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# **Flying Scale Models**



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## **MODEL MASTERPIECE MIKE TREW'S PERCIVAL VEGA GULL**



## EDITOR

Tony Dowdeswell (Tel: +44 (0)7736 419868)  
[tony.dowdeswell@keypublishing.com](mailto:tony.dowdeswell@keypublishing.com)

## ADVERTISEMENT SALES

Sean Leslie (Tel: +44 (0)1780 755131)  
[sean.leslie@keypublishing.com](mailto:sean.leslie@keypublishing.com)

## DESIGNER

Peter Hutchinson  
[peter.hutchinson@keypublishing.com](mailto:peter.hutchinson@keypublishing.com)

## EXECUTIVE CHAIRMAN

Richard Cox

## MANGAGING DIRECTOR/PUBLISHER

Adrian Cox

## GROUP-EDITOR-IN-CHIEF

Paul Hamblin

## COMMERCIAL DIRECTOR

Ann Saundry

## PRODUCTION

Production Manager - Janet Watkins

Ad Production Manager - Debi McGowan  
[debi.mcgowan@keypublishing.com](mailto:debi.mcgowan@keypublishing.com)

## MARKETING

Marketing Manager - Martin Steele

## SUBSCRIPTIONS

Subscriptions Manager - Roz Condé  
Subscriptions Department, Flying Scale Models,  
Key Publishing Ltd, PO Box 300, Stamford, Lincs,  
PE9 1NA, UK.

Telephone: +44 (0)1780 480404

Fax: +44 (0)1780 757812.

E-Mail: [subs@keypublishing.com](mailto:subs@keypublishing.com)

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# Formatic

## FLYING SCALE MODELS - THE WORLD'S



## ON THE COVER

The full size Douglas Skyraider is a big beast that has commanded much attention from scale modellers. It certainly held the interest of Bob Hart, whose example is seen here, caught on final approach at the 2011 LMA event at Elvington on the camera of Alex Whittaker. Full report on the goings-on there, starting on page 20 of this issue.

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# A Widgeon reborn

Out at the back of beyond (a destination that does not register on SatNav!) at Durley Airport near Southampton, the AeroAntiques Group led by Ron and Mike Souch, together with Phil Kimber, Bill Probert and Phil Harris are all involved in the restoration of a Westland Widgeon III, which was brought back from Australia two years ago. The UKS was exported, new, from Westland Aircraft's Yeovil factory in 1926 and registered to the Aero Club of New South Wales in July 1929. This example of the Widgeon III, last flew in 1946/7, but remained in Australia until AeroAntiques acquired it from Nick Chalcraft of Brisbane. When it arrived at AeroAntiques, the disassembled airframe proved to be absolutely complete, including the ADC Cirrus engine. Nothing was missing and the airframe was re-registered for the UK as G-ELMS, thus preserving the three last letters of the original Australian registration.



# CONTACT

## WIDGEONS PROGRESS

Peter Rake's Westland Widgeon III that was featured in our February issue struck a cord with quite a few people, particularly since it was backed up with the review of the AeroAntiques restoration project for the sole remaining full size example now being undertaken.

For the interest of those with a soft spot for the Widgeon, Ron Souch of AeroAntiques sent along this picture showing the latest progress with the restoration of the fuselage as it now stands - when we photographed it in the AA workshop it was a partially complete unit on their workbench, but clearly has now taken a good step forward toward that post-restoration test flight.

More power to their elbow!



## PRINT YOUR OWN SCALE MODEL?

Do any of our readers out there ever watch the BBC's 'Click on-line' program that goes out at weekends? Presented by Spencer Kelly, it reviews all kinds of IT related developments and a few weeks ago picked up on '3D Printers' that can create a full three dimensional image from flat original artwork.

In the program, 3D printer was used to create a three-dimensional miniature replica of Spencer's head. Great we thought, the technique could be used to produce a really convincing likeness for a pilot's head for a scale model - you could have your own head on the dummy pilot's shoulders.

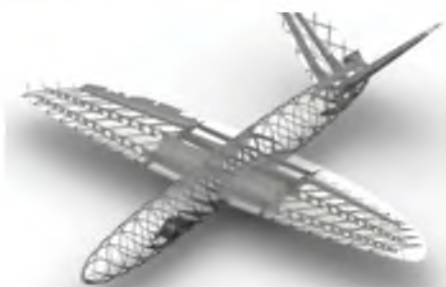
However, a group at University of Southampton led by Jim Scanlon have taken that technology much further, 'printing' a complete R/C model using a 3D printer. It's a purely functional 'model' drawn in AutoCAD, with geodetic airframe structure and electric power. Seen on YouTube, the project went from digital computer files to successful ramp-launched test flight by Paul Heckles in just a week.

So what does this have to do with scale modelling? Well just think of the super-accurate surface detailing that could be achieved this way - and what implication could this have UK manufacture of ARTF models? Factories in China and the like should be worried!

But, as Andy Sephton, who tipped us off to this one asked, "... what does this do for the builder-of-the-model rule?"

Look it all up at:-

<http://www.youtube/watch?v=ffrJ012ETaU>



## Indoor Scale Nationals

The BMFA Scale Indoor Nationals takes place again this year at Nottingham University Sports Centre on Sunday 29th April 2012. All the main events will be held in the main hall and will include: Kit Scale, Open Rubber, CO2/Electric, Peanut and Pistachio plus the informal events for Air Race and Mass launch.

The adjacent small hall will be available for fun-flying and trimming and small R/C models will also be permitted this year (but not Shock-Fliers). Remember though, that this is a serious scale competition, so if the radio flying gets too intense, it will be necessary to apply slot times so that all flyers get a chance to use the hall.

Entry for the formal competitions requires completion of the Nats entry form to be submitted by 26th April at the latest. There was an entry form in the February 2012 BMFA News and there is also a copy on the BMFA Scale web site - [www.scalebmfa.co.uk](http://www.scalebmfa.co.uk).

For all attendees, both competitors and spectators, there will be the usual catering facilities available plus some model trade vendors. There will also be the Raffle, so please bring any attractive modelling items that can be used to expand the prize pool.

The raffle helps offset costs of the event, but the organisers also rely on a sizeable income from the spectators, so come along to enjoy the spectacle and lease encouragement your clubmates, families and friends to join in on the day. It can be a great spectator event. Entry fees for fun fliers will be £12.00 and for spectators £6.00; kids (under 18) are free this year, to help promote younger modellers and family groups.

## LMA Cosford 2012

Well, where would we be without this, the boldest Scale event of the year?

But this year *The Large Model Association* have moved their Cosford Show to the weekend of 28/29th July. Owing to the use of the airfield in support of the Queen's Diamond Jubilee celebrations, something had to give, because the usual mid-July weekend was not available. However the RAF and the Museum staff have made it possible to secure the 20th anniversary of an LMA show at Cosford.

In recognition of the economic situation and the difficult trading conditions for the model shops and outlets that have regularly supported the events, Trade attendance prices will be standardised for all the LMA main shows,

With specially discounted camping prices, full size displays and new large models, Cosford 2012 will celebrate our 20th anniversary with a too-good-to-miss extravaganza.

For further details and pricing, please see [www.largeamodelassociation.com](http://www.largeamodelassociation.com)

## BEAUFIGHTER BONANZA

Two British twin-engine combat aircraft of the WW2 era stand head and shoulders above others. Of these, the De Havilland Mosquito has, over the years, gained much of the popular recognition, but the pugnacious Bristol Beaufighter was an equally effective and successful aircraft.

Now, *Key Publishing* have produced a 100-page tribute to Bristol's legendary warplane that gained a reputation during World War Two for its speed, range and lethal fire-power as a ground attack aircraft, torpedo bomber and night fighter.

The new monograph covers its evolution, colour schemes, squadron heraldry, operations and 'aces' with exceptional narrative, detailed archive material and many rare illustrations.

*Beaufighter* is a long overdue tribute to this valiant warrior and is an excellent reference source for scale modellers.

Available for just £4.99 from WHSmith and other leading newsagents from Thursday 15 March. Alternatively, order your copy from [www.keypublishing.com/shop](http://www.keypublishing.com/shop) - delivery from Monday 12 March.

Key magazine subscriber? Call 01780 480404 to claim your £1 special discount.



## Flea powder!

Henri Mignet's Flying Flea is an aircraft to which scale modellers have been drawn over many years. The 'Flea' was by no means an entirely successful design but, from inception in 1920 Henri Mignet strove to provide those with a hankering for flight, the opportunity to build their own aircraft, at minimum cost using only basic tools.

The *Pou du Ciel* was by no means a perfect flying machine - it killed a lot of people, but has remained one of those notable aeronautical oddities that have fascinated many, including aeromodellers.

Thus, *Stenlake Publishing Ltd's* book *'Flying Flea - Henri Mignet's Pou-du-Ciel'* has an appeal for scale modellers and this 100-page book is crammed with archive images and information about the many variants.

It is available from *Stenlake Publishing Ltd* 54-58 Mill Square, Catrine, Ayrshire, KA5 6RD (tel: 01290 551122). Price £13.95. Web site: [stenlake.co.uk](http://stenlake.co.uk)



## Butcher Bird pictorial

The Focke-Wulf Fw 190 must be one of the most modelled aircraft in aviation history. Reference sources abound and you just can't get enough! Pictorial stuff is a primary demand for anyone wishing to pile on the surface detail, so *'Focke Wulf Fw 190 Vol 1 (1938-43)'* by Smith & Creek and published in the *Ian Allan Chevron Classics* range will satisfy many scale modellers.

This Hardback - 336-page book is a mine of mainly pictorial content on Kurt Tank's WWII fighter, but also covers the full history of the Focke-Wulf Company from early beginnings through to 1943 with particular reference to the Fw190.

This is a popular aircraft for Warbird enthusiasts and for anyone contemplating a true scale model this book makes essential reading. It is packed with photographs, squadron markings, internal detail and full type history. With two more volumes yet to be published this series will form the most comprehensive 'one-stop' reference on this superb German WWII aircraft published to date. RRP £50.00



## Two very different 'Hawks' remembered

Hi Tony,

FSM dropped through the letterbox yesterday and I have to say that for me, it was a vintage issue.

As you already know, I have a soft spot for the Miles Hawk Speed Six, it was great fun to fly when it was based at Old Warden - the article and pictures will come in really useful.

But beyond that, I've always fancied the Farman Moustique as a free flight project and also for small radio, so you've beaten me to it in that area.

Finally, I was really impressed with the Goshawk article. I flew the BAE Hawk during my time in the RAF over an 11-year period, both as a Weapons Instructor and Test Pilot. I then had the pleasure of flying it from time-to-time while working as a test pilot for Rolls Royce. This led to me doing a test and assessment of the Goshawk during a visit to the US Navy Test Centre at Patuxent River in the mid 1990s. It was a little heavier than the RAF Hawk I was used to, but it 'felt' just the same, nonetheless.

Best Wishes, Andy Septon

## CUT PARTS SET FOR THE CULVER DART

For readers looking to building Peter Rake's Culver Dart (for which Part 1 and accompanying 1st sheet of the plan appear in this issue), we have a laser-cut component pack available. As emphasised before, these cut-part sets provide ready-cut pieces of all the bits that you would otherwise have to trace out onto the balsa or plywood sheets before knifing them out, thus saving a fair bit of tedious time, so that the airframe assembly process can start immediately. The parts sets do NOT include strip and sheet wood that you can get from your friendly model shop.

The parts set costs £80.00 plus £9.50 for carriage in UK. Sets can be supplied to overseas customers, with carriage costs quoted on an individual destination basis.

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**MASTER MODELS FEATURE** *by Mike Trew and Simon Delaney*

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# PERCIVAL VEG

Just occasionally, a scale model comes along that defies superlatives. Mike Trew and I have featured those, here presented in this feature compiled and presented by Simon Delaney.





# GA GULL

rew's Vega Gull is certainly one of  
ney

## BACKGROUND

I first came across the Vega Gull whilst visiting the Vintage Aircraft Flying Weekend in Mat 2003, at Kemble, the ex-RAF base that once was home to the Red Arrows display team when they flew Folland Gnats, and I was immediately captivated by its clean attractive lines.

I took numerous photographs and I returned home to read up on the type's history. I discovered that it was built by the Percival Aircraft Company based at Maidstone in Kent and it first appeared in the air in 1935. It was one of the final versions of Percival's 'Gull' series of civil aircraft for private owners, developed from their first aircraft in 1932. I also discovered that the Vega Gull was named after a bird that inhabits the north-eastern area of Asia and is the equivalent to our herring gull.

Percival's aircraft were sturdy and robust, but nevertheless economical and reliable, powered the de Havilland Gypsy series of engines. In 1934, one of their Gull series of aircraft was piloted by Jean Batten and reached Australia in less than five days. Subsequently, a Mew Gull, piloted by Alex Henshaw, made a record breaking return flight to South Africa in 1939 in four and a half days.

Researching the historical background is a great part of scale modelling so, fired up with this information, I contacted the owner of the Vega I had photographed, who advised me that it was the sole remaining example of the ninety examples that had been built. The Vega Gull design was subsequently adapted and developed to produce the more well-known Percival Proctor which was used extensively for communications work during the war years, and of which 154 examples were built.



Looking totally convincing on final approach.

## THREE-VIEW DRAWING

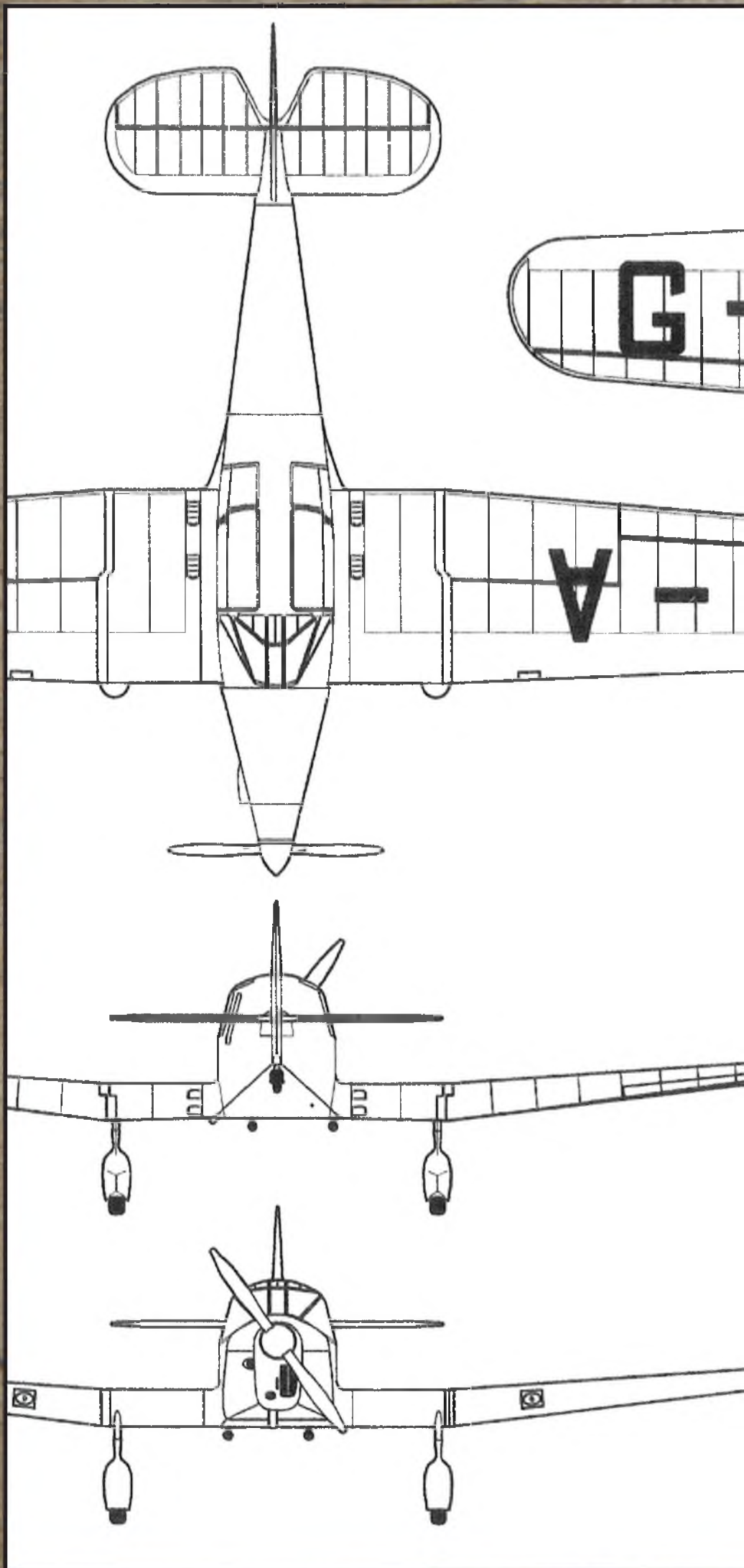
Spurred on by all this information, I commenced to draw up the plan in AutoCAD, based on a simple three-view drawing I had found in a magazine and by analysing the detail on the photographs. As I wished to fly the model at competition level, I ultimately submitted the scale drawing to the BMFA Scale Technical Committee for their approval. Bill Dennis kindly did the honours and after a few minor tweaks, the three-view was in a form where I could start on the construction plan.

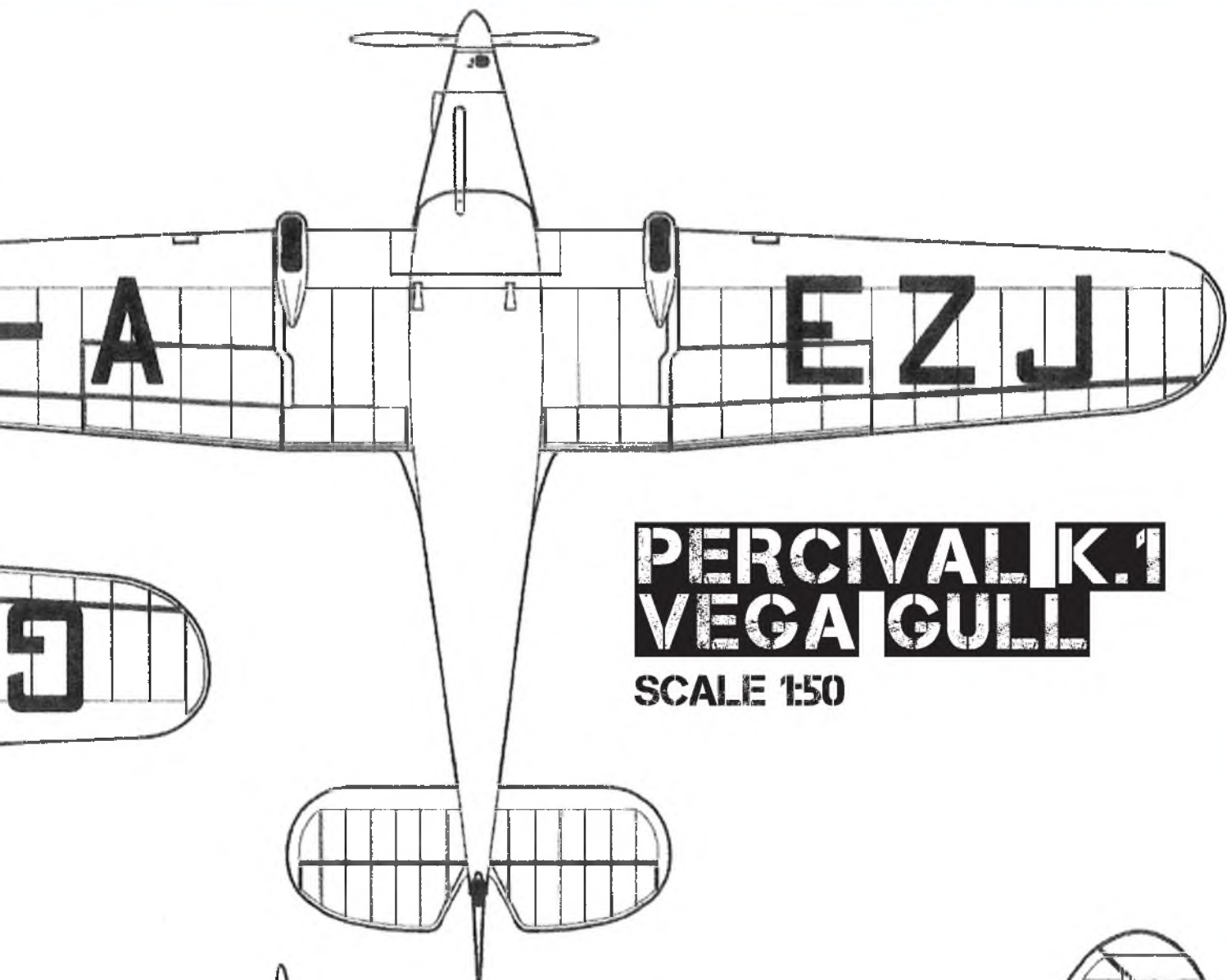
In recent years, wherever possible, I have produced my own scale drawing for approval prior to commencement of construction, which provides reassurance that the model will hopefully be constructed to as accurate a representation as possible. I also would add that I always produce my scale drawing to full size and then I am easily able to scale it down within the AutoCAD programme to meet several parameters. The first question is: will it fit in my car? It is no good building your pride and joy if you are unable to get it to the flying site!

I decided the model needed to be at a scale of 30% of full size to enable it to have some standing against other models entered in the BMFA competitions, that are increasingly becoming larger and larger.

A close second requirement: will the engine fit in the cowl? This is where I hit a snag. I was unable to find an engine powerful enough to pull this model around the sky that could be totally enclosed. I refused to contemplate anything that left bits of non-scale machinery visible on the outside.

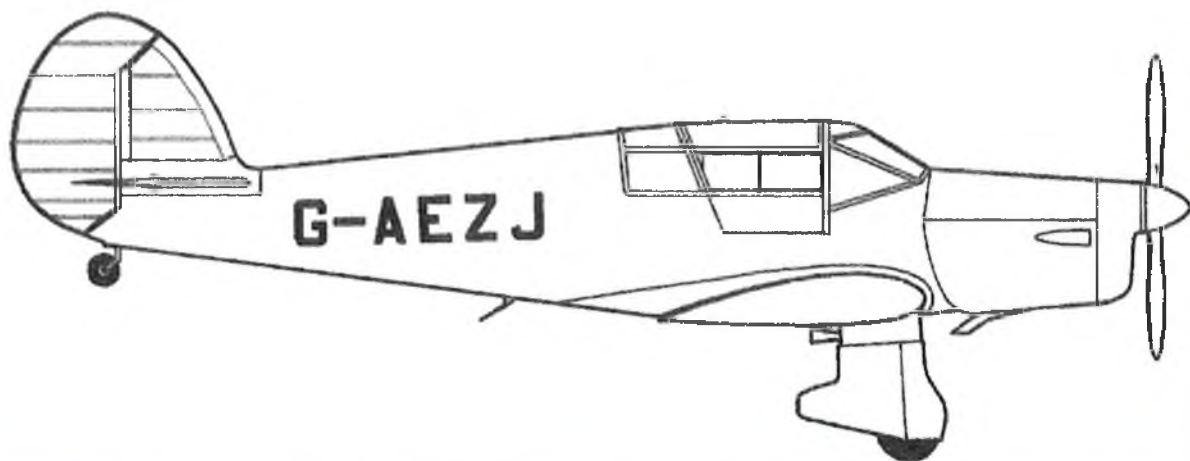
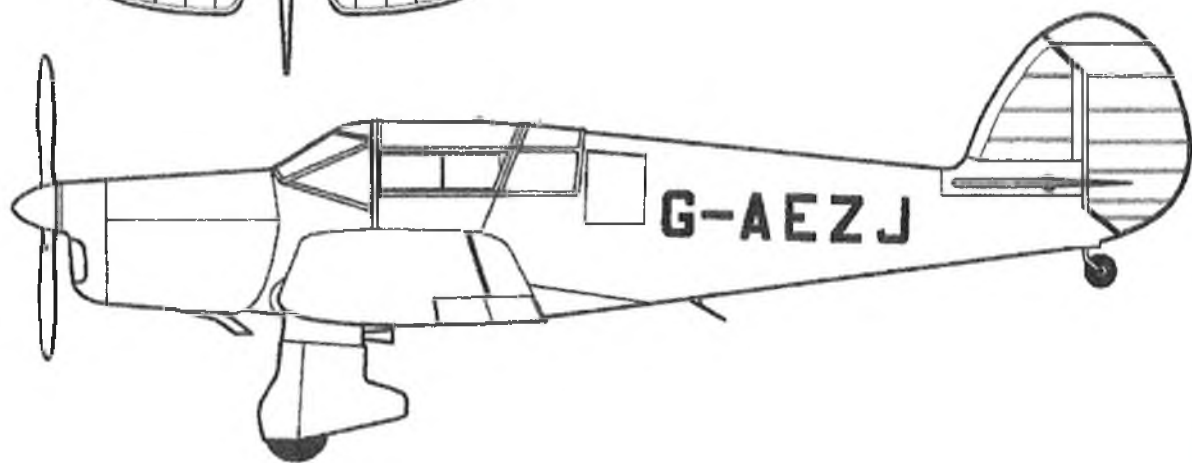
At this point I abandoned the development of the Vega Gull and went off to build quarter scale Focke-Wulf Stieglitz!





**PERCIVAL K.1  
VEGA GULL**

**SCALE 1:50**





### O.S to the rescue

The drawing lay archived on my computer until the summer of 2007 when, browsing the adverts in a model magazine, I noted that O.S. Engines had recently produced a 30cc four cylinder. There were lots of tests and positive discussion about this engine and it seemed that although a very expensive purchase, it would probably be ideal for the Vega Gull. I downloaded the technical details of the engine from the internet and

discovered to my delight that it just fitted totally within the cowl of the model at the scale that I had chosen. Unfortunately there was quite a considerable waiting list for this engine, and not many were going to be produced. However, having been given a firm delivery date by the local model shop, I went ahead with the construction drawing.

### Construction overview

The model was to be built in the traditional

method that I have used for decades. Primarily using balsa, with limited amount of plywood and hardwood in high stress points, I also use spruce for wing spars and fibreglass mouldings for the cowl and spats. For ease of design, internal access and transportation of the model it was made in five separate components: the fuselage and centre section of the wing - the centre section being permanently fixed to the fuselage; the two outer wing panels and the tailplane, fin

**1:** Wing tip under construction. **2:** Wing panels ready for covering. **3:** General view of the fuselage with the O.S four cylinder and custom mount in place. **4:** Plenty of space for cockpit detail! **5:** Although the model is big, you can see how lightly Mike builds. **6:** The front end of the Vega under construction. Balsa, ply, brass strip and fibreglass materials all in evidence. **7:** Nice set of moulds made by Mike for the cowling parts. **8:** Cowling pieces straight out of the moulds. **9:** Fibreglass parts ready to be fitted to the model. **10:** One of the criteria Mike set was that the Vega must fit in his car for easy transportation. **11:** This is neat scale modelling! A scale exhaust system made up to the full-size design and location.



WHAT A GLORIOUS COLOUR SCHEME THE VEGA GULL HAS. SO EVOCATIVE OF THE ERA!



and rudder, which was fixed a composite unit. This method of assembly only required the connection of four servo leads and three small bolts on arrival at the flying site.

### Wings and fuselage

The primary concern was designing the fuselage strong enough to take such a physically big and heavy engine. However, O.S provided a bespoke mount with the engine so all that was necessary was to make the Former F1 from 1/4" plywood and secure this to 1/4" x 1/4" spruce longerons, incorporating plywood gussets at the high stress points. The longerons ran the entire length of the fuselage and with the exception of 1/64" ply-

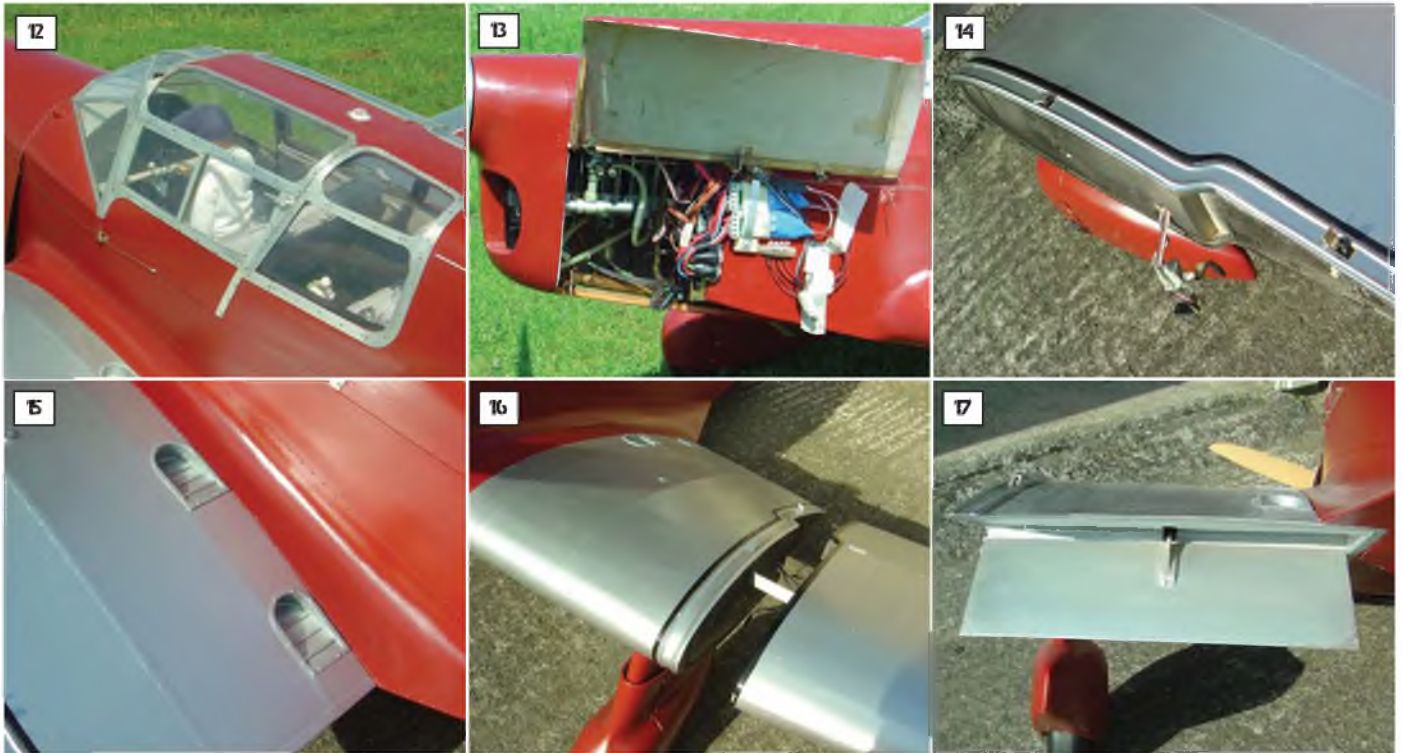
wood facing to the inside face, back to the rear of the cabin, all other components of the fuselage were made from medium balsa. The fuselage surface was constructed in the manner of the full-size which was typical for the period, with sheeted external faces back to the trailing edge of the wing and a sheeted turtle deck aft of the cabin and a sheeted remainder open fabric covered.

The wings incorporated a main and rear spar in spruce with the spars to the aileron hinge line in balsa. The surface features were represented in the model with balsa sheeting back to the main spar and fabric covering to

the remainder of the surfaces with the rear spar set below the surface of the wing.

All the ribs were in balsa, with the exception of those either side of the undercarriage legs which were constructed in 1/8" plywood. These were spanned by a pair of beech spars to mount the proprietary offset oleo legs. These were secured, with a pair of grub screws in a short length of steel tube which was then fixed to the additional beech spars with brackets silver soldered on. These oleo legs are very robust and have sufficient material to enable the fibreglass spats, which were in two parts, back and front, to be fitted





**12:** The detail on the cabin frames is unbelievable! **13:** Plenty of wiring to find a home for during test runs. **14:** Beautiful work on the wing panels where these locate to the centre section. **15:** Super foot step detail. **16:** The outer wing panel slides in on a single metal blade spar. **17:** Inboard flap panel arrangement. **18:** Rudder servo just visible through the tailplane opening. **19:** The elevator servo is set in the tailplane for short linkage and easy dismantling. **20:** The tailplane and fin/rudder are removable as a unit for transportation.

with self-tapping screws. The fin, rudder and tailplane were constructed in a similar manner as the wings and Kavan style flap hinges were used on all the moving flying surfaces.

The model features flaps, as per the full size, fitted to both the centre section and the outer wing panels. A servo was used for each pair, linked by a 10 gauge brass tube with a 1/4" square brass tube end in the centre section. The latter connected to a 7/32" brass tube in the outer panel with which to transmit the movement to the outer panel when the wing panels are connected.

### Cowling and cabin construction

The cowl was gigantic to accept such a large engine, (a Gypsy six cylinder on the full size), and ideal to take the O.S. four-cylinder model engine. This made it necessary to make the cowl in five pieces: the front, top, bottom and two sides, the latter which were hinged to open, to gain access to the engine compartment. Unfortunately I could not find any piano hinges of the scale size so these were

made out of short lengths of brass tube soldered alternately to a brass T-extrusion top and bottom and held together with a length of 18 gauge piano wire to give the scale affect. The piano wire could be easily removed to enable the side panel to be removed completely if necessary.

Home-made scale spring loaded fasteners were fitted to secure the side panels and an arm was fitted to hold the side panel open during access for filling and starting. The fuel tank was fixed behind former F1 and the larger-than-normal amount of wiring was necessary in the engine bay to provide on-board glow to all four glow plugs, using a pair of *Telco* twin glow units, each with a 4.5Ah *Cyclon* battery to provide the heat. The idea was to start the engine using these glow units as used on single cylinder engines. However, but it was quickly established that this would not be sufficient and an external battery set-up and jack plugged into the glow units was needed to avoid unnecessary current loss during starting.

The full-size subject features a four-seat almost fully glazed cabin and therefore it was necessary to represent all these features to make the model look as 'lifelike' as possible. 1mm acetate was used for the glazing, with the curved panels very carefully curved using a heat gun over a mould. The cabin glazing was held in place with aluminium strips and shaped components all secured with screws and all replicated in the same material.

The seat covers and head restraints, which were made by my wife Angela, were made from cushion fabric with parallel rib stitching to provide an air of realism. The interior also included the multi-dialled and switch instrument panel which was made using dial images downloaded from the manufacturer's advertisements found on the internet. These were recessed in the panel behind a thin piece of acetate to provide depth and realism and the whole face finished in matt black. The inside of the cabin was lined with felt to match the seats and secured with contact adhesive to the plywood liner and a 1:3 scale



## FANTASTIC AIRSHOW PASS SHOWING EXACTLY WHAT SCALE MODELLING AS ALL ABOUT!



pilot to complete the effect.

### Paintwork

The model was covered in a layer of light-weight tissue, doped on and finished with a layer of silk which was applied over the tissue with wallpaper paste and doped to the final finish. In true scale manner, the rib and junction tapes were added using strips of gift wrapping paper, cut to shape using children's pinking scissors, secured with *Balsaloc* and a final coat of dope to seal the tape edges. The model was decorated in cellulose car paint and sealed with a coat of gloss fuel proofer.

The colour scheme was an attractive maroon-and-silver for flying surfaces with white lettering edged in black on the fuselage and maroon lettering edged in white on the wings. The only potentially difficult part of the decoration was the manufacturer's logo on the fin, but fortunately a photo had been taken of this to enable a transfer to be made on the computer.

### Air test

As always, I was somewhat apprehensive with a new model, but I should not have been concerned as it flew 'straight off the board' with minimal adjustment necessary to the control surface throws and no adjustment to the centre of gravity. I was very pleased with the Gull, which had the correct sit in the air. The model took up a very slow scale speed and appeared satisfyingly realistic.

I was intending to enter the Vega Gull in the F4C section of the National Championships at Barkston heath in 2008, but unfortunately I broke one of the undercarriage legs in a heavy landing at a competition immediately prior to the Nats event and I took another model instead. However the most pleasing footnote to this model was when I took it to the North Berks event in June of the following year. The North Berks flying site is one of the best around and offers a virtually 360 degree flat hori-

zon. The flying judging is undertaken on relaxed basis with six models in the air at any one time with none of the rigorous discipline of flying and scoring as carried out at a BMFA event.

The field adjacent is used by a syndicate that operate a red and silver Miles Hawk two seat trainer and at the point of take-off and return all models have to be on the ground for obvious safety reasons. Individual members of the club are tasked during the day with the responsibility to watch for the return of the full-size aircraft and request all models to land.

A call to land was requested whilst I was flying, and we all proceeded to descend and land. At this point the caller stated that the full-size aircraft had promptly disappeared from view. It was quickly established that the Vega Gull had been mistaken for the returning aircraft! It was this occurrence that surely must have persuaded the judges to award me with the trophy for first place! ■



THE CLASSIC 30S LINES OF THE VEGA ARE WELL DEMONSTRATED IN THIS SHOT.

## FULL SIZE IN DETAIL

# PERCIVAL VEGA

Pure 1930s elegance of line - no wonder Mike Trew selected it as a subject for scale modelling



- 1: Tailcone, showing the metal fairing between fin and tailplane.
- 2: View from the rear shows the line of the fuselage.
- 3: Rear fuselage, showing access panels and tailwheel.
- 4 & 5: The wheel spats are closely tailored around the wide wheels.
- 6: A view of the cockpit window frame rear section.
- 7: Cockpit instrument panel showing the dual control columns.
- 8: Head-on of the nose, showing air intake.
- 9: Panel detail of the engine cowl.
- 10: Nose underside, showing the exhaust pipes.
- 11-14: More details of the polished metal cockpit frame.
- 15: Left side cockpit access door - fully upholstered on the inside.
- 16: Upper surface wing panel detail.
- 17: The shape of the wing-to-fuselage fairing.
- 18: Landing light set into the wing leading edge.
- 19: Wing leading edge detail, showing wing-to-fuselage fairing and fuel tank access panel.
- 20: Outer wing flap panel on wing undersurface.

6



7



1



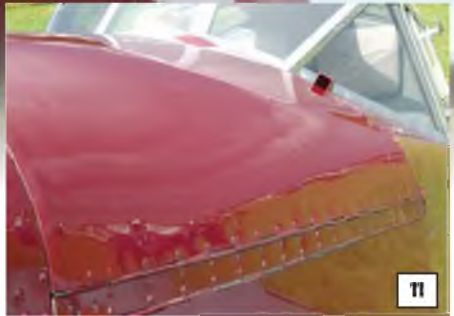
# A GULL



9



10



11



12



13



14



15



1

1

1

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# ELVINGTON 2011

**WHITTAKER TAKES HIS CAMERA TO THE LMA'S  
NEW VERSION OF THE ELVINGTON SHOW**



**YET ANOTHER JUG! BETTE OF BROOKLYN ON APPROACH, WHEELS DOWN.**



**FAR LEFT:** Roger Bale's huge (4.5 metre span) and well-known Fairey Swordfish.

**LEFT:** Ian Turney-White's massive and well-known Nieuport 28. 66.6% scale (!) with a JPX 425cc petrol engine.



**F**or many years, the *Yorkshire Air Spectacular* (under gifted Dave Tappin) delivered the old Elvington Show. I often made the glad summer trek from North Wales to attend. YAS also had a great Christmas Show that was similarly popular with many of us in North Wales, despite the long cross-country dash in snowy weather. With such pleasant memories, I was delighted when I discovered that the Large Model Association was revisiting the idea of a summer show at Elvington.

### Variety

It's the spice of life; and model airshows. In this regard, LMA Elvington 2011 had it

in spades. All the various special interest groups within the LMA were present, and energetically touting their sweet obsessions. Also, the YAS precedent of an offering a full-size fly-in was also part of the new LMA mix. I was most impressed when a little known Balkan fighter flew in. This was a Kraguj, or Sparrowhawk, from the former Yugoslavia. Reputedly the last piston engined fighter ever to see combat, it looked a very characterful airframe indeed.

### Lumpy glory

The variety of scale models flying was astounding, as the pictures show. At one point, the sheer number of P-47 Thunderbolts overwhelmed my puny

note-taking ability.

However, Barry Banks' LFG Roland CII 'Walfisch', built to 1/3rd scale, was one truly magnificent model aircraft that demanded immediate attention. She is beautifully finished, and wonderfully odd. Fussy, in that teutonic Roland sort of way. She spans 135" and weighs 42 lbs, with Moki .75 power. She did not fly on the day, but I managed to shoot a full walk around. When I have the flying pictures to complement the statics, she will be presented in all her lumpy glory, here in good ol' FSM.

### Tigercat

Andrew Cosby was flying an immaculate Grumman F7F Tigercat twin. There are



Jeff Pearson's P-51D on short finals.



No LMA show is complete without a Ju-87b Stuka! This one was Barry Barker's.



Andy Johnson's majestic Handley Page Victor V-Bomber.

few more glamorous piston engined military aircraft than the Tigercat and this one was glossy and gorgeous. She looked fabulous on low fast passes, and as to the engine note(s) - wonderful beyond belief!

### Tempest

Brian Rawcliffe's Hawker Tempest Mk.II is a painstakingly well observed scale model. She spans 97" and weighs 41 lbs. She is fitted with a sublime Moki five-cylinder radial. Like all Brian's models, the Tempest II flies exceedingly well, and the fit and finish is impeccable.

### Little Toot

I covered this model at last year's LMA

Bradford Symposium, so it was fascinating to see this one in the air. It did not disappoint. This is a smashing scale model, sassy, colourful, and American. Also, I just loved the faithful Little Toot decal.

### Frigid Migit

There were indeed many Republic P-47 Thunderbolts at Elvington, but one of the larger ones was worthy of special note. This was Ozyray Peters' bubble-top example, built from the Martyn Serginson plan pack. To 1/5th scale, it weighs 41 lbs, and spans 102". Power is a ZDZ 80cc petrol engine driving a Menz 26x8 prop. Amazingly, she is fitted with

Ray Slack retracts, sourced from Roy Palin's shed! The airframe is built around an enormous resin / polyester fuselage. 'Frigid Migit' looked very aggressive in the air. Watch this space, because I hope to get a full FSM walk around later this season. Incidentally the *Frigid Migit* nose legend was painted by Ray's wife, Christine.

### Skipton YAK

Sounds like a village in deepest Somerset, but really it's a 'plane. You see, this was interesting: Robbie

## BOB HART'S SKY RAIDER ON THE GLIDE SLOPE



Ray 'Ozyray' Peters Frigid Midget P-47 Thunderbolt 102" span from the Martyn Serginson plan pack. ZDZ 80cc power / Menz 26x8\* prop. Ray Slack retracts.



Harold Chattel's very nice 1/4 scale SE5a wafting by.



John Webb's P-47 Thunderbolt 'Wicked Wabbit'.

Skipton gave one of his show stopping aerobatic displays with his massive (60% scale) YAK 54. Then, a full size Yak 52, G-TYAK 'Betsy', flew in a few minutes later. The full size Yakolev 52 is a great scale subject, and its almost-but-not-quite retracted-undercarriage system is so characterful, that it just cries out to be modelled.

### Spitfire 300

It always amazes me how little modelled the historic Supermarine Type 300 (prototype Spitfire) is with UK modellers. Bucking this trend, Jeff Pearson has been campaigning his fine silver Spit 300 K5054 for some seasons now, and to my eyes, it always looks handsome in the air.

### Heston Phoenix

Another rare British aircraft that is scandalously under-modelled is the exquisite Heston Phoenix. Derek



Phil Clark's 'Screamin' Demon' Douglas A-24 Banshee on a flaps-down approach.



Jeff Pearson's Spitfire 300 prototype K-5054.



Superb LFG Roland CII 'Walfisch', built by Barry Banks, to 1/3rd scale. Spans 135" and weighs 42 lbs, with Moki .75 power.



Scrumptious engine detail on Barry Banks' LFG Roland CII 'Walfisch'.



Brian Rawcliffe's superb MK II Hawker Tempest. It spans 97" and weighs 41 lbs. Moki five-cylinder radial.



Brian Rawcliffe's MK II Hawker Tempest is beautifully finished.



John Braithwaite's delightful Little Toot.



Cheerful artwork on the Little Toot.

Martin's fine example is still the only one on the summer show circuit. This is a pity since the elegant Heston Phoenix was 'way ahead of its time in looks, refinement, and comfort. A *Subject For Scale* if I ever saw one!

## THE VERDICT

I AM NOT A MEMBER OF THE LMA. I AM A MEMBER OF THE BMFA. SO, I AM DISPASSIONATE. HOWEVER, I DO KNOW QUALITY WHEN I SEE IT. THE AMAZING THING ABOUT THIS VERY FIRST EVER LMA ELVINGTON, IS THAT IT HIT THE GROUND RUNNING. IT DID NOT FALTER, OR HAVE TO PLAY ITSELF IN. IT WAS BIG, BOLD, GLAMOROUS, AND ASSURED FROM ITS FIRST STEP. THIS IS QUITE AN ORGANISATIONAL AND LOGISTICAL ACHIEVEMENT. IT MEANS THAT THE LMA 'FRANCHISE' IS TRANSFERABLE. IT IS FLEXIBLE, ADAPTABLE, AND LIKE MY IPHONE, IT JUST WORKS. BETWEEN YOU AND ME, IT MADE ME PROUD TO BE BRITISH, AND TO BE AN AEROMODELLER. I PREDICT THAT ALTHOUGH INSTANTLY ALREADY LARGE AND SUCCESSFUL, LMA ELVINGTON WILL GROW VERY QUICKLY. IT JUST FEELS RIGHT.

**THE SOKO P2 KRAGUJ WAS PROBABLY THE LAST PISTON ENGINED FIGHTER TO BE FLOWN IN COMBAT ...**





**IMMACULATE SKY-RAIDER ON SHORT FINALS.**



Full-size Soko P2 Kraguj, or Sparrowhawk, built in Yugoslavia.



The LMA really know how to keep the kettle boiling.



Jugs A Plenty at Elvington 2011! This is Zombie II a nicely schemed Thunderbolt Razorback.



Jim Lambert's 74" span Maule, brought South of the Border fra' Bonnie Scotland. Great lad, Our Jim.



Frank Fletcher's WW2 Airspeed Horsa assault glider



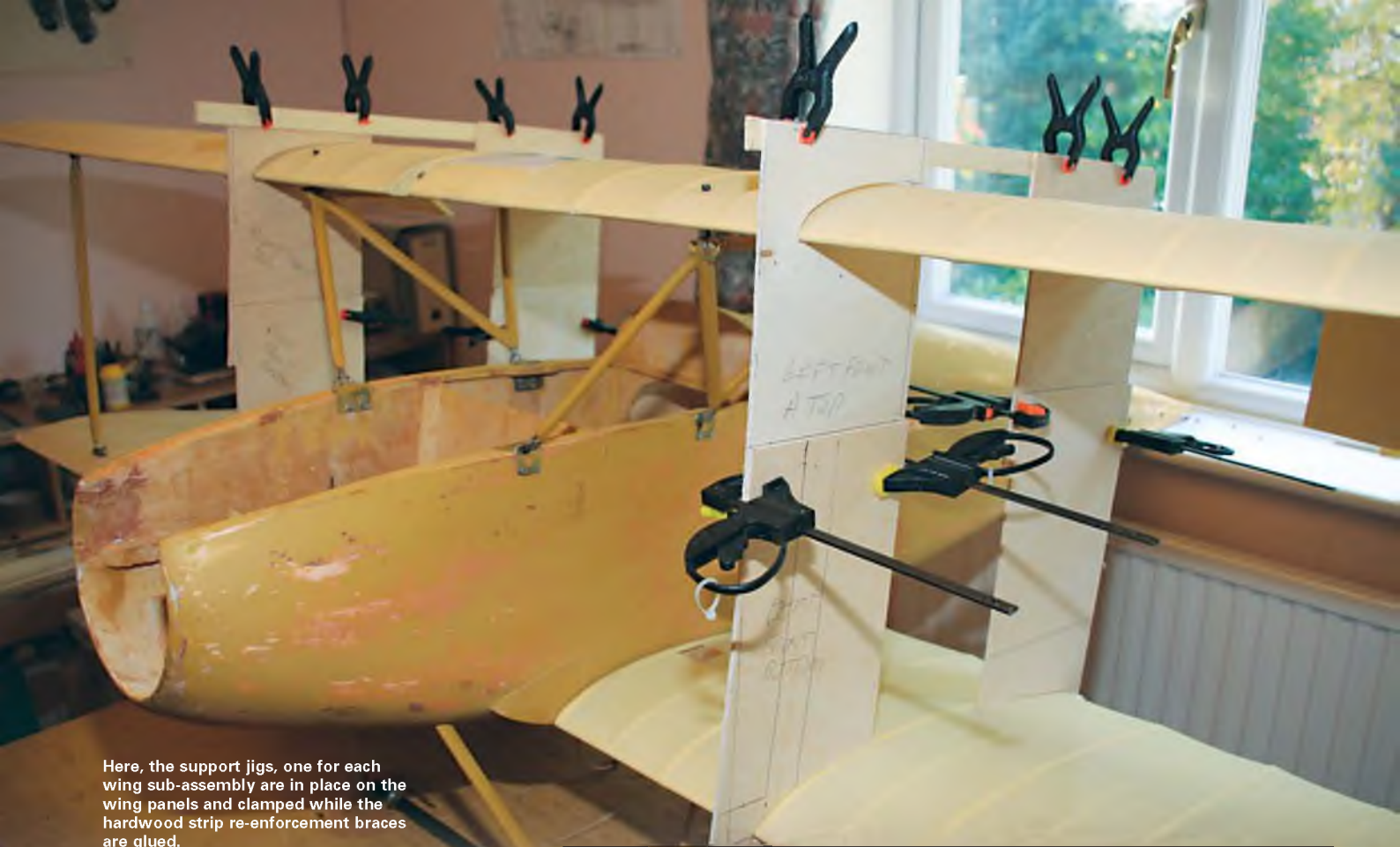
Harry Harland's pretty Druine Turbulent is built to 40% scale.



Derek Martin's exquisite 1/4 scale Heston Phoenix. Wing Span: 10 foot 1 inch; weighs: 39lbs. Engine is a 3W 70i driving a 24x10 prop.



As usual at the LMA, lots of multi-engine bombers. I have never seen so many in the air at once!



Here, the support jigs, one for each wing sub-assembly are in place on the wing panels and clamped while the hardwood strip re-enforcement braces are glued.

## SCALE TECHNIQUE *by Tony Dowdeswell*

# WING CRADLE

HERE'S A LITTLE IDEA THAT SOME OF YOU WHO ARE HEAVILY INTO EARLY AVIATION AND BIPLANE SCALE MODELS MIGHT LIKE CONSIDER AS AN AID TO ASSEMBLY AT THE FLYING FIELD



LEFT: This is as close as I could get, with just hand tools, to the interplane strut anchor-point brackets that were a feature of the full size Albatross D.II., made from sheets metal and brass picture hooks.

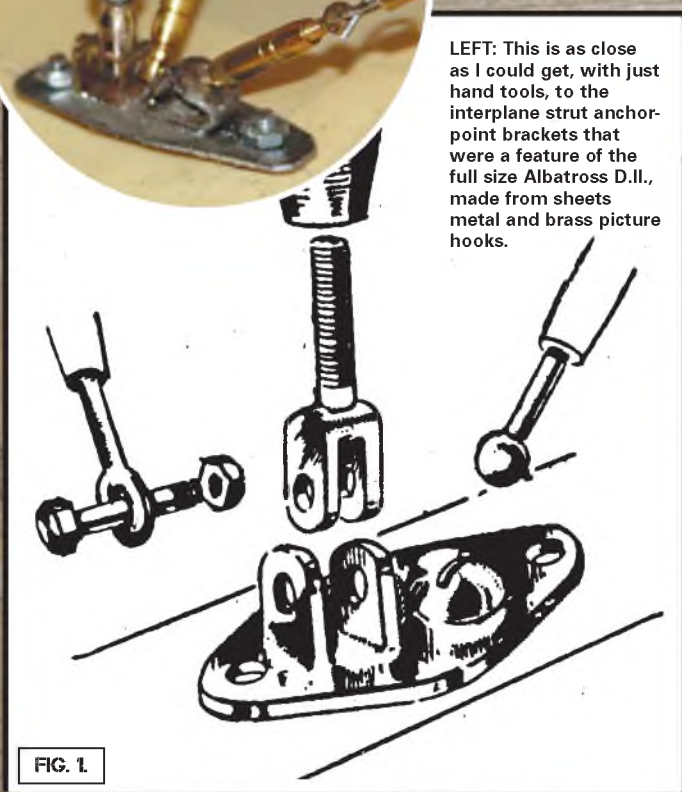


FIG. 1.

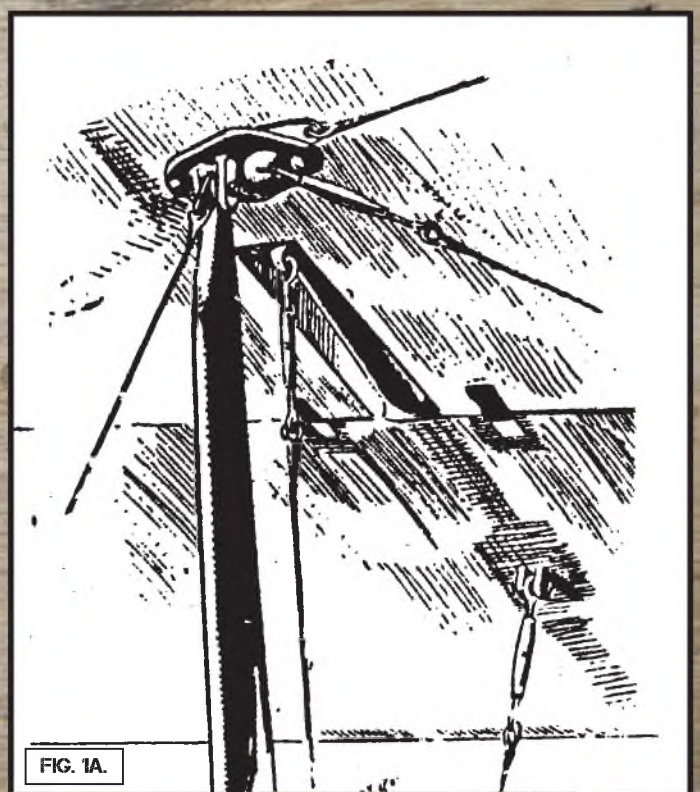


FIG. 1A.

The subject, in my case was my long running (and seemingly never-ending) project for a quarter-scale Albatross D.II, based on Gary Sunderland's plans in the FSM Plans Service. I've tried to make this as near to true scale as possible, including the rigging and 'struttery'. To do that, I had to reproduce (as near as I could) the anchor brackets for the wing interplane struts that also anchor the bracing wires.

When one looks at the sketch (Fig.1 & Fig 1A) of the brackets for the full size machine, one realises that it is a cleverly thought out arrangement that would ease and speed up the work of the ground-crew riggers who would have had the job, back in 1916-1918, to keep the aircraft fettled for flight. However, when reduced to quarter-scale it's a trickier proposition; the turnbuckles (from *Proctor Enterprises* - pricey but very good) are tiny, as are the 12 or 14BA bolts that secure the turnbuckles and the interplane struts to the anchor brackets.

As the whole project ground forward to the point of doing the rigging, it became clear that at-the-field assembly of the airframe with four fully disassembled wing panels would be a time consuming fag, particularly in cold weather! Something that would group things together in partially assembled state, suitable for storage and transport, seemed the answer.

So here it is in glorious pictorial! The idea holds the upper and lower wing panels (left and right), as rigged sub assemblies. The Interplane struts do their job as they do when the model is fully assembled and the two-part cradle for each of the left/right wing sub assemblies slots over the leading edges and the trailing edges, to be held in place with bolts/butterfly nuts. Each is a



simple band-sawn panel braced with hardwood strip, furnished with foam faced 'shoes' that slot over the wing leading and trailing edges.

On my model, the bracing wires are cosmetic rather than functional, the flying loads being taken by the wing panel joiners that are 'flatie' Graupner blade-in-box, steel-and-brass components. The only bracing wires that need to be

undone are the two (one each side) that run from the top rear outer strut positions to the fuselage nose. Everything else stays in place and slides outwards as a unit, off the wing joiners.

When removed from the fuselage, here's a certain amount of 'sway' on each sub assembly, but basically, it all hangs together. Try it - adapt it to your own needs. ■

1: The components of the ply support jigs band-sawn to shape and with the strip wood fore & aft joiners glued on. 2: One of the support jigs, now with the support shoes in place. Note the foam cushions. 3 & 4: Close-ups of the support shoes showing the foam inserts that protect the fabric covering when slotted over the wing leading and trailing edges. 5: Here the left hand wing sub-assembly is being slid off the Graupner wing joiner 'blades'. 6: Detail of the support jibs, slotted over the wing panel leading and trailing edges. 7: One complete wing 'half' supported by the jig and the interplane struts. All the wire rigging remains in place.



## SUBJECTS FOR SCALE

# HANRIOT DUPONT H.D.1

ONE OF THE LESSER KNOWN ALLIED FIGHTERS OF WW1, BUT ONE THAT HAS STRONG APPEAL FOR MODELLERS DUE TO ITS PLEASING APPEARANCE AND UNCOMPLICATED SHAPE

**A**lthough one of the lesser-known pioneer producers of aeroplanes, the Hanriot organisation can be traced back to 1910. But even before then, founder Frenchman Rene Hanriot was a celebrated racer of Darracq cars and designed his first aircraft as early as 1907. Others followed, notable for super-slender fuselages and by 1912, Hanriot had established a factory at Reims together with a flying school - remember, most customers were well healed individuals attracted to aviation, but who need to be shown how to

'drive' their new 'toys'!

Rene Hanriot must have very quickly gained a good reputation for, by 1911 the *Hanriot Monoplane Ltd* company had been established in London, together with a flying school at the Brooklands aviation and racing car centre.

Hanriot withdrew from the aviation scene in 1913, but by 1916, re-established himself with a new factory at Billancourt, for license production, in France of Sopwith 1.1/2 Strutters.

Hanriot recruited the services of aircraft designer Pierre Dupont in early 1916, leading to the creation of the Hanriot H.D.1 - a neat and attractively shaped biplane fighter characterised by distinct upper wing dihedral and substantially staggered lower wings.

French military pilots who tested the H.D.1 were enthusiastic about its exceptional maneuverability, but it's single machine

gun armament was somewhat of a throw-back to the Nieuport 11 which was, by then, superseded by such Germany types as the Albatross D.II now packing twin-gun firepower, so that the Hanriot design was bypassed in favour of the SPAD VII.

Yet the Hanriot H.D.1 did find favour with Belgian pilots and the first Belgian unit to receive the type was, fittingly, No.1 Squadron, which began taking delivery of examples in August 1917. Top Belgian fighter pilot Willy Coppens, then a Warrant Officer, was immediately impressed by the excellent



This is the Hanriot H.D.1 on display in the Graham White Factory annex at the RAF Museum Hendon. It is known to have seen service with the 1e Escrille de Chasse of the Belgian Aviation Militaire from 1917 during WW1. At one time, just prior to WW2, it was briefly owned by Richard Shuttleworth of the Shuttleworth Collection, before the wrecked remains were restored in USA. The (then) owner eventually donated it to the Hendon museum. (See full story on side panel overleaf.



## A PRESERVATION SAGA

**M**ost really early aircraft survivors have a fascinating tale to tell - perhaps not at all surprising in view of their longevity and FSM is indebted to Kevin Panter of the Shuttleworth Collection for the following story, and also to Andy Sephton who made the enquiries.

**T**HANRIOT HD.1, SERIAL NUMBER 75, WAS BUILT IN 1917 BY SOCIÉTÉ ANONYME DES APPAREILS D'AVIATION HANRIOT AT NEULLY-SUR-SEINE, PARIS. IT WAS DELIVERED TO THE 1<sup>È</sup>E ESCADRILLE DE CHASSE AS HD-75.

THIS WAS THE BELGIAN AIR FORCE'S FAMOUS 'THISTLE' SQUADRON AND IT IS BELIEVED TO HAVE BEEN FLOWN FOR A TIME AT THE WESTERN FRONT. IT WAS RETIRED BY THE BELGIAN AIR FORCE AS A FRONT LINE FIGHTER IN 1928, BUT CONTINUED AS A TRAINING MACHINE UNTIL THE 1930S.

IT WAS SOLD AS SURPLUS TO BROTHERS, ANDRÉ, PAUL AND JULES DROSSAERT AND REGISTERED AS OO-AP; THE REGISTRATION REFLECTING THE INITIALS OF THE BROTHERS. IT SUBSEQUENTLY PASSED ON TO JACQUES LEDURE WHO BASED THE AIRCRAFT AT BRUSSELS, ÈVÈRE AERODROME AND AT ONE POINT THE AIRCRAFT WAS USED OUTSIDE A CINEMA TO PROMOTE THE WW1 FILM 'WINGS'. THERE, IT WAS SEEN BY RICHARD SHUTTLEWORTH, WHO PURCHASED THE AIRCRAFT IN 1938.

RICHARD FLEW IT BACK TO UK BUT, AFTER ARRIVING AT LYMPNE AERODROME, THE LE RHÔNE ENGINE STOPPED AND REFUSED TO START AGAIN. IT TOOK TWO DAYS TO RESOLVE THE PROBLEMS BEFORE RICHARD WAS ABLE TO FLY THE HANRIOT TO OLD WARDEN.

A BRITISH CIVIL REGISTRATION WAS APPLIED FOR AND THE REGISTRATION G-AFDX WAS ALLOCATED TO ENABLE RICHARD TO TAKE PART IN A ROYAL AERONAUTICAL SOCIETY GARDEN PARTY AT HEATHROW. AFTER THIS DISPLAY, THE HANRIOT WAS OVERHAULED AT OLD WARDEN BEFORE TAKING PART IN FURTHER GARDEN PARTIES.

IN 1939, RICHARD SHUTTLEWORTH DISPLAYED THE HANRIOT AT A BROOKLANDS GARDEN PARTY; UNFORTUNATELY, DURING HIS RETURN FROM THE DISPLAY, A WHEEL FELL OFF THE AIRCRAFT AFTER TAKING OFF FROM BROOKLANDS. DESPITE A WARNING TELEPHONE CALL TO OLD WARDEN AND RICHARD'S FAMILY TRYING TO WARN HIM OF THE DANGER BY SPELLING OUT WORDS ON THE AERODROME WITH TABLECLOTHS, RICHARD ATTEMPTED TO LAND THE HANRIOT NORMALLY AND IT WAS VERY BADLY DAMAGED IN THE ENSUING CRASH. THE WINGS NEEDED EXTENSIVE REPAIRS AND RICHARD SENT THESE TO BROOKLANDS TO BE REPAIRED. WW2 BROKE OUT BEFORE THE WORK WAS COMPLETED AND THE WINGS WERE DESTROYED DURING AN AIR RAID ON BROOKLANDS.

AFTER THE WAR, THE AIRCRAFT WAS SOLD TO A COLLECTOR, MARVIN HAND, IN AMERICA WHO COMPLETED THE RESTORATION AND PRESENTED THE HANRIOT TO THE RAF MUSEUM AT HENDON WHERE IT CAN STILL BE SEEN TODAY. IT HAS SINCE BEEN COMPLETELY RESTORED TO ITS ORIGINAL 1<sup>È</sup>E ESCADRILLE COLOURS.



This is the H.D.1 that French ace Charles Nungesser took to USA for a Barnstoring tour in 1924. It was afterwards used in the Hollywood aviation movie 'Hell's Angels' and eventually, post WW2, wound up with Ed Maloney's Museum of Flight in California.

handling qualities and airframe strength, as compared to the French Nieuport, which the H.D.1 was intended to replace.

Then, following an Italian Military Mission to Paris, in November that year, the Italian *Nieuport-Macchi Co.* commenced production of the type, supplying sufficient numbers that, by the end of the conflict in November 1918, some 130 examples of the H.D.1 were in service with the Italian squadrons.

Silvio Scaroni, one of Italy's leading pilots

, with 26 victories, flew the H.D.1 extensively, using non-standard two-gun armament in place of the standard single gun installation. Probably the greatest exponent of this aircraft was Frenchman Charles Nungesser, credited with a total of 45 victories - and almost as many broken bones, due to his numerous crashes!

His various personal aircraft were emblazoned his 'coffin-and-candles' identity device on the fuselage sides. Whether he flew the H.D.1 operationally cannot be certain, but after WW1, he

The Hanriot H.D.1 presently on show in the Air Museum at Dubendorf, Switzerland.



Hanriot H.D.1 at the Italian Air Force Museum, Vign di Valle, Rome.



ONE OF THE SWISS HANRIOT H.D.1S DURING ITS MILITARY SERVICE DAYS, POST 1921



An example of the Hanriot H.D.1 built by the Nieuport-Macchi Co. in Italy, for service with the Italian Air Service. Post WW1, when the Regia Aeronautica was formed in 1925, a few H.D.1s were still on charge.



One of the 12 Hanriot H.D.1s that entered military service with Switzerland from 1921.

took one example to U.S.A. (no. 5934) in 1924 for a barnstorming exhibition tour, still bearing his notorious fuselage insignia.

Later, after Nungesser (and Colli's) unsuccessful non-stop trans-Atlantic crossing, the aircraft passed through several ownerships, appeared in several aviation movies, including the celebrated Silent epic 'Hell's Angels'.

Despite all this, the machine survived, to wind up in the ownership of Californian aircraft restorer and air museum operator Ed. Maloney.

Although, during its time in service, the H.D.1 was quite a useful fighter, it was normally armed with only a single machine-gun, at a time when most of its contemporaries and opponents had adopted the classic, twin-gun armament. Initially at least, the gun was

offset from centre while the gun-sight was positioned on the fuselage centre-line and was thus not completely harmonised with the gun line-of-fire.

Later, this gun installation was repositioned on the centerline, although the standard armament of one gun remained.

Twin-gun armament was applied to some examples of the H.D.1, but these were the initiative by individual pilots, to augment firepower, but sacrificing service ceiling and climb rate - a debatable trade-off!

The H.D.1 was a typical fighter product of its time with a wooden airframe with conventional fabric covering. Good structural design imparted a strong and reasonably light structure, with much of the airframe style of

Sopwith incorporated - not surprisingly, in view of Hanriot's license production of Sopwith 'Strutters'.

Wings were heavily staggered, built on two spars, internally braced with cross-wires and steel tube compression members.

The basic fuselage was of box girder construction with curved upper deck plywood skin over rounded formers - typical of the period. Curved metal side panels faired the radial cowl into the flat fuselage sides

Post WW1, the Hanriot H.D.1 soldiered on with both Belgian and Italian Air Arms and was still on the strength of both in 1926.

A floatplane version was designated H.D.2, and operated by U.S.Navy forces at a few coastal stations in France after USA entered WW1. Subsequently, some of these found their way back Stateside, to be converted to landplane configuration and used for training purposes, while one at least was used to fly off from a gun turret mounted platform on the battleship USS Mississippi during 1919.

Switzerland acquired sixteen H.D.1s in 1921, while one example found its way to Ecuador and three to Paraguay.

### Where to see one now?

As featured 'In Detail' elsewhere in this issue, the Royal Air Force Museum, Hendon has a superbly restored example, eminently viewable at ground level (NOT hung up like a plastic kit!). It can be seen any day of the week.

The Belgian Musee Royal de l'Armee et Histoire militaire in Brussels MAY still have H.D.1 no.78 hung up.

In Switzerland, the Dubendorf Air Museum definitely have one on show and illustrated on their excellent web site, while there is also

one at the Museo del Volo, in Turin, Italy .

### Colour schemes

Belgian aircraft were camouflaged on the top and vertical surfaces (Including the engine cowl and metal access panels in large 'shadow shading' patches of dark green and khaki, with cream or very pale blue undersurfaces.

Roundels of near to full chord in red, yellow and black were applied to wing upper surfaces, while none were applied to the fuselage; the rudder was equally divided, vertically, in red, yellow and black portions with the red next to the rudder post.

Italian Hanriots were uncamouflaged, the finish being a creamy shade of clear-doped linen fabric; metal panels and cowling were usually polished. Green, white and red roundels were carried on the wing tips and fuselage sides; the rudder was divided (vertically) into equal-width red, white and green divisions, with red foremost.

U.S.A built examples has battleship grey fuselages, aluminum wings and tail. Red (outer)/blue (inner)/white (centre) roundels were applied to the wings only, placed inboard of the ailerons. Rudder stripes of equal width were applied with red foremost, the white and blue. A large serial was carried on the fuselage sides.

### SPECIFICATION

Wing span (upper): 28 ft. 6.5ins  
 Wing span (Lower): 24 ft. 3.5 ins.  
 Length: 19 ft. 1.875 ins  
 Upper wing dihedral: 4.45 degrees.

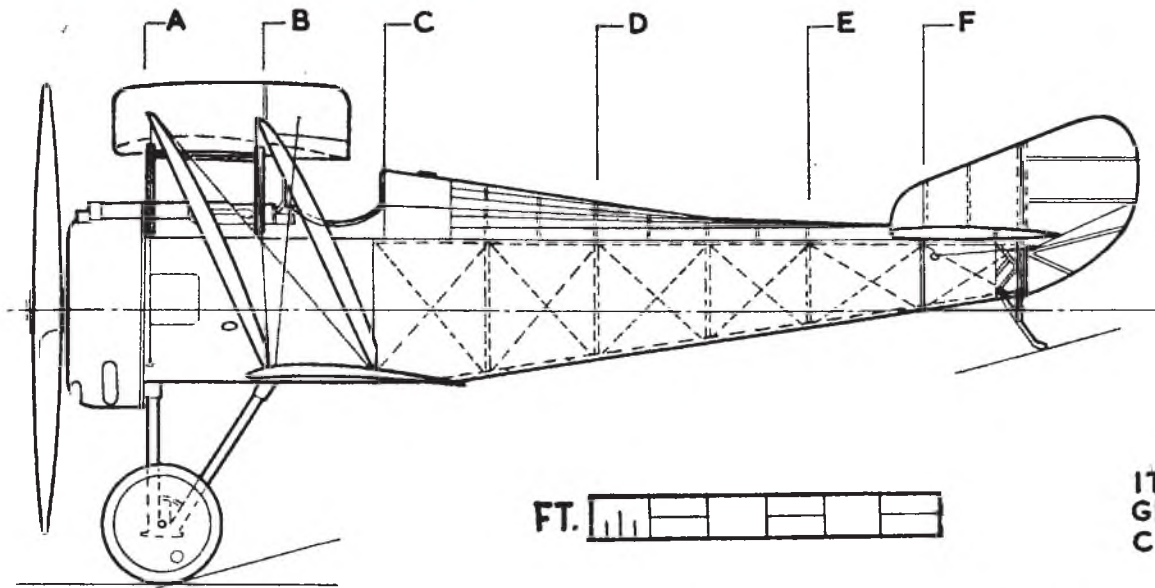


## WANT TO BUILD ONE?

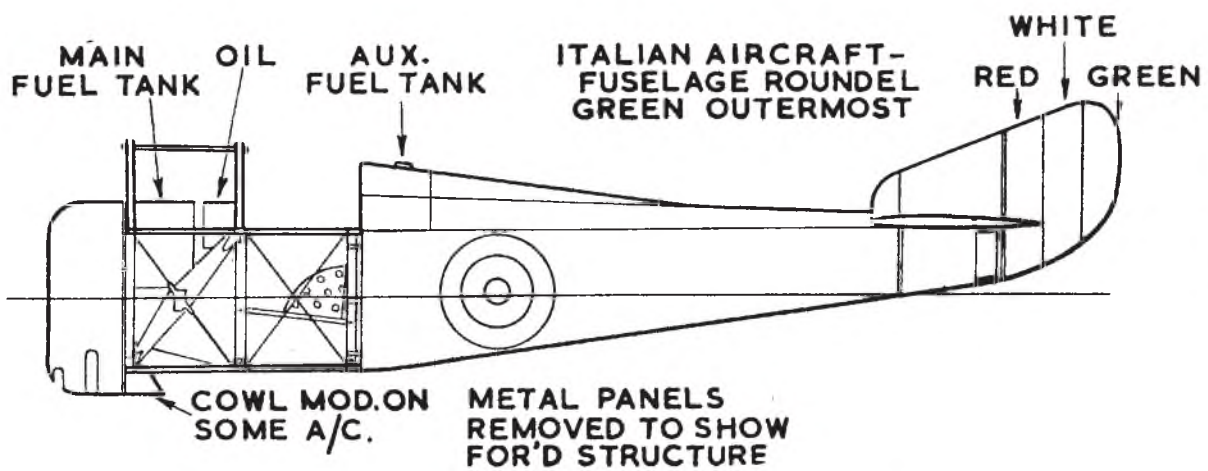
The only decent model we've ever seen of the Hanriot H.D.1 was the one designed by the late Peter Neate, who flew it in competition with considerable success during the early 1970s. Pete's model was built to a scale of 1:4.75. It had a wingspan of 72" (1829mm) and used a .60 size engine since, back then, such was the maximum engine capacity allowed for National and International Scale competitions.

The design was published in *Radio Modeller* April 1972 issue and the plans are still available in the X-List range of *myHobbystore* ([www.myhobbystore.co.uk](http://www.myhobbystore.co.uk)) plan no. RM95 price £17.50.

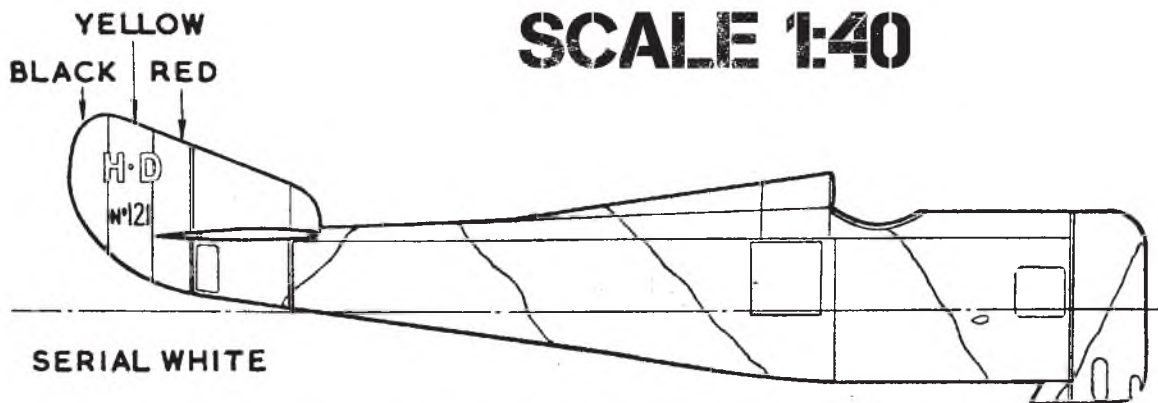
It was a good, accurate model and flew extremely well.



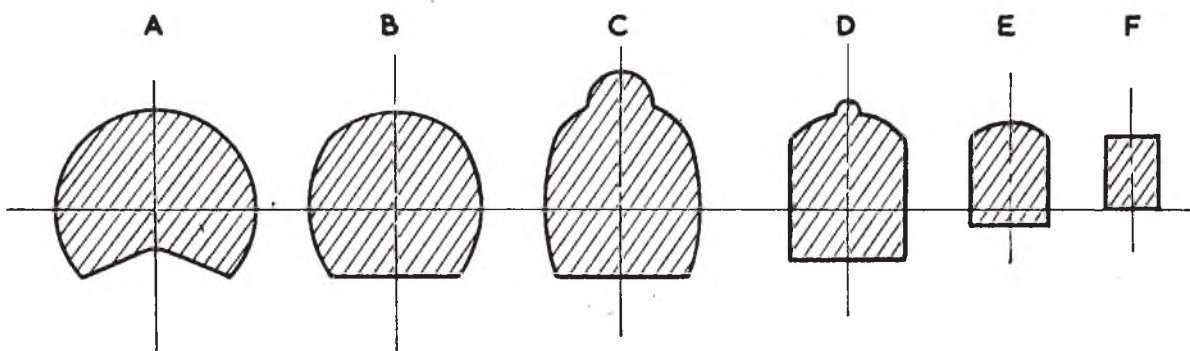
ITALIAN ROUND  
GREEN, WHITE R  
COLOURS SOME



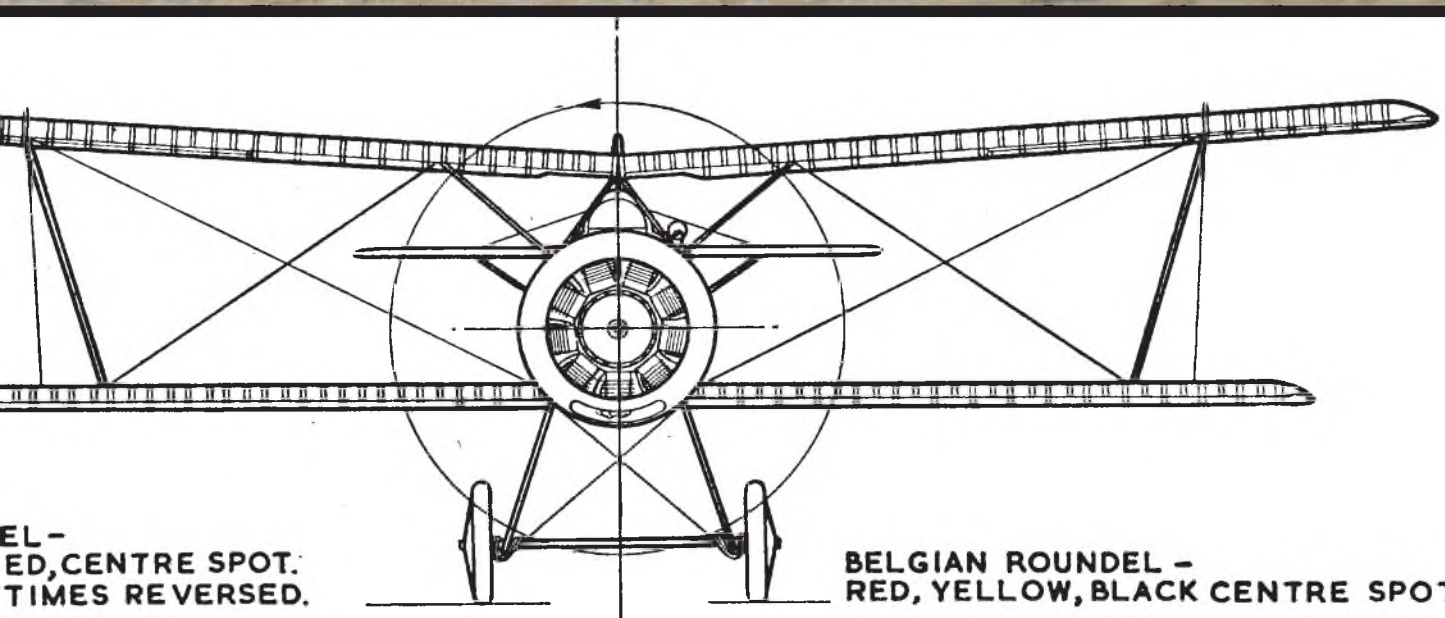
**SCALE 1:40**



**BELGIAN HANRIOT-CAMOUFLAGE SCHEME  
NO FUSELAGE ROUND**

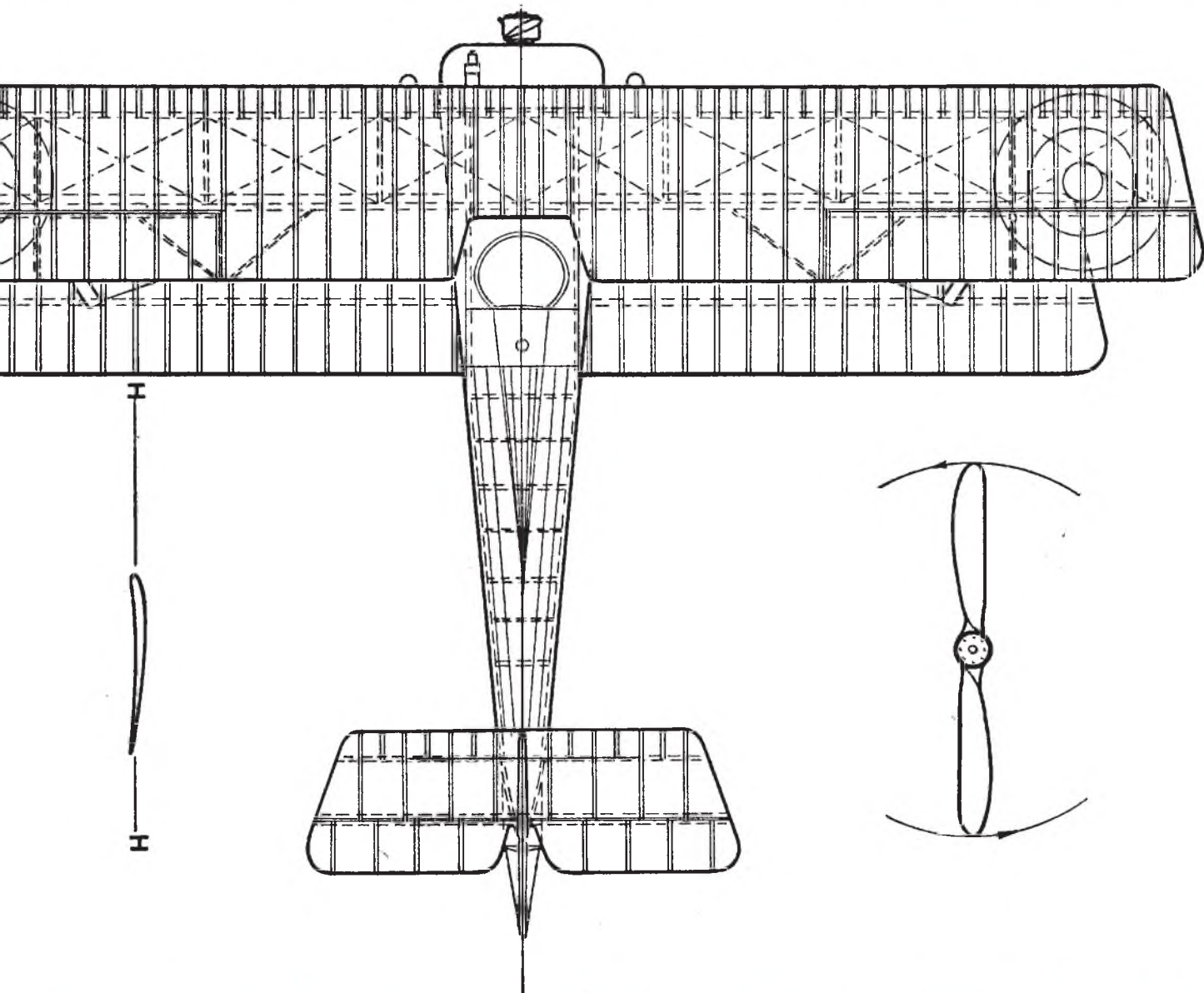






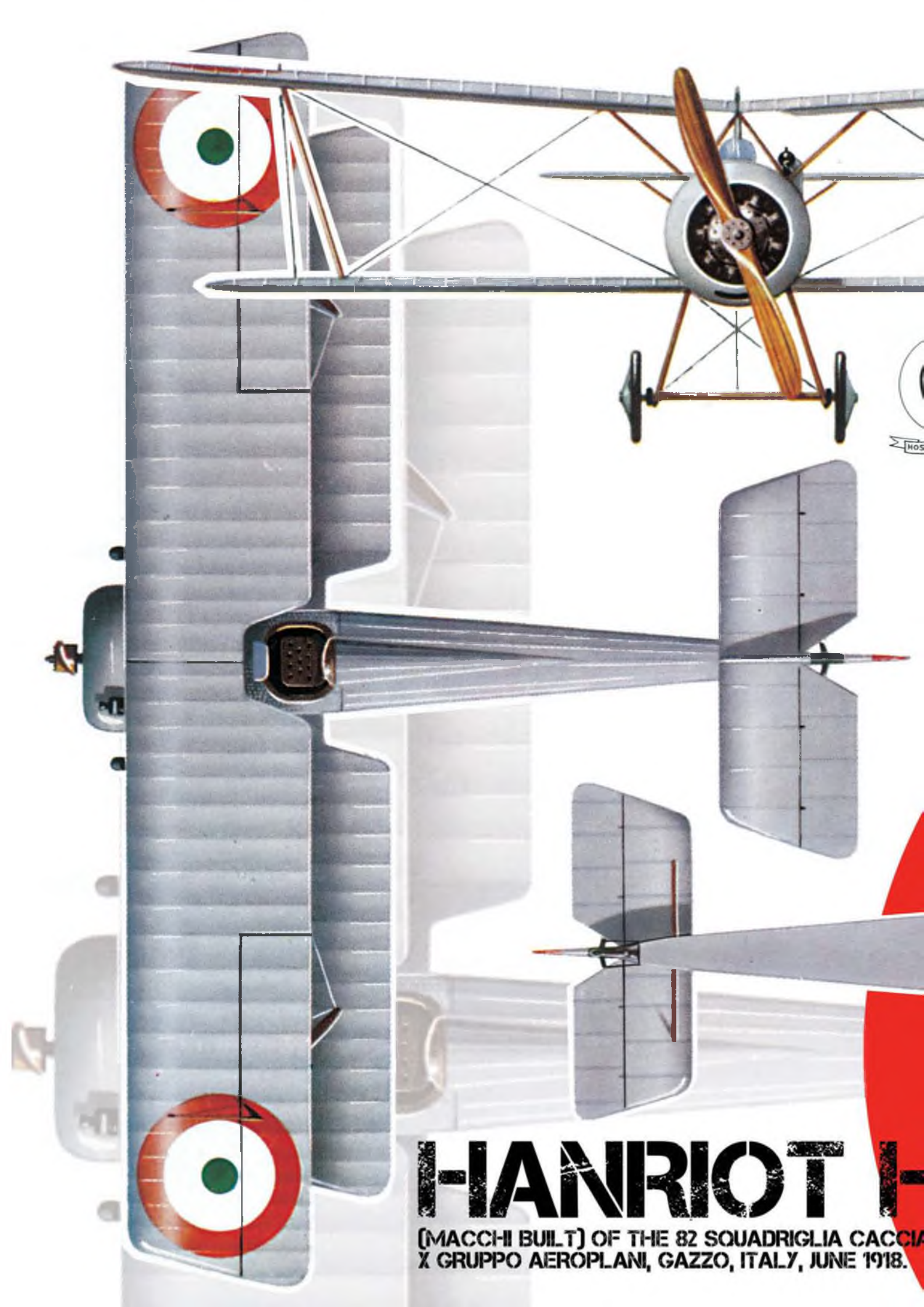
EL-  
ED, CENTRE SPOT.  
TIMES REVERSED.

BELGIAN ROUNDEL -  
RED, YELLOW, BLACK CENTRE SPOT.



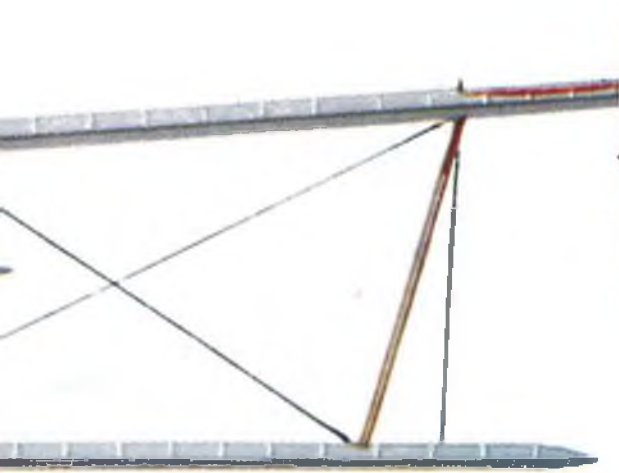
**HANRIOT**

**HD'1**



# HANRIOT H

(MACCHI BUILT) OF THE 82 SQUADRIGLIA CACCIA  
X GRUPPO AEROPLANI, GAZZO, ITALY, JUNE 1918.



## 82 SQUADRIGLIA EMBLEM



# HD 1



HD 1, 1ST ESCADRILLE DE CHASSE, AVIATION BELGE MILITAIRE, 1917.



HD 1, 11TH ESCADRILLE DE CHASSE, AVIATION BELGE MILITAIRE, 1917.



HD 1 (MACCHI-BUILT), 76 SQUADRIGLIA CACCIA, VI GRUPPO AEROPLANI, AERONAUTICA MILITARE, ISTRANA, ITALY, NOV 1917.



HD 1 (MACCHI-BUILT), 81 SQUADRIGLIA CACCIA, VI GRUPPO AEROPLANI, AERONAUTICA MILITARE, ISTRANA, ITALY, NOV 1917.



HD 1 (MACCHI-BUILT), 81 SQUADRIGLIA CACCIA, VI GRUPPO AEROPLANI, AERONAUTICA MILITARE, ISTRANA, ITALY, NOV 1917.



HD 1 (MACCHI-BUILT), 80 SQUADRIGLIA CACCIA, XII GRUPPO AEROPLANI, AERONAUTICA MILITARE, MARCONI, ITALY, NOV 1918.



HD 1 (MACCHI-BUILT), 70 SQUADRIGLIA CACCIA, X GRUPPO AEROPLANI, AERONAUTICA MILITARE, ISTRANA, ITALY, NOV 1918.





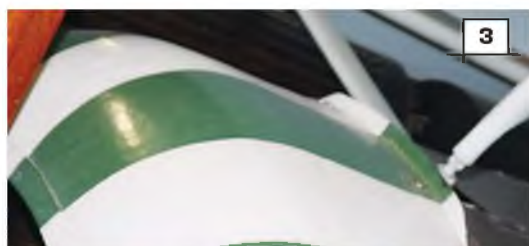
# ZOOM IN ON THE DETAIL

## IN DETAIL

# HARRIOT H-D 1

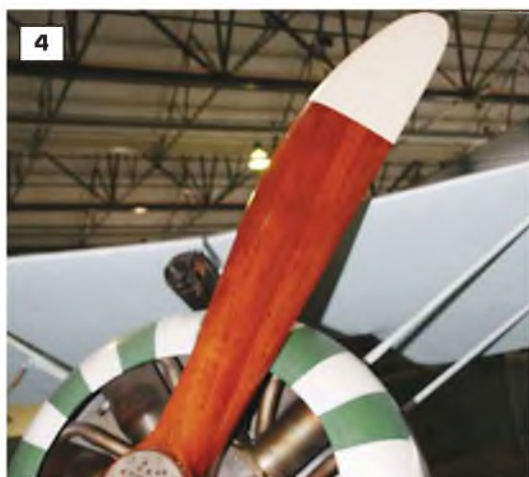
A close-up study of the Harriot H.D. 1 on display in the R.A.F Museum, Hendon's Graham White Hangar annex.

With much thanks for their kind co-operation.



3

1: View of the lower engine cowl showing the shape of the air intake holes.



4

2: Detail of the propeller boss.

3: This view reveals the 'lip' at the rear edge of the engine cowl. Opposite side similar.

4: The slightly 'scimitar' shape of the propeller.

5: Interplane struts and rigging.



5

**6:** Wing upper surface, showing the aileron control horn, with brace wire to the trailing edge and control wire forward.

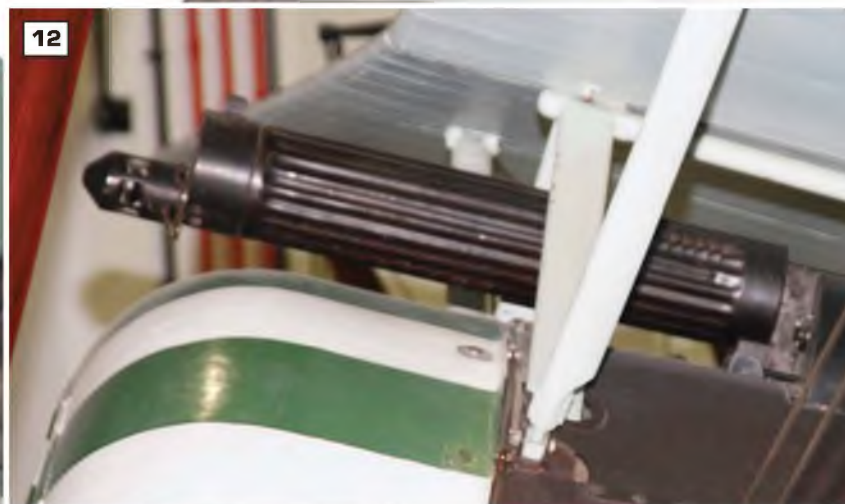
**7:** Upper wing underside showing the aileron control wire.

**8:** Aileron control cable exits upwards from lower wing access panel.

**9 & 10:** Two views showing the metal braced cockpit windshield.

**11:** Another view of the cockpit area.

**12:** The single machine gun that was standard armament of the Hanriot H.D.1. This one is centre-line mounted. On early examples, it was offset to the left.





13



14



15



16

13: General view of the forward fuselage.  
 14: Fuselage access panel, just behind the engine cowl.  
 15: Wing root detail, showing the anchor point for bracing wires that run from the top outer wing strut.  
 16: Rear fuselage lifting handle, positioned forward of the tailplane.  
 17 & 18: Two views of the cabane assembly, viewed from front three-quarter.  
 19: Cabane again, viewed from rear.  
 20: Cabane assembly, also revealing the 'lip' on the cowl rear edge and the narrow space between the wing halves on the centre-line.



17



18



19



20



21 & 22: Two views showing one of the pressed metal 'shoes' that seat and locate the interplane strut.

23: Lower anchor points for the outer wing interplane struts, also showing the bracing wires and turnbuckles.

24: Outside face of main undercarriage wheel.

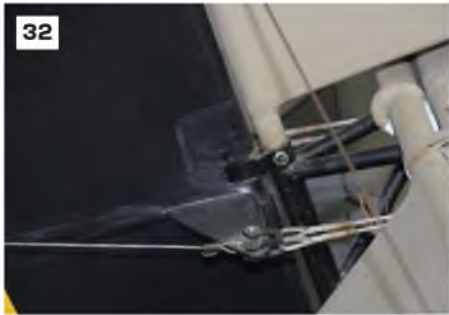
25: Bungee cord 'shock absorber', bound around the undercarriage axle.

26: Anchor points for the main undercarriage struts.

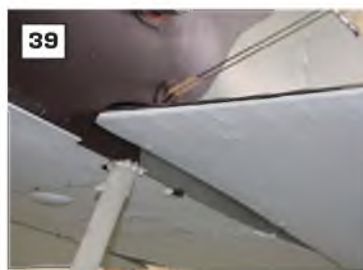
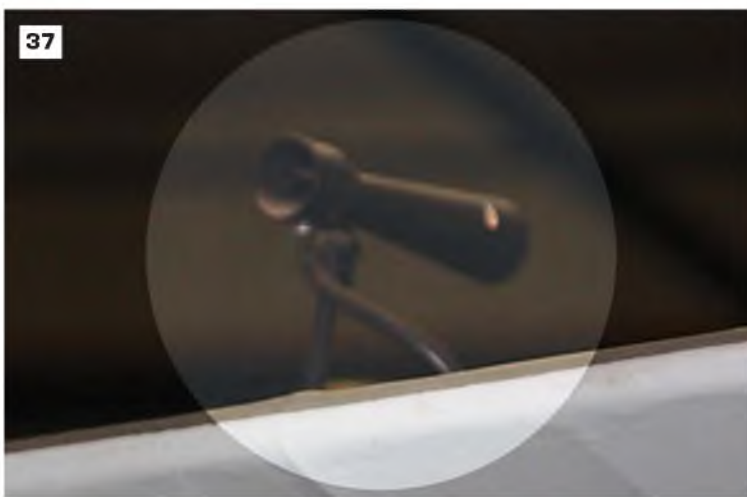
27: Inside face of the undercarriage mainwheel, also showing the bungee cord shock absorber.

28: Configuration of the complete main undercarriage.





29: The complete tailcone. Note the space between the fin and tailplane. 30: Bracing wire anchor point on the tailplane upper surface. 31: Rudder, showing the bracing wire from the control horn to the rudder trailing edge. 32: Rudder control horn close-up. 33: Tailplane underside bracing strut. 34: Tailplane underside bracing wire. 35: Detail of one of the interplane strut locating 'shoes'. 36: Same view, showing the access panel in the upper wing lower surface. 37: Detail of the instrument venturi (upper left outer wing) close to the leading edge. 38: Another view of the instrument venturi run to the upper wing aileron. 39: Lower wing/ fuselage. 40: Another view showing the centre-line cap between the upper wing panels



## FULL-SIZE FREE PLAN FEATURE *by Peter Rake & Marion Crowder*

I firmly believe that if it weren't for this wonderful hobby that I have been a part of since I was 5 years old thanks to my father, I would already be dead and gone. I have been fighting heart disease for over ten years now and the wish to build another airplane has kept me going. I have had some surgery in the last year that has vastly improved how I feel and I am happy that I can get back to my sadly neglected modelling.

Pete has been an absolute peach through all of my hassles and allowed me all the time a person could ask for. There is something magical about watching a scale model of a particular aircraft as it floats by in the morning light. I don't believe that I will ever get enough of that feeling so I just keep building them and flying them and plugging along.

Some Japanese scientists have determined that time travel will never be possible. Obviously they don't fly scale aircraft models because time travel is exactly what we do every time one of our creations takes to the air. What a wonderful hobby to be part of!

# Cubver DART

**PART 1:** An electric powered scale model designed by Peter Rake, with the prototype model built and described by Marion Crowder

**Pretty as a picture, Marion's model looks very effective in**



## History

The Culver Dart started life as a low wing aircraft designed by Al Mooney, as a possible replacement for the Monocoupe. The Dart were being built for the Lambert Aircraft Company as it was then called. In original form it was a two-place side-by-side open cockpit low wing monoplane, but it was never put into production by Lambert because the factory was on hard times with the depression.

Mooney did keep working on the Monoprep G as it had been named. When the open cockpit was changed to a coupe type closed cockpit, the name was changed to the Monosport G. Enclosing the cockpit reduced drag and she became a very nimble little craft requiring a light touch and finesse to be flown well.

Clare Bunch, who was in charge of Lambert at the time, announced that production would begin in October of 1935. Unfortunately the solvency of the company was in question and production was never started.

Al Mooney left the company at this time and teamed up with K.K. Culver. They purchased the rights and tooling for the Monosport G and together they formed the Dart Aircraft Co. The name of the Monosport was changed to Dart to match that of the company and the aircraft was finally put into production in the late 1930s. The name of the company was then changed to Culver Aircraft Co. in 1939. Only a small number were built prior to the start of WW2.

Because the Dart never received a large enough powerplant, the full potential of the design wasn't achieved. Too soon, the little Cadet came along and thus the Dart was never built in large numbers. A few remain airworthy and she is simply one of the best and most advanced designs to come out of the golden age of aviation.

## The model

I enjoyed building my Dart and because of how Peter designed her. It went together quite nicely and I won't go into a great A-to-B story, but rather, touch on the certain aspects of construction that need detailing. So grab something good to drink, get your stuff together and let's get started!

Always on my favourites list, and one I truly wanted to build, I was delighted when Peter gave me the chance to do just that. I have often wondered how good a model the Dart might be

its' nice, bright scheme.



The only difficult part of the tail surfaces is laminating the outlines.



The laminated ply centre rib takes the landing loads and the ply plate provides fixing for the P-clip retainer.



Laminated balsa parts provide the nose shape and the motor mount parts set the thrust lines.



Laminated balsa again, along with some ply parts make up the strong, simple to build cowling.



There's plenty of room below the hatch for all the 'gubbins' that has to go in there. Makes battery access simple too.

rudder and the ailerons and the turns are nice and co-ordinated. I suppose you could simply use your thumbs, but I am basically a lazy flier and prefer to let the radio do it for me.

### Tail surfaces

I always start building a new model by doing the things I like the least. That way, those are done and I can get on to the good stuff. The only thing on the tail feathers that requires any discussion is the laminated out-lines. I find a piece of cardboard big enough and then trace the surface outline on to it. I use the pin-prick method which involves placing the cardboard under the plans and poking around the outline to give me a track to follow when I pencil in the outline. It is sort of like follow-the-numbers that we used to do as kids.

Remember to use the inside edge of the outline as you will laminate the balsa to the outside edge and thus be at the proper size when done. More than once, I have screwed up here

because of how close-coupled the wing and tail were. I was afraid that it would be rather pitch sensitive, but thus far she seems fairly well mannered. Peter did add a little length (about 1" - PR) to the fuselage but it

isn't noticeable.

The Dart requires very little rudder control to maintain a straight line on takeoff. Add a little up at the start and she simply flies off the ground. I do have about 30% couple between the

**Still a bit to do, but this is as close as we get to a naked model photo. Nothing too complicated about construction here.**

**WANT A SET OF PRE-CUT PARTS?  
THERE'S A SET AVAILABLE - SEE PAGE 7**





**Swooping in for a low pass, the Culver Dart shows off her slightly 'chunky' lines. Very pretty though.**

and built an outline that just didn't want to fit the plans. Live and learn so they say! And by the way, who is 'they' anyway? They seem to know a lot more than I do! *(Oi!! You can cut out that sort of waffle Marion. That's strictly reserved for my column. PR).*

Next, you cut it out. The cardboard outline needs some wax around the edges to prevent the glue from sticking it to the balsa. I use a crayon and just colour the edge with it. I prefer red, but any colour will work.

Five pieces of 1/16" by 1/4" balsa are used for the tailplane outline and four for the rudder. Pin the template to a small building board that you can rotate around so you can do the outline in one continuous length. Soak your strip wood in whatever way you prefer. I just run water on them and give it a minute to soak in.

There are two ways that I add the glue. I either coat each strip with white glue, slightly thinned, using a brush, or I lay up the laminations, let them dry and then coat it with cyano. Either way works for me, but the brushed way doesn't give you all the fumes. Take your pick. Everybody has their own way that they prefer.

Once you have the outlines, just pin them down and add the sticks to finish. I build the elevators and tailplane in one piece as well as the fin and rudder and don't separate them until after they are sanded. You will need to shape the wire joiner for the elevators and fit it once you separate them. Once you have them sanded, separated, and hinges temporarily installed, you can set them off to the side. Don't forget the joiner!

Now we move on to the wing.

**Wing centre section**

The wing is in three pieces, a centre section and two outside panels. All three are shown on the plan, which makes building them much easier. I shaped up the landing gear struts first, but I didn't install them until I had the wing all framed up and the panels attached to the centre section. It is much easier to work on the

wing if you don't have the gear legs installed; it will lay flat on the workbench for you.

Assemble the centre section first. The wing joiners are one-piece and should be epoxied together. S1 goes in front of DB and has a notch in it for the centre rib to lock into. All ribs in the centre section have a front piece and a back piece and butt against the joiner. I started by pinning down the trailing edge and then glued in the bottom sheeting. This blocks your view of the plans, so mark the location of your parts on the sheeting before you hide everything.

Assemble your centre rib pieces with epoxy and clamp them until set. Sand everything smooth, glue in the plywood blocks for the landing gear mounts and install in front and in back of the spar. I used 30-minute epoxy for all the plywood glue joints; it was probably overkill but I like things to be strong. *(Epoxy sounds good to me. PR).*

Add the blocks in the back for the wing bolts. These are important so don't forget them. Use fairly hard wood so you don't mash the wing when you tighten the wing bolts later. I left the wing dowel out until the very last. It makes sanding the leading edge much easier. Add your R2A and R2 ribs. These should be vertical when you put them in. The root rib on the outside panel will be leaned when you put the wing together.

Pull the sheeting up to the ribs in front and glue it. Now you can pick up the centre section and sheet the top. Once all that is done, add your leading edge and carve some shape into things. As I said before, both main panels are shown on the plans, so you don't have to trace or oil any thing. Sure makes it nice for building.

We'll have to leave things there until next month, so make sure you don't miss the second part of the plan and construction article for this attractive model.



**ABOVE CENTRE:** Yes Marion, you do have every right to look pleased with yourself. Don't tell me, you're just lending scale to the model.

# SCALE TECHNIQUE

## EXPERIMENTS

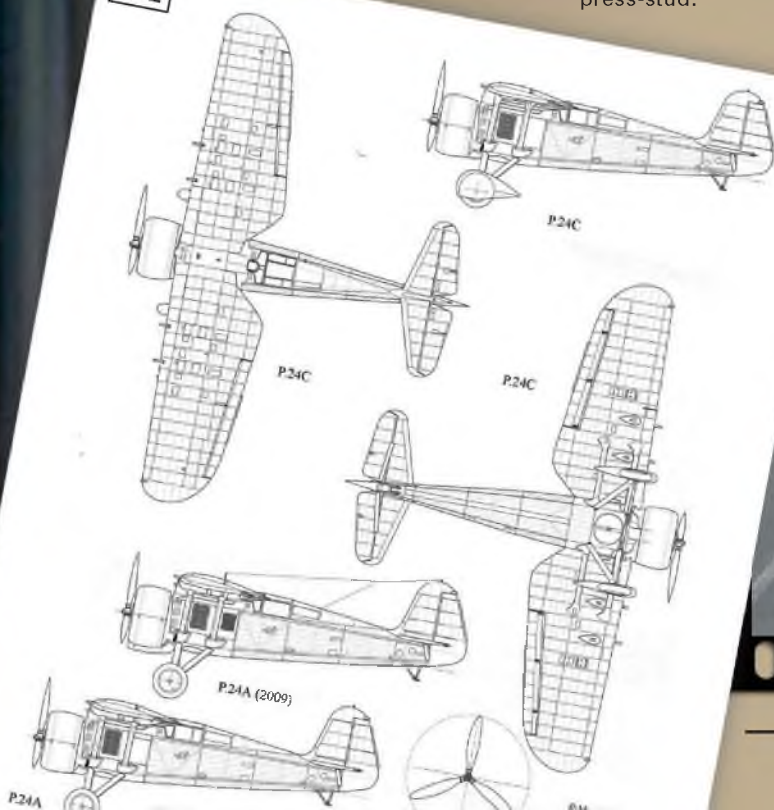
# CORR

**CORRUGATED SURFACE SKINS ARE A MAJOR CHALLENGE FOR SCALE MODELLERS AND MANY HAVE BEEN THE TECHNIQUES ADOPTED TO CIRCUMVENT THE PROBLEM. MARTIN SIMONS MET IT HEAD-ON!**

In my early teenage years I was attracted by a drawing in Book 1 of *Aircraft of the Fighting Powers*, of the Polish PZL P-24. It was a fighter with the attractive Pulawski 'gull' wing. A prototype with an open cockpit was exhibited in plain dural finish and red trim at the Paris International Air Show in 1934 (Figure 1). At this time it was 'the best armed and fastest interceptor in the world'.

Some years later (post-WW2), *Aeromodeller* magazine published plans for a small free flight 'semi-scale' model with a 1.5 cc diesel motor. After an interval, I built this, following the plans exactly. The wing struts were attached using carpet snaps, a kind of large press-stud.

FIG.2



# WITH... RUGGATED SKINS



FIG.1

Even in my inexperience I thought this odd and my doubts were confirmed when the wings came off in the air during the first flight.

The Polish Air Force was never equipped with squadrons of the P-24 but continued to rely on its predecessor, the P-11 (see *Subjects for Scale - FSM*, October 2011), which was no match for the Messerschmitt Bf109 in the early days of World War 2. Almost the entire P-24G version, with more powerful engine, enclosed cockpit and heavier armament, had been unwisely exported to Greece and other East European countries. A three-view drawing of the P-24G

was included in Jerzy Cynk's fine book, *Polish Aircraft 1893 - 1939*. (Figure 2).

After more than sixty years I am thinking again of building the Paris Exhibition showpiece P-24, but this time with functional struts, radio control and scale of 1/4 full size.

All the Pulawski wing fighters had corrugated metal skins on wings and tail surfaces.

Corrugated skins were much favoured in early years by the Junkers aircraft company. Modellers sometimes imitate these, on such types as the Ju 52-3M, with corrugated cardboard. This is a crude material. It adds little strength, has

to be painted and does not stand up very well to general handling. (I am told by Tony Dowdeswell that John Menhennet built a Junkers 52 model with boiled spaghetti for the corrugations. I hope the mice didn't get at it!)

I want my P-24 to be like the Paris prototype, in unpainted metal.

The obvious material for the skins is printers' litho plate. It is easy to obtain this cheaply from lithographic printers. After use, the metal plates are usually sold for scrap and a few sheets may be obtained at very low cost, on request. The metal comes in different thicknesses, the thinnest being the most useful for



FIG.3



FIG.4



FIG.5



FIG.6

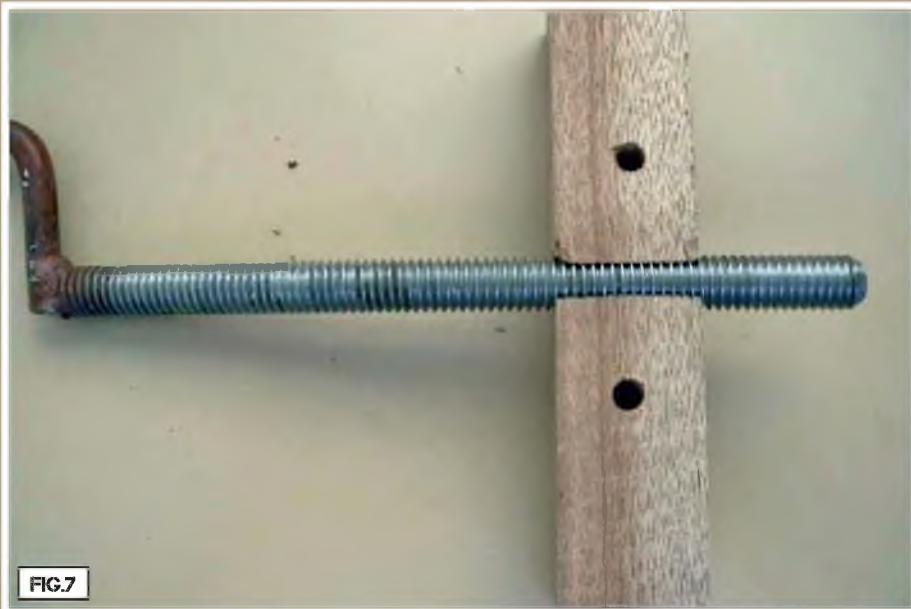


FIG.7

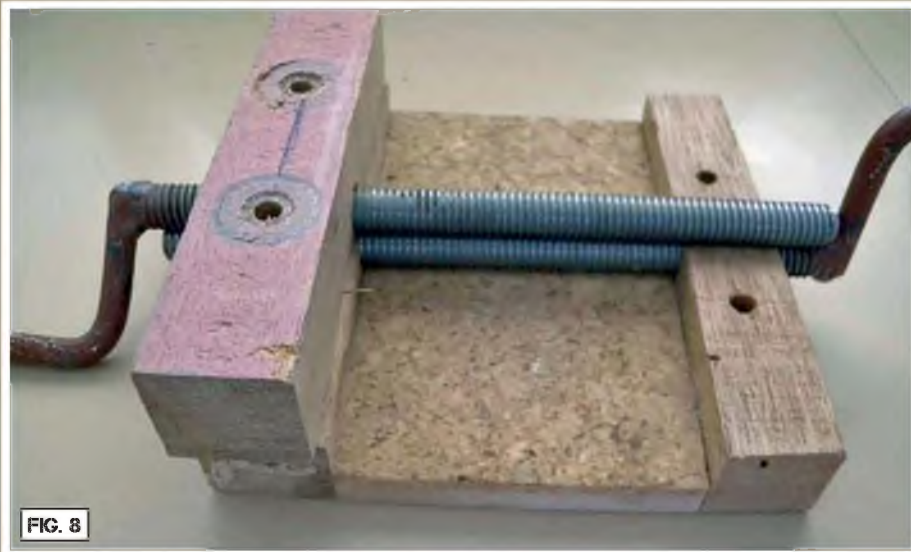


FIG. 8



FIG.9

flying model aircraft. Although litho plate is not usually thought of as a structural material, it adds greatly to the stiffness of a foam wing (with internal spars) when glued on under vacuum pressure, and is not very vulnerable to occasional rough treatment.

The problem with the P-24, indeed with all the Pulawski series of fighters, is that the corrugations were very fine. **Figure 3** is a photograph of a tail unit copied from a Polish book (number 15 in the *Pod Lupa* series from *Ace Publications* of Wroclaw, 2002). The reproduction here is not perfect, but enough can be seen to illustrate the difficulty. This photo is also interesting because it shows that the full-sized corrugated skin was a little wobbly here and there with small gaps and other minor imperfections.

I examined all the references I could find. There are differences between the various publications. Often, the corrugations are described as 'fine', without exact clarification of the meaning. One of the best sources is a readily available drawing of a P-11C by the Polish draughtsman, Z A Datkiewicz. (The wings of all the Pulawski fighters were similar, but not identical). Datkiewicz states, in imperial measures, that the corrugations were eight to the inch, but the lines representing them on his drawing are not consistent with this.

It is not clear if eight-per-inch refers to distance between two ridges of the corrugations, i.e., the distance between the crests of the ridges, or half this, from ridge to trough. In the latter case the corrugations would have been close to 1/4 inches wide. On the model they should then be 1/16 in 1.6 mm.

These points were checked by study of photographs of the only surviving P-11, which is in the Cracow Museum, and from books and the Internet. Very few show enough details to be sure. The internal wing ribs were not all the same distance apart, especially in that part of the wing that was bent to follow the complicated 'gull' dihedral. The best estimate I can make is that on the outer wing panels, there were 44 corrugations for wing rib bay widths of 264 mm., i.e., 6 mm ridge-to-ridge. A quarter of this, 1.5 mm, is thus a likely figure for the model. Another complication is that where the metal had to be riveted down to underlying ribs, about 20 or 25 mm of



FIG.10



the skin was flat. Presumably these were lapped joints in the skins. (Some pictures show, on the underside of some of the P-11 wings, that the skins had flanges standing up from the surface like crude boundary layer fences. I think this did not apply to the P-24. The P-11 tail unit in **Figure 3** shows this on the rudder, but not the fin).

If more certain information is available I would like to hear of it.

### Making the skins

How can a modeller reproduce skins like this? Perhaps the question should be: is it even possible for an amateur to produce them? When I talked to other people, some said I should just build the fighter with plain, uncorrugated skin. To me, this was unacceptable. Anyone knowing the Pulawski series would be aware of the error.

Architectural modellers and model railways enthusiasts can buy small sheets of plastic marketed by various companies such as *ANRI* and *Metcalfe*, with corrugations moulded on one surface. Some of the available range of products would come close to the suggested dimensions, but I do not think these would give me what I require. The plastic sheets are small and to skin a whole wing with them would require many separate pieces, all which would have to be butted together without overlapping. The result would look like a sort of jigsaw puzzle and every joint would be a line of weakness. A metallic appearance would also be hard to achieve.

A solution could be to employ a professional engineer to make a rolling mill, a quarter-sized version of the ones that must have been used to make the original PZL skins. With such a mill, it would be possible to churn out sheet after sheet of finely corrugated litho plate. I made enquiries, learning immediately that the cost would be quite prohibitive. Indeed, I could not find an engineer willing to do the job for the sake of one small production run. I was proposing to build only one model, not marketing

hundreds of kits. To develop a mill would not be worthwhile for any professional.

I decided to try to make my own rolling mill. I did not expect much success, but had an interesting time with this idea and the results were better than I expected although, in the end, it did not give me exactly what I wanted.

### Tools for the job

Hardware stores stock lengths of threaded rod in various sizes, with nuts to fit. I thought it might be possible to use two such rods one above the other, turning in opposite senses to pass sheets of plate between them. I recognised that the threads were not the ideal shape but the idea seemed worth trying. If my mill worked, I might be able to refine it later but I needed first to test the concept.



FIG. 14

Two lengths of the threaded rod, each with a handle welded onto one end, were mounted as shown in plain wooden bearings, well oiled (**Figure 4**). The rollers had to be close enough together so that the threads meshed.

To make the bearings was done by first drilling holes through the hardwood end blocks clamped together, so that the rod would just go through without slop. The blocks were then separated and cut away just far enough to expose the thread, allowing the rods to engage with one another (**Figures 7** and **8** show this more clearly). The spacing was critical and several attempts were necessary to get it right. If the rods were too close to one another, the metal sheet would not enter the mill at all. If too far apart, the plate would pass through almost unmarked.

After a few trials and adjustments, small strips of plate were fed in between the rods, the handles turned in opposite

directions, and the metal passed through, emerging with corrugations as **Figures 5** and **6** show. The corrugations were about 2 mm apart, ridge-to-ridge. This was too coarse but the result was quite encouraging and I persisted with further experiments.

The strips I had made were not wide enough to cover a single rib bay on the model wing, and were far too short to go right across the chord, except at the wing's narrowest part near the tips. To try to make longer and wider strips, I made a wider mill (**Figures 7, 8** and **9**).

A further improvement, I supposed, would come if I made the mill adjustable, allowing me to tighten up or slacken slightly the distance between the rods. With vertical bolts and wing nuts, I was able to place washers of varying thickness between the upper and lower bearing blocks to change the pressure and depth of the corrugations.

I learned a lot! If the two wing nuts were screwed down a little too much, what came out was aluminium spaghetti (**Figure 10**. Pace John Menhennet). The threads on the rods simply tore the plate into narrow strips. If not tight enough, the sheet would pass through without impression.

Another difficulty was that if the sheets were cut exactly wide enough to pass between the blocks on each side, it seemed impossible for them to go through straight. The sheets would slew slightly out of line and shifted slightly from side to side, crumpling the edges, or worse (**Figure 11**).

These faults are more evident in the enlarged picture (**Figure 12**). With a little more persistence, always leaving a margin on each side for the slewing, some fairly good results were achieved, but corrugations usually emerged with slight sideways wobbles.

A further difficulty arose when I tried to make strips of rolled metal long enough to go right across the wing chord at the broadest point. During the rolling process the threaded rods inevitably screwed themselves inwards and after a



FIG. 11

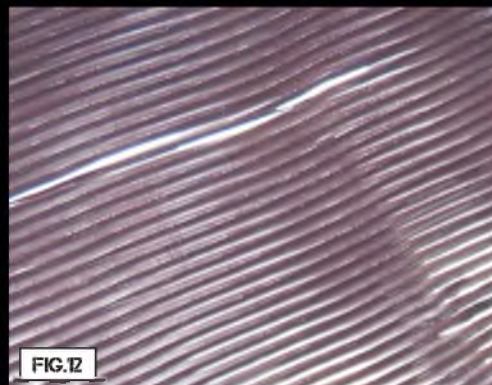


FIG. 12

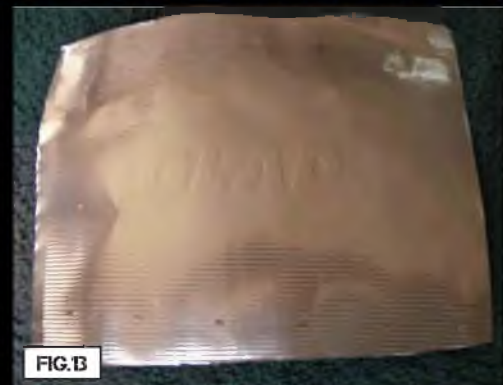
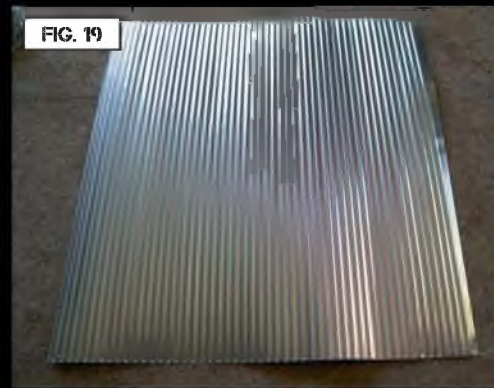


FIG. 13



certain number of turns, could go no further (**Figure 8**). The obvious answer, to use longer rods which would allow more turns before the handles ran into the wooden blocks, allowed longer strips to be rolled, but the wobbling and slewing tended to be worse. Sometimes, everything would go well and a usable strip emerged. More often, the outcome was a failure.

I had hoped to be able to make wider pieces of skin, to minimise the number of pieces in the jigsaw puzzle. To attempt this, I made a much wider mill with long rods. This did not work well. When the butterfly nuts were adjusted to produce satisfactory results at the sides, the middle of the sheet was not touched. The rods themselves were distorting by a small amount, enough to miss the centre of the plate as it went through. Tightening the butterfly nuts produced spaghetti at the sides and still the middle was barely touched.

I tried using some softer aluminium to reduce the distorting force on the rollers. A simple cooking tray of thin aluminium was cut up and a piece was fed through the mill (**Figure 13**). The manufacturer's trademark survived, showing how little pressure was reaching the middle of the plate while the edges were tearing and crumpling.

For the next trial, I added a series of adjustable plastic restrainers (**Figure 14**). The restrainers were adjustable 'feet' intended for the legs of furniture). I hoped that the slight bowing of the rollers under load would be prevented by screwing the restrainers down slightly in the middle. This had some effect, but the central part of the sheet still was not adequately corrugated when the edges were beginning to tear. The effort required to turn the handles was much greater and maintaining a steady rate of progress quite difficult. Even with relatively small pieces of plate I was still a long way from producing long-and-wide corrugated sheets for wing skins (**Figures 15 and 16**).

At this stage, I decided to abandon the threaded rod mill. I do not regard the time and effort as wasted. I had enough success to suggest that if a modeller needs to manufacture a small and fairly narrow section of corrugated metal skin, perhaps one wing rib bay wide, or for an engine cowling, inspection panel or hatch on an aircraft, it can be done this way. The thread of the rods used should be carefully chosen and after a few trials satisfactory results can be obtained for small sections of skin.

To skin the whole wing of a fairly large model requires something different and more predictable. I decided to try another very simple experiment. I raided my box of spare bits and pieces and extracted all the lengths of heavy gauge hard wire I had. After a brief cleaning, these were glued side-by-side with epoxy resin to a flat piece of chipboard. I laid a piece of litho sheet on this ridged base and, holding it firmly down, pressed the rounded end of a

FIG. 20

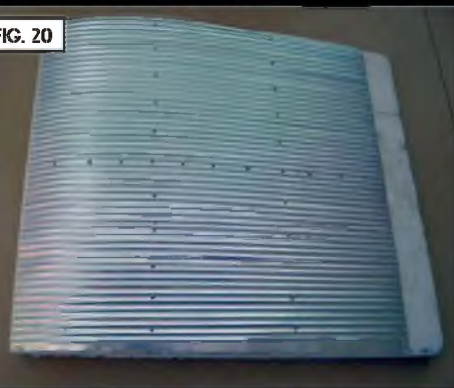


FIG. 21

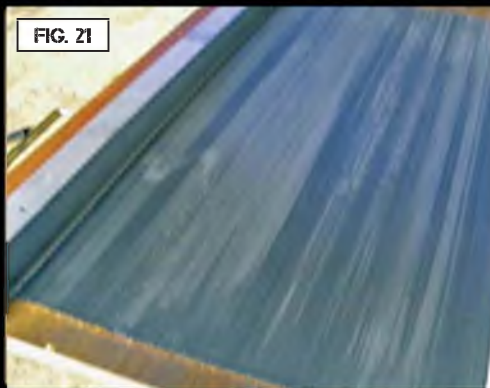
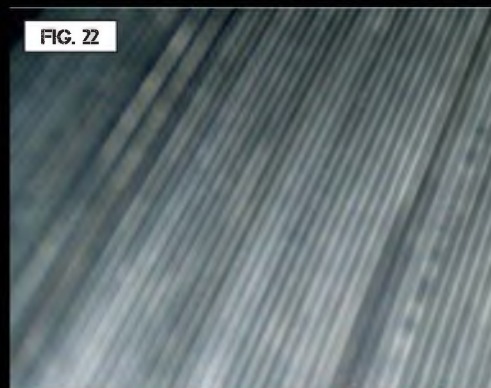


FIG. 22



spare piece of the wire firmly into the metal between two of the underlying rods and, still pressing, dragged it firmly along, forcing the plate into the furrow as it went, a sort of ploughing action but not so deep that the plate could be torn.

After the first pressing and dragging, the plate was moved over using the recently formed corrugation to align it properly. This was repeated. As more corrugations were formed, the plate curled up (Figure 17).

With the help of a straight edge and gloves as protection (Figure 18), in a few minutes I had produced the sheet shown in Figure 18, pinned down. (Figure 19).

The result was surprisingly good. To check one further point, I used epoxy resin to glue this piece as it would be on a wing, to a suitably shaped piece of white foam (Figure 20). Since this was merely for demonstration, I did not use vacuum bagging or take a lot of trouble over the exercise, but merely weighted the sample down while the epoxy hardened.

There was no difficulty of adhesion. The plate, despite its tendency to curl the wrong way, bedded down to the foam and showed no sign of lifting or peeling off. To complete this trial I drilled tiny holes and pushed pins in to represent rivets. Each pin had a dab of glue to keep it in place. For an actual model, more care would be required for a good finished appearance but I regard the corrugations themselves as quite successful.

Although the corrugations were too gross for the P-24 model, the simple method used here could be used for a Junkers aircraft model or any other with this type of skin. The spacing of the ridges and furrows can be determined by choosing the correct wire gauge for the baseboard.

A further trial was made using lengths of much thinner wire, to make PZL style fine corrugations. As before, I was trying at first, only to test the procedure. I now made a base board consisting of more than 200 lengths of 1.2 mm gauge piano wire, each 450 mm long, glued side-by-side to a flat wooden baseboard, edged with two thin straight pieces of steel (old steel rulers) on each side. These edging pieces, just visible in the photograph, were intended only to prevent any of the wires shifting outwards under pressure. Two lengths of 25 mm square tubing

with nuts and bolts, as shown in (Figure 21), were to clamp the litho plate down.

(The first difficulty was to obtain sufficient numbers of the steel wires. I raided three model shops and bought all their stock of 1.2 mm gauge, arousing a good deal of puzzlement among shop assistants and proprietors.)

Figure 22 shows a close up of the wires, as they were placed tightly together and glued down flat. I used thin cyanoacrylate adhesive, which spread out under the wires and hardened quickly. Afterwards, the assembly needed a little cleaning to make sure there were no unwanted pieces of grit or glue that would interfere with the next operation. The size of the base was determined by the dimensions of standard plates provided by the local lithographic printer. I was fortunate in that these are long enough to cover the whole chord of the wing and wide enough to skin several rib bays.

(A note about lithography. The aluminium plate is coated on one surface with a thin layer of light-sensitive emulsion. The items to be printed are photographed and transferred to the plate for development. The plate then goes to the printing machine. Ink is taken up by the image but repelled by the rest of the plate, which transfers it to the printing roller and thence to the paper or card.

One side of the plate is bare aluminium and may need cleaning and polishing, since this is the side, which will be visible on the finished model. It is best to do the polishing before making the corrugations. The emulsion does not yield to common solvent fluids, such as methylated spirits and paint thinners, but if required the images can be removed with meths, leaving the emulsion untouched. It is sometimes possible to obtain lithoplate before the emulsion is added.)

To make the furrows, the tool used was a simple scribe obtained from a hardware store. Grasping the tool firmly and holding it at a shallow angle, it is pressed down into the plate at one end between two of the base wires, and drawn with steady pressure along the groove. The intention is to push the plate down between two of the wire guides, all the way along the full length.

The angle at which to hold the tool can be established by trial. The extreme tip of the scribe must not touch the plate,

because this would split the thin sheet. Working on the emulsion side seems to help, perhaps because the emulsion acts as a lubricant. It also helps to add a few drops of machine oil.

Move on to the next furrow. Progress can be rapid. Not a lot of force is needed, but it is very easy to let the scribe jump over into the next furrow, rather like a railway train becoming derailed. This is not necessarily disastrous. By returning to the appropriate track and trying again with more concentration, the slip can be corrected. Stop, rest, and start again with care. Attention to the job is essential. The next furrow then can be done. The mark left by a 'derailment' usually disappears. If the error is more serious, turn the baseboard round and work from the other end.

The corrugations were at the lower end of the scale for the P-24,  $\approx 1.2$  mm apart, the gauge of the baseboard wires.

First results looked good, but problems emerged before the first sheet of plate was finished. As Figure 24 shows, the plate began to lift and develop waves, some of which became locally severe enough to crack it as the work progressed. The first few centimetres of the sheet were finely corrugated and were useable, but the 'ploughing' became more difficult as the process continued and became impossible.

The reason is not hard to understand. Forcing a metal plate to corrugate causes it to curl. With rolling, the expansion is on the crosswise axis (Figures 5 & 6). When the distortion is along the length of the plate, the metal is stretched laterally as each furrow is made (Figure 15 & 16). Being clamped down, as it pushes out sideways it has nowhere to go but up. To force it down, as more and more furrows are made, makes matters worse and the plate begins to crack, which shows in several places in Figure 24.

My first naïve reaction was to change the order of work, starting the first furrows in the middle of the plate and working outwards from there. This does halve the problem and it was possible to complete a whole sheet. There is a little more room for the plate to expand and cracking was avoided. When all pressure was off, it lifted as shown in Figure 25.

One further change was necessary to produce consistently acceptable results. It was a mistake to clamp both edges of the litho plate down hard. Instead, one



edge was clamped firmly, the other was restrained very gently, the butterfly nuts slackened off on that side allowing the plate to creep outwards under the aluminium bar as the work progressed. The furrowing process began at the clamped side and as the scribe was drawn along each furrow, firm pressure was maintained with the other hand and a cloth, so at no time was the plate allowed to lift as new furrows were formed. In this way, good and consistent corrugations were made across the entire sheet, with a small but acceptable flat margin on

both edges. The total expansion measured afterwards totalled about 13 mm. On release, the sheet curled up, but was fully acceptable (Figure 26).

At this stage I consider the problem solved. Neither corrugated cardboard nor boiled spaghetti will be needed in future.

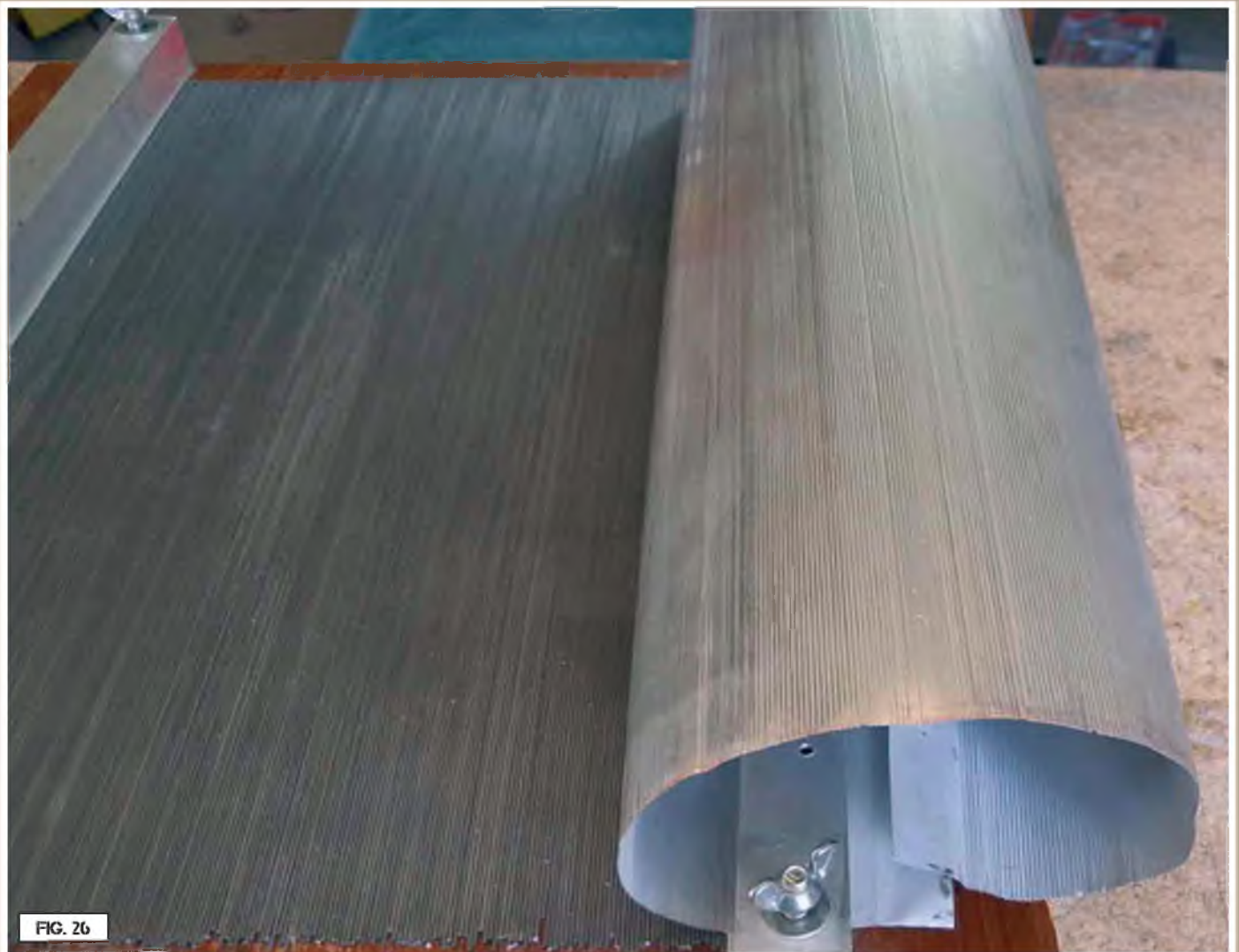
Using 1.2 mm gauge wires for the base, the final result yielded 50 corrugations for a rib bay width of 62.5 mm. I was aiming for 44 corrugations, not 50 (See paragraph 9 above).

I doubt if anyone, except myself, will go over the model with a micrometer,

but I intend to go up one wire gauge. This will require a new baseboard with heavier wires. 1.4 mm is a stock size. This should get me very close to the desired 44 in 62.5 mm ( $62.5/44 = 1.42$ ).

Another raid on the model shops is necessary; I require 85 of the stock length (914 mm ≈ 36 ins) cut in half. Another point is that I must leave a flat across the litho sheet at each underlying rib, for the rivets.

I seem to be building the P-24 from the skin inwards and there is a long way to go! Don't hold your breath. ■



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**Y**es, that flippin' man is back again with more of his usual old waffle. However, I promise not to regale you with more indoor foamies or talk about how I design models. I'm sure you all feel you deserve a break from that by now.

So, that said, what do we have lined up for you this month? Well, obviously there is the final part of the foamie Dr1 drawings for those who've been waiting patiently to build the red and white version, but that isn't to be the focus of this issue. Despite avoiding foamies, we are still in Indoor Season, so that has influenced my choice of content to some extent. To be honest (there's a first time for everything), I didn't have anything planned for this month's column (nothing new there then) and was floundering around trying to think of something interesting and entertaining for you. I'm kind like that sometimes, I'd hate to think of you all being too bored. A little bored is okay though.

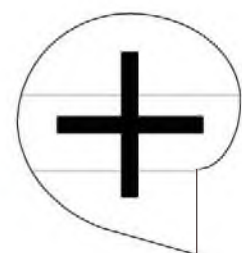
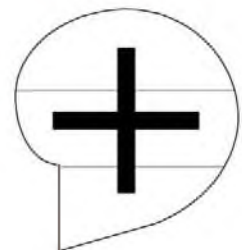
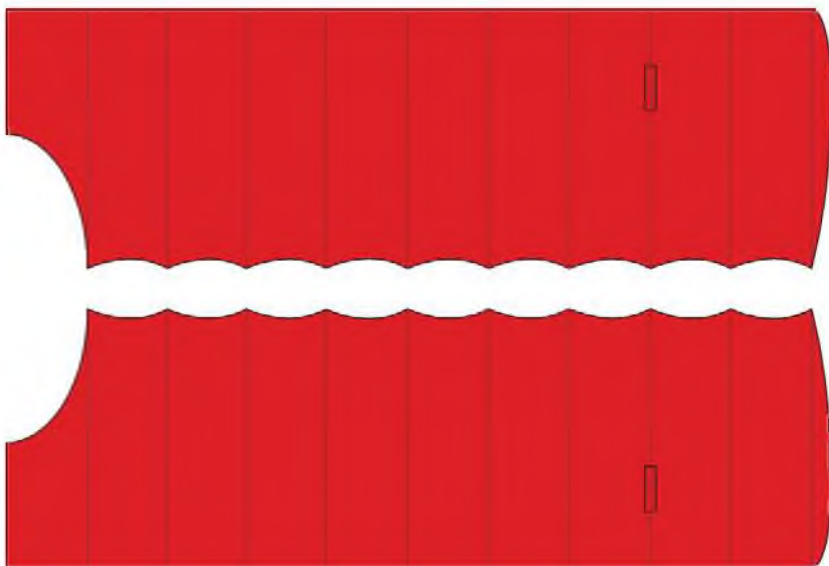
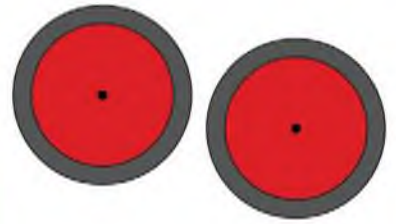
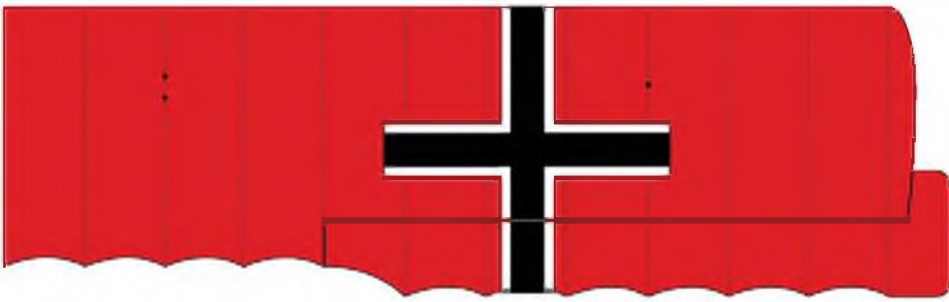
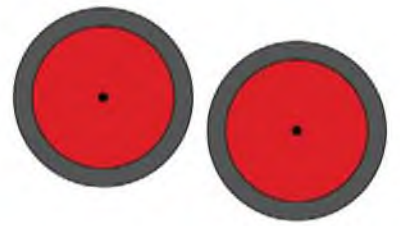
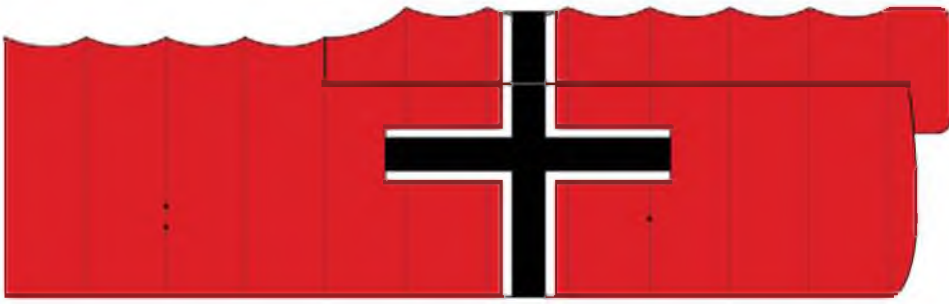
As I said, there I was, totally at a loss as to what to write about when, absolutely by chance, I decided to treat myself to a couple of new toys. Well, somebody had to. The big chap in red hadn't delivered any exciting playthings for me, so I had to buy my own. It's a hard old life being an aeromodeller who's wife feels he should have 'useful' gifts. Much as I need socks, pants are just pants.

Anyway, these new toys have prompted me to update something I featured a year or so ago - helicopters. No, not those stonking great, oily, smelly things, but



THE LITTLE FLEET OF GYRO EQUIPPED HELICOPTERS: THE ORIGINAL CO3RA POSES WITH THE DEFENDER AND DOLPHIN.

Wings, wheels and rudder for the Indoor foam Fokker Dr.1 left out of last month's issue.





A close-up of the sort of detail typical on these little models - although only the defender has the crew figures.

small indoor type helicopters that are cheap, fun and scale(ish). After all, this is supposed to be a column about electric powered scale models and these qualify on both points - even if the wings have gone all rotary on us.

### Looking back

For those of you who regularly follow my particular brand of madness - you know who you are, so it's no use denying it - I'll start off by very briefly recapping what has gone before. Honest, it will only be a brief recap.

You may recall that when we last broached the subject, miniature scale helicopters that were fitted with a gyro were very much in the minority. As far as I could tell, from spending many hours trawling the Internet, there were only about two - a Cobra and an Apache. Whilst I raved about the Cobra, I found the Apache left a bit to



To get flying shots this good indoors requires a really steady flying subject - yes, the model really was flying in the author's lounge at the time.

be desired. I bought two and, whilst they flew very well, both suffered charging issues that resulted in extremely short flights.

Now, by contrast, we are virtually falling over little scale gems that are gyro equipped. Thanks to companies like *Syma* (among others), we are really spoiled for choice these days. A quick glance through any of the websites will reveal a veritable plethora of mini and micro, three channel helicopters that use gyro stabilising. As well as the original Cobra (I still have mine and it still flies really well), Syma now list one and there's even one that fires missiles in flight. Mind you, as ex-tank crew, I'm not too sure I approve of the cardboard tank targets. I did threaten to buy one, but the wife forbade it. I think she had visions of me chasing the dog around the house, firing little bits of plastic at it. I ask you, as if I'd do such a thing. In addition to the

Cobras, we see various Apache models, Hawks, Dolphins, Chinooks and Hughes Defenders. All are reasonably accurate replicas of the original prototype and, if you don't like the colour schemes available, they're simple enough to treat like a plastic kit and paint them in a more realistic finish.

### Why gyro

I'm so keen on these little gyro equipped models (and do feel they are sufficiently nice to deserve being called models, not just toys) that there just has to be a reason for specifically mentioning them. Having flown a whole variety of different three-function helicopters, some with gyros and some without, I can assure you that there is a whole world of difference in how the gyro equipped ones perform. Although great at the time, the way the non-gyro helicopters performed was, to be kind to



**JUST TO PROVE THE DEFENDER FLYING SHOT WASN'T A FLUKE, THIS SUPERB SHOT OF THE DOLPHIN IN ACTION SHOWS JUST HOW PREDICTABLE THESE MODELS ARE.**



them, somewhat variable. Some performed quite well, although turns could be slightly fraught at times, while others were virtually uncontrollable. The hover was never terribly convincing because the slightest variation in throttle setting would interfere with the trim and the model would often rotate quite badly. Often, the only way to keep them under control was to keep them moving forward. An additional problem was that the trim setting appeared to alter from flight to flight. You'd get it nicely sorted out on one flight, only to find you were starting from scratch again on the next flight. As you can perhaps imagine, that could become more than a little frustrating at times. I had one, an Airwolf I believe, that was so bad it did nothing but bounce off my lounge walls. I never did get a chance to trim it out and gave up trying in the end.

The magical little gyro chip totally transforms the helicopter's performance. The hover becomes stable, with absolutely minimal rotation throughout throttle changes. The trim settings seem to hold well between flights and turns in both directions become a thing of joy, as opposed to something to be dreaded. On-the-spot rotation becomes predictable and, more to the point, ceases instantly upon releasing the stick. In other words, and to stop me rambling on for too long about how much difference it makes, although most can be made to fly without a gyro, add that little chip and they actually perform as we always knew they were supposed to. Although, by virtue of only having three channels, they may lack the side-slip ability of their larger, more expensive four channel cousins, as far as controllability is concerned they certainly equal them in all other respects. Okay, so most are IR (infrared) controlled, so can't be flown outdoors, but most co-axial rotor helicopters are very poor performers outside anyway. However most larger, four channel, helicopters are too big to fly in the house. These little gems are absolutely perfect for buzzing around the lounge, practising coffee-table landings, buzzing the wife while she watches TV and generally making a nuisance of yourself. Absolutely great fun and cheap too.

### Down to cases

One of the larger helicopters I looked at previously was a model Hughes Defender, complete with little figures attached. Yes, little things pleasing little minds again. Nice as that helicopter was, at over 17"

long it was hardly the sort of model you could fly in the lounge - not in my lounge at any rate. I also had a palm sized, non-gyro Defender without the crew, that was less than stellar in the way it performed. So, when I saw a smaller version of the bigger one listed, bearing in mind I'm rather taken with this prototype, I simply had to try one. Right now, with several living room sorties under my belt, I'm awfully glad that I did. It perfectly matches the flying performance of the large version to the right size for puttering around the house, annoying all and sundry.

Available in two colour schemes, the desert camouflage one I have and a pseudo police style dark finish, it is a lovely little helicopter. It comes with a USB charge lead, so you don't run down the transmitter batteries, and flies brilliantly. Take-off can be performed quite smoothly, the hover is very stable (once you've adjusted out any rotation using the trim knob) and control is very precise. Unlike many of these little models, forward flight is actually quite fast if you want it to be, but it can also absolutely crawl along. When you tell it to go forwards, that is precisely what it does, it goes forward without wandering round in ever decreasing circles like the non-gyro helis do. Backwards flight requires a little additional power to the main rotors, because the little tail rotor is trying to push the tail down, but fly backwards it most certainly does, and in a virtually straight line.

When it comes to turning the model, either static or whilst moving forwards, control response is excellent. You can either nurse it through very gentle turns, or snap it round in a most ungainly fashion if the mood takes you. Courtesy of the gyro, the instant you release the stick the turn stops. It turns equally well in either direction, unlike non-gyro helicopters.

Taking around 20-25 minutes to charge (plugged into my PC port), flight times seem to be very good indeed. Although I'm still bringing the LiPo up to maximum performance, it's only had four or five charges, I'm getting well in excess of five minute flights. Although the gyro seems to lose a little of its 'grab' as the battery runs down, the model remains admirably controllable right up to the point where it lands itself through lack of power.

At about nine inches long, this is a little larger than most of these helicopter models, and is slightly more expensive than many. However, at around £25 it has to represent really good value in terms of

looks and performance. If you're looking for a scale-like helicopter to have some winter fun with, I can strongly recommend you give this one a try.

### Getting fishy

Okay, I admit it; I'm struggling for section headings. However, there's an awfully big clue there about the next helicopter I persuaded myself I simply must have. No you twit, it isn't a Codfish. Of course it isn't, it's the rather pretty little Dolphin that *Syma* sell in a most attractive Coastguard colour scheme. *Syma* have probably done more for the lover of small helicopters than any other manufacturer. Not content with being the first to produce palm size models of a Chinook, Hawk and Apache, they've now added to the range AND upgraded them to being gyro equipped to boot. Whilst they may not have always had a great reputation for the quality of their product (although I think some of this may actually have been due to the forgeries so often seen) there's certainly none of this evident in this range. I loved my little Chinook, and that was before the gyro upgrade, the Hawk (also non-gyro) was good and this one is great.

Okay, so *Syma's* Dolphin is a little simplified and does, due to the need for that little tail rotor, lack the shrouded fan style rotor so obvious on the original. Nonetheless, it is a very nice little model for all that. Enough like the original to be recognisable and with enough surface detail to add realism to the overall package, it is really set off by the high visibility colour scheme. Talking about that surface detail, this one isn't endowed with the rivet detail seen on many others. However, at this scale I'm not at all sure that's such a bad thing. Sometimes it just looks overdone and toy-like. What it lacks in that respect is made up for by ample panel detail and little sticky-out bits that impart a really nice overall appearance. Yes, I think it's pretty fair to say I like this little helicopter a lot.

Of course, the proof of the pudding isn't so much in how it looks, as in how it flies. Just suffice it to say I have no complaints at all about that. The hover is excellent, turning is really good, be it high speed or slow and control reaction seems to be as precise as with any helicopter I've flown. All in all, and bearing in mind its' sub £20 price tag, a really excellent model that represents great value.

As usual, should you so desire, I can be found at [PETERRAKE@aol.com](mailto:PETERRAKE@aol.com) ■



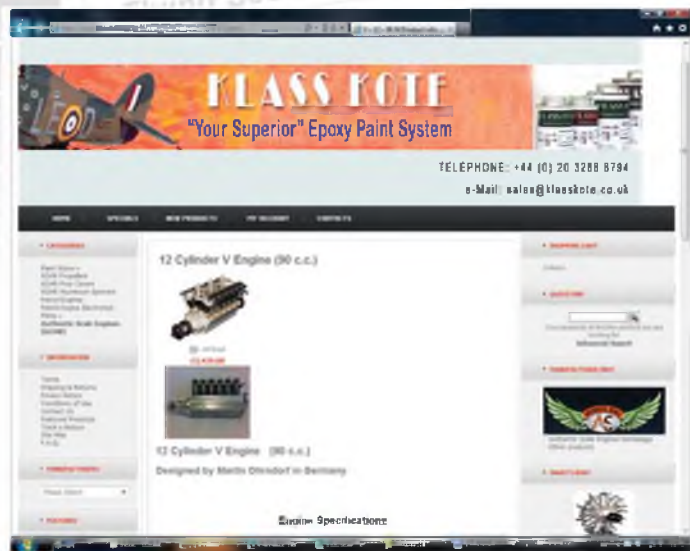
I still think that crewman looks a little perilously exposed.



It may be none too scale but that shroud around the tail rotor does a good job of protecting the blades.

# Techno Scale

Mike Evatt searches cyberspace for more TechnoScale Topics



ABOVE LEFT: A 90cc 12 Cylinder V Engine is available from Klass Kote. ABOVE RIGHT: Rich Uravitch's 109" span OV-10 Bronco.

**K**lass Kote are well known for their exceptionally versatile and fuel proof two-component epoxy coatings available in a variety of colours, primers, and clear produced predominately for the scale modelling fraternity. However, investigating the on-line shop on their website at <http://www.klasskote.co.uk> reveals a number of other goodies including a 90cc 12 Cylinder V Engine designed by Martin Ohrndorf in Germany. This air-cooled delight has an RPM range of 950 -5000 and weighs 4.8 kilos and will swing 22" - 24" diameter propellers. All parts are CNC machined from solid bar.

Rich Uravitch's website at <http://www.richuravitch.com> was set up for two basic reasons. Firstly, to provide a means of communicating with other modellers and secondly, to display some of the products which he offers exclusively for sale. Here you will find R/C models that he has designed over the years, together with accessories and components to make your modelling life a bit easier and more enjoyable. Rich's 109" span OV-10 Bronco (22.5% scale) is shown in the screen-shot. It's powered by a pair of Hacker A60's and four Thunder Power 6S 5200 mAh LiPo packs. 3300w per side!

Rob Pike's RC Final Touch is dedicated to the

scale aircraft modeller who wishes to have the best Cockpit Components and 'Scale' items in or on their latest masterpiece. So far, the majority of Rob's parts are for use with Jerry Bates' plans and he has been working very closely with Jerry for some time in order to accomplish this task. Some of his parts will fit into and onto other designers' aircraft as well. Rob's intention is to provide the major parts that are difficult to make, yet allow the modeller make the sides, the floors, and the plumbing. Check out his wares at <http://www.rcfinaltouch.com>

Evan Quiros lives in Lake McQueeney, Texas and maintains his personal webpages - enti-



ABOVE LEFT: Rob Pike's "RC Final Touch" is dedicated to the scale aircraft modeller. ABOVE CENTRE: Evo's fine large scale Fw190D. ABOVE RIGHT: Vic Catalasan's latest project - a 1/4 scale LA-7 Lavochkin.



**TOP LEFT:** The Thrust(r) 50 is an ideal motor for .40-.60 size electric scale aircraft conversions.  
**TOP RIGHT:** The TopFlite P47 canopy slide from Aerotech Scale Parts.  
**ABOVE LEFT:** At VQ Warbirds their focus is strictly Warbirds!  
**ABOVE RIGHT:** Windsor Propeller Company Inc. host excellent photo galleries.

tled **Evo's Hanger** at <http://evoshangar.home-stead.com>. Since visiting the Champlin Fighter Museum Evo has always wanted to build a big Fw190D. His version is based on the Fw190D-13 "Yellow 10" that was brought to the USA at the end of the war for evaluation and survived to be restored to flying condition. This was flown by Major Gotz, who was the Kommodore of JG26 by the end of the war. Evo has built this model entirely from scratch. It is of all balsa and ply construction with a wingspan of 104" and a target weight of 37 lbs.

**Vic Catalasan** hosts a website at <http://www.vicrc.com> where he displays his latest project; a 1/4 scale LA-7 Lavochkin Russian warbird built from a David Anderson plan. However, it was his webpages devoted to the design and construction of a CNC (Computer Numerical Control) foam cutting machine which appealed. The technology used is very similar to a printer/plotter connected to a computer, but of simpler construction. Vic will eventually incorporate the CNC foam cutter with a typical XYZ CNC table

where it can rout three dimensional objects.

The Thrust(r) electric motor by **Precision Aerobatics** at <http://www.thrustmotors.com> is one of the coolest running, high performance, high-torque and high efficiency brushless motor ever produced to date. The design incorporates their latest innovation, RotorKool(r) which keeps the stator core material, the low resistance windings, highly permeable stator plates, high quality NMB Japan triple bearings and powerful neodymium magnets at optimum operating temperatures. The Thrust(r) 50 is an ideal motor for .40-.60 size electric scale aircraft conversions.

It is sometimes a frustrating problem with scale models when there is no mechanism provided to allow the sliding canopy to slide! Well! **Aerotech Scale Parts** at <http://www.aerotechmodels.com> have an answer for one kit at least. The TopFlite P-47. This slider is designed to operate with the TopFlite canopy supplied with the kit. It comes with all the parts finished in olive drab and requires very little painting to complete. The company also stock a large range of acces-

sories including a range of dummy radial engines in four sizes.

At **VQ Warbirds** their focus is strictly Warbirds! Their motto "Keep 'Em Flying" means they strive to preserve the history and legacy of the men and women who flew these full size warbirds.

Their website at <http://www.vqwarbirds.com> reveals that they serve their aim by selling a vast range of superb models. The ASM Lancaster Bomber model is an exciting replica of the original. Its impressive 120-inch wingspan results in a great flying model that is easy to see and manageable to fly.

**Windsor Propeller Company Inc.** who maintain a web presence at <http://masterairscrew.com> has been making high quality **Master Airscrew** propellers since 1978. Computer designed and produced with advanced CAD/CAM machine tools, they make an extensive range of propellers for radio control airplane electric, glow and gas motors. Browse their different categories for propellers, accessories for cutting balsa wood, balancing props and gearbox kits for electric planes.

Well worth visiting for the photo-galleries alone.

**SAMS** have been in the model business for over 35 years and have built up a formidable fount of knowledge regarding small model aircraft, especially of the free flight variety. They also have access to the latest developments in micro radio control, which, with the latest reduction in size and weight is now suitable for many of the smaller models listed in their catalogue. I always enjoy re-visiting their website at <http://www.samsmodels.com> as I always find something new such as the delightful Siemens-Schuckert D.III in peanut scale.

<http://web.mac.com/tectonite/iWeb/Site%20/FACE.html> is the rather clumsy URL of **Flying Aces Club Europe**, or FACE. Bernard Guest, the site initiator, explains that FACE is an attempt to bring outdoor free flight scale aeromodelling back into vogue in Europe. He suggests that at present free flight scale activity seems to be limited to the United Kingdom and the Czech Republic with a few isolated individuals or small groups of enthusiasts scattered in between. He further suggests that the goal of FACE is to connect existing free flight scale enthusiasts in Europe via the internet and establish a European outdoor free flight scale competition scene.

That's all there is time for from me this month so press that button and if you find something out there of interest that might be good to share, email me at [mikeevatt@hotmail.com](mailto:mikeevatt@hotmail.com)



**ABOVE LEFT:** SAMS specialise in small model aircraft, especially of the free flight variety.  
**ABOVE RIGHT:** FACE is an attempt to bring outdoor free flight scale modellers together.

# PLANS and PARTS

BE READY TO START BUILDING AS SOON AS YOU UNFOLD THE PLANS WITH THESE LASER-CUT PARTS SETS



**ELECTRIC CANBERRA B(1)8**  
**Plan price £29.50 Plan No.262**  
**Component Pack £175.00**

From the building board of electric ducted fan scale expert Chris Golds, this 84" (2,134mm) span model is the 'Interdictor' version of the famous jet bomber. Prototype used two Hacker B50-16L motors and two ten-cell 3300 NiMH power packs. Four sheet plan shows retracts and flaps. Plans are supplied complete with step-by-step written construction sequence.



**PIPER SUPER CUB**  
**Plan price £16.50 Plan No.146**  
**Component Pack £95.00**  
**G/F Cowl price £17.50**

A great first-time scale model for novices and sport fliers who want real scale accuracy. 79 ins span 1:5.33 scale model suits a range of engines .40-.60. Two sheet plan. Glass fibre cowl available.



**CORBEN SUPER ACE**  
**PLAN PRICE £19.50 PLAN NO.275**  
**COMPONENT PACK £65.00**

A 50" (1270mm) wing span sport-scale model of the delightful American homebuilt aircraft, this design is an excellent introduction to the world of radio control scale modelling, featuring simple airframe structure that will result in a scale replica ideally suited to regular club-field flying on a regular week-upon-week basis. 1/6th scale replica suits .26-.30 four stroke engines, or .20-.25 cu.in. two strokes. Four function radio systems required.



**HEINKEL HE 51**  
**PLAN PRICE £17.50 PLAN NO.80**  
**COMPONENT PACK £125.00**

A 68" (1727mm) wingspan 1:6.4 scale model of the pre-WW2 German biplane fighter for 4-function radio control and .70-.90 cu.in. four-stroke motors. Can be built without recourse to glass fibre mouldings for items like engine cowl and wheel spats. Two sheet plan.



**RUMPLER C.IV TAUBE**  
**PLAN PRICE: £19.50**  
**PLAN NO. 269**  
**COMPONENT PACK: £110.00**

A 1/7th scale 80" (2032mm) wing span sport-scale model of the early German WW1 aircraft designed for .60 cu.in. size four stroke engines and four function radio control operating rudder, elevators, ailerons and throttle.



**De HAVILLAND DH 82a**  
**TIGER MOTH**  
**PLAN PRICE £26.50 PLAN NO.051.**  
**COMPONENT PACK £115.00**

An 80 inch (2032mm.) wingspan, 1:4.33 scale model for 1.20 cu.in. motors and four function radio control systems. No moulded cowl required - all wood construction. Three sheet plan.



**FE8**  
**PLAN PRICE £19.50**  
**PLAN NO.267**  
**COMPONENT PACK £88.00**

Accurate 1/5th scale 75.6" (1920mm) wing span replica of the British early WW1 pusher fighter. Requires .78-.91 four stroke engines and four function radio control system. Excellent for electric conversion.



**FELIXSTOWE F2A**  
**PLAN PRICE £19.50 PLAN NO.276**  
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An amazing 1/6th scale fully flyable replica of the British WW1 maritime patrol flying boat. Model spans 100.5" (2553mm) and suits two .25-.30 cu.in. two stroke engines. Can be flown from water, or from land using a take-off dolly to safely landing on its hull. Prototype model won "Best of Show" at the prestigious Toledo R/C Expo in USA. All the detail is there on the plans for an impressive model.



### FOKKER D.VII

1/4 PLAN NO.241, 1/5 PLAN NO.242

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COMPONENT PACK 1/4 £125.00

COMPONENT PACK 1/5 £120.00

1/4 scale spans 82.5" (2095mm) for 30cc (1.8 cu.in.) two stroke engines. 1/5th scale spans 65.78" (1673mm) and suits 15cc (90 cu.in.) four stroke engines. BE SURE TO QUOTE SCALE REQUIRED WHEN ORDERING!



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### D.H. 103 HORNET

PLAN PRICE £22.50 PLAN NO.052

COMPONENT PACK £130.00

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### BOEING PT-13 STEARMAN

PLAN PRICE £19.50 PLAN NO.243

COMPONENT PACK £99.50

A 58" (1473mm) wingspan replica of the famous bi-plane radical engined trainer aircraft of the WW2 era. Designed for 700 size electric motors, but with option of i.c.engine power using a .52-.60 four stroke engine, with modifications shown on a separate plan sheet. (Ready-cut wing ribs and fuselage formers available - see below) Three sheet plan.



### TIPSY JUNIOR

PLAN PRICE £19.50 PLAN NO.286

COMPONENT PACK £95.00

A 1:3.44 scale, 79" (2006mm) wingspan replica of the late 1940s Belgian light aircraft, designed to suit .90-1.20 cu.in engines. Designed by Philip S.Kent, the model features all built-up balsa/ply construction throughout and makes an excellent entry into R/C scale modelling. Rudder, elevator, aileron and throttle controls.



### AVRO AVIAN MONOPLANE

PLAN PRICE £19.50 PLAN NO.278

COMPONENT PACK £110.00

Designed by respected R/C scale expert Philip S.Kent, this quarter scale replica of the radial engined version of the 1930s air racer spans 96" (2438mm) is an ideal/introduction to the world of large scale. The model suits 1.50 cu. in. size four stroke engines and requires four function radio control operating the basic control functions of rudder, elevator, ailerons and throttle. Conventional wood airframe structure throughout.



### SOPWITH CAMEL

PLAN PRICE £14.50 PLAN NO.188

COMPONENT PACK £79.50

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### SOPWITH PUP

PLAN PRICE £16.50 G/F COWL PRICE £17.50

PLAN NO.177 COMPONENT PACK £135.00

Superb, true-to-scale 1/5th scale replica, features accurate outlines and rib-for-rib reproduction of the full size wing structure. 63 ins. (1600mm) span model is of manageable size for transport and offers realistic flight performance. For .60size motors and 4 function radio. Glass fibre engine cowl available.



### BUCKER BUI 80 STUDENT

PLAN PRICE £26.50 PLAN NO.015

COMPONENT PACK £120.00

The R.A.F. maritime recce/ anti-submarine patrol aircraft, modelled by renowned electric scale expert Chris Golds. 86" (2185mm) span model flies on four Speed 400 electric motors, driving pusher props. Full step-by-step written building instructions.

## WHAT DO THE CUT-PARTS SETS CONTAIN?

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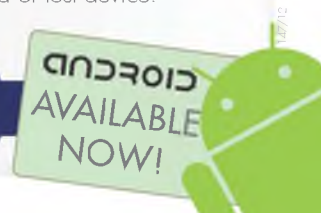
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<b>Li-Po</b>	2S (7.4V)	35C	35C	35C	35C	35C	RX	25C&35C	35C	25C	RX	25C	35C	-	-	-	25C	-	-	25C	25C	-
	3S (11.1V)	35C	35C	15C&35C	35C	35C	-	25C&35C	25C&35C	-	-	25C	35C	35C	35C	35C	25C	35C	35C	25C&35C	25C	25C
	4S (14.8V)	-	-	-	-	-	-	-	25C&35C	-	-	25C	35C	-	35C	-	25C	35C	35C	25C	25C	25C
	5S (18.5V)	-	-	-	-	-	-	-	-	-	-	-	-	-	35C	-	-	35C	35C	-	-	-
	6S (22.2V)	-	-	-	-	-	-	-	-	25C	-	-	25C	-	-	35C	-	25C	35C	35C	25C	25C
<b>NiMH</b>	Capacity mAh	750		1200		1500		1600		2000		2300		3000		3700		4500		4700		
	Cell Type	AAA		AA		2/3C		AA		AA		SC		SC		SC		SC		SC		
	Layout	Flat	Square	Flat	Square	Flat	Flat	Hump	Flat	Square	Flat	Flat	Hump	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat	
	4.8V (Rx)	✓	✓	✓	✓	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-	-	
	6.0V (Rx)	-	-	-	-	-	✓	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	-	
	7.2V (Drive)	-	-	-	-	✓	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	8.4V (Drive)	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	
9.6V (Tx)	-	-	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-	-	-		
<b>Li-Fe</b>	Capacity mAh	850		2100		3000																
	2S 6.6V (Rx)	✓		✓		✓																

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