getting in on the act. He made his first ever indoor entry. This was a neat Corben Baby Ace, which he entered into Kit Scale. It seems that, as we all get older, there are fewer of us to support proper scale aeromodelling in all its glory. Perforce, we have to turn our hand to co-support other scale disciplines. Brian acquitted himself with dignity, but did not place.

Kit Scale

Kit Scale is doing well and had 21 entries. Standards, already good, are improving. Ian Lever came first with his DH Puss Moth. Tony Rushby was second with his Taylorcraft, and Russ Lister placed Third with his SE5a. Some kit models flew very well indeed on just their original kit balsa, kit rubber, and kit tissue. Not my experience as a nipper!

Peanut Wonder

Lord of Scale and English gentleman Mike Hadland ('Have Tea-Pot / Will Travel') greatly confused my puny brain with no less than two immaculate Peanut Bucker Jungmann models. They differed only in their colour schemes. One of them won Peanut Scale. It flew well and garnered a large static score. Richard Crossley's superb Junkers Ju87 Stuka came second, while Nick Peppiat's nifty Blackburn Bluebird came third.

The Pits area was much more extensive at this new Walsall venue.

Pistachio Scale

Nick Peppiatt continued to have a good day, and went on to win Pistachio Scale with his BAT Baboon, which we featured last year. Roel Lucassen was Second with his Navy Wright NW-2, and my old sparring partner and good bloke Bryan Stichbury came third with his Andreason BA4-B.

Kevin Wallace new MD of SAMS Models, with his venerable AVRO 545.

Gary Flack's amazing Peanut scale Westland Wyvern. Hand built except for the commercial prop.

Lord of Scale Richard Crossley's impressive Peanut Ju87Stuka.

Monique Lyons' rubber-powered Kit Scale Fokker DVII - quite large, from the well-known Herr Engineering kit.

Peter Fardell's 18.5" span Polikarpov Po-2. Flying Scale Models Magazine plan from January 2004, by Dave Deadman.

Scale Maestro Mike Hadland's scratch-built Peanut Class Bucker Jungmann. He has two. This is the new scheme.

Peter Fardell's ski-equipped Norwegian-schemed Fieseler Storch from the Dumas kit. 30" span and weighs 71 grams.

Dave Banks' sublime Sopwith Pup in a French scheme, 17" span, and Co2 powered.

Scale detail and pilot on Dave Banks' Sopwith Pup.

Dave Banks' wonderful Mitsubishi Claude, with its rolled balsa fuselage. 18" in span, rubber powered, and weighs but one ounce!

Beyond artistry. One of Dave Banks's impressively detailed 1/6th scale Battle of Britain pilots.

Indoor Gliding

This version of indoor aerotowing has now progressed a long way past novelty, with no less than eight entries. The Class was won by Peter Fardell with his fascinating Lilienthal glider, with Ian Lever and Peter Smart in close touch. Chris Strachan was fourth, not far behind them. Great to watch, and a real crowd pleaser.

The Triple

I spent a good deal of the lunch break pulling the leg of my owd mate Ian Lever (of SAM 35 fame). FSM readers will remember Ian from such previous indoor events, and also for his F/F outdoor Bowden Comp and Scale entries. He also does a nice line in Keil Kraft classic kit / free-flight cabin models. However - emphatically - Ian had the last laugh on me. He came first in Kit Scale, 2nd in glider, and won a trophy painting for the year. Richly deserved. Next time I will say nowt.

SAMS Stall

It was very gratifying to see a very large SAMS Model Supplies stall extending down one wall of The Pits. Getting kits, plans, and supplies for FF and indoor scale is increasingly tricky, so this appetising emporium was doubly welcome. In a bit of Trade News, it emerges that well-known scale competitor Kevin Wallace has bought SAMS. This is good news in these uncertain times for traditional model supplies. (www.samsmodels.com).

The Verdict

A very good venue, with a much better layout for 'The Pits'. Attendance was very healthy, and there were lots of lovely handcrafted models - quite a tonic in this fallen age of the ARTF. The quality on

John Valiant's stunningly good foam construction Doflug entered into Peanut Class. Swiss scheme for this rare Dornier / Morane Saulnier hybrid.

Rich Moore's Bristol Fighter F2B from the Comet Kit. 15" in span and weighs 20 grams. Unusual Mesopotamian scheme.

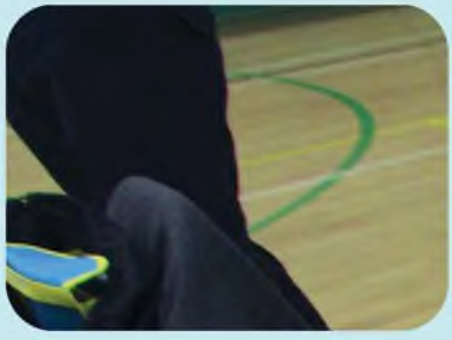
display was really encouraging, and yet it made you feel humble at the same time. If you desired a cornucopia of scale inspiration, this was it.

Andy Sephton and Team are to be congratulated for their seamless and slick organisation of a very complex event. It all ran like a Rolex. I was utterly delighted to find brief written details alongside most of the models. This was very informative, for which many of us casual gongoozlers were very grateful indeed. The only fly in my ointment was that I missed out on the booze in the Mega Raffle. Besides that, a very rewarding experience that re-energised my scale muscles.

Acknowledgements

Thanks to Gordon Warburton and Trish Dennis who worked like Trojans to get the BMFA Official Results out on the day, and then by email the day after. The Delightful Ladies-of-the-Door put in a full day too. They even managed to fit in the Mega Raffle; very grateful. ■

Expert Peter Boys built this Waco SRE from a Canadian "short kit" by Skylake Models. 16" span and weighs 19 grams.



Typical Pilot's Table in The Pits.

Closer view of Kevin Wallace's well-used AVRO 545. Still a great model.

Robert Pajas' 1/58th scale Fokker F.VIIa. that I seem to remember was once also modelled by Eric Coates, as L-BAAH.

Brian Waterland's first foray into The BMFA Indoor Scale F/F Nats. This is his 17.5" span / 25.5 gram Kit Scale Corben Baby Ace.

Paul Brigg's Brandenburg W-20 WWI pusher seaplane, from the Mike Midkiff plan. Electric powered, traditionally built, and spans 20".

ENTER THE DRAGON

De Havilland DH 84

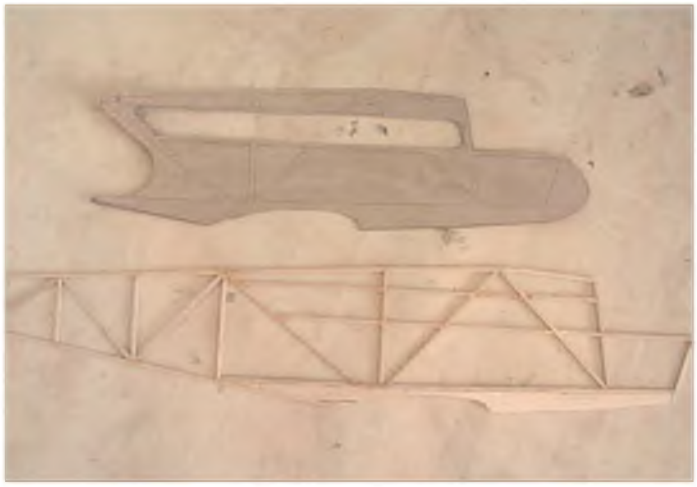
48" span semi scale 1930s biplane airliner for twin electric power designed by PETER LEWIS

Quite a long tome ago now, I built a 33" DH 82 Tiger Moth from the Mercury Models free flight scale kit, fitted a speed 400 motor and MFA mini Olympus gearbox, 9g servos, Hitec Feather Rx, finished it in yellow and silver leftovers of Solarfilm and was amazed at how well it flew.

That ?Tiggie? was flown and flown and flown. The free flight heritage built into this model really showed they don't make 'em like that any more! I flew the Tiggie at lots of electric fly-ins and won a number of prizes for its ability to fly in all sorts of conditions - and it looked ace! Every time I looked at the Tiggie, I could not help but wonder if a de Havilland DH 84 Dragon would work using some of the same design features - it does!

I had done some calculations on wing area, weight, etc, and the DH 84 idea sat

The classic de Havilland lines are all retained in the DH 84 Dragon.



Side frames from 1/8" hard balsa, with a handed ply doubler.

Initial fuselage assembly complete. F5 (horizontal, above lower wing seat) is removed later.

The completed nose, showing the important tapered noseblock.

The battery is loaded through the bottom ...and located in a snug-fitting tray.

in the back of my mind as other commitments intruded. Then, later, whilst on holiday near Edinburgh, I visited the Museum of Flight at East Fortune and there, amongst its other treasures was a DH 84.

Needless to say, this was enough to re-awaken the sleeping dragon!

I decided on 48" wingspan as a convenient size and as two speed 400/mini Olympus gearboxes were on the shelf back then, things moved on. I did think that some smaller motors and batteries could be better, but I had the motors anyway, so an executive decision was made! At the time when the design was being prepared, these were the typical electric power options available. Electric power technology for model aircraft has progressed handsomely since then and in the specification box here, we have shown a power train option that is a typical present-day alternative.

DRAWING IT UP

I had drawings of a DH 84, but at 98" wingspan, it was too big for my workshop and pocket! The smaller version came together with the Tiggie at arms reach for reference and inspiration. The construction details of the big version were not of much help, but with much head-scratching, a final design was drawn up using only the outlines from the big one. The method of securing the wing struts was copied from the Mercury kit and, whilst being a little fiddly to set up, provides a very neat and secure fixing. Some scale buffs out there will notice that the wing planform has been simplified, but this made things far easier for the build, and is hardly noticeable on the completed model.

So there you have it - a twin-engined version of the Tiger Moth!

START BUILDING

The fuselage is built around 1/8" square longerons, uprights and cross pieces, faced with 1/64" ply doublers at the front end. I build on a piece of plasterboard as it is cheap, takes pins and can be discarded after use. Don't forget to build handed sides - one on top of the other to ensure they're identical (use clear polythene between plan and sides to prevent everything sticking together). You will notice that on the prototype I didn't include the cockpit side frames - a mistake! It would be far easier to make them integral.

Cut out F3 from 1/8" ply and after drilling holes (2mm dia), sew the wire undercarriage to F3 using good strong thread and then flood with cyano to bond everything together. F5 is cut from 1/16" sheet - it is removed after the fuselage is complete, but needs to be accurately fitted together with F3 as the basic foundation of the fuselage. Glue F3 and F5, together with F4 and F4a, to the sides, taking some time to ensure everything is nice and square - the tail ends must line up without having to twist them. These formers carry the battery box/chute, which should be made next from 3/32" balsa with no top. Build it round the battery you are going to use - 8 x 2000 mAh in my case - then trim F3, F4 and F4a until it's a good fit and glue it in place. Pull the tail ends of the fuz. together and glue (check for square). Then fit F1 (be careful not to snap the sides!), followed by F2.

Make up a soft balsa block for the nose (glued around a 1/64" ply centre profile - when you have shaped it down to the ply, you have the right shape) carve to the side profile first then from the top, finishing with the sloping facets - this nose shape is very distinctive so needs to be 100 % accurate. Then complete the cabin roof and windscreen frame.

Finish all diagonal bracing to the rear fuselage, fit curved the turtle deck formers on the top rear and finish with 1/32" balsa skin. Fit F6 and F7 to the angle shown on the plan, then the turtledeck formers at the front and rear, followed by 1/32" sheet as per plan.

Tailplane and fin are from 1/8" balsa. Build the platform for the tailplane, making sure the incidence angle is correct, as this affects flight performance. You can now temporarily glue the fin and tailplane in place and admire those lovely, graceful de Havilland shapes!

LOWER CENTER SECTION

Start with the lower wing centre section and make up top and bottom wing skins from 1/16" med balsa, marked with the position of ribs and spars.

Lower wing centre section ready for top skin. Note hardwood blocks at each end rib to support wire stub joint to outer bottom wing panels. Paper tubes are for motor wiring.

Engine nacelles showing initial box construction.

Nacelles glued to wing centre section, with wiring in place.

Top rear of a nacelle, showing formers ready for stringers.

Beginning to look like an aeroplane at last!

Wing ribs are all produced the same way using the sandwich method (different ribs for top and bottom wings and lower centre section). Whilst the ribs are as a block, you would normally need to cut the slots for the wing spars using a razor saw, etc, but in the case of the lower centre section, you can omit the spar slots as you will cut them using the 1/8" spruce wing spars as a guide, as the spars are perpendicular to the chord across the span (different position in each rib).

Make holes in the ribs for the motor wiring as per the plan (I fitted paper tubes to make things easier later), then glue and fit all ribs and spar (root ribs at 90 degrees), fit the leading edge along the front edge of the bottom skin, bevel the trailing edge of the bottom skin, add the op skin and then remove from the building board and clean up.

NACELLES

Cut base pieces N1 from 1/8" hard balsa (it is easier to make both nacelles at the same time) and glue 1/16" ply strips to the underside for gearbox mounting screws - fit the motor and gearbox temporarily at this stage to check that you have a good fit and then remove to carry out the next stages. Cut four nacelle sides N2 from 3/32" medium balsa and glue to the inverted base piece. Glue in former N3.

At this stage, you should have two nacelles that will need to have the slot that fits the wing, trimmed to produce a right and left unit to accommodate the swept-back leading edge of the wing. Check that the nacelles face straight forward - i.e. no side thrust - and mark centrelines of the nacelles on the wing skin top and bottom surfaces. At this stage, make sure you can insert the wiring for the motors, by cutting holes where the wires exit. Glue on both nacelles.

Fit spine piece Z and then N4, N5, N6, N7 and N8, I cheated here by fitting these formers as a rectangle and then shaping (after marking on the shape with a Dremel tool). Slots for stringers were also cut using the Dremel, loaded with three or four grinding discs, to chop a perfect 1/8" wide slot. The 1/8" stringers were soaked in hot water before fitting in place.

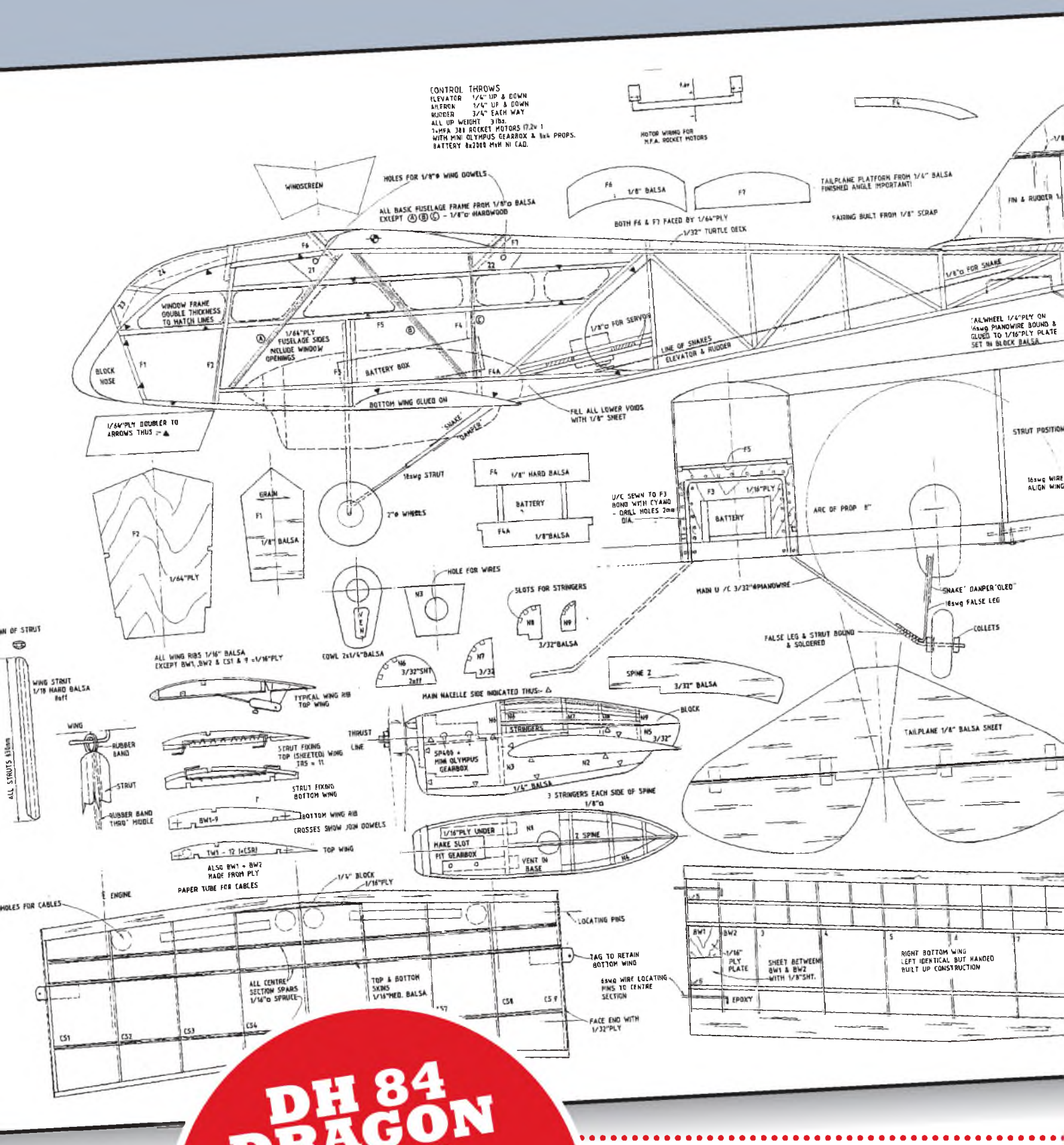
The motors were finally fitted at this stage and wires soldered to the motor connectors (I used the MFA ROCKET 380 and gearbox that comes as a unit, complete with suppressers ready fitted). Connect a battery at this point to make sure both motors go the same way. Bottom panels are 1/4" balsa, with two laminations of the same for the cowl fronts. Top front is 1/16" balsa. I must mention the method of cutting round holes of various sizes for wiring and vents, etc. (nothing is lighter than a hole!) I use old helicopter tail boom ali tube sharpened at its inside edge - with some practice it is possible to bore perfect round holes in all balsa sheet...but beware, once you get the hang of it you can't stop boring holes everywhere!

TOP WING

Make up the wing skins, cut to shape off the plan and mark on the position of ribs and spars, plus the aileron cut-out (top wing panels are built up minus ailerons - they are built separately) and most importantly, the position of the wing struts in exactly the correct place, as they must match up with strut positions on the bottom wing. Make up the ribs that carry the wire strut mountings as per the plan (the hooks on the wing under surface are shaped after the wing is removed from the building board) so that we have two ribs with 20swg wire loops sewn to them with strong thread and soaked in cyno to bond them.

Don't forget the wire loops at

A completed nacelle with shaped sheet noseblock and thin sheet balsa cowl top.



DH 84 DRAGON
(PLAN MF142)

Full size copies of this three sheet plan are available from Flying Scale Models Plans Service, ADH Publishing, Doolittle Mill, Doolittle Lane, Totternhoe, Bedfordshire, LU6 1QX. Tel 01525 222573 enquiries@adhpublishing.com Price £9.95 plus p&p (U.K £2.50; Europe £4.00; Rest or World £6.00.

this stage, stick DOWN through the bottom skin into holes drilled into our wonderful plasterboard building board! Start with the RH panel. Glue on spars and ribs, followed by the leading edge moulding at the front edge of the skin, top spar, 1/4" tip pieces, after trimming the ribs where they ride over aileron cut out (save the bits to make ailerons later). Fit the ply dihedral braces, glued to the fillet pieces that allow them to sit straight across the central joint. Make the braces to the angle on the plan - one half protrudes, so that they can be joined to the other wing during its construction.

Now mark out the route of the Bowden cable outer as per plan, ensuring a smooth curve and exiting as shown (you need more space than you think for the clevis threaded end joints, etc - roughen the tube where it passes through ribs and skin, but don't get glue inside the tube! Don't forget the slot that will expose the Bowden cable, for later connection of the servo. You need an extra piece of 1/8" sq

DH 84 EI-ABI flew the inaugural service of the Irish airline Aer Lingus named 'Iolar' (Eagle). Although the original aircraft is long-gone, the airline acquired a replacement in 1986, which underwent a full restoration to flying condition 2012, finished in the livery and registration of the original.

Silver Solarfilm gives a super finish - there are so many different schemes to choose from!

along the front edge of the aileron opening, glued on top of the rear spar - this, and the trailing edge, will need some bevelling to mate with the top skin, also fit some bits of scrap at the hinge position to give some meat to glue to.

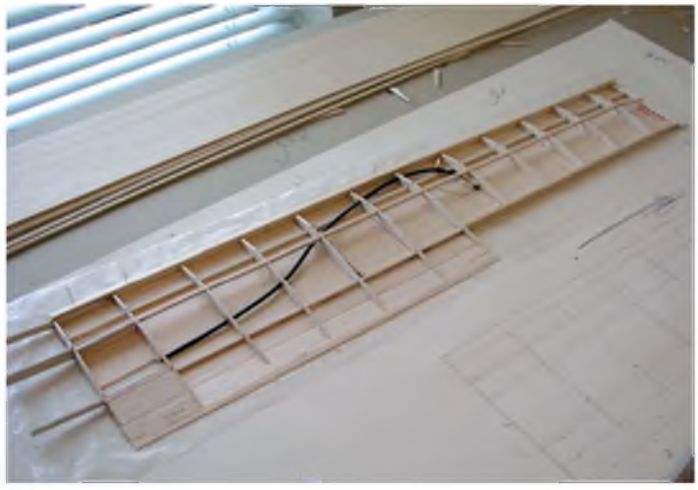
Try the top skin, sand and fettle untill it fits perfectly - then glue it on (I used thick cyano for most of this and thin cyano for around the edge). When removing the wing panel from the board, be careful, as glue seeps down the strut wires, bonding everything together!

After removing the right wing panel from the building board, bend the piano wire strut hooks FORWARD as on the plan. The left hand wing panel is built exactly the same as the right one, but with one important difference - it will be joined to the right hand panel using the stubs of the dihedral braces that we left protruding from the end of the right panel. This takes a little setting up to ensure that the ply dihedral braces mate up accurately and that we don't finish up with one wing having more incidence than the other.

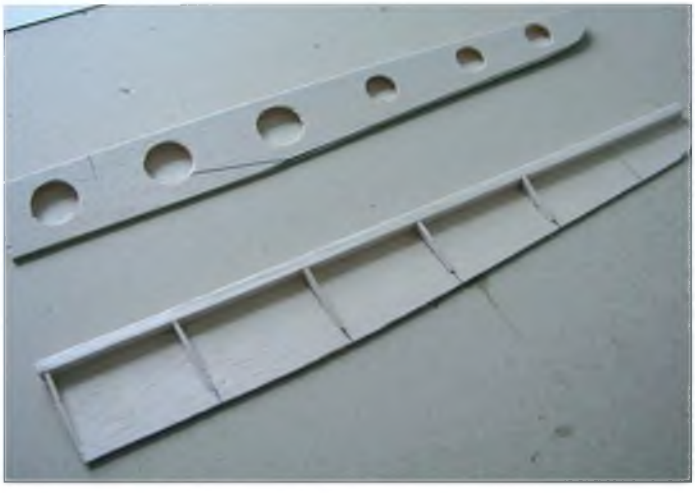
Using our plasterboard to good effect, we can use a piece cut just big enough to support the right wing and even glue this piece to the main build surface (at the correct dihedral angle). This will provide a custom made jig on which to build our complete wing. Only when you are satisfied with the soundness of the center section and its dihedral braces, after fitting the snake tube and wire strut fix points, can you finally fit the left wing top skin. When the complete wing is lifted from the board, you can bend the left hand strut hooks and give the wing a good tidying up. I applied narrow paper strips (1/16" wide) to represent the wing ribs and when covered (centre section too) - which looks quite convincing.

Ailerons are built like small versions of the

Strut hook wires are bound to balsa strips and glued against rib and skin.



Top right panel ready for skin with dihedral braces protruding from inner end of wing.



The aileron is built up with sheet skins - note lightening holes.

Strut hooks for bottom wing are bent up before being bound and glued.

wing and construction is evident from the plan and photos. At this point you can temporarily fit the 1/8" main wing dowels and band the top wing to the fuselage. This will allow the construction of the fairing over the wing centre.

BOTTOM WING

For the prototype model, the bottom outer wing panels were built-up for lightness, so you will need two new 1/16" ply templates, then use the sandwich method again to produce all the ribs needed - 16 in all. The construction is self evident on the plan and when covered, is strong enough. Two of the ribs in each bottom panel will need the strut fixing hooks bonded to them - it is easier this time, as the hooks are on the top surface and can be shaped to their finished form, as per the plan.

Bottom outer panels will have to latch on to the centre section and this is achieved using 16swg stubs bonded into the end rib. This is done by making BW1 and BW2 (and the facing rib) for the wing and centre section end ribs and, holding them together, drill holes for the stubs as per plan. The panels are held together on final assembly using 1/32" ply tongues on the underside, glued to the center section, a small servo screw then holds the outer in place (a 1/16" ply plate is built in to the wing as plan for this screw).

FINAL ASSEMBLY

I didn't glue the wing centre section on until it had been covered. Build in the servo rails at the back of the wing opening for the rudder and elevator - I used snakes with piano wire pushrods to connect servo and surfaces. Extend the motor cables so you can reach them after the wing is finally fixed.

Make up the wing struts as on the plan, carve and sand them to a streamlined cross section and try fitting them in place, using a tool made from 22swg piano wire with a tiny hook to pull the small rubber bands through their centre - practice this, you will need to be good at it! A word of warning - be very careful if the band gets stuck inside the strut, the tiny wire hook can inflict serious injury if it breaks through the side of the strut, especially if you pull it really hard! The struts need to be fitted carefully so as not to distort the wing panels, when you look at the wings from the back of the aircraft, you should see that the panels all have the same incidence, but a little washout is desirable on the bottom outer panels - i.e. the outer panel should twist up about 3/16" at its outer trailing edge.

You can now glaze the windows. I used some acetate from a chocolate box! I fitted the top wing with wing dowels and rubber bands for the test flight, but I aim to change this to wing bolts later (the choice is yours!)

Eager to get into the air! The Dragon has bags of power and will take off off from.grass with ease.

COVERING

I used silver Solarfilm with Solartrim stripes and lettering - you can find lots of ace colour schemes on the net, so have a look before you decide. After covering, fit the ailerons using Mylar hinges and make sure they move freely, then fit the Bowden cable in one piece from one aileron to the other, I always make my own control horns from laminated 1/64" ply soaked in cyno - they are very strong. Mount the aileron servo onto the wing underside using servo

Designer Peter Lewis looks a little apprehensive holding the Dragon, before making the maiden flight - he needn't have worried, it was a doddle!

SPECIFICATION

Name: De Haviland DH 84 Dragon
Span: 48" (1224mm)
Structure: All built up, top wing and lower wing c/s sheet covered.
Weight: 3 lbs

POWER TRAIN OF PROTOTYPE MODEL
Motors: 2 x geared Speed 400 (prototype model used SP400 Mini Olympus gearbox)
Functions: Four (3 servos + 40A eesc)
Battery: 8 x 2000mAh pack

SUGGESTED TYPICAL ALTERNATIVE POWER TRAIN
Motors: 2 x hexTronik DT750 (750kv) bell-type 'out runner' (Hobbyking code DT750 £9 each)
Battery: 1 x 3S 2200mAh 20C pack (Hobbyking code T2200.3S.20 £5.78)
Esc: 2 x 20A BESC (Hobbyking code F-20A £5.28 each)
Prop: 2 x 11" x 4.7" slow-fly

tape (seal the surface first with cyano) and if you installed the cable outer as per plan, you should be able to solder an arm to the Bowden cable and connect it to the servo.

The undercarriage is finished by installing the snake tube guides (well roughened where they go thro the base of the nacelles). I bored the holes for these using a long piece of 12swg wire to get the angles correct and then soldered on the false u/c struts. The snake tubes are finished off with wrapped around paper tubes cyanod in place - you should finish up with a very smooth operating, and realistic looking undercarriage. Paint the paper tubes to match color scheme.

Position battery to attain correct CG only when all components are in place - don't add weight to get balance, move the battery. I used a Kontronik Sun 4001 40 amp speed control with BEC, an 8 x 2000 mAh battery pack, 8" x 4" Master airscrews and GWS receiver. The servos are Hitec HS 55 for rudder and elevator, with a Ripmax SD 200 for ailerons.

When I had everything installed, I checked the motor run and was appalled - the Dragon pulled violently to the left! I realised the left motor was not turning as fast as the right one, so after some running in for 20 minutes, full power was applied and hey presto - no asymmetric thrust at all. This out-of-balance of power could have been disastrous on the test flight. So make sure you run the motors in fully and check they pull evenly together before even thinking about flying.

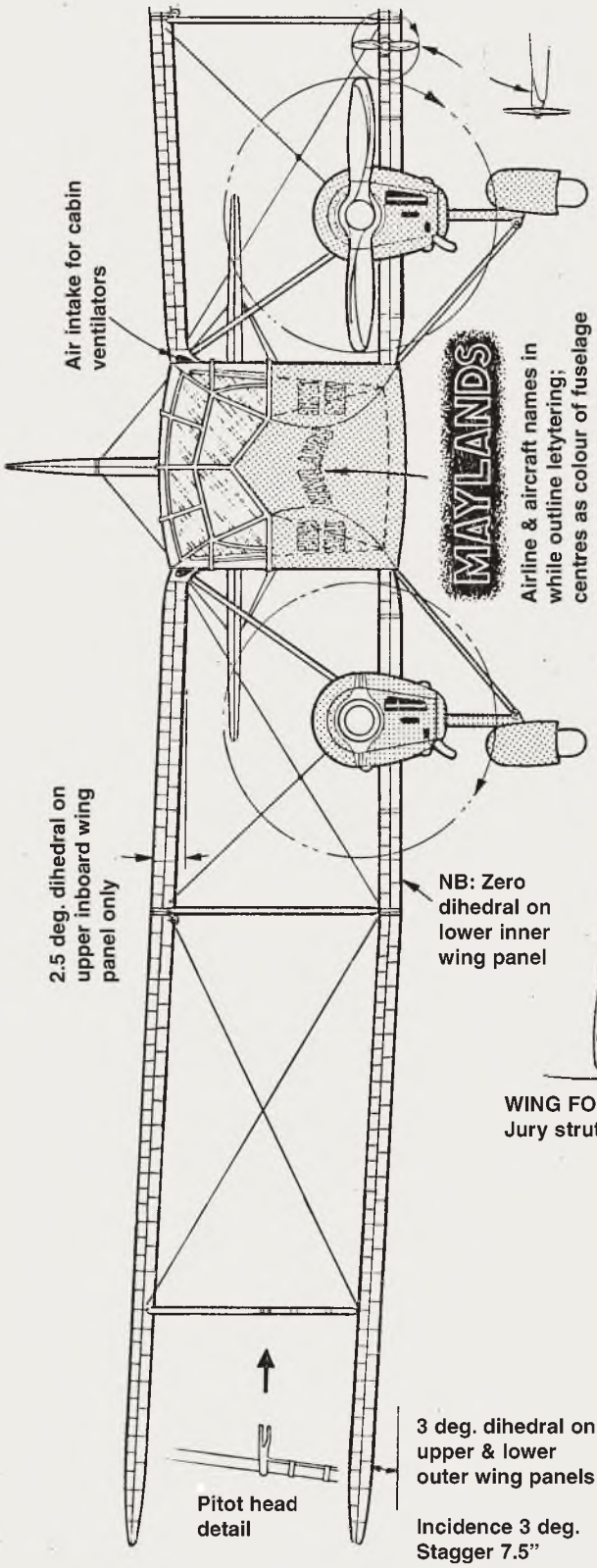
I still think it would be possible to use much smaller motors, all-built up wings and smaller LiPo battery pack, but the version on the plan works well enough for now!

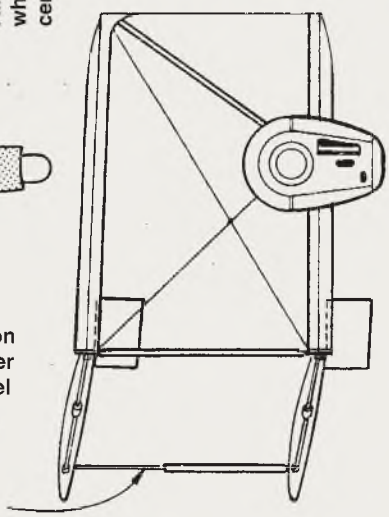
FLYING

The MFA motor, gearbox and prop combination provide tons of thrust and as long as your setting up is correct, the Dragon will ROG quickly and smoothly - my first flight being a bit of an anti climax - the aircraft just lifted off and flew round as if it had done so a million times before, just two clicks of right trim and she grooved round no bother. Landing was equally easy - I just lined up into wind, dropped the power to a trickle and she just creamed in with no hint of a nose over - fantastic. THE DRAGON HAS LANDED! ■

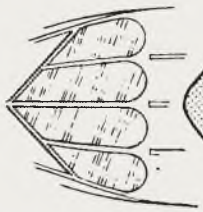
Purists may spot a slight deviation from the full-size wing planform to ease the build, but it's still a Dragon!

DE HAVILLAND DH 84 DRAGON

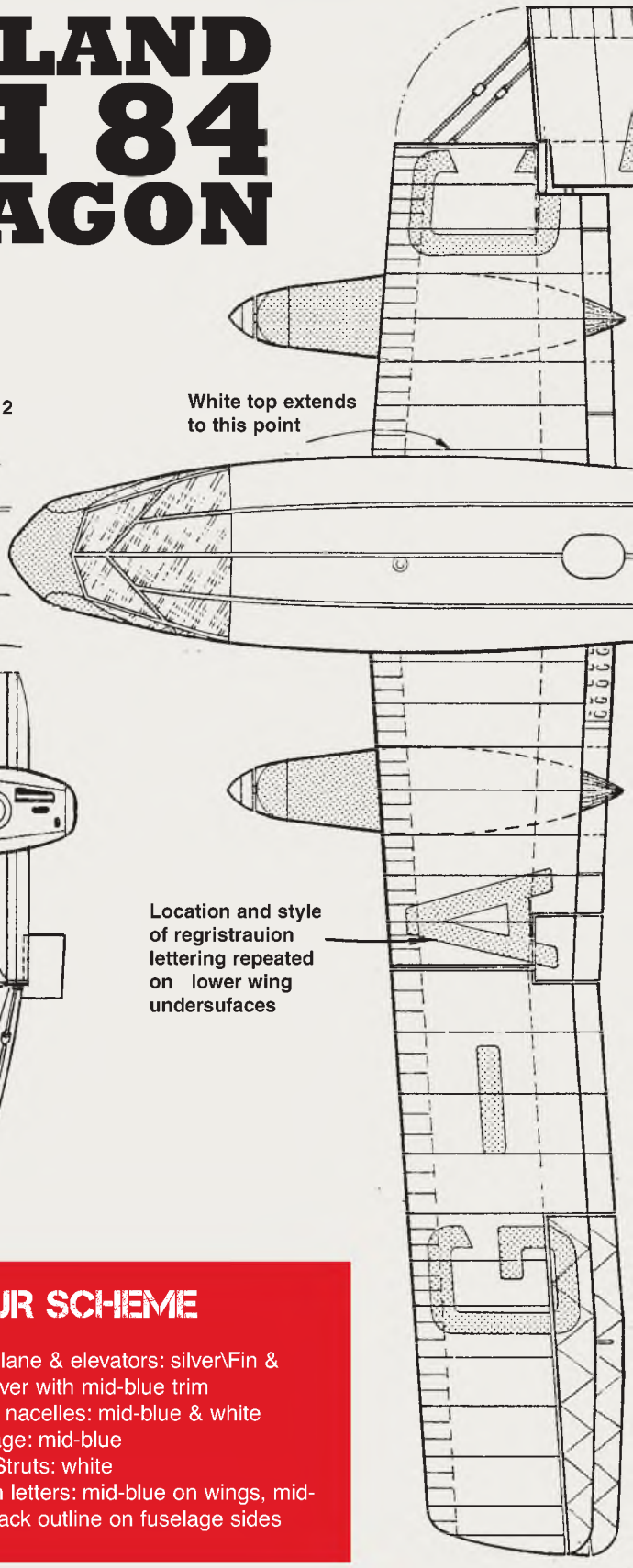




WING FOLD DETAIL:
Jury strut in position

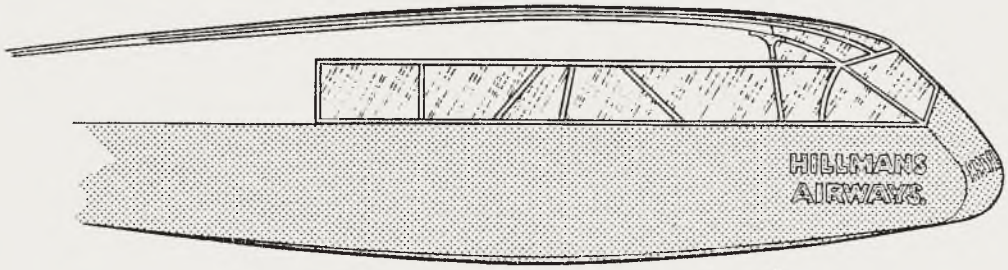


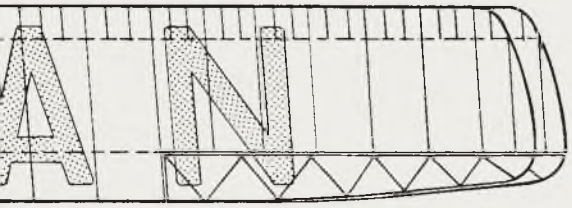
Detail of Dragon 2 cabin roof



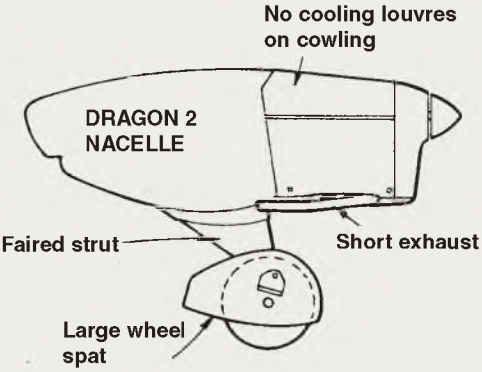
COLOUR SCHEME

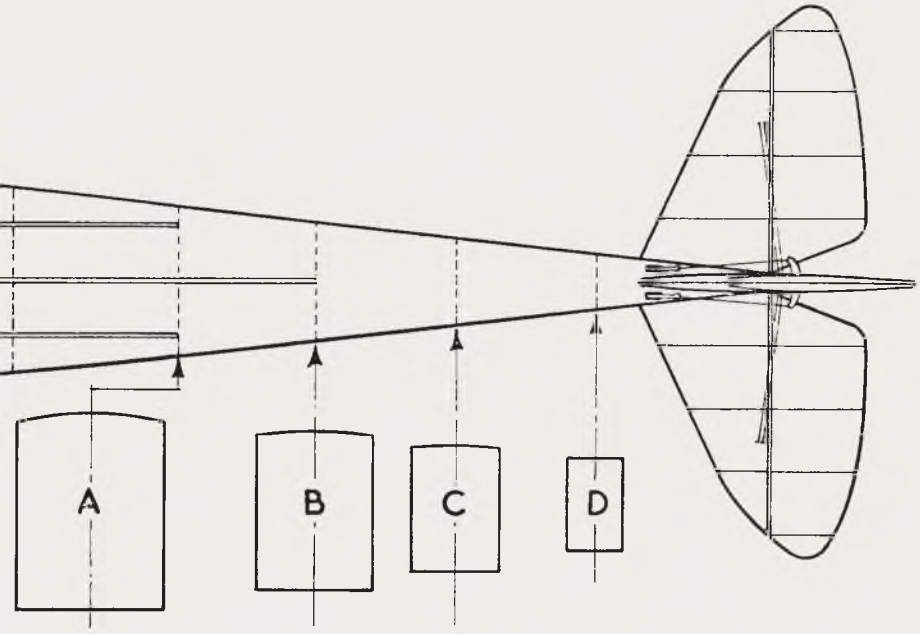
Wings, tailplane & elevators: silver\Fin & Rudder: silver with mid-blue trim
Fuselage & nacelles: mid-blue & white
Undercarriage: mid-blue
Interplane Struts: white
Registration letters: mid-blue on wings, mid-blue with black outline on fuselage sides

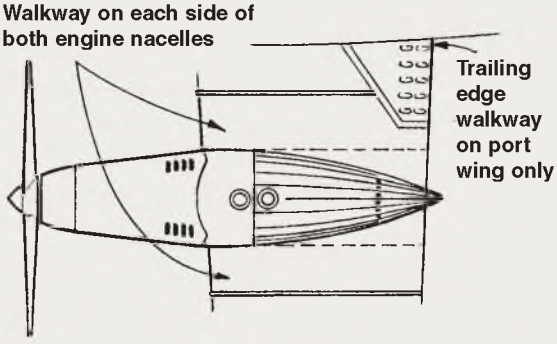


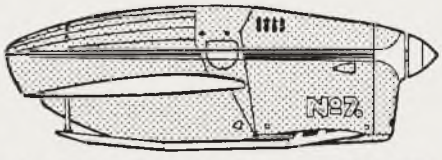


ENGINE NACELLE DETAIL

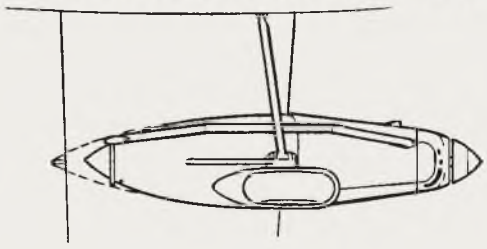




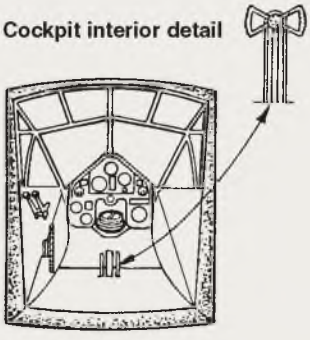


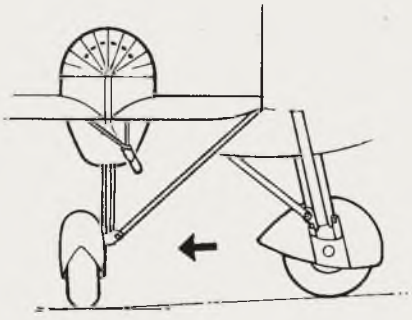


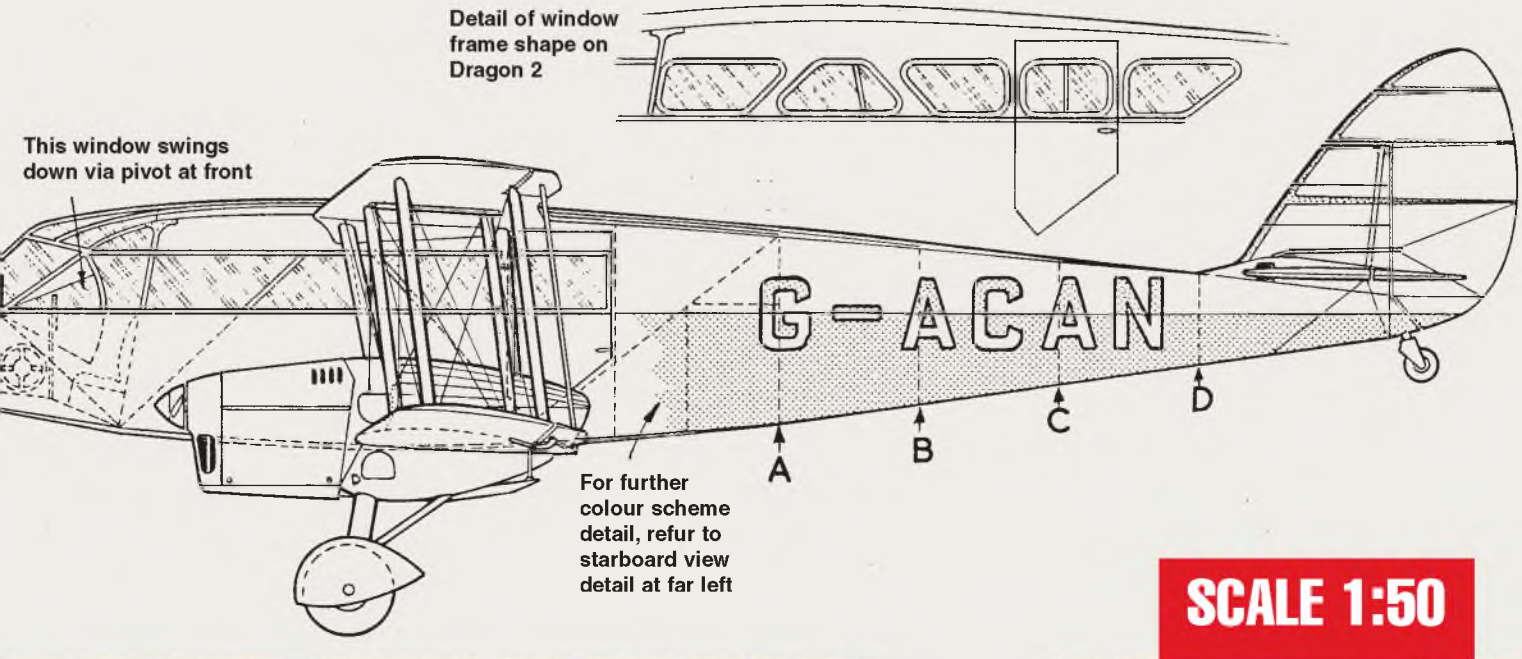
Fleet number outboard on cowling both sides



Cockpit interior detail







SCALE 1:50

Jersey Airways' D.H. Dragon 2 G-ACMO St. Ouen's Bay parked at Barton, Manchester in May 1934. In March 1938 this Dragon was shipped off to Australia where it became VH-ABK. *(E. J. Riding photograph).*

DE HAVILLAND DH 84 DRAGON

A MODEST WORKHORSE WHICH, IN ITS TIME PLAYED A SIGNIFICANT ROLE IN EXPANDING 'COMMUTER' AIR TRAVEL UN UK PRE-WW2

It is unusual that a single engine aircraft should spawn a larger twin-engine type. By the commencement of the 1930s, travel by air in the U.K. for commercial and personal purposes as a paying passenger was showing a modest demand capable supporting formal civilian air services, albeit at penny-number passenger levels.

One of the aircraft types purpose designed to serve that demand was De Havilland's single engine biplane DH 83 Fox Moth, that could carry four paying passengers in a fully enclosed cabin, while the pilot sat out in the breeze in an open cockpit above and behind in a sort of stage-coach driver's position!. The Fox Moth first appeared at the beginning of 1932 and proved commercially successful with a number of operators including Hillman Airways, where the forward thinking Edward Hillman urged De Havilland to take the bold step of creating a larger, twin engine type capable of carrying a larger passenger load - initially of six.

The result was the DH 84 Dragon, development of which was spurred on by an entirely different source when

D.H. 84 Dragon G-ACCV Seafarer was flown by Jim and Amy Mollison from Pendine Sands, South Wales to Bridgeport, Connecticut, USA in 39 hours in July 1933. The aircraft was wrecked and both pilot injured when the Dragon landed downwind, at night and parts of it were built into Dragon G-ACJM Seafarer II. *(Richard Riding Collection).*

the Iraqi Ministry of Defence requested a study for a twin engine aircraft - which eventually emerged as the DH 84M capable of carrying sixteen 20 lb bombs and armament consisting of two forward firing machine guns mounted in the nose and a mid-upper gun position at the rear.

Edward Hillman's objective had been to obtain a new aircraft type ideally suited to a new air route service he was planning for London (Romford)/Paris and what better way to inaugurate the new service on April 1st 1933, with a brand new modern aircraft type.

Hillman Airways had all four of their DH 84s ready for service when the new route commenced - at the princely sum of £3 10 shillings for a one-way journey, £5 10 shillings weekday return or £4 15 shillings for a weekend return trip. The commercial foresight paid off - the '84 proving superior to the Fox Moth in every respect, cruising at 109 mph, while consuming only 13 imperial gallon of fuel per hour. Encouraged by the success, Hillman ordered two more DH 84s and had all six converted to eight-seaters by dispensing with a dedicated luggage compartment - presumably there were carry-on facilities.

The Iraqis received their eight DH 84Ms on May 13th 1933. The whole delivery flight was made in formation, after which further examples of the military Dragon were supplied to other countries, Denmark taking two, Portugal three, the Irish Air Corps acquired one second hand and the Turkish Air force took three civilian Dragons which were then converted for military use.

SUCCESS BREEDS MORE SUCCESS

Throughout the 1933/34 period, De Havilland's Stagg Lane factory was more than busy fulfilling a flood of small-number orders for the DH 84, mainly from small British air service operators but also from overseas. Midland & Scottish Air Ferries Ltd took three to bolster two acquired second hand for a thrice-weekly Glasgow-Campbeltown-Islay service and twice weekly Glasgow-Campbeltown-Belfast run.

Northern & Scottish Airways served Campbeltown, Islay and the Outer Hebrides, eventually operating six Dragons, while Highland Airways Ltd progressively increased their DH 84 fleet to five, operating between Dyce and Orkney from May 1934, and then a London-Liverpool-Isle of Mann service from July, plus a regular British internal mail service.

Dragons were also delivered to overseas operators in Spain, India, Egypt, Kenya and Canada.

D.H. 84 Dragon 2 G-ADCR at Shoreham in August 1937 in the colours of Isle of Man Air Services Ltd, though owned by Blackpool & West Coast Air Services Ltd. It was lost in a crash during poor weather at St. Just, Land's End airport in July the following year. *(E. J. Riding photograph).*

IN PURSUIT OF RECORDS

DH 84 Dragons were used in two epic, if unsuccessful long-distance record attempts. As a saga of determination, that of the famous 1930s aviatrix Amy Johnson and her air-pioneer husband Jim Mollison takes some telling.

At a time when aviation records had greater significance, their objective was the absolute world long-distance record, then standing at 5,309 miles. To stretch that, a specially modified DH 84 was build for them involving airframe weight reduction, installation of vastly increased fuel tankage to provide a calculated still air range of 6,525 miles and a suitably strengthened main undercarriage. To take the 7,334 lbs weight.

The plan was to fly east from New York, USA, which thus requiring a ferry flight out from UK, so that on June 8th 1933 after a number of familiarisation flights, an overload of 450 gallons was loaded and the Mollisons lined up their Dragon at the

D.H. 84 Dragon 2 G-ADEE of Railway Air Services, seen here at Barton, Manchester in June 1935, was lost when it crashed high up Fairsnape Fell, Forrest of Bowland, near Garstang, Lancashire in October that year. *(E. J. Riding photograph).*

end of the Croydon airport take-off strip (in the pre-hard runway era) which had been specially extended beyond the normal airfield perimeter for the longest possible take-off run. The wheels struck a rut during the take-off run and the undercarriage collapsed.

Following repairs, the aircraft was taken to the long expanses of Pendine Sands in South Wales, scene of automobile record runs, where a take-off run of about three miles was possible. Here weather intervened, coupled with an unexpected high tide that threatened to swamp the aircraft, before volunteers manhandled the aircraft out of danger and the Mollisons thereafter flew their Dragon to the dry land safely of Cardiff airport, before returning to Pendine for a departure to New York of July 22nd. Landfall was made at Bar Harbour, Maine, before progressing with little remaining fuel, to a downwind landing at Bridgeport, Connecticut. The aircraft overturned, wrecking the aircraft after a flight duration of 39 hours, covering a distance of 3,300 miles at an average of 85 mph. Headwinds had clearly done for them and the Mollisons were seriously injured.

At this point in the saga, British philanthropist Lord Wakefield stepped in to provide a replacement Dragon with engines recovered from the original. Delivered to the launch point in Canada via sea, on October 3rd 1933, the new aircraft, fuelled with 608 gallons made two runs along the three-mile beach runway strip without lifting off. On the third run, the aircraft lifted just a few feet, refused to climb and flopped back heavily into the ground sustaining heavy damage.

At that point, the Mollisons abandoned the project, returning the aircraft to De Havillands for repair and disposal.

PASSING OF THE BATTON

Suitably repaired, the aircraft was sold to Captain J.R. Ayling and Leonard G. Reid who resurrected the record attempt also planning an eastward departure from Canada, from where, at Wassaga Beech, they managed to drag the Dragon into the air. En route over the Atlantic, carburettor icing was experienced and on making landfall over Ireland, the two aviators calculated that they had insufficient fuel remaining to break the existing record and so landed the aircraft at Heston, just outside London, after a flight of almost 31 hours.

Although the Distance Record was not exceeded, they had achieved the first not-stop flight from mainland Canada to England (Alcock & Brown had departed from Nova Scotia). Subsequently, the remaining fuel was carefully measured at 198 gallons - theoretically enough for the intended destination of Baghdad! Two days later, the intrepid two wrecked the aircraft beyond repair in a heavy landing.

D.H. Dragon I G-ACGU in the livery of Blackpool & West Coast Air Services and about to leave Squire's Gate, Blackpool in September 1933. It crashed and burned whilst taking off from Heston in July 1935. ***(E. J. Riding photograph).***

The original D.H. 84 Dragon EI-ABI was first registered G-ACPY to Olley Air Services but was sold to Aer Lingus in May 1936. It was presumed shot down by a German fighter off the Scilly Isles in June 1941. The Dragon featured here was originall Dragon 2 G-AECZ and was sold in Ireland in May 1950 and registered EI-AFK. It was later re-registered EI-ABI and named 'Iolar', representing the first aircraft operated by Aer Lingus, and is seen here flying over County Wexford in April 1986. ***(Richard Riding Collection).***

GENERAL CHARACTERISTICS

Crew: one, pilot
Capacity: 6-10 passengers
Length: 34 ft 6 in (10.52 m)
Wingspan: 47 ft 4 in (14.43 m)
Height: 10 ft 1 in (3.07 m)
Wing area: 376 ft² (34.9 m²)
Empty weight: 2,300 lb (1,045 kg)
Loaded weight: 4,200 lb (1,909 kg)
Powerplant: 2 x De Havilland Gipsy Major 1 4-cylinder air-cooled inverted inline, 130 hp (97 kW) each

PERFORMANCE

Maximum speed: 128 mph (111 knots, 206 km/h)
Cruise speed: 109 mph (95 knots, 167 km/h)
Range: 460 mi (400 nmi, 740 km)
Service ceiling: 12,500 ft (3,800 m)
Rate of climb: 612 ft/min (3.1 m/s)

DH 84 Dragon fuselage under construction at De Havilland's Stag Lane factory. Shop floor looks quite untidy and perhaps indicative of the short-run nature of production at any given time during the full four-year production period that generated 202 examples - just one per week.

BACK TO REALLITY

If record breaking was a colourful sideshow to the DH 84's intended purpose, the type continued to provide reliable service and as a consequence, achieve expanding popularity among air service operators. Newly formed Jersey Airways Ltd received its first example in December 1933, eventually taking on a fleet of eight Dragons, their service being developed to a point where all their aircraft would fly the Channel Island/Heston route in formation!

Railway Air Services started with a single Mk.1, to which were then added eight Mk.2 examples, flying a Birmingham-Bristol-Isle of Wight service. A number of Air Charter organisations also operated the type.

In all, the Dragon proved to be a reliable, economical and adaptable small-scale airliner that rewarded its operators with excellent service. One at least, was operated in Canada on floats and at least two were converted, in UK, for air ambulance duties.

DH 84 Dragon production was terminated at De Havilland's Hatfield factory in May 1937 to make way for the DH 89 Dragon Rapide. A total run of 202 examples finished with two military types for Portugal. The Dragon's story was nevertheless far from over as existing operators continued to make best use of what they had.

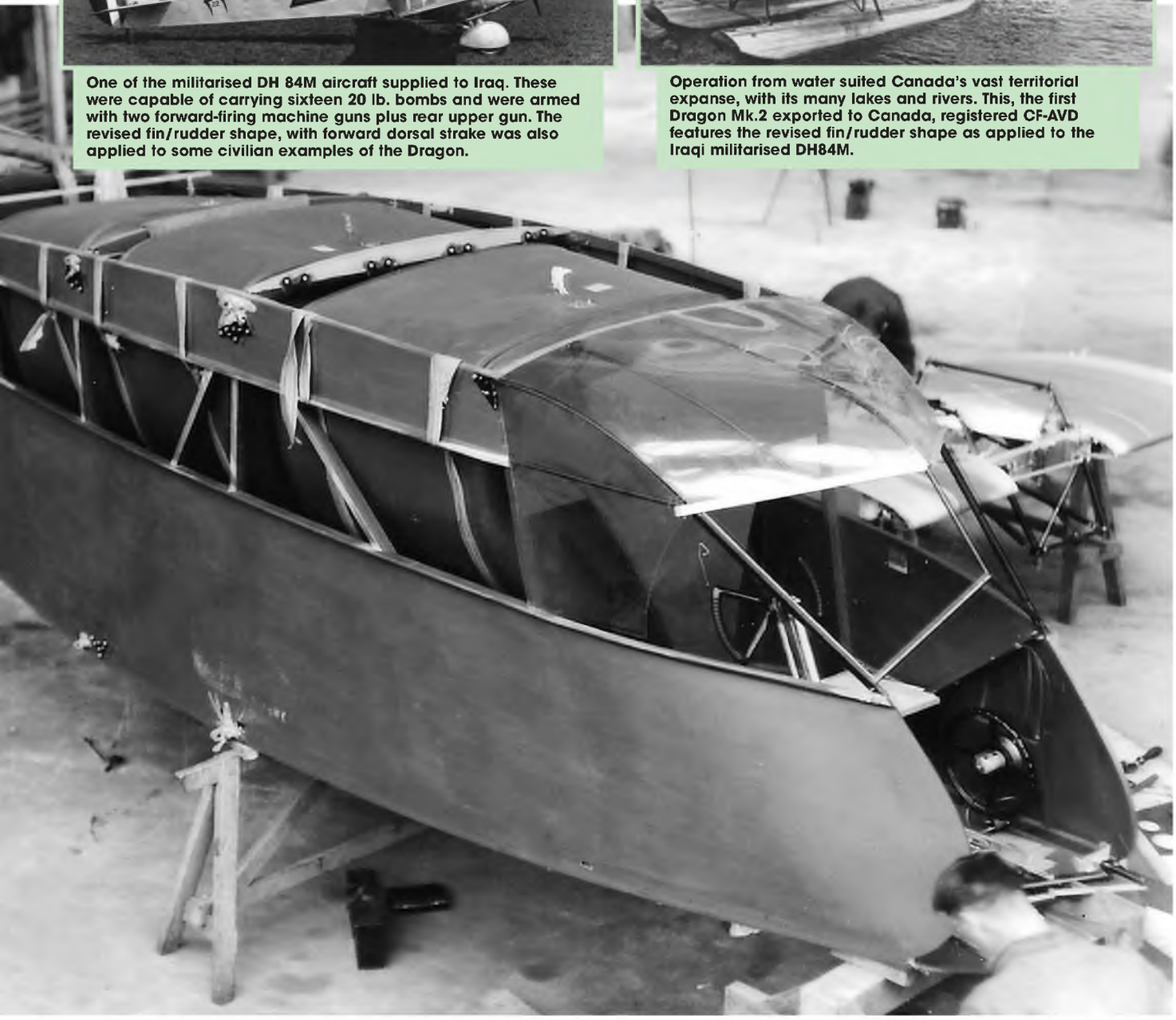
WARTIME CALL-UP

The commencement of WW2 in September 1939 quickly revealed an expanded need for all kinds of aircraft that the British armed forces simply did not have and among the civil aircraft of many types impressed into second-line non-combative service was the DH Dragon and in 1940 No.24 Squadron RAF received five civilian Dragons among a large fleet of miscellaneous transport aircraft.

The last of the five 'impressed' Dragons was operated until 1944, after which it was stored at No.5 Maintenance Unit at RAF Kemble, Wiltshire and then released for sale to Air Taxis Ltd in 1946. ■

One of the militarised DH 84M aircraft supplied to Iraq. These were capable of carrying sixteen 20 lb. bombs and were armed with two forward-firing machine guns plus rear upper gun. The revised fin/rudder shape, with forward dorsal strake was also applied to some civilian examples of the Dragon.

Operation from water suited Canada's vast territorial expanse, with its many lakes and rivers. This, the first Dragon Mk.2 exported to Canada, registered CF-AVD features the revised fin/rudder shape as applied to the Iraqi militarised DH84M.



BEYOND THIS POINT, TH

The DH 84 was by no means the end of the de Havilland biplane airliner story. Here are examples of the others that followed on from the first DRAGON

THINKING EVEN BIGGER! DH 86 EXPRESS

Having successfully launched the DH 84 twin, de Havilland went bolder still with the four-engine DH 86 EXPRESS, the prototype of which first flew in January 1934, powered by thene new 200 hp. de Havilland Gipsy Six in response to a demand from the Australian air line Quantas for an aircraft capable of serving a Brisbane-Singapore service. The DH 86 was more streamlined than its predecessor with finely tapered wings. For this new, long route the aircraft carried ten passengers, but when other airlines ordered examples to serve shorter routes, larger passenger complements were possible. A total of 62 production examples of three variants - DH 86, '86A and '86B were built.

BELOW: G-ACVZ crashed at Elsdorf near Cologne during th night of March 15/16 1937. INSET: DH 86A in Royal Air Force camouflage, having been impressed into military service soon after the commenecement of WW2

HERE BE other DRAGONS

LAST OF THE LINE: DH 90 DRAGONFLY

Smaller, sleeker and more streamlined, the DH 90 prototype first flew in August1935 and was structurally different from both the DH 84, '87 and '89, making use of a preformed wooden monocoque fuselage shell similar to the construction technique applied to the DH 88 Comet Racer and featured slightly swept-back wings. Expensive for its time, with a price tag of £2,600, it was intended as a luxury touring aircraft for four passengers and was very much the Exucutive aircraft of its period, but was also ordered by Commercial operations. A total of 57 were built from 1936 and 1938 and 23 examples were impressed into military service during WW2 of which six survived to be returned to the civil register. Silver City Airways, which pioneered scheduled car & passenger drive-on/drive off car ferry flights to Europe, used one as an executive transport from 1950. Seven DH 90 airframes built by de Havilland in UK were shipped to Canada and assembled there by de Havilland Canada serving with Commercial companies and two with the Royal Canadian Air Force.

Today, there are two survivors, DH 90A serial ZK-AYR in New Zealand which was originall of the UK register as G-AEDT, while, CR-AAB, also a '90A, started its working life in Angola in 1937 before moving to South Africa as ZS-CTR, before returning to UK in1979 as G-AEDU It then went to USA as N190DH in 1983, before reverting to UK in 1992 , reverting to G-AEDU.

Much re-registered G-AEDU now does the rounds of UK air shows.

G-AEWZ was operated by Silver City Airways for executive transport post WW2.

G-AEDT evenyually went to New Zealand as ZK-AYR.

THE ONE WE KNOW BEST: DH 89 DRAGON RAPIDE

We know it best perhaps because it was the most numerous - 731 built in all versions and not surprisingly the most numerous survivor. Design of the 'Rapide' began in late 1933 as a faster, more comfortable successor to the DH 84, but using the same basic airframe construction technique. Pre-WW2, 205 were supplied to airlines and other commercial operators, including Hillman Airways, which had started the ball rolling with the DH 84 and was first to take delivery. Railway Air Services was another prominent operator with a fleet for routes that linked London with northern England, Scotland and Northern Ireland.

'Cloak-and-Dagger' stuff involved one DH 89 when, in July 1936, two British MI6 agents flew Francisco Franco from the Canary Islands in Rapide G-ACYR to Spanish Morocco at the start of the military rebellion that pressaged the Spanish Civil War. This aircraft is on public display at the Museum del Aire in Madrid.

At the start of World War II, many Rapides were impressed into British armed forces service under the name 'Dominie'. A further 500 were built specifically for military purposes, powered by improved Gipsy Queen engines, and used mainly used by the R.A.F and Royal Navy for radio and navigation training. Economical to operate, post WW2, the DH 89 continued to provide service for military and civillian operators and today there more than sufficient survivors to regularly please aviation enthusiasts at the Summer air shows.

Manufactured to military specification in 1943, and used during WW2 for radio and navigation training, this DH 89A now earns its keep on pleasure flights at air shows.

This DH 89A built to military spec. in 1941 was transferred to civil register after WW2. Chequered history and ownership, it is now based at Duxford in Scottish Aviation colours and is a regular air show attendant.

British European Airways (B.E.A.) used the Rapide on their Scottish islands service post WW2. This one is another example that began service life with the military.

JR'S XG11

PART 2: XBUS, WHAT IS IT AND WHAT CAN IT OFFER?

REVIEWED BY IAN TITCHELL

Last time we looked at JR's 11XG when I reviewed it primarily as a 'normal' radio in as much that I glossed over it's XBus feature. This month we are going to look in more detail at what XBus is, how it works and why I think it's such a useful feature. It's fair to point out that several other manufacturers offer their own 'Bus' systems. I found that JR offered a lot of the key supporting items at reasonable prices, which made me a lot more interested in using the system. The XBus system is clearly something they are looking to develop in future.

As I said last time, I highly rate the XG11 radio as it is comfortable to hold and provides a very secure radio link. For me the icing on the cake on what is a very capable radio, is the XBus feature that is a welcome extra and one, which means that I can set up models that would previously have needed extra channels or multiple Y-leads or match boxes.

Since the XBus system allows more versatility in setting up models, it goes a long way to obviating the need to upgrade to an even more expensive radio like the Flagship JR 28X. That's not to say that the higher end radio isn't attractive, it's just that you don't need it quite so urgently!

Why would you need XBus?

Let's start at the beginning. I apologise if you are after a long detailed technical bit because I want to focus on what it does rather than the minutiae of how it works. If you consider a conventional radio with say 11 channels and use an 11 channel receiver, you will be fairly familiar with the idea that you plug one servo into each channel.

If you want to connect two servos to a single surface you have two basic options. Firstly you could use a Y-lead and split the output from a single channel and drive two servos from the single channel. The downside with this is that you can't fine-tune each individual servo (unless you have programmable servos or you use a Multibox). If you are using high power digital servos and they aren't perfectly aligned, they will fight each other, which will potentially damage them and will certainly cause a higher current draw than you want.

In such a case you might chose to use the second approach and assign each servo to a separate channel. This will give you the ability to fine tune them to eliminate the slight mismatch in neutral points and travel. This would be my preferred route provided that I had sufficient free channels to do it. However as models get larger and more complex, I have run out of spare channels on occasion and that means I need to either use a 'smart' Y-lead like JRs matchbox which allows you to fine tune the travel of two or more servos on a single channel, or I need to upgrade the radio to one with more channels. The trouble is, that can become costly especially as you start to get towards the more specialist high end of the spectrum.

An 11 channel DMSS receiver which isn't XBus enabled and hence you can only use 11 channels with no possibility of expansion.

JR RG031BX is a minute receiver but can cope with at least 28 channels and 112 servos. However there are no servo ports!

Here we can see quite clearly the absence of servo ports on the smaller receiver (satellites not shown for clarity). This receiver can cope with more channels than its larger brother!

The RG731BX looks like a traditional 7 channel receiver apart from the extra port marked XBus. This port allows the receiver to receive more channels, up to the maximum your radio is capable of transmitting In addition each of these channels can be split into 4 sub channels with control of servo travel and rotation etc.

Another issue you need to consider is the complexity of the wiring cables. The more servos you have, the more wires you need to run through the airframe to support them with the current system.

What would be nice would be a system that allows you to run multiple servos on a control surface from a single channel and to be able to fine-tune them without needing to buy matchboxes or similar devices. These can start to add to the cost and weight of the model if you aren't careful. If you could add to the ability to run multiple servos off a single channel with a means of simplifying the wiring of the model at the same time, that would be great. And that is exactly what the XBus system enables you to do.

What does XBus offer?

JR's XBus allows you to independently adjust up to four servos on a given channel without adding matchboxes. To my mind that is like having a radio with a lot more channels, so there's no need to upgrade your transmitter for the sake of adding a few extra servos to a control surface. You can run up to 44 servos and independently set their direction of rotation, neutral-point and end-points, all on JR's XG11, which is an 11 channel radio.

The other thing is that by being able to run four servos on a given channel, you have free channels that would otherwise have been assigned to control these servos. These channels could obviously perform another function; not only that, but you won't need to use up the free mixers to link separate channels, so that gives you even more flexibility. Additionally, the way the bus system works you can achieve this without having to run loads of cables everywhere in the model.

So what is XBus?

Basically XBus is a slightly different method of linking servos to the receiver. In order to see how it works, it's worth recapping on how a conventional radio is linked to the servos. All you really need to know is that the servo output in the receiver is supplied by its relevant signal and that's then fed down the servo lead to drive the servo. The information from the transmitter is received and converted, within the receiver, to a signal that is fed directly to the port for the servo channel.

Basically the servos are controlled by a method called Pulse Width Modulation or PWM for short. To be honest the only thing you need to take away from this is that the command for individual servos are fed down particular wires from the receiver. Traditionally we simply plug the servo leads in the appropriate ports and the job is done. Some radios allow you to alter the channel assignment, but it still works in the same way.

This method is tried and trusted and works. For simple models it is perfectly adequate but as I said, when models start to get larger and more complex, the wiring can get quite complicated etc. JR has announced a 28 channel transmitter. Just imagine using all 28 channels - the wiring would be quite involved with at least 28 servo leads coming out of a conventional style receiver.

This is where XBus comes in. Instead of using a receiver fitted with an internal decoder and having the associated port with a separate signal wire to each servo, the XBus system can pass all the servo commands down a single wire. This wire or 'Bus' can then be tapped in at various points to feed servos. The difference is most striking if you compare a 14 channel conventional receiver with an XBus Infinity receiver, which simply doesn't have any conventional servo ports. The infinity receiver is capable of running at least 28 channels and possibly more. Obviously you can only control as many channels as your transmitter provides, but one immediate benefit is obvious if you fully

ABOVE LEFT: The XPort Duo has 14 PWM (conventional) servo ports. However you can assign these as you wish. In addition it offers one heavy duty hub and two standard XBus outputs to allow even more servos to be controlled. This would be an ideal candidate for retrofitting DMSS into a pre-existing model without having to replace all the wiring and servos.
ABOVE RIGHT: A closer look at the ports of the XPort Duo. If you want to build in lots of redundancy for an expensive model then multiple receivers and batteries are catered for.

embrace XBus. The receivers are going to cope with an upgrade in your transmitter in terms of channel numbers!

One immediate benefit I can see is that for a wing using four servos is that you could install an XBus four-channel decoder which looks like a conventional Y-lead, except that it splits into four rather than two. This could be housed in the wing and to connect the four servos to the receiver now, all you need to do is plug in one wire instead of four. You would still have individual control of all four servos.

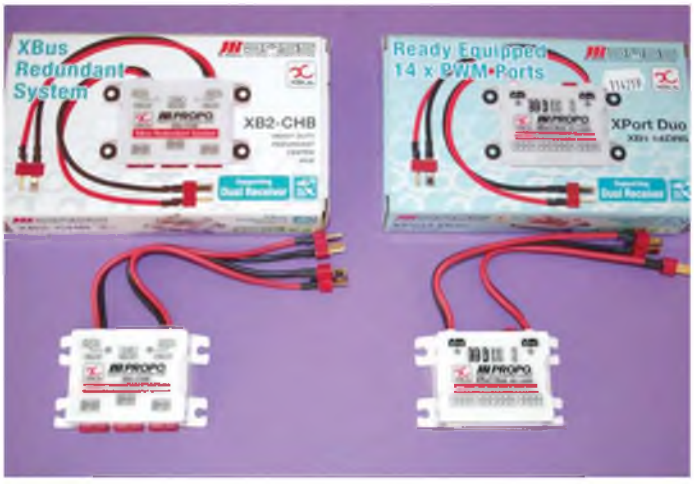
Connecting things up!

Basically the XBus system comprises four parts, the transmitter to send the appropriate commands, the receiver, the wiring and the servos. The XG11 transmitter has all the programming to cope with XBus and if your radio does not have the software, it can simply be downloaded and installed.

However, from here on things get complicated to write about as there are many possible options you could adopt. To make things harder for writers, there are hybrid receivers that have both conventional and XBus functions built into them. Obviously since we are talking about using XBus, we need a receiver with the XBus facility and I have included pictures of some of the options. Let's not worry about the conventional side of the receiver, as it works the same way as normal.

Once we have an XBus output on the receiver, we can utilise all the channels on our radio even if the receiver looks like a seven channel conventional output example, such as the RG731BX that has seven integrated channel ports for conventional PWM servos. However it also has the XBus facility and this allows you to operate a lot more channels via the XBus system. You can use it as a seven channel receiver with conventional servos and ignore the XBus facility if you don't need it. But supposing you want to run eight or nine channels, you could simply replace the receiver with another one with a higher channel count. Alternatively you could simply embrace the XBus features and add

This is a combo I will be using to put a DMSS system into an existing model with minimum changes.



There are two type of Heavy duty hub the XPort Duo and the XB2-CHB.

The XB2 uses XBus to distribute the wiring and simplifies wiring in complex models with less cables needing to run from the receiver.

A handy device! The channel programmer allows you to set up XBus identies with minimum fuss.

XB1-HB5 This is a 5 channel hub with a battery socket for power input. It is deceptive. You can run up to five x bus devices from this hub. Note that there is only one wire which needs to feed back to the receiver or wiring harness.

the two extra channels simply by using the appropriate XBus items.

In this example there are two routes you could go depending what servos you have. If you have some 'normal' PWM servos (analogue or digital) and you want to use them, you need to find a method of translating the XBus command from the receiver to the servo. The easiest route is to use a converter cable. This simply needs to be set up to translate the XBus command for the channel you want use, to the servo plugged into the convertor cable.

The second option is to use XBus servos and these simply need to be set up to recognise what they are being assigned to, such as elevator servo or rudder servo. These are simply plugged directly into an XBus hub, i.e. into the XBus cable somewhere in the model. The XBus hub can simply be thought of as a Y-lead type socket. However it's slightly more than that because the signal wire in the XBus system carries the commands for all the channels.

So what is XBus Part 2!

Okay I have said it; the primary thing about XBus is that the one signal wire now carries the signal for every servo. In order for an individual servo to respond to commands intended for it to do something, it must be able to recognise its own specific command. Clearly the servo needs to know two things; what that command is and what it's being commanded to do.

XBus uses a separate address for each servo and this address is assigned either via the radio or by using the XB1-CPG. This provides the simplest way to carry it out by wire. It allows you to set up the individual 'ID' for each Servos or XBus converter output. Once the servo recognises its command, it will respond as normal.

XBus servos

There are a few XBus servos available at the moment and these are interesting as they function as conventional servos and will auto-detect a PWM signal and work as normal servos. However they also feature XBus signal recognition and can be programmed with their ID when they can be plugged into an XBus cable.

To be honest, as the range develops, I can see myself buying only XBus servos for future use as these give more options. I rather suspect that in the coming years there will be a migration towards this type of servo becoming the standard type. Obviously as the numbers sold increase, the price should fall due to the economic benefits of ever increasing mass production.

Using XBus with high power servos

lif you start to use high power servos, the current demand in the system goes up and your power supply needs to be adequate. If all the servos are feeding off a single cable from the receiver, then clearly you wouldn't expect all the power for the system to be fed down that single cable from the receiver. That's where the different types of 'Hub' come in. These are basically there to split the wiring up and to feed appropriate batteries into the system.

Some ideas for using XBus

The good thing about XBus enabled radios is that you don't have to use it if you don't need it. However let's look at a model I am currently planning to build. This is a Dassault Mirage 2000 which features elevons. The full size aircraft features split elevons with two separate control surfaces on each wing. This is a good feature to copy on a gas turbine model because it provides a degree of redundancy in the system if a servo or linkage fails. With one elevon only per wing, you would lose control so splitting the surface as per the full size is clearly a better bet.

I started to look at doing this on the XG11 without using XBus and found that if I wanted to use two channels on each wing to operate the servos, I needed to use a total of four channels for the elevons. In addition I needed to use up lots of mixes to mix the second channel in each wing to the aileron and elevator function. It can be done but it seemed a little cumbersome and left very few free

Okay servos don't look exciting however the XBus servos are interesting. They auto detect the incoming signal format and can work as normal PWM servo or can be programmed as XBUs devices having a unique identity which can pick out its own commands form anywhere in a XBus system.

Hard to spot but here one servo is in a PWM elevator port and the second is in the XBUS port in this case it could be configured as perhaps a second elevator servo or anything else you wanted. This is perhaps the simplest set up and allows an extra servo to be added with independent control to a "7 channel" receiver. In other words you have to think about XBus receivers slightly differently as they have more capability than the number of conventional servo ports would suggest.

This harness allows four channels to be picked up and decoded for conventional servos. This would simplify many wing connections as there is only one connection to make to enable four servos.

A similar decoded but for a single servo. You don't have to buy XBus servos to benefit from some XBus features.

For high voltage setup these regulators will allow a low voltage servo to be plugged into the system without risking damaging the servo or other electronic device like a turbine ECU.

For heady duty applications there are heavy duty harnesses with separate power lines.

A typical jet model with an 11 channel reciver with all the servo ports filled and lots of cabling to run out through the model. Just imagine how much wiring would emerge from a 28 channel receiver?

mixes for anything else I wanted to do.

I then tried an 18 channel radio and found that I had to use the same process of four channels and lots of mixes. Consequently I looked at using the XBus system in this role and could do it by using just the normal elevon route as I was able to define two left elevon servos and two right aileron servos, each pair driven by a single channel. The point is that with XBus, I was able to fine tune the position of each servo. Better yet, there was no need to use any of the free mixers in the radio, so it freed up a lot of the radio capability to cope with other things I wanted to do.

I could have gone the Multibox route and brought two Multiboxes, one for each wing. This would have allowed me to achieve the same goal. However the point is that the radio already provides a better facility and all you need is the appropriate adaptor, or better yet - if you use XBus servo then you only need the XBus hub. This simplifies and lightens the model.

I then thought about an YT Hawker Hurricane I am about to refinish. This has four servos in the wing. I like to reduce the odds of making an incorrect connection and usually solder on multi-pin connectors. However I realised that by using XBus to carry the signals to the wings it is possible to reduce the wing connection to a single cable. The idea is that you use XBus to carry the signals into the wing then split the signals to go to the four servos in the wing.

In fact, the more I thought about the possibilities of XBus, the more uses I could see for it. The maximum benefit comes if you use XBus servos but even if you don't, you can still make life a lot easier for yourself. If you wanted to fly a large model with multiple servos on single surfaces then the XBus system is a very neat solution.

Conclusions

In this review I have tried to de-mystify the XBus system and illustrate that it's really a slightly different method of wiring up servos. I expect you can detect that I am thoroughly sold on XBus. I won't use it on simple models as its not needed, but as soon as you start moving to models where the servo count rises and featuring lots of wiring, then it is worth looking at. ■

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Perfect Pilots

Wendy Norman explains her approach to a custom service for cockpit occupants, from Pontius onwards...

Most modellers would agree that a scale model needs a pilot in the 'office' to make it come alive! This was certainly true for our 1/4 scale Tiger Moth. It had taken many years of dedicated building and we needed a scale pilot with just the right look to occupy the cockpit AND complete the picture.

Unable to find an example suited to the job, I decided to make our pilot myself. Unbeknown to me at the time, this was the start of *Perfect-Pilots*. Looking back at those early days, I realise how much I have learned about so many diverse subjects including human anatomy, plastic and acrylic resins and the details of the aircraft and their sometimes eccentric pilots!

Perfect-Pilots is still small, so that I can provide a personal service that is so important to me. All the products in my growing product range are hand made by me, right here in Kent, and I enjoy working with scale R/C modellers to help them make their models come alive. I especially enjoy the challenge of a special or unusual commission, which is a regular occurrance. This is the story of one such project.

Commission and research

It all started at Gaydon Large Model Aircraft show 2014 where I had a stand displaying a range of my pilots, harnesses and other accessories. Claude approached me and asked if I would be interested in making a pilot for his current project - a 1/4 scale model of the American microlight style RLU-1 'Breezy.' A short discussion followed and Claude

It's all in the eyes. Wendy painting a set of 1/4 scale eyes.

RIGHT: 'Cut and Shut' - a standard torso with a shortened version on the right.

Quarter scale Carl Unger ready for action. 'Breezy' is the right name for the aircraft with the pilot fully exposed to the elements!

A shed full of body parts - Wendy with some of her pilot bodies.

promised to be in touch.

A few days later a letter dropped through my door. This contained more details of the aircraft, the pilot and a dimensioned sketch of the seat and essential dimensions of the pilot. One of the photos demonstrated the importance of getting the pilot to look 'just right' - he would be completely exposed!

As usual, I started researching the aircraft and the pilot. I really enjoy this part of the process. Most of my special commissions are based on specific individuals, flying specific aircraft. For example, I modelled a 1960s jet pilot based on personal period photos of my customer sitting in his DH Vampire - no pressure there then!

The full size Breezy was designed and built by Carl Unger, together with Charles Roloff and Robert Liposky. It first flew at the annual Experimental Aircraft Association (EAA) Fly-In at Oshkosh, Wisconsin, in 1965 where it was described as one of the most unusual and distinctive home built designs. The 'no cockpit' parasol wing pusher configuration was designed to seat the pilot and passenger with a maximum unobstructed view - it also makes the 1/4 scale Carl Unger totally exposed. This meant it was important to include as much extra scale detail as I could.

The provided dimensions made it apparent that I would have to shorten my 'standard' 1/4 scale pilot to suit the Breezy. This is not a problem thanks to the materials I use. Although based on standardised moulded body parts (torso, legs, arms etc.), I am able to shorten or lengthen the scale pilots to suit specific aircraft. This is far easier in enclosed cockpits, however, as it is not easy to see the full pilot figure. For the Breezy I had to be extra careful to retain lifelike proportions!

I normally work hard to keep my model pilots as light as possible but I know that builders of models of aircraft like the Breezy often battle to get enough weight up front to achieve the required fore/aft balance (CG). This is particularly difficult when the airframe is an open tubular construction with no obvious locations for ballast! I therefore contacted Claude and discussed whether it would help if Carl weighed more than my standard pilots. We discussed various options and settled on adding the battery pack into the small of Carl's back. All my pilots have this cavity - originally designed to house a servo to move the head - but it has also been used to hold lead ballast. In extreme cases I could make the torso from much heavier materials, doubling or even trebling the weight of the pilot!

Scale seamstress.

With those details settled, I could concentrate on Carl's unique outfit! Claude wanted Carl dressed exactly like the photos of him and the original Breezy now displayed in the Oshkosh EAA AirVenture Museum, also at Oshkosh, Wisconsin.

Carl's outfit comprised:

- Black trousers and black shoes
- Red waistcoat - with scale detail in form of buttons, pockets and chain
- White shirt with black tie
- Goggles (teardrop shape) with silver frames and beige leather surround - worn on top of the head or over the eyes
- Peaked cap worn back to front

With these details agreed I worked up a price and confirmed to Claude that I could make his 1/4 scale Carl. Claude agreed and so the next

Pilot Roscoe with pet lion Gilmore, wearing his parachute and harness.

ABOVE LEFT: Accurate measurement of the acrylic resin is critical. ABOVE RIGHT: Raw materials for making the waistcoat pattern.

phase of the commission started - turning my 'standard' pilot - into a 1/4 scale Carl Unger.

Preparation

All my pilots are based on a number of standard component parts. I make all the original parts by hand, carefully measuring and following guidebooks intended for sculptors and artists. I use sculpting clay to make the originals and this, typically, takes a while as I work to get just the right look. This is so that I can be sure that the pilots are correctly proportioned.

Once I have the original, I make a two or three part silicone mould of it so that I can produce replicas. I use four distinct processes and types of mould for the four different materials I use for each pilot figure.

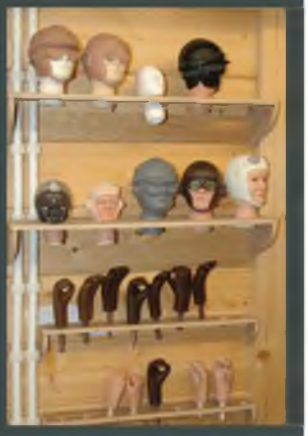
Construction starts

The torsos are made from a rigid lightweight foam (a flexible version is also available for those curved glider seats). This foam is easy to cut using a razor saw - or even a breadknife - so I pushed it through my band-saw to remove a horizontal slice to reduce Carl's height. I then simply glued the two parts together.

The standard arms and legs are made from a flexible lightweight foam that makes it easy to fit my pilots into most cockpits. This flexibility also makes it possible to attach the limbs to flight controls of models and have them move in a realistic way! The limbs can also be shortened for specific purposes but this was not necessary for Carl, so I cast a standard set.

Hands and feet are cast from a rigid polyurethane foam. I have developed a range of bespoke additives that I use to vary the density of the finished components. These introduce air bubbles into the solid resin so I have to carefully balance the amount of additive to suit the needs of the customer. As weight was a bonus for Carl, I could use the casting material without additives.

The heads are different as they are hollow to save weight and to reduce the likelihood of the head drooping from excessive weight. I use a casting technique that allows this, but it is quite time consuming. For Carl, I used one of my range of standard quarter-scale civilian moulds to produce his head. My painting techniques allow me to represent most pilots from these basic heads.



Pilots in various stages of painting.

Wendy's painting desk.

This basic set of body parts was then dry assembled so that I could measure him for his bespoke clothing. I have patterns for the clothes I have made previously, but Carl presented two challenges - I had never made a waistcoat like this before and it is not an off-the-shelf item!

Quarter-Scale tailoring

It is no surprise that patterns for clothing to suit 1/4 scale pilots are not easily available so I design and make all my patterns. I work from reference photos and try to make the final article as realistic as possible. This can be a real challenge because not everything scales. For example, light coloured shirts at 1/4 normal thickness would be almost transparent! The seams and stitches, too, are not easy to reduce to scale sizes.

A large proportion of my pilots wear leather jackets. This too, initially at least, presented a problem but I am now able to source suitable leather. This very thin leather, intended for high quality formal gloves, is not cheap but looks far superior to the various artificial leathers I have tried.

Carl's black fabric trousers presented no problem. I made them to my standard pattern but left off the transparent map pocket some pilots have. I usually sew the trousers closed, but for Carl I made trousers with Velcro fastening. This will allow easy access to the body cavity for positioning the extra weight required. Additional scale detail was included in the formal white shirt - I added stitched cuffs and pleats to the sleeves.

Next came the black tie and for this, I cut a length of ribbon and stitched a simulated knot. The waistcoat was more of a challenge as I first had to design a pattern. I do this by drawing pattern pieces based on pictures of the garment. This involves much fiddling and adjustment to achieve a usable pattern. Once I was happy with it, I cut out the red fabric pieces and stitched together the double layer waistcoat.

The finishing touches really make the clothing look real. The buttons on the waistcoat are 3.5mm diameter and the links on the silver chain are only 1.8mm wide. I find I have to work in very bright light to work at these sizes! Carl wore a brown cap, back to front. To model this I, once again had to make a pattern using the same process as for the waistcoat.

Painting

I use artist acrylic paints for my pilots. These are quite durable but where the pilot is likely to become oily or exposed to fuel, I am able to apply a transparent satin fuel resistant coat as an option. Gloves, hands and shoes are relatively easy to paint but faces are the real challenge.

I start painting faces by first applying a thin base coat wash, this is a relatively dark reddish-brown. I wipe most of this off, but leave it in the wrinkles of the face. Once dry, I apply three to four coats of a bespoke skin tone mixture to suit the subject I am modelling, being careful not to cover the earlier wash in the wrinkles.

Some pilots, battle weary WW1 pilots for example, look better with a 'five o'clock shadow' and some dirt on their faces. I paint this on, but have to be very careful to keep it subtle, yet noticeable. I then mix up the required hair colour and apply

SUITING UP!

Work in progress - flights suits and Mae Wests

Work in progress - Mae West life jacket

Working in progress - harness fasteners.

PILOTS GALLERY!


Civilian or glider pilot


Early era pilot in leather coat and gaiters


German pilot sporting leather coat and leather gaiters


Jet pilot


Patty Wagstaff wearing her distinctive flightsuit


Pilot wearing Sidcot Suit


The Red Baron

sufficient coats to obtain uniform coverage over the hair area. This is followed by several coats of brushed 'streaks' of lighter colours - each lighter than the preceding one - to give the natural depth of hair.

When painting leather helmets I start with a black wash, ensuring it goes into the stitching and other detail on the helmet. When dry, this is followed by a solid black coat over the entire helmet. Two or three dry brushed brown coats are then applied to give a weathered leather look before the detail in the metal buckles, eyelets etc. is painted in a metallic colour to suit the subject.

I finish the heads by doing the fine detail of the eyes - and lipstick on the girls! It always amazes me how this makes the face 'come alive'. The iris of a quarter-scale eye is 3mm diameter and the pupil only 0.5 to 1mm so steady hands, very fine paintbrushes and a magnifying work-light are essential!

Assembly and despatch

After this, it is a matter of assembling the pilot and checking that everything is as it should be before photographing him for my portfolio. Most of my customers pay using *PayPal* so I then send an invoice - often accompanied by an email with a photo or two - before shipping the pilot to his new home.

About Perfect-Pilots

I started Perfect-Pilots about six years ago and have continued to increase my range of pilots and scale accessories. My pilots now fly an international fleet of aircraft, from Australia to Switzerland and the USA.

My current range includes fully

Pricing

Examples of pricing:
Fully moulded half body unpainted pilots from £12-00
Harnesses from £13-00
Full body articulated pilots dressed in leather/fabric clothing: 1/4 scale - from £115-00, 1/3 scale - from £145
Both 1/4 and 1/3 scale pilots are also available in partial/half body versions.
It is not possible to list prices for bespoke work, each pilot being made to the customer's specific needs, so please contact me for quotes and to discuss your requirements.

Delivery

As each bespoke pilot is hand made to order, it takes me approximately 4-6 weeks to complete. If a pilot is needed urgently, a shorter lead time may be possible. A customer in the USA asked me to make a pilot quickly for a newly completed 1/3 scale model, which he would be displaying at an upcoming show - an empty cockpit just wouldn't do! I managed to have his pilot ready in 10 days - a big challenge!
Delivery of fully moulded, unpainted items and accessories is usually just a couple of days.

One brown cap.

articulated, bespoke, 1/3 and 1/4 pilots in a variety of styles to suit most aircraft styles and ages of aviation. These include a number of female pilots and these have been used to represent Hanna Reitsch, Liesel Bach and Patty Wagstaff (complete with logos on her flight suit!). All of these can be supplied as full or partial body pilots.

I specialise in unusual commissions and am happy to make accessories for pilots. For example, I made a parachute to suit a warbird pilot of one of my customers. For another, I shortened a pilot supplied with an ARTF to make it fit the cockpit correctly - and then made a leather jacket to replace the shiny plastic one supplied in the kit. Possibly my most unusual commission was a 1/3 scale Roscoe Turner. Roscoe was a record-breaking, flamboyant American aviator who had a pet lion. The lion was named Gilmore, after Roscoe's sponsor, and used to fly with Roscoe in the Thompson Trophy air races. The rules stated that all passengers had to have a parachute and harness so I had to supply not only a scale Gilmore but also a scale harness and parachute for a lion!

I also have a range of fully-moulded pilots designed primarily for scale warbirds. These are available in half body versions at 1/4, 1/5 and 1/6 scale, and a full body 1/5 scale version. There are two styles of harness available in both 1/3 and 1/4 scale - a QS style and a general aviation unit that can be assembled as a lap belt or with shoulder straps. Most recently I have added scale goggles to my range and can supply these as a kit or ready painted.

My website - www.Perfect-Pilots.co.uk - carries details of my product range, and prices for accessories and optional extras. The 'standard' items (e.g. moulded pilots, harnesses, goggles etc.) can be ordered from the site. I am not able to accept online orders for the bespoke pilots because each is unique and made specifically for my customer. Consequently I am only able to quote once I fully understand what is needed.

I can be contacted by email on info@Perfect-Pilots.co.uk and am always happy to work with you to design and make that special pilot for your model. ■

Torso and limbs showing the different foams used.

Carl's face after the first wash. Note how it brings out the detail.

Eyes done!

Carl with the goggles pushed up.

SCALE FROM SCRATCH

WANT TO TAKE A STEP BEYOND KITS AND ARTFS? KEN SHEPPARD CONTINUES HIS SERIES TO ENCOURAGE OWN-DESIGN SCALE MODELS

PART 5 – AILERONS, FLAPS AND LINKAGES

The story so far...

If you've read the series so far, you'll know we've gone through the design stages of creating a WW2 fighter wing up to the point that we have to consider the construction of the moving surfaces - ailerons and flaps, plus designing the operating linkages/systems. I've already stated that for a .40 sized fighter, the added complexity of flaps isn't really necessary, or advisable, but these are perfectly feasible for - say - the next size up - a .60 powered design. In fact, the prototype that I have chosen to accompany this series is, as you might remember, a .60 sized Dornier Do335 'Arrow' twin (pull you - push me), and I plan to use a RCV 58CD four-stroke up front, with a 60-sized outrunner electric motor at the rear.

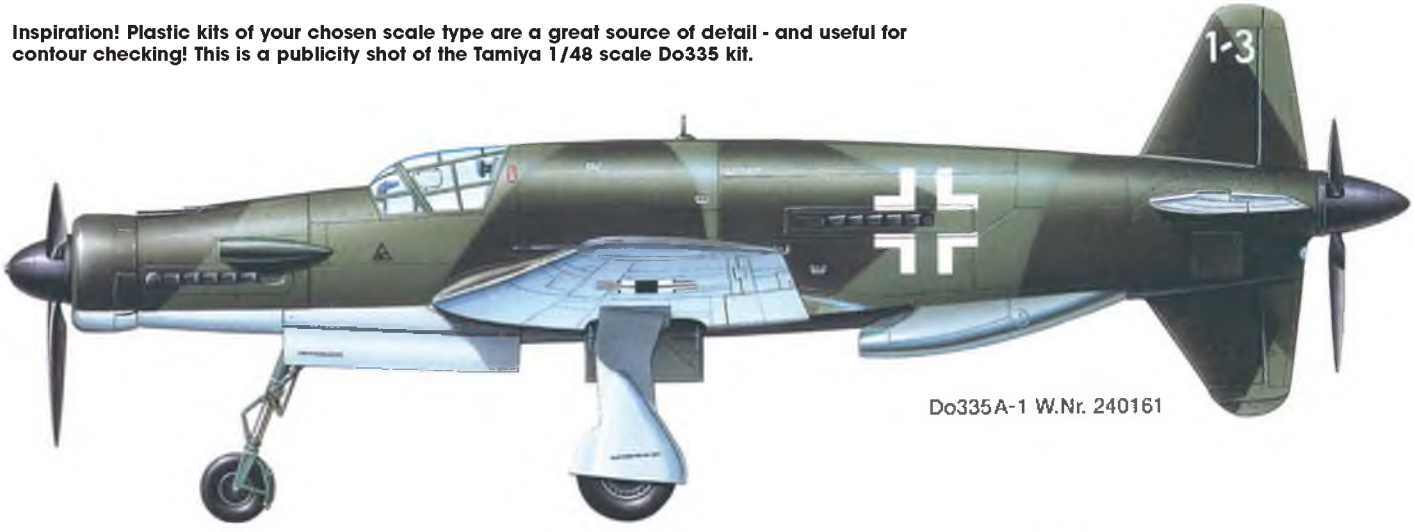
Due to the available power and the expected top speed, I thought that flaps would, in this case, be advisable and so have included them in the design. The photos in this section show one of the Do335 wing panels during the stages of construction described to date.

Aileron assembly

Consider the construction of the full-size aileron fitted to the aircraft you are modelling. A lot of early WW2 fighters had ailerons that were metal framed , but

The author's latest O/D project – more conventional than usual, but a rewarding build. A 1/4 scale Fokker EV, 120 four-stroke powered.

Inspiration! Plastic kits of your chosen scale type are a great source of detail - and useful for contour checking! This is a publicity shot of the Tamiya 1/48 scale Do335 kit.



covered in doped fabric. Some were ply skinned and some aluminium sheet clad. For a .40 size model, this is somewhat unimportant, as the easiest way to produce the aileron is to cut it from sheet balsa and carve/sand it to match the wing section.

On a bigger scale aircraft, the options increase. For fabric-covered ailerons, the favourite method is to use a thin sheet balsa core and build up a leading edge and ribs, using strip balsa, the covering with film or fabric then produces a realistic surface appearance **(fig.1)**. You can, even on a large model, still use solid balsa (laminated from 1/4" sheet), covered in film or fabric and the ribs simulated by 'weathering' the surface with coloured chalks, or careful airbrushing to simulate the ribs.

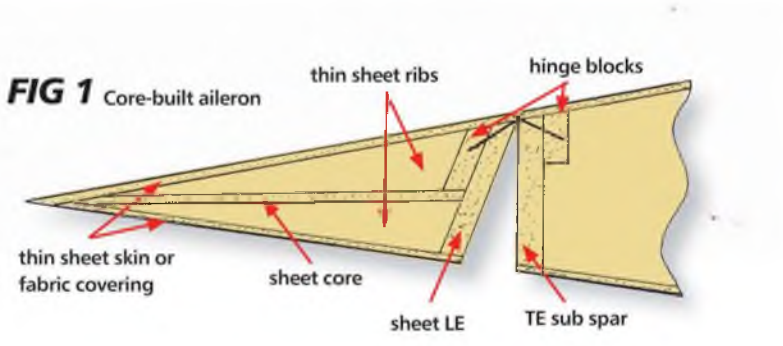
For metal or ply-sheeted ailerons, simply omit the weathering! Alternatively, use the core method as before, but instead of fabric, cover with thin (1/32") balsa sheet, after fitting the necessary hard points - hinge blocks and control horn mounting plates.

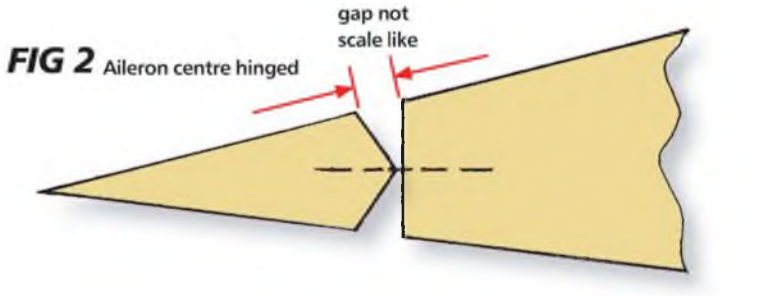
One thing that is necessary, however you choose to build the ailerons, is to top-hinge them. A centreline hinge, with the aileron leading edge bevelled above and below the hinge line just doesn't look right, even on a .40 size model **(fig.2)**. A top hinged aileron is more likely to be scale-like, whilst being more aerodynamically efficient as well **(fig.3)**. For both .40 and .60 sized models, using the film covering as the hinge material, the aileron/wing gap is also sealed, giving the most efficient aerodynamics. If however, you opt for the more traditional hinge fittings, top-mounting is not difficult.

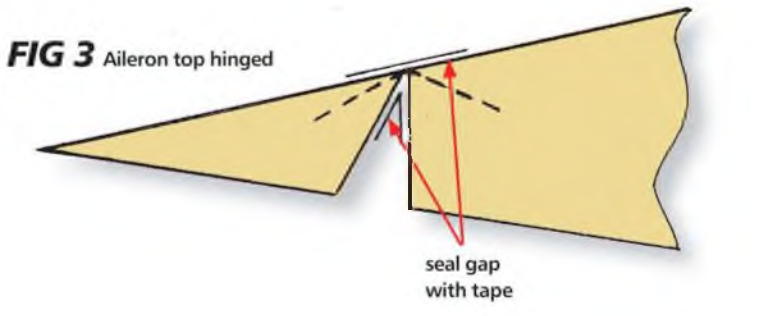
As regards the control horn hard points, if using commercial horns, rebate 1/8" thick squares of birch ply (not lite-ply) into the aileron surface under the horn position (if using a sheet aileron), or build up a block of balsa on the core to within 1/8" of the top surface and fit the ply mounting square so that it is flush **(fig.4)**. Most commercial horns are too long for the throw needed on our .40/.60 powered model aileron, so a method that I have been using of late is to cut off the rectangular base of the horn, cut a slot on the aileron leading edge (at least 1/4" deep) in line with the servo arm, rough up the end of the arm with glass paper and epoxy the cut-off horn arm into the slot so that the pushrod hole in the horn is right over the hinge line **(fig.5)**. If necessary, drill a hole in the arm at the cut off end, so that the epoxy fills the hole, giving extra 'grip'. This method does away with the un-scale look of screws and clamp plates and is very strong.

The sheet aileron is easiest to produce (but may use a lot of wood) and is simply marked out, cut to size to fit the wing profile and thickness, tack glued in position and carved/sanded to match the wing panel sections. Cut through the glue tack spots, remove the aileron from the wing and then remove material from each end to allow a gap between the fixed wing trailing edge (3/32") and chamfer the aileron leading edge (a straight taper from the top, remember) to allow the desired amount of 'down' throw (plus a bit to allow for the covering material and the hinge joint).

The core method is a bit more complicated but, like the sheet aileron, is built 'on the wing'. Let's assume that we've already built the wing panel structure and fitted the aileron sub spar and sanded the wing panel to a nice smooth section **(fig.6a)**. Cut off the rib ends contained in the aileron, flush with the sub-spar rear face. Now make up







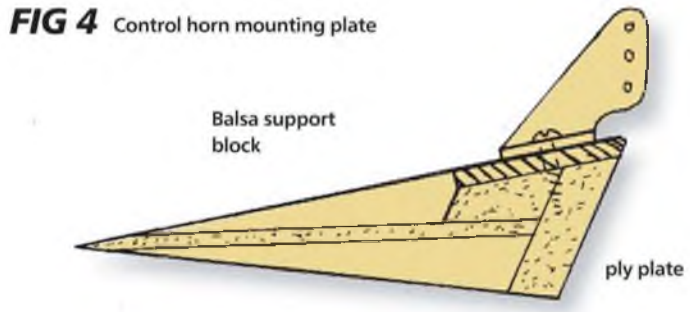


FIG 4 Control horn mounting plate

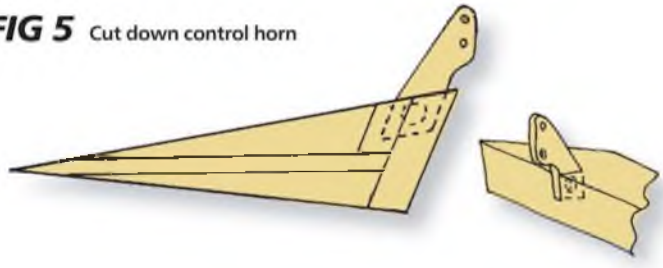


FIG 5 Cut down control horn

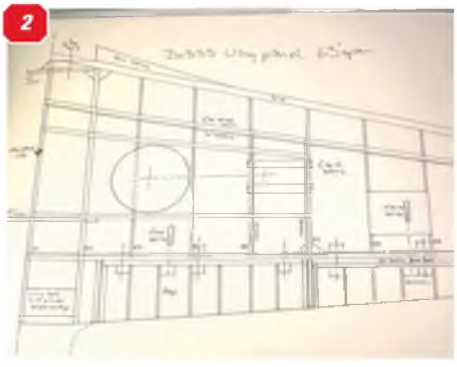
aileron rib ends to match the fixed ribs at either end of the aileron (allowing for the 1/16" skin, top and bottom) and tack glue them in position using scraps of 3/32" packing between the ribs to give an end 'gap'. Cut a 1/4" aileron leading edge to fit between the two 'tacked' ribs, deep enough to protrude above the front edge top and the rear edge bottom of the ribs, angled back to give 'down' movement clearance **(fig.6b)**. Glue this strip to the ribs.

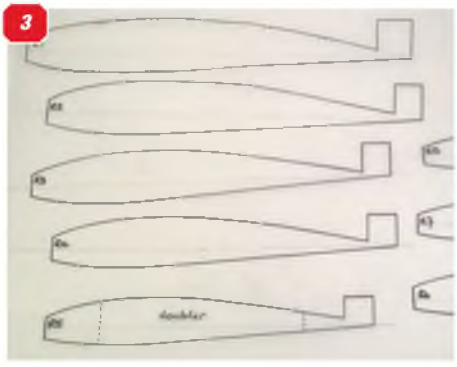
Now cut a sheet balsa core (1/16") to fit along the aileron centre line, lining up with the rear ends of the 'tacked ribs. Cut carefully to ensure a good fit and when satisfied, glue in position **fig.6c)**. Using a strip of 1/16" ply to protect the top and bottom surface of the rear spar/sub spar (and to represent the final skin), carve/sand the aileron leading edge flush with the ply packing and the trailing edge of the aileron core. Now mark the position of the scale aileron rib positions on the aileron core top and bottom and glue on 1/16" balsa rib strips top and bottom **fig.6d)**.

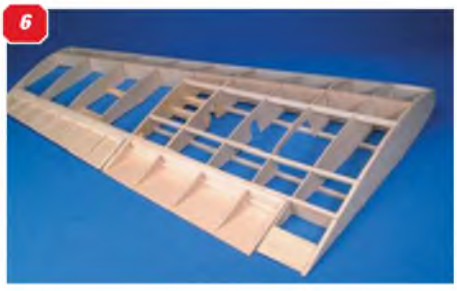
When all are fitted and the glue is dry, use a long sanding block to sand the ribs to a triangular section, flush with the leading and trailing edges. Fit hinge blocks and horn mounting point as described. This method can be used for 'skinned ailerons, retaining the core and skinning with 1/32" balsa sheet to represent the thinner gauge of metal/ply skin used on the full-size aileron. Using the core method it is usually easier to build the aileron after skinning the wing, if flaps are not being fitted, but as they are in the case of the Do335, the photos show the aileron built before skinning.

Flap construction

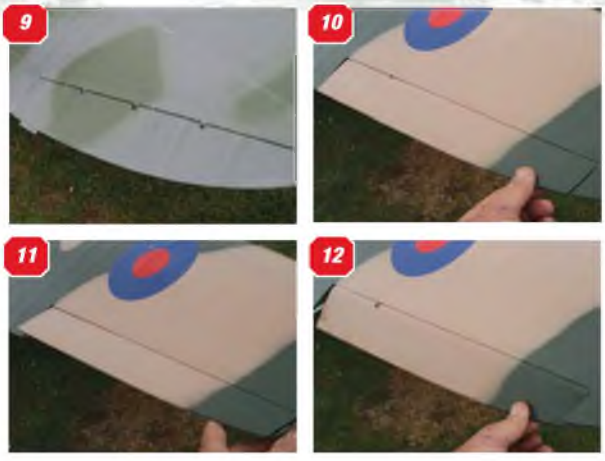
WW2 fighters usually had one of two types of flaps - split, where the top surface of







1: Panel lines, wing section and control surface sizes - all can be scaled up and checked against our drawing - a plastic kit is invaluable. 2: The wing plan has most of the assembly detail filled in, moving on from the original outline - ready to start assembly. 3: The ribs have been drawn individually ready to be cut out from sheet. 4: Completion of stage 1 - built upside down, the ribs, spars and leading edge are assembled, using PVA glue (allows setting up and adjustment). 5: Stage 2 - Spar webbing, aileron sub spar, uc mounting beams and aileron hatch support plates fitted. 6: Stage 3 - Rib tabs removed, ribs/spars sanded to section and flap/ailerons built. Note also the root rib wing bolt reinforcing block. 7: View of the aileron showing the sheet core and gusset ribs. Angled leading edge allows top hinging and 'down' throw clearance. 8: The flap detail - built on a sheet base, the leading edge is centre hinged to give a 'closed joint' in the 'up' position.



9: An example of a top-hinged aileron (Steve White's P-47 Thunderbolt). 10-12: A shrouded aileron – see the gap is minimal in full up, down and neutral positions. (The author's Stinson Reliant).

the wing is fixed and the flap is a section of the lower surface skin which lowers (Hawker Hurricane - see **fig.7)** - or all-moving, where the whole rear section of the wing inboard of the aileron is actuated (F4U Corsair - see **fig.8)**. The Do335 features the latter type and for ease of assembly are centre hinged, but the flap leading edge is only bevelled below the hinge (only 'down' movement required - see **fig.9)**.

In this case, the ribs are cut off behind the rear spar and the length reduced to allow for the 1/4" sheet leading edge and a 1/4" square strip reinforcing along the lower rear edge of the flap leading edge (so that the lower flap leading edge can be bevelled from below the centre hinge line). The flap leading edge is tack glued in position and the top and bottom edges sanded flush to the airfoil section and the lower 1/4" reinforcing strip fitted.

The ribs are then glued back in position, together with new end ribs, ensuring that the lower surfaces align with the wing lower surface. Fit hinge blocks and control hard mounting point, then we are ready to skin the wings – almost! First we have to look at linkages, operating mechanisms - and decide how the wing is going to be held on!

Moving up and down...

With the advent of relatively cheap mini servos, the easiest way to operate the ailerons is to fit a separate servo in each wing, placed in front of the aileron and operated by a short, slop-free wire pushrod. Whatever the size of model, this linkage arrangement is far more positive in operation than one where all flaps are driven from a single servo located in the wing centre section – and the linakage is simplere), For a .40 sized models, mini servos are OK, for .60 size I would recommend fitting standard size, metal-geared servos and for anything bigger, unless very slow flying (and most fighters aren't!), hi-torque, metal-geared servos powered by a 6v Rx battery. Why? Well, the loads on a fast-flying model's control surfaces vary and are probably higher than we may think, so it pays to have torque in reserve, rather than overstrain the servo. Speed induced control surface flutter can wreck an underpowered, or nylon-geared, servo in an instant.

It is possible, of course to use bellcranks and wire pushrods, or curved snakes to operate both ailerons or flaps from a single centrally-mounted servo, but this invites linkage slop, or friction resistance, both equally undesirable, as well as preventing differential from being programmed in at the Tx (it still can be adjusted in by horn/pushrod geometry, though). I favour the separate servo approach and so each of the Do335 wing panels has two servo hatches, one for each moving surface.

FIG 6a Core aileron construction

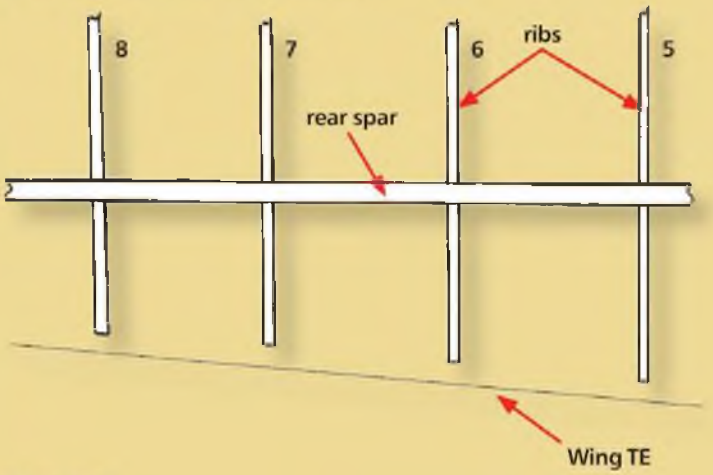


FIG 6b

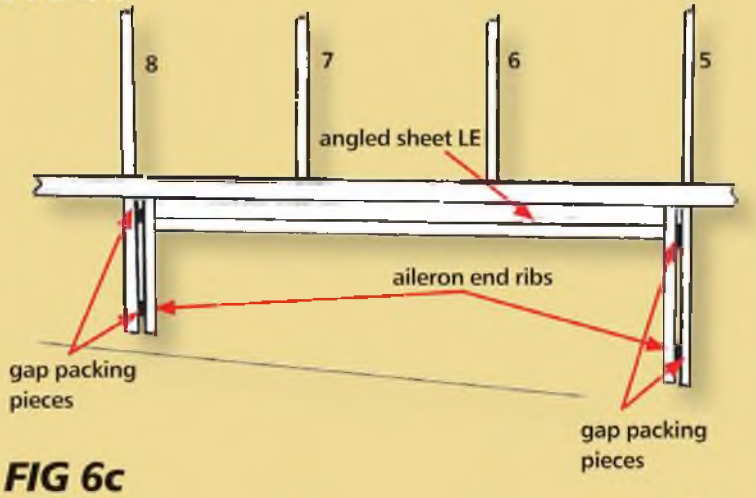


FIG 6c

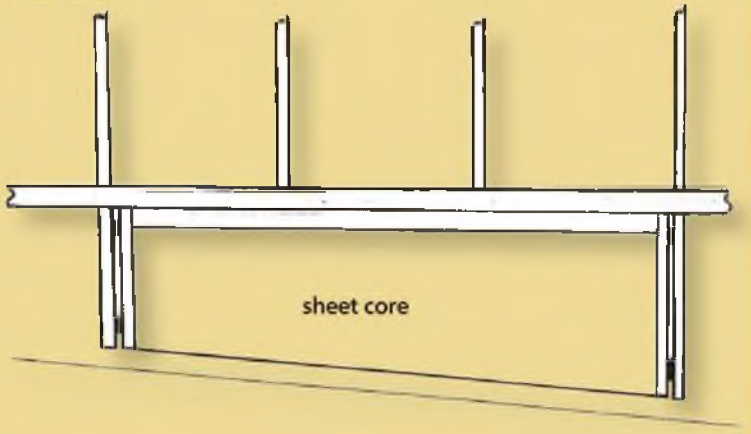
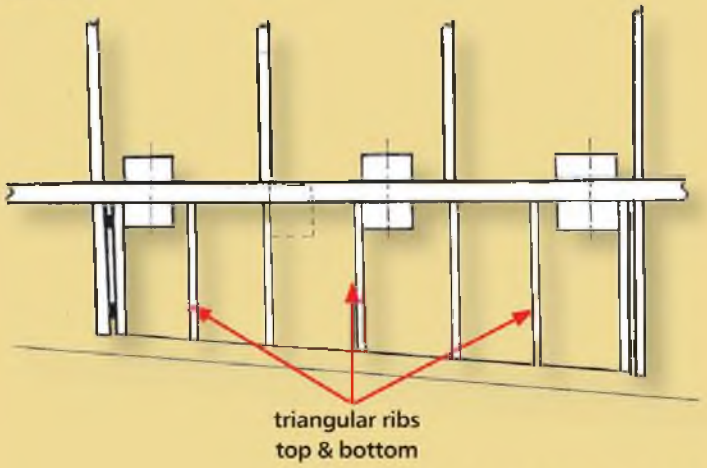


FIG 6d



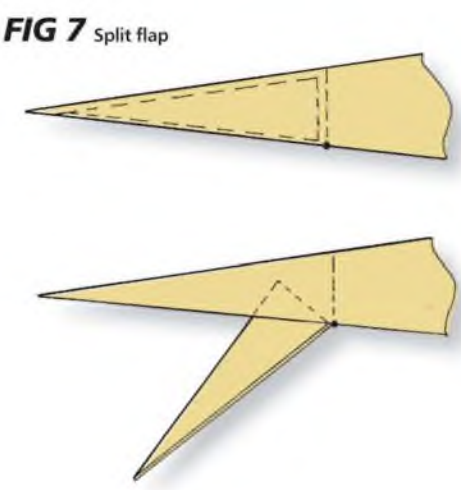


FIG 7 Split flap

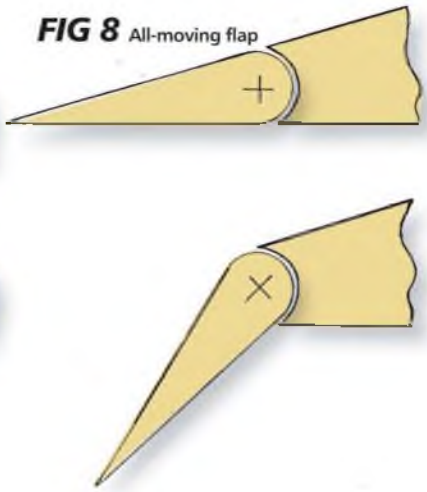


FIG 8 All-moving flap

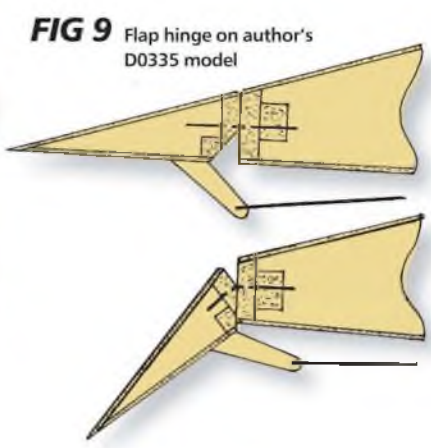


FIG 9 Flap hinge on author's D0335 model

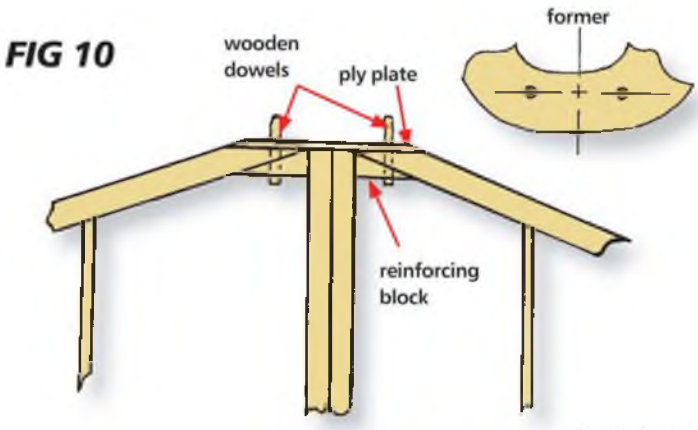


FIG 10

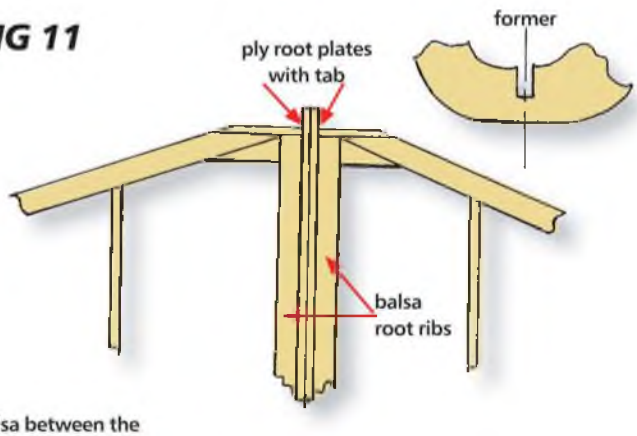


FIG 11

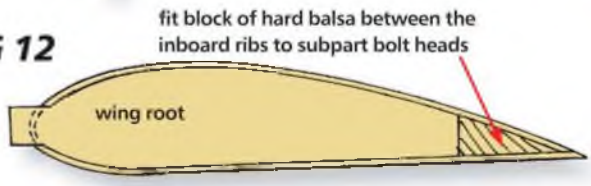


FIG 12

This necessitates servo extension leads, so holes must be cut in each rib to allow the leads to pass through on their way to the wing root - before fitting the skins, position a length of string taped to a rib adjacent to the servo access hatch, running through the rib holes all the way to the root, to allow the servo lead to be pulled through - tape the extension lead to servo lead connector joint well, to prevent any chance of it coming apart - in the worst case (sod's law), in flight!

Talking up and down, before skinning, don't forget to trial install the retract undercarriage, complete with wheel and air hoses, as it's much easier to route the tubes and check and adjust clearances at this stage, rather than later.

Wing fixings

The most common method of retaining the wing to the fuselage is using the two dowels front, two bolts rear **fig.10** and as most WW2 fighters are low wingers, it probably takes some beating. Some modern ARTFs have a variation on the theme in that the root rib of each wing panel is made from ply and has a rectangular lug at the leading edge which, when the wing panels have been fitted together makes a substantial 'key' that engages a slot cut in the former at the front of the wing seat **fig.11)**. I've flown many ARTFs that employ this method and not had one fail, so it is a well-proven alternative, for small to medium sized models.

As a guide, the lug should be about one inch high, 1/4" thick and protrude into the slot by at least 3/8". I prefer nylon wing bolts at the rear, fitting into metal captive nut mounted on a 1/4" ply plate, rather than use metal bolts favoured by the majority of Far East produced ARTFs.

As far as our design considerations go, at this point we have to build into the wing some dowel mounting blocks, if we are going for the two dowel approach, or prepare ply root ribs with the locating lug as described above and fit them to the wing panels before joining the panels together. At the wing trailing edge, fit full depth solid sheet blocks between the two inboard ribs in the area of the wing bolt position **fig.12),** to prevent the wing bolts crushing the wing structure when tightened up.

Joining the panels

Take a look at any ARTF kit and the wing panels are joined in a 'standard' fashion. For a .40 - .60 size fighter model, the wing will be a one-piece, so some former of 'joiner' will be needed, to spread the cantilever load across the wing seat. The easiest way, copying the ARTF method - cut a slot in the wing root ribs between the top and bottom main spars and epoxy a shaped hardwood joiner between the spars, bridging between the next adjacent wing rib on either side. The joiner can be birch plywood (not lite-ply) or cut from hardwood strip wide enough to cater for the full depth between the spars and the dihedral angle. A dowel located in the root rib in the rear 1/4, picking up a hole in the other wing panel root rib will ensure accurate alignment (drill both holes together at the rib cut-out prep stage, before wing panel assembly).

After sheeting, a strip of 2" wide bandage can be wrapped right around the root joint, using PVA brushed on and worked into the bandage weave. ■

NEXT MONTH...
Skinning the wings, and designing the fuselage - putting the meat on the bones!

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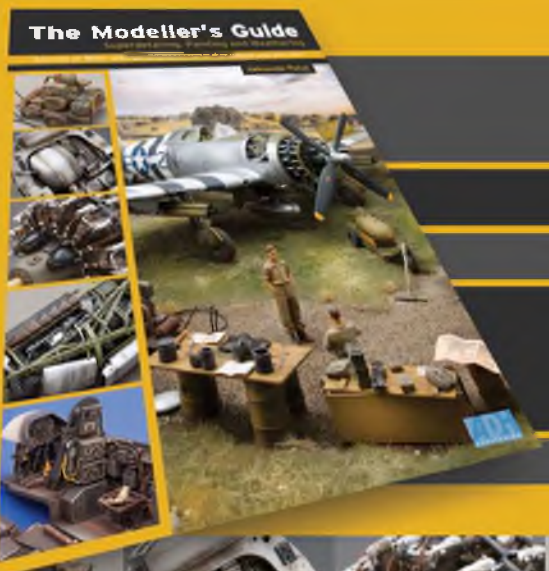

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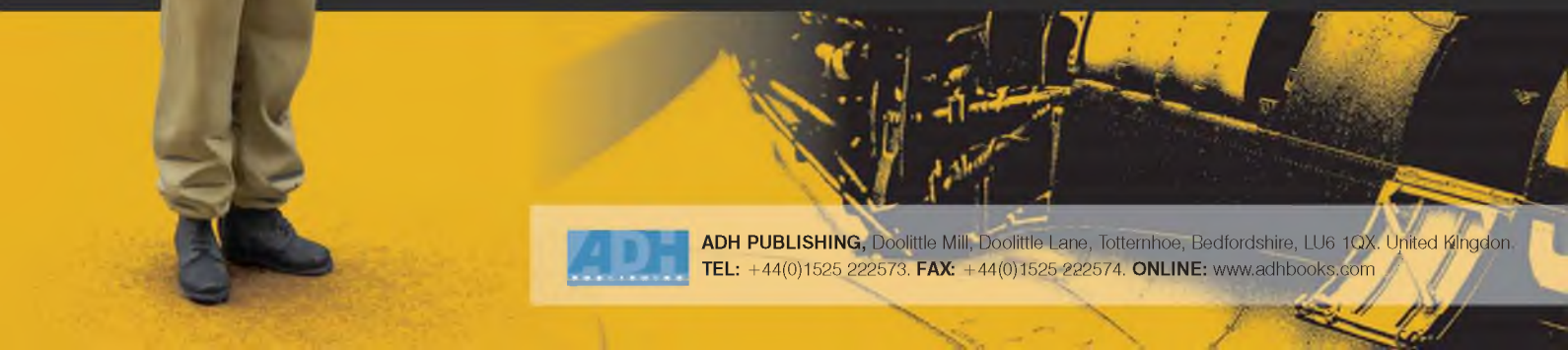

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THE QUIET ZONE

R/C SCALE ELECTRICS WITH PETER RAKE

Okay, it seems it's that time again; time for more electric flight musings. By now you're probably heartily sick of small model stuff. At least, it appears our editor is since he's asked me to save that for later in the year, closer to the start of the next indoor flying season. Oh well, such is life. When you combine this unexpected change of direction with the fact that my computer (the one containing all my potential column material) died the death on me, it put me in something of a quandary as to what to write about at relatively short notice. In case you were wondering, yes, that is my excuse for this month's column being even more thrown together than usual.

Anyway, now that you know what you aren't going to be getting, I suppose we'd best consider what will appear this month. Usually at these times, when I suddenly find myself with nothing to write about, we take a look at forthcoming designs for you to look forward to. This time however we can't do that because none of them seem to be getting finished.

Yes, it is hard to tell from the real thing but it's only the finish and detailing that sets this otherwise 'sport scale' model apart and that's where the skill come into things.

Once on the model and with a few additional parts added that basic cylinder makes for a convincing dummy engine.

Small models (this one is 30" span) look best if the detailing isn't overdone. The Air Coach's dummy cylinders are simple, but set it off beautifully.

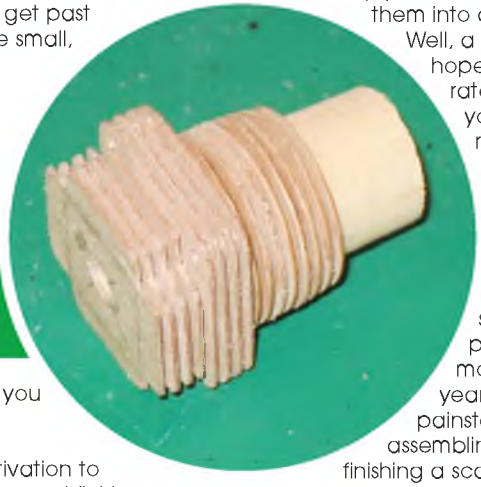
So, you may be asking, what precisely are we going to get from the king of waffle? At this point your guess is as good as mine, so I'll just go with the flow and you can decide what it was all about at the end.

WHAT MAKES A SCALE MODEL

Well, I suppose that really depends on why you're building the model. Obviously, if it's for top class scale competition you'll be trying to create a precise miniature version of the full-size aircraft. Okay, so it won't use the same materials in many cases, but it will need to include every detail of the original.

That's one extreme, while at the other end you have the RTF style of 'scale', which often will mean something only just recognisable as the prototype it is meant to represent. Believe me, there are some real nightmares out there in RTF or ARTF form. By-and-large they are getting better, and some are actually quite acceptable looking models - once you get past the high gloss film finish. The small, foam ones are probably amongst the best, but I promised no small models this time.

That aside, however, they can offer an excellent basis for those of you without the time to build a complete model, but the inclination to do a bit of titivation to improve the overall detailing and finish on your model. Even if you stick with a film finish, it isn't rocket science to alter the colour scheme, add some cockpit detail or improve the external detail; anything that takes it away from being just another model that's the same as every other one from that particular manufacturer.



Absolutely no special tools were used for this dummy cylinder, just lots of bits of ply and the desire to do it low-tech.

All of which assumes that you are more modeller than flyer. I know many of you simply want a basic representation of something that resembles a full-size aircraft and enjoy the flying side of the hobby without the inclination to actually build something. That's absolutely fine. Not my thing at all, but fine if it's what floats your boat. (Yes, there are ready-to-run model boats too.) However, if that is your interest, you probably don't buy FSM because you're more interested in those magazines that deal with that sort of thing. Let's face it, if you're not at all interested in actual scale modelling, apart from the occasional blip, FSM doesn't have that much to offer you. It's aimed far more at those like myself; dinosaurs who still get great pleasure from butchering poor, innocent pieces of balsa.

So, since I have either grabbed your attention because you too are a dinosaur, or alienated you completely because you happen to like RTF models, let's take a little look at the group I haven't mentioned yet. By that I mean those who do actually enjoy cutting out bits of balsa and ply and then assembling them into a flying model. Well, a model that will hopefully fly at any rate. After all, you're never really sure what the outcome will be until you attempt to commit aviation.

It takes a special sort of person to spend months, or even years, painstakingly assembling and finishing a scale model, only to throw the finished product into the air. Specially masochistic perhaps? I'm sure we've all been at that point where we wonder why we bothered. Usually a few moments after our latest creation rolls over and impacts the unyielding surface of the ground. The ground might not yield very much, but the model usually does. Often in a quite spectacular manner. I stopped asking if such afflicted modellers could do it again because I missed it that time on the grounds that it might not be totally beneficial to my health. Well, I mean, if you can't take a joke you have no right building scale models. The comment about could have been worse, could have been mine didn't sit a great deal better. Does that make me a sado-masochist?

OH DO GET ON WITH IT

Okay then, if you insist. I did warn you that this column was going to take on a life of its own as it progressed. Getting back to what I was supposed to be writing about, let's take a look at a few ways to improve the scale-like appearance of our models.

First, let's start with some general observations. Some of these can also be applied to improving your RTF model too, so it's worthwhile to get them out of the way first. As an 'average' modeller, it isn't really practical to emulate every single detail of a given prototype. Some just add too much weight (usually where we can least afford it), while others simply take too much time to do well. If you're in any doubt about your ability to actually reproduce the detail you are trying to simulate, or are less than impressed with trial attempts, it's probably safest to omit that particular detail altogether. There's nothing more likely to ruin an otherwise beautiful model than poorly executed details. Let's face it, the bolts and rivets used on relatively lightweight aircraft are far from the same size as those used to build a battleship. Nonetheless, I have seen models displaying just such bolt detail on removable panels. Sometimes we simply have to accept that less is more.

By the time most of us get to the point where we want to detail out models we already have a fair idea of our capabilities. We know what we can replicate and what is simply too much for

Because of the detail that is there you don't see what's been omitted on this F2B.

Probably as good as cockpit detailing is ever going to get, but all done using basic tools. This shot is hard to tell from the real thing.

Here you see that fuselage lacing done using perforated covering strips and actual lacing.

our skills. There's nothing wrong with knowing your limitations, and it can be turned into an advantage. The general idea is to do the best job you can on the detail you do apply and use that to draw the eye away from the detail you decided to omit. People admiring your model will be so enthusiastic about what you have done that they probably won't even notice that there's more missing detail than there is included detail. Think of it like a stage magician, you distract the viewer with things you do want him to see in order to obscure the areas you don't want viewed too closely. Throughout the entire process, tend to think not so much in terms of modelling but more of it being an art form. You aren't trying to simulate the original precisely, more trying to give the impression of there being more detail than there actually is. Yes, it is all very devious, but it works well.

DOWN TO BUSINESS

Since my main interest is early types (pre-1920), let's take a look at what can be done with models from this era. Rib tapes in this period were usually just strips of fabric doped over the covering, so are fairly easy to replicate. Depending on the size of the model they can be anything from narrow strips of that cream coloured masking tape up to strips of Solartex ironed over the basic covering. Simulated rib stitching can add to the appearance, but only if it isn't overdone. It's usually the 'knots' that show more than the actual stitching, so an old method of reproducing that is to add spots of PVA (with a little talc added to thicken it) evenly along each side of the rib. Allow that to dry, sand it back slightly if you think it's too much and then apply your rib tape over that. Obviously, this is only applicable to larger models since at smaller scales it would look totally out of place. Another case of less sometimes being better than more.

Fuselage panel lacing, by contrast, can be quite complicated to do well. This is especially so on quite small models. It's also a lot more time consuming, so you need to decide if it's something you want to try. For small models, assuming you have access to a sewing machine, a simple way of producing it is to zig-zag stitch some lines on heavyweight tissue, cut them out leaving a narrow border and simply dope them onto the fuselage covering. Apply more dope once they are secure and then lightly sand to remove any fuzz the dope may have raised. Once your model is painted a little additional painting will highlight them and really make them stand out.

When it comes to larger models there are numerous ways of simulating this particular detail. One of the simplest, and I use the term loosely, is to drill a double row of holes through the covering and, using a broken off needle (broken though the eye, that is) to tuck thread into the holes. You'll need to keep

...AND ON THE COMPLETED MODEL IT LOOKS TOTALLY CONVINCING.

stopping to glue the threads so you don't start pulling them out again as you try to maintain tension. Once it's all laced, a coat of dope will help seal it and hold it in place. Then it's just a case of a light sanding and artistic paint work to finish the job.

Probably the best looking method I've seen is also, by strange coincidence, the one that most closely resembles actual panel lacing. This technique involves applying strips of Solartex (or similar) along the panel line, but leaving the adjoining edges loose. Then you make holes in these edges and actually lace them together. All this being applied over the basic covering. If you really want to add that little extra touch, tiny vinyl (self adhesive) 'washers' can be applied to each hole to both reinforce them and simulate the little grommets often used on the edges to prevent the lacing pulling through the fabric.

Obviously, which method you opt for will, to a great extent depend on what tools you have at your disposal. For example, those vinyl washers would be a nightmare to cut by hand, but access to a vinyl cutter makes it a simple task to create as many as you want.

MORE ON TOOLS

Whilst items like a vinyl cutter, or even your very own laser cutter make many tasks a whole lot easier they are far from essential if all you want to do is build 'average' scale models. Goodness knows I've managed for over 40 years with nothing more technical than a razor plane, balsa knife and Dremel electric drill. As I said at the beginning, it's entirely up to the individual how many resources you want to dedicate to detailing your models - and how much time to want to spend doing it.

There's much talk of 3D printers these days, but unless you know precisely how to use one, and that includes drawing up the 3D CAD files for it to use, it's just so much expensive junk. Yes, it will mean that if you are producing a dummy engine you only need to draw one cylinder, which can then be scaled accordingly and reproduced as many times as you like, but it all takes time and a high level of CAD skill. It's all I can manage to draw in 2D, never mind making 3D files for such a printer. Also, of course, as any regular reader knows by now, I'm far too mean to spend vast sums (or anything at all) on such luxuries. For me, and I'm sure for many other modellers, it would take far longer to draw the files than it would to produce a complete dummy engine.

So, whilst the luxury tools are nice to have, if you know how to use them, they are far from essential for producing very convincing scale models. Any fool can throw money at a project to achieve the results he wants but it's far more satisfying to be able to know that what people are admiring is all your own work.

Don't get me wrong, there are certain items it simply makes better sense to create using commercial items (pilot figures being a prime example for all but the most artistic amongst us) but sometimes it's simply more enjoyable to use minimum technology and the tools you have to hand to create the details for your models. A balsa knife, a selection of files and a Dremel (with a variety of accessories) and a little bit of ingenuity are all that are required.

Okay then, we got somewhere in the end and allowed me to get into some sort of flow. As usual, of course, it's also left me running out of space before I had finished waffling about detailing our models. Oh well, at least you have a fair idea of what you can expect next time - all being well. In the meantime, if you'd like to contact me you'll find me at the usual place - PETERRAKE@aol.com ■

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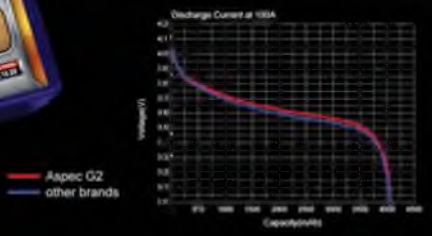

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