No. 1 ELECTRIC MODEL FLIGHT MAGAZINE

Electric Flight

INTERNATIONAL

FEBRUARY 1999
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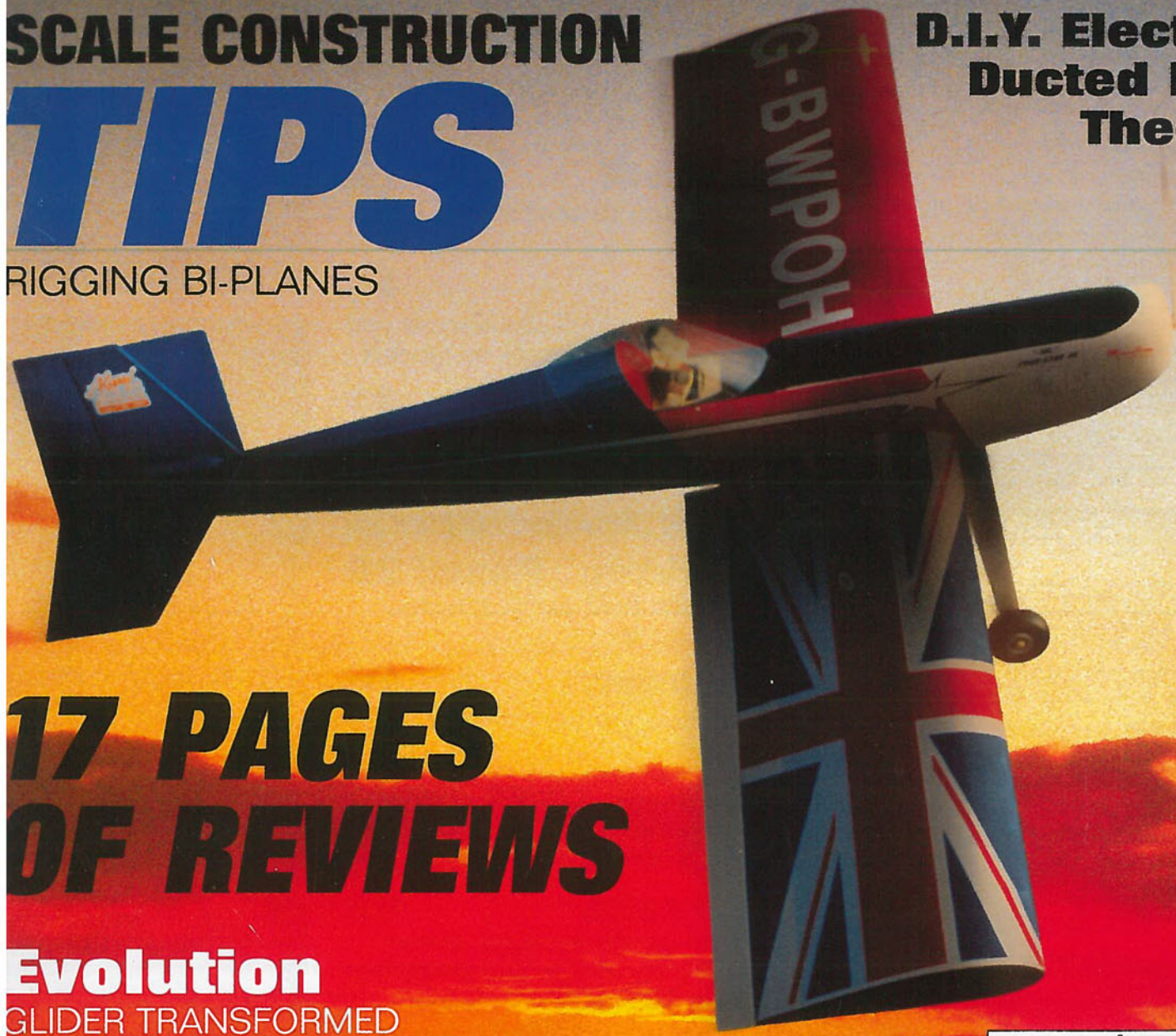
SCALE CONSTRUCTION TIPS

RIGGING BI-PLANES

D.I.Y. Electric Ducted Fan Theory



17 PAGES OF REVIEWS

Evolution
GLIDER TRANSFORMED TO ELECTRIC

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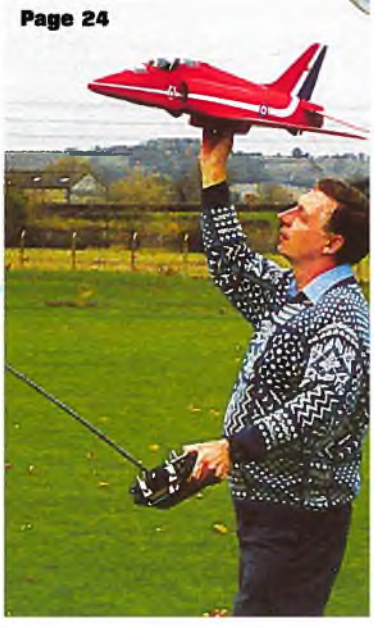
Regulars



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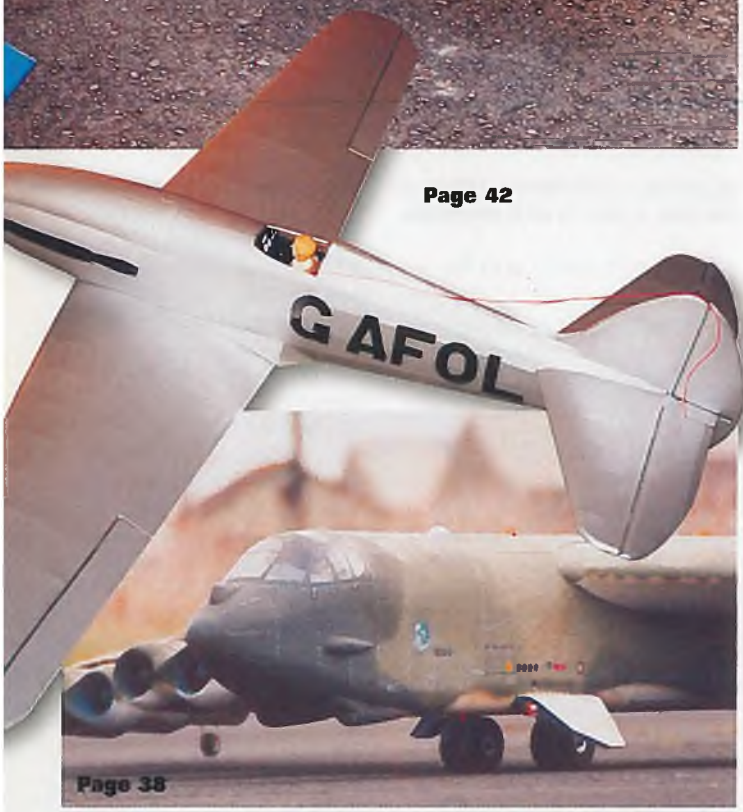
Page 46

Page 34



Page 42

Page 38

Features

Page 20

Services

Editorial

Good news, sad news, model news and a little advice regarding air travel.

Classic Aircraft

There have been in the past few years several TV productions in the UK that I had hoped would make the general public more 'Aviation Aware'. If a minute percentage of the public become interested, some may wish to become involved. Youngsters especially are more amenable, they may wish to have flying lessons, they may be interested in flying in the armed services or with airlines, in any capacity, they may wish to work for the Airport Authorities or they may even wish to build and fly model aeroplanes. Interest in older persons of any age between twenty and one hundred might be revived; perhaps they were moderately interested before and will become interested again. If a few within that 'minute percentage' were to come our way - I would be delighted.

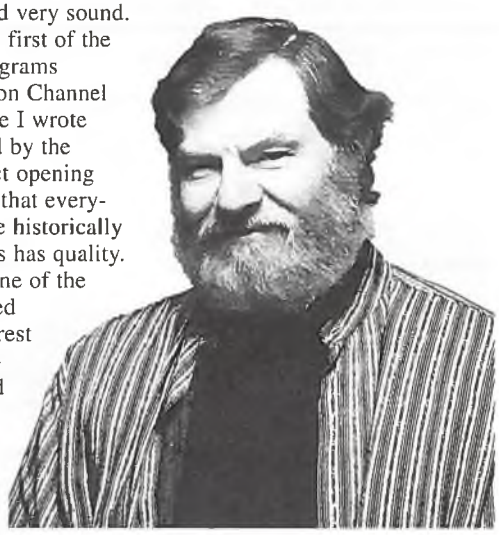
The above mentioned 'aviation' programs, documentary or drama, have not inspired me to watch a second one in a series and often I have not watched for more than a few minutes.

I received a manuscript copy of the book 'Classic Aircraft' reviewed in a 'A Good Read' in this issue. It is interesting, not predictable and very sound. I waited to see the first of the series of eight programs 'Classic Aircraft' on Channel 4 Television before I wrote this. I was amazed by the banal and incorrect opening sentence but after that everything seemed to be historically correct. This series has quality. It has followed none of the common hackneyed routes. It will interest the informed aviation enthusiast and it may interest any intelligent members of the populace who watch TV, enough to inspire them to learn more or even become involved. I hope that either directly or indirectly it recruits some model fliers. We need more quality TV programs like the 'Classic Aircraft' series.

▲ **Heron, a Bill Winter 1980s design for electrics for which a kit and a plan is still available.**

Obituary

We were unfortunate to lose a good all-round model flyer when William "Bill" Winter, writer, editor, and publisher, died December 11, 1998. He was 86.



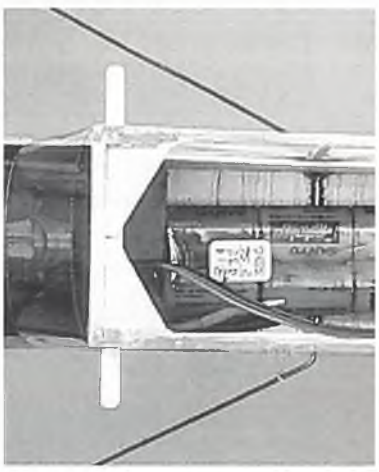
On my part, I have read his articles for years and admired his designs all my life. I was delighted when such a distinguished model aviator 'went electric' a few years ago - even before I did. I am grateful to Carl Maroney, Special Services Director of the Academy of Model Aeronautics (of the USA) for supplying this obituary written by Jim Haught.

William J. Winter was born in 1912. During more than 60 years in the model publications field, he published nearly 300 articles; wrote 19 books; and had 11 of his designs kitted.

Bill began with Air Trails in 1937, later became managing editor of Air Progress, and served as an advising editor for Air World and Flying Models. From 1950-1960 he was editor of Model Airplane News, became production director for Flying in 1960, and was

editor for Grid Leaks and the early Model Aviation until 1966. During the 1970s he served as editor and publisher for American Aircraft Modeler, Junior American Modeler, Sport Modeler, National Aeronautics, and was editor of the 'new' Model Aviation from 1975 until his retirement in 1980.

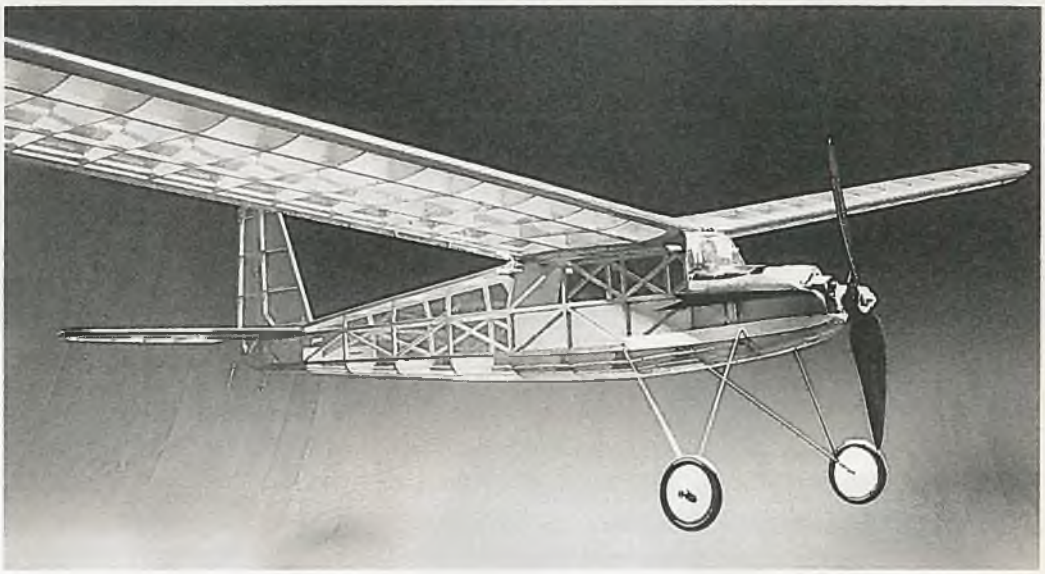
Despite his 'retirement,' Bill was a prolific designer and flier. He and John Hunton teamed on many projects in later years; the last of which, Duster, appears on page 22 of the March 1999 Model Aviation. An in-depth retrospective will appear in a future Model Aviation.



Dallaire Update

Readers of the last issue of EFI will remember the 'Cover Story' which is a kit model manufactured by Spirit of Yesteryear of the 1937 'Dallaire Sportster'. I had inserted the day that EFI went to the printers a 'STOP PRESS' label over a photo on page 37. It read "This model was test flown on Sunday 29th November 1998. First flight: 16 mins 12 secs on 7 x 500AR cells. Second flight: 30 mins 28 seconds on 7 x 1100AAU cells. Full report in the next issue. SM"

I said in the review (before I had flown it) "Now that I have built it and discovered how light it is, I am sure that a direct drive Speed 400 would suffice." Now that I have flown it, I am even more sure! I am using a 2.33:1 gearbox and Speed 400 7.2V motor and 9 x 5 Slim Prop. The flights were conducted in a light breeze and with the motor RPM just sufficient to maintain height, the model did not penetrate forwards in that breeze. So that is how fast it needs to fly to remain airborne - "light breeze" velocity - sorry about that woolly description. The air was as described but far from smooth. This is a good way of measuring how much energy it needs to fly.

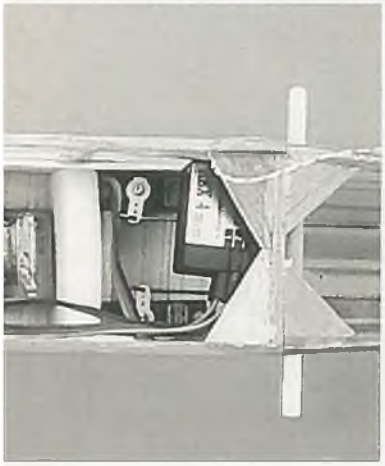


▲ **The Dallaire Sportster.**

I did make tests to check stability and stall recovery. Total weight with a 7 x 500AR power pack was 18.5 oz (525g) and flat out it climbs well. On the glide, up elevator was gradually applied to check the stall characteristics. It did not stall, just nodded its head and flew on, descending a little more quickly. It would only stall with power on and climbing too steeply; even then it did not flick, just dropped its nose abruptly and speeded up - very docile. It weighs one ounce (35g) more with 7 x 1100AAU cells, very high capacity pencell nicads. I made a few uncharacteristic manoeuvres in the second flight but it flew 30 minutes 28 seconds. I was beginning to feel the cold.

Time for the sums. My flying was not wasteful of energy for most of the time, divide amp minutes capacity of the cells by the flight time, it is about 2 amps. Two amps, that is an average of about 17 watts energy to keep flying - a very efficient aeroplane. I am sure that a direct drive Speed 400 7.2V with a 6 or 7 inch diameter prop would not be as efficient but it would be simpler and cheaper and a little lighter and quite sufficient to keep it airborne for almost as long.

▼ **Equipment arrangement in the Dallaire. The floor is for the battery pack and two Jamara branded 9g servos are on this floor too. The Jeti Rex 4 micro Rx sits on a peg 'shelf' above the servos. Foam pads fore and aft of the battery pack locate it. The 1100AAU battery pack occupies no more space.**



This Month

Content this month is the usual regular contributors plus the usual variety of feature articles. I wish to bring to your attention the article: 'Airline Shipping Box'. "Pretty mundane" do I hear you say? If you ever travel by air, build one whilst we are in the 'off season'. If you ever need one in a rush you will not be able to find the half day it takes to build it.

I have carried models a few times by air. Airline cabin crews are always most helpful but I have travelled close to Christmas when even one of the cabin crew did not have a seat to herself for take-off. Not legit I am sure but what do you do when it is very busy and you really do want to be home by Christmas Eve? What I am getting at, is that it is not always possible to carry something like a model into the cabin. I have carried a few long kit boxes onto a busy flight where other passengers had already occupied all of the overhead lockers. I politely refused to let them go in the hold. I was politely dispossessed of the boxes that were stored safely in the 'coat cupboard' by the door. On a less busy flight I sat in the centre one of 3 seats and a fuselage sat on a seat to my left and a wing on a seat to my right, both safely retained by seat belts. No one minded. Whilst still at school I used to spend the school holidays in North Africa. On one trip I carried out in a paper bag (poly carrier bags with handles had not been invented) a 17" (432mm) span one piece control line model. It sat on an open elastic net shelf above my head. I shooed any coats and brief cases well away from it. On the return trip I carried this model plus a one piece Ringmaster Junior 30" (762mm) span control line aerobatic model with my prized ED Racer motor in it, both in a very large paper bag. There was not enough room on the shelf and I absolutely refused to be parted from it. It sat part on my lap and obscured the window (I think it was one of those big ones in a Viscount). I ate round it.

A few years ago I built myself a box about the size of Grant's so that I could transport by air a light vintage model to Germany. It is not quite as big and not as heavy and I am sure not as strong as Grant's but I have since fitted a folding handle (off a disco loudspeaker). This is valuable to me and saves so much trouble. I now design models to fit the box. Two piece wings make this easier and fuselages can be just so long or I remove the spinner. Carrying models is no longer a problem. Check the airlines regulations for the sizes of boxes for the hold and check also maximum sizes if you send in advance via Air Freight.

You may be on a busy flight, you may be going on holiday, there probably will not be a spare seat. I know models are getting smaller but you may want to take one with you that will not fit in a box that fits under the seat. Cabin crews may read you the regulations. It is easy if you go by the rules, or you need a VERY good friend who is a stewardess. EFI

Current Affairs

A variety of new kits, components and tools to assist your selection and accelerate your building of new models for the 1999 flying season.

◀ The Versatile Drill Holder (MB592) and in the foreground Tool Rest & Accessory Holder (MB594 - RRP £9.99).

Minicraft Accessories and Attachments

Whether you scratch build and cut absolutely everything yourself or if you purchase ARTF models with almost nothing to cut, you will have discovered that power tools do definitely reduce the building time.

There are many tools available that enable you to carry out different operations but the right accessory can make that job not only possible but so much easier. If you do not have access to a workshop with machine tools you can build up your own miniature one, quite big enough for all the operations you need to carry out to build models. All the attachments and accessories can use just one power tool or you may wish to have several in order to save time spent installing it, removing it and re-installing it.

The Versatile Drill Holder (MB592) enables you to clamp the drill at almost any angle, leaving the hands free to steady whatever you are working on. The unit can be clamped to a workbench. RRP in the UK £14.99. You will need a clamp like this if you ever use a Flexi Drive (MB720).

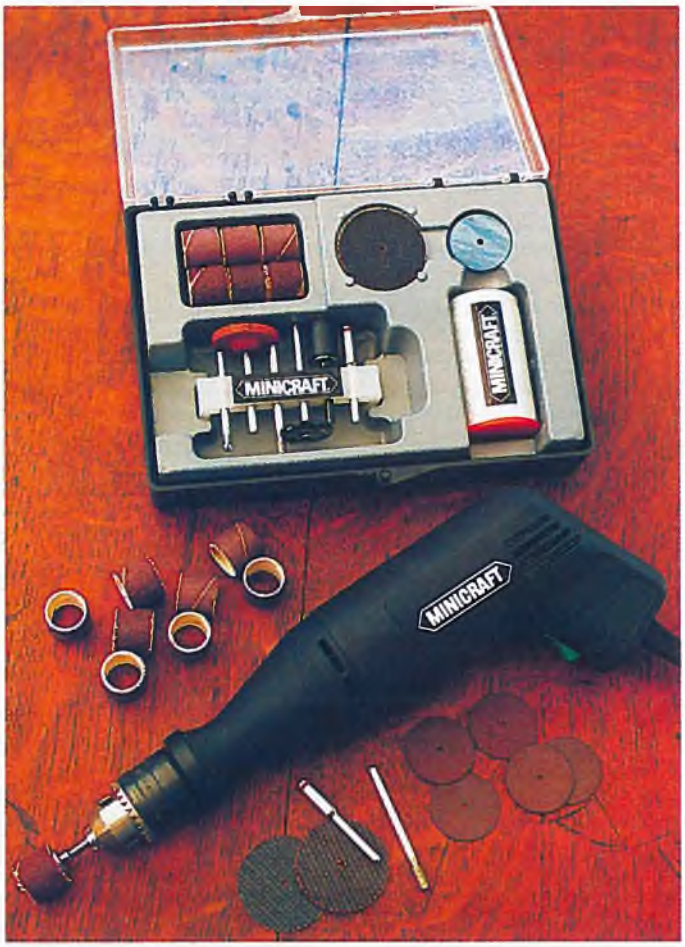
The 100 Piece Heavy Duty Accessory Set (MB1940) stocks a range of 3.3mm (1/8") shank accessories for use with any of the 12V or 230V mini power tools, RRP £ 29.99. The plastic storage case with two layers of accessories can be re-stocked with individually packed items.

In the Minicraft Attachments photo you will see: Precision Vertical Drill Stand (MB540) which comes with a reducing ring for 25, 30 and 40 watt drills and its sturdy metal base can be fixed to a bench for extra stability. Mini Drill Stand (MB820) is suitable for 25, 30 and 40 watt drills, operating height is adjustable. For any delicate operations or precise drilling you may need the Machine Vice (MB715) which can be hand held, screwed to a bench or clamped to the baseplate of MB540. The Lathe and Router (MB850) is suitable for Minicraft 100 watt drills and comes with two bench clamps.

MiniMax 230

This mains variable speed mini rotary power tool from Minicraft has the DIN size body (43mm diameter) which enables it to fit the range of Minicraft attachments and has the high (90 watt) rating for a small power tool.

Features include:
Keyless steel chuck 0.3 - 3.2mm.
3.2mm steel 4 jaw collet.
Variable speed 8000 - 21000 RPM.



▲ The 100 Piece Heavy Duty Accessory Set (MB1940).

Output 90 watts.
Ball raced drive shaft.
DIN 43mm body.
Mains 230V powered.
High torque.
Fan cooled motor.
Hanging hook for storage and use with Flexidrive.

MiniMax 230 is available in two versions:
MX1. MiniMax Tool only.
MX2. MiniMax plus heavy duty accessory set MB1940 and accessory holder MB594, all packed in a tough plastic storage case.

MiniMax 230.


Minicraft Attachments.

Aero-naut Katana

Announced at Nürnberg last year, the Aero-naut 'Diamond Aircraft DV20 Katana' kits are now in the shops. The Katana and 'Diamond Aircraft TC80 Super Dimona' models use identical moulded lightweight glass/epoxy fuselages and as you can see in the photo they use identical boxes too. The only airframe difference is the longer span wing and tail on the Super Dimona. Both models have similar controls, aileron, rudder, elevator and motor. The longer span model is very much a model of a 'motor glider' and will obviously have a lower rate of descent but the shorter span Katana should be more lively and more fun to fly.

There is no real building, as you see in the photo all the major construction has been done for you. Even the cockpit interior and instrument panel are provided for you as very light mouldings, plus moulded halves for you to assemble the wheel covers (spats).

Several power trains are recommended for both models, all with gearboxes and from 7 to 12 cells. Motor options include all the '400 size' motors like the Speed 400 and 480, Race 400, 410 and 480, Permax 450 Turbo and LRP Super 400. Keep an eye on forthcoming issues for a review of this kit.

For more information, contact local dealers or:
Aero-naut Modellbau,
Postfach 1145,
D-72701 Reutlingen,
FR Germany
E-mail: info@aero-naut.de
Website: http://www.aero-naut.de

▼ **The contents of the Aero-naut Katana kit box.**

▶ **Electro 700.**

Electro 700

Eric Leadley of EDL Plans is a great advocate of the small low cost model. He designs and flies and offers for sale plans for a lot of 400 powered models and rarely uses the 600 and 05 motors that I know he possesses, so I was surprised to be told about his 'Electro 700'. It is a logical step though, the 700 series of motors goes from middle priced down to really quite inexpensive and you do not need large numbers of cells or expensive chargers with the low voltage ones. Eric says:

"The model is based on my Electro 400 and Electro 600 designs but this is the next step up; it is the ELECTRO 700. This model is 50 inches span (1270mm) and is designed around the Speed 700 motor and will take up to 10 cells. Because the 700 is such a large diameter motor it means that most other motors will fit the design. By increasing the dihedral by the recommended amount and fitting the lower powered 600 on 7 or 8 cells, beginners can also use this model. The construction is all balsa and ply and as is usual with my plans an additional sheet is added with all the ribs shown to save cutting into the plan. The prototype is fitted with two aileron servos to assist short landings with mixed aileron/brake and rudder for better aerobatics. These can be omitted for simpler flying."

ELECTRO 700 specification:

wingspan	50 inches (1270 mm)
length	36 inches (910 mm)
wing section	SG3021
energy	7 to 10 x 1700 or 2000 cells
weight	2 lb 14 oz (1288g) minimum, this increases with cell numbers and motor type
motor	Speed 700, geared 600 or similar motor or direct drive 600 for beginners

Price of plan £6 plus 50p P&P.

Available from: EDL Plans, 3 The Glade, Ashley Park, York, UK-YO31 1LA.

Carbon D-Light E

The V tail version of this high quality ready built lightweight 1.8m (6 ft) span electric glider was reviewed in the September 1998 issue of EFI. There is now available a version with a cruciform tail.

ICARE is pleased to be able to offer this new alternate version because so many customers requested a version that doesn't require any mixing function, allowing the use of a regular 3 channel radio. The vertical fin has to be glued in place, and the horizontal stabilizer is bolt on, for easy removal. With the exception of the tail the specification is identical, weight: 19 oz (550g), wing loading: 6.2 oz/sq.ft (19g/sq.dm) and airfoil S4083. The kit is part no: CAR-003 and the introductory price is: U$ 229.00, or for the Combo special (specify which set-up): U$ 309.00.

The Combo special is model plus one of two specific high performance Speed 400 set-ups. The first power set-up is to be used on 7 cells for limited motor run contests (LMR or Electroslot) and combines a Speed 400 6V, fitted to a 4:1 inline gearbox, a 14 x 8 lightweight folding prop and an Easy 1000 motor controller. The gearbox is a high quality inline gearbox, with aluminum housing and tempered gears for very long, hassle free usage. The lightweight folding prop has stiff yet light fiberglass reinforced blades, on an aluminum yoke and the whole assembly is attached to the gearbox by an aluminum 4mm collet adapter. The 35mm spinner fits perfectly the nose of the Carbon D-light.

The second set-up is for long duration, on 8 to 10 cells, like All-Up-Last-Down. This set-up uses a Speed 400 7.2V, fitted to a 6:1 inline gearbox, a 12 x 8 lightweight folding prop and an Easy 1000 motor controller. Full throttle motor run draws a mere 1.5A, with sufficient thrust to get a gentle climb. Combined with KR1100AE cells, over 30 min motor run can easily be achieved.

For more information about ICARE products see their a web page at:
http://www.jonction.net/~icare/icare.htm
E-mail: ICARE@telts.com
ICARE Sailplanes, 381 Joseph-Huet, Boucherville, Qc, J4B 2C5, Canada. Tel: (450) 449-9094 Fax: (450) 449-3497

Piper Cub J3

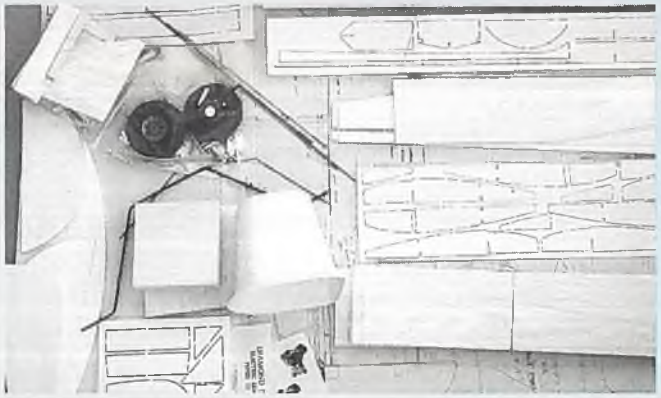
It is almost certain that you will all be familiar with the subject of this model but you will not know this new model manufacturer. It is being offered by a new company called 'Diamond Designs', started late last year by Barry Goldspink. He has a list of models to reveal to the electric pilot and the first of these is the ever popular Piper Cub.

It is a semi scale model designed specifically for electrics and geared 500 or 600 motors on 7 cells. The prototype used an MFA Rocket motor and MFA 3:1 gearbox and flies for 8 to 10 minutes on 1700mAh cells. Quoted typical weight is 36 to 38 ounces (1020 to 1080g).

Wingspan is 53.5" (1360mm) and the very complete kit contains a lot of CNC cut components, wheels, control horns and even push rods. All you need is covering, power train and radio gear. RRP in the UK is: £54.99. Look out for a review of this kit.

Available from:
Diamond Designs
16 Diamond Close
Ipswich, Suffolk,
IP1 5HN
Tel: 01473 413043
(call after 3pm)

▼ Some of the parts in the Diamond Designs Piper Cub J3 kit.

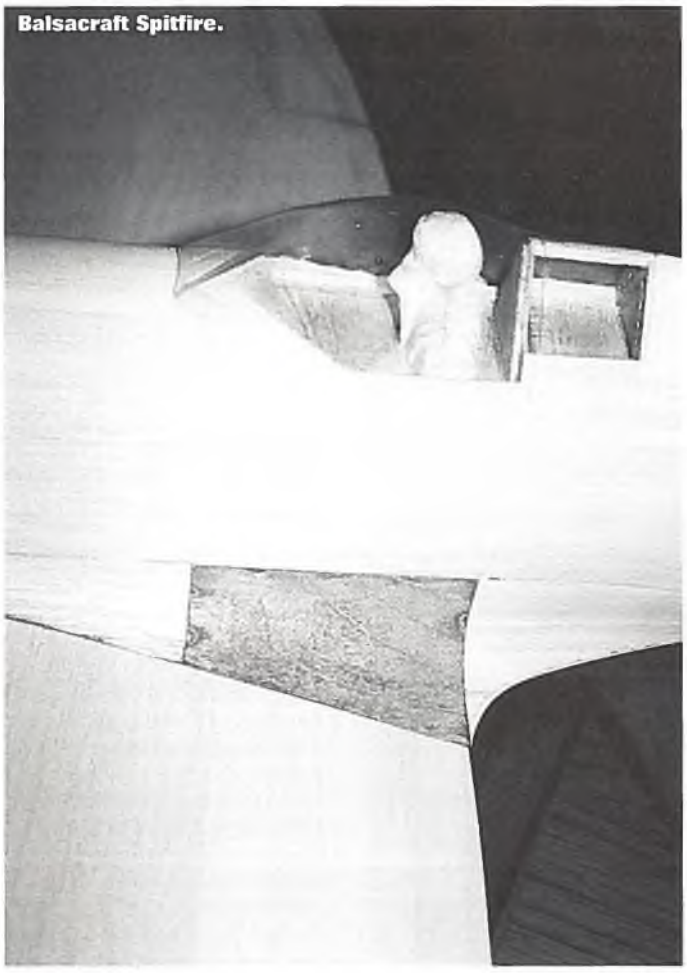


Spitfire

Designer Pete Nicholson revealed in November at the BEFA Technical Workshop at Leamington Spa, the next Balsacraft Models Designs electric model that will be available to us. This was Pete's own prototype and still in raw balsa. As with all of his designs for direct drive 600 motors every component that needs cutting accurately is already CNC cut for you and he insists that construction is very easy. The spinner on this model contains the plywood motor mount and most of the motor, a trick that fools anyone when the model is flying, a technique previously used by Pete with his Hurricane. The Mark IX was one of the last produced Marks to have the sleeker Merlin size fuselage and the original definitive flying surface outlines, preferred by many Spitfire enthusiasts and model builders. We will surely see a lot of these models at fly-ins this year; kits should be available by the time you read this.

Availability: ask your local dealer or check with Balsacraft who manufacture or Ripmax who distribute.

Balsacraft Spitfire.

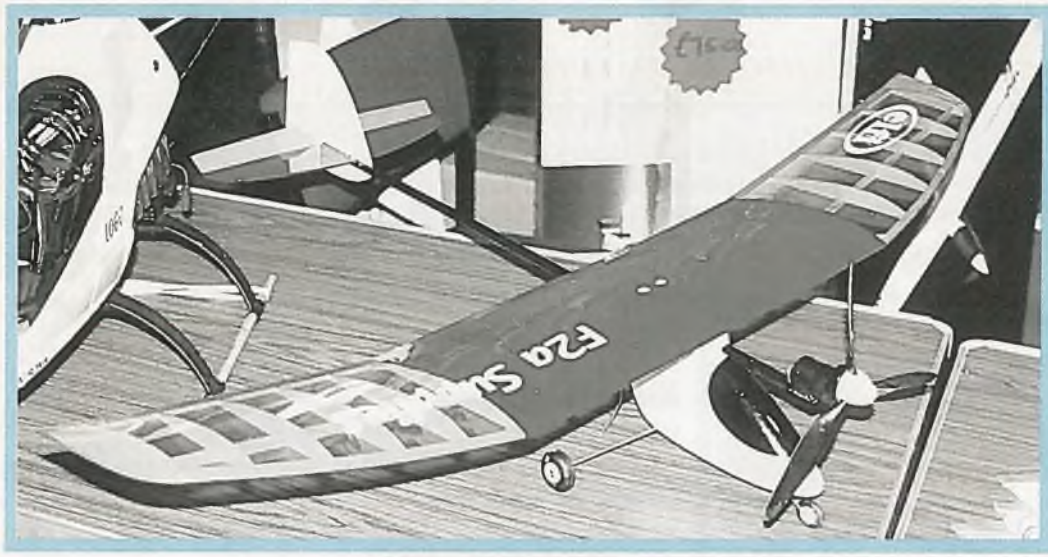


Muffett Gears

Some of us make our own gearboxes for drive systems or need gears for other cunning applications like retracts or swing wings. The following is extracted from a Press Release.

S H Muffett Ltd - the gear specialists - has increased its range of moulded products. The company claims for its new range "the most versatile standard moulded gears available on the market". The number of spur gears in the range has been doubled enabling S H Muffett to offer forty different teeth sizes for seven different modular pitches with racks now available for each. The bevel gears in the extended range are available in an unrivalled five different ratios with many alternatives in each ratio.

Duncan Fisher of S H Muffett said: "We have increased our standard moulded product range for lighter duty applications where a slight reduction in tolerances is acceptable. An advantage of plastic moulded gears is that the flow of material around the teeth means that the gears actually give better mechanical results than



Elfi

Also seen at Leamington was this new 900mm (3') span Slow Fly model called 'Elfi' which comes with already built up and covered wing and tail, fuselage, motor, gearbox and prop. All you need do to fly this model is fit two micro servos, speed controller, battery and Rx. The price is £99.95.

Available from: F2a Supplies, 30 Blackdown, Hilltop, Stony Stratford, UK-MK11 2AB,
Tel: 01908 260858.

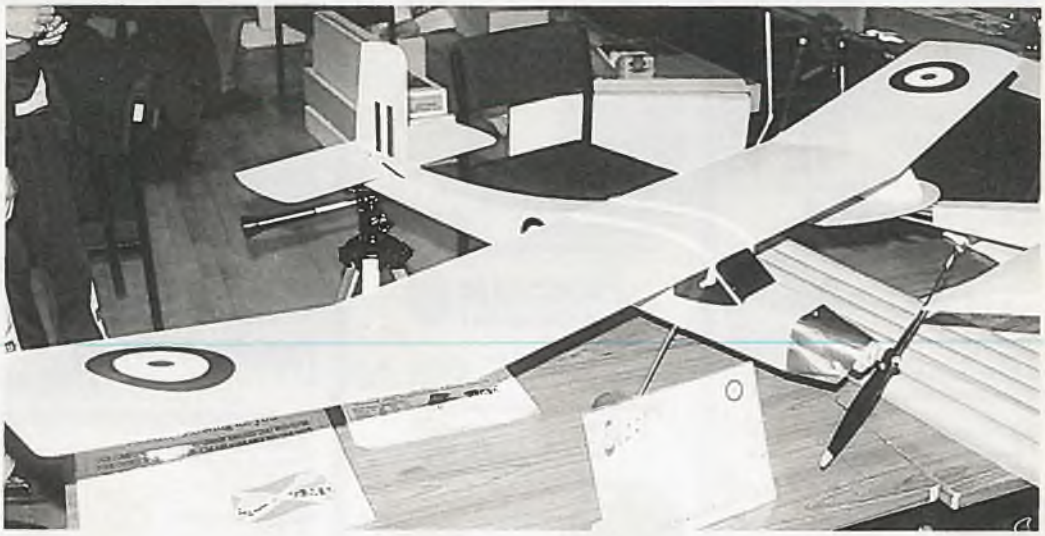
◀ **Elfi.**

machined gears. In short, they offer a very economical and effective alternative to machined gears".

For more information on the S H Muffett range of gears or its manufacturing capabilities contact Duncan Fisher, S.H. Muffett Limited, Woodbury Park Road, Tunbridge Wells, Kent, TN4 9NH. Tel: 01892 542111, fax: 01892 542117. Email: sales@muffett.co.uk or visit the S H Muffett Website at http://www.muffett.co.uk

Electro Tutor

Another model revealed at Leamington was the Graham McAllister Designs 'Electro Tutor'. This lightweight high wing cabin trainer has an undercarriage and looks like a regular sports model but its large wing and low wing loading provide the performance of an electric glider. This makes it good for beginners or experienced pilots who like long flight times. Graham's own example here uses a Speed 600 motor with Graupner FG3 gearbox and this model is equipped with standard size (low cost) RC gear and seven cells. There is sufficient space in the fuselage for up to 10 cells and 3000mAh size. This simple model has controls for rudder, elevator and motor and its tip dihedral wing makes it stable and easy to fly. The kit includes the three veneered foam wing panels, CNC cut sheet balsa and ply components and all the hardware like pre bent undercarriage, wheels and control snakes.



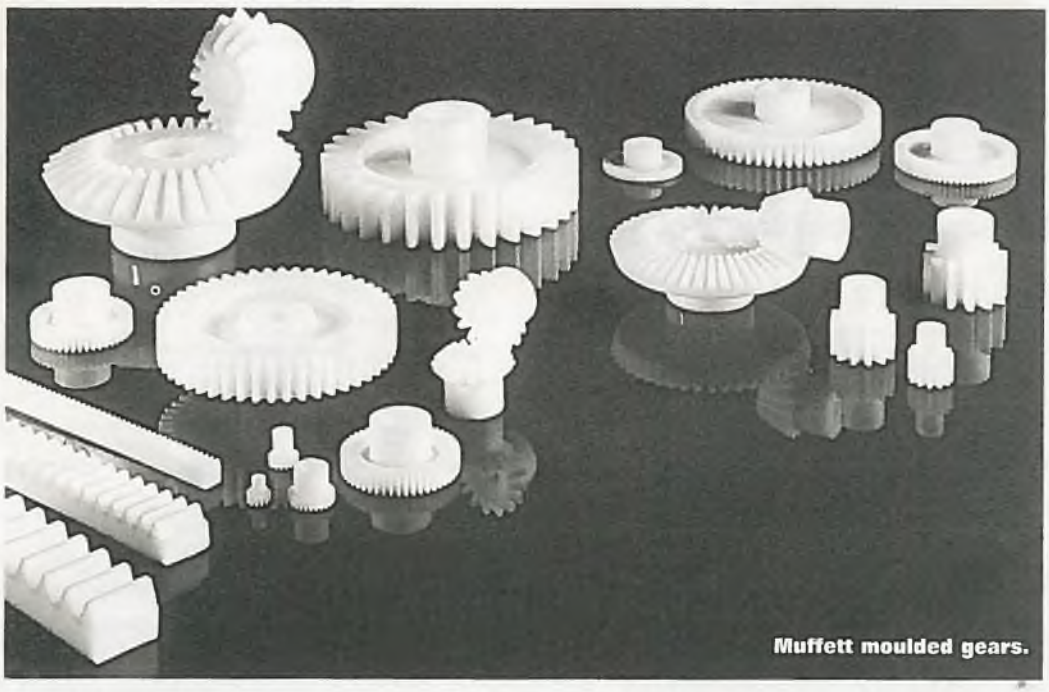
▲ **Electro Tutor.**

Specification:

wingspan:	64 inches (1625mm)
wing area:	520 sq.in (36sq.dm)
wing loading:	15 oz/sq.ft (46g/sq.dm)
wing section:	Eppler 205
energy:	7 to 10 up to 3000mAh cells
weight:	54 oz (1530g)
motor:	Speed 600 with Graupner FG3

Available from Graham McAllister Designs, 60 School Road, Wales Village, nr. Sheffield, S26 5QJ, UK.

McAllister footnote: Do you remember the Filey Flyer in Current Affairs, in the September issue? In addition to the plan (£9.50 + 50p P&P) Graham now offers a rib set for £9 + £1 P&P. **EFI**



Muffett moulded gears.

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JR-X3810 £489.95

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Diary Dates

Plan ahead, you cannot get information to us too early. The lead times for publishing can be months so let us know as soon as you know. If you wish your events to be included sent details to the editorial office by post, fax: 01684 594586 or Email: efi@traplet.co.uk Include wherever possible: name of event, date, location, type of event and contact names and numbers. In the list below, unless otherwise stated, the event and address is in the UK.

The January 8 to 10 dates quoted in the last issue for the Sinsheim Show were for toys and model railways - if this is not your scene, see March 5 to 7.

February 12 to 14
MID-WINTER ELECTRICS sponsored by The Silent Electric Flyers of San Diego. This event will be similar to our first - and rather wet - winter fly of this year. There will be symposiums, pylon races, AULD, fight demonstration, a tour of the San Diego Aerospace Museum with a Saturday dinner and a guest speaker. In spite of the El Nino rains, our first Midwinter Electrics was exciting and was well accepted with participants from as far away as Iowa, Washington, Texas, and New Mexico. The second Midwinter Electrics can expect much better weather with much flying and fun. Contact: Charlie White, 4420 Ladera St., San Diego, CA 92107-4232, USA. Tel: (619) 223 8903, email: charliew@adnc.com.

March 5 to 7
Model Show at Sinsheim on the A6 between Heidelberg and Heilbronn, Germany. All model types, exhibitors, traders, indoor flying and if weather permits outdoor flying too.

February 14
BEFA Indoor meeting at Parklands Leisure Centre, Wigston Road, Oadby, Leicester, UK, 10am to 6pm. All indoor types, no competitions but facilities for those wishing to establish duration records. For further details, write (with SAE) to Roger Winsor, 14 Butler Gardens, Market Harborough, Leics, UK-LE16 9LY.

February 20 (Saturday)
Model Show. Fleet Air Arm Museum, RNAS Yeovilton, Ilchester, Somerset, BA22 8HT. Tel: 01935 840565, fax: 01935 840181. Entrance to the show will include full admission to the museum (well worth visiting!) and the model show stands will be arranged amongst the planes and exhibits which cover over 3 acres of hangar space.

February 26
Model Aircraft Bring & Buy Sale, by the 2nd (Hale) Farnham Scout Group at: The Scout Hall, Upper Hale, Farnham, Surrey (opposite the Ball & Wicket public house on the A3016. Setting up: 7.00pm. Doors Open: 7.30pm. Sellers per table: £5. Entrance: £1, children: 50p. For those with just a few items, 10% commission less 50p per item. Contact Robin Colbourne, Farnham (01252) 727492. 19 Shady Nook, Folly Hill, Farnham, Surrey, SU9 0DT.

February 27
AeroNutz Indoor Fun-Fly, 5pm to 11pm. Parklands Leisure Centre, Wigston Road, Oadby, Leicester, UK.

March 14
BEFA AGM at Royal Spa Centre, Leamington Spa, Warks, UK.

March 28
AeroNutz All Day Indoor Fun-Fly. Parklands Leisure Centre, Wigston Road, Oadby, Leicester, UK.

April 4 & 5
The 28th RC Model Expo on Sunday 4th at Leicester Aerodrome, UK. Organised by Ross Willis, Barnstormers Flying Circus - Tel/Fax 01933 663700.

April 4 & 5
Chart DB Easter Fly-In, Old Warden, Beds, UK. 10am to 5pm. Flying is primarily for DB models but others are welcome, also trade stands. Contact: Sally Meadows at Chart International on 01903 773170.

April 11
BMFA F5B League event, Owthorpe, Notts. Contact: Mike Proctor, tel 01904 489386 or email: mike@mproctor.demon.co.uk

April 21 to 25
Intermodellbau Dortmund, Dortmund, Germany. All types of models in seven big exhibition halls. Manufacturers showrooms, hundreds of traders, static model exhibition of hundreds of aircraft, all sizes, all types.

April 24
AeroNutz Indoor Fun-Fly, 5pm to 11pm. Parklands Leisure Centre, Wigston Road, Oadby, Leicester, UK.

May 1 & 2
Winston-Salem, North Carolina, USA. This is a novel format - Saturday at the Mocksville site of the Winston-Salem RC club, near to local motels. Sunday, over to the Riverside Aeromodelers Club field near King, NC, with its superb runway. The contacts are Colin McKinley on 336-924-5890, John Mountjoy, 336-722-7609 and Randy Covington at 336-983-9126.

May 8
Springfield OH Meet. 30 mins from the USAF Museum at Wright Patterson AFB, USA. Contact: Sp400racer@aol.com

May 8 & 9
Sandown Show, Sandown Racecourse, UK.

May 9
BMFA F5B League event, Owthorpe, Notts. Contact: Mike Proctor, tel 01904 489386 or email: mike@mproctor.demon.co.uk

May 15 & 16
Mettenheim 99. Two days of electric flight only. Thursday 13th is a holiday in Bavaria, we will have a long weekend! Interested readers can contact Franz Stockinger, tel: 0049 8677 2157 or email: Franz.Stockinger@t-online.de

May 16
The Bickley Model Flying Club (BMFC) Electric Day/Fly-in. Superb site in Kent only 5 mins from the M25, J3, close cut grass and no restrictions on airspace. All electrics welcome especially the ducted fan, scale and performance end of the spectrum. Entry will be by pre booking only. Contact: Terry Adams, 01322 527527. Email: Jantel@netcomuk.co.uk or: Brian Gaskin, 01322 865701.

May 23
BMFA Southern Area Electric Fly-in at the Winchester MAC site. AULD at midday. Contact; Andy Palmer, 47 Lovage Way, Horndean, Hants, UK-PO8 0JG. Tel: 01705 591228 or Eddie Clowes, 2 Chalmers Way, Hamble, Hants, UK-SO31 4LR.

The Light Fantastic

CHRIS GOLDS

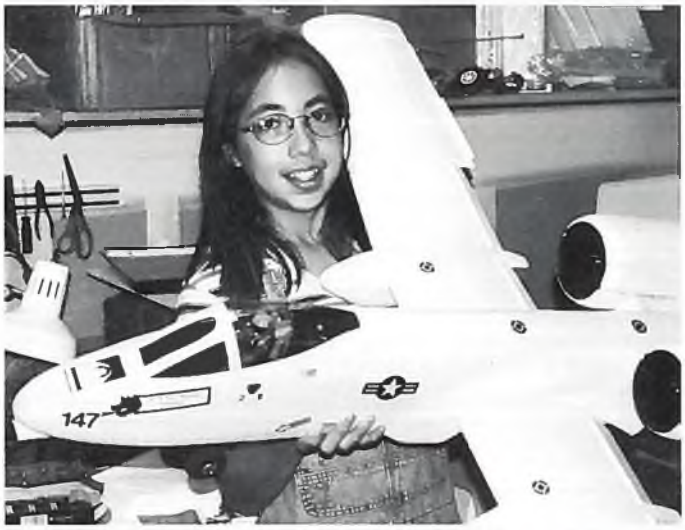
"The boat you buy has got to be handsome or else you will soon tire of its lack of beauty - it's the same with aeroplanes!

Beauty and The Beast

A long-time friend of mine, Roger Hymans, who was a member of the Black Arrow aerobatic Team (the all gloss-black Hunters of No.111 Squadron RAF) as well as a model flier and yachtsman, once said something to me which sits squarely in my brain to this day. He was accompanying me on a trip to Southampton to see and buy my first small sailing cruiser; I had worked my way steadily up through various sailing dinghies and I wanted a boat capable of weekend family sailing and short cruising. Roger said: "The boat you buy has got to be handsome or else you will soon tire of its lack of beauty - it's the same with aeroplanes!"

How right he was. There are some aircraft which immediately turn me on and some which instantly switch me off. The former category contains such obvious 'beauties' as the Hunter, Swift, Vampire, Me109, Fw 190 etc., etc., and extends to cover the Lancaster, B17, B52 and a great host of others which I have yet to build. The category of 'beast' is much more difficult to describe - some are just horrible shapes but most just turn me off without any sensible reason. For instance, I would never build a model of the Blackburn Botha - a twin piston monoplane of World War II with a dreadful reputation for poor flying qualities and possessed of a really ugly shape. But I won't list the others which I consider 'un-handsome' because I would undoubtedly start a paper war over some of the aircraft which are regularly modelled - but not by me. Thank goodness that our likes and dislikes vary so much across the hobby otherwise all we would ever see is one type of model and

▲ Derek Jones entry into EDF with Blackbird using two Pletts. Nothing like beginning the difficult way!



▶ Natalie Wagoner holding dad's A-10.

that would never do. So I look forward to the 1999 season and I will keep my eyes open for any 'beauties' to be seen. Please send me photos of your EDF models which you consider to be 'handsome' so that we can share in your predilections (well some of them anyway!). So to business.

Your Models

From John Miller of Camerton, Bath, came a letter describing his entry into EDF with a Kyosho T33 - an excellent choice to start with - and his mounting urge (no, no! not that, Mavis!) to be the owner of a Plettenberg 200-20-6 to up-motor the model. Just contact Stephen Mettam for that little toy, John. He is teaching himself Spanish and so he sent me a

▶ Young Master Wagoner holding F-16 bigger than himself!

▲ **Derek again with OD YF-22 which now flies very well.**

▲ **Jones the Hunter.**

▲ **...and Derek with his Tornado F3, described as "Great!"**

short list of Spanish Fan words - for which many thanks.

Next from Derek Jones of Worsley in Manchester came pictures of his recent entry into EDF with Lockheed SR-71 Blackbird using two Plett/Wemo 480 fans - as Derek says: "Why take the easy way in?". He followed that with a YF-22 using two 540 wet mag motors with ECO fans. After some initial problems this unusual model now flies well.

The other two photos are of Hunter and F3 designed by somebody or other. Derek has a long list of "must do's" and we look forward to seeing and hearing about them, thanks Derek.

From Robert Wagoner of Tucson, Arizona in the USA comes details of some very nice models and even nicer children (his). Holding his model of an A-10 Warthog is eldest daughter Natalie. The A-10 uses Graupner Ultra 930/10 brushed motors driving Wemo ECO FAN PRO fans on 20 x 2000 cells giving four minutes plus with full aerobatic

▲ **Raquel with dad's Styro EDF, Two pretty models indeed.**

capability. Next seen is young master Wagoner with GFK Modelle F-16 awaiting its large size EDF unit. Last but by no means least of the W family, comes little Raquel holding a 'Flying Styro' which, though shown with whizzy around thing at the rear, has now been converted to use the HiLine Red Flame Blaster with Astroflight 020 brushless motor. Breathtaking performance according to Robert. Thanks to the Wagoners - please make sure that little Raquel sees herself in print. A modeller in the making without a doubt.

From Mincinglake Road, Exeter, (not far from me up here in the North) writes Ray Donno who sends us a photo of some of his fleet. He has been back into modelling only since September 1997 after a long enforced break. He especially likes the clean-ness of electric flight (so do I!) and having been into radio (Radio Amateur G3 YBK) and electronics "all his life" the voltage way of life is a natural for him. His photo does contain three prop-driven models for which allowance must be given as he is now into EDF with - you guessed it - a Kyosho T33. Ray states that he has always had a fancy for a Hunter and he feels that he must build one from my plan (Traplet plan MW 2676). Go ahead Ray, get completely captured and come up and see me in North Devon sometime!

With assistance from John Miller's Spanish classes our word this month is FANGO which translates loosely as mire or mud. Appropriate really as the whole of our world here in Devon is at the moment (late November) exceedingly FANGOSO! I wish us all a great EDF year in 1999 and I hope to meet some of you at the shows. Or you can send in details and photos of you and your EDF models (additional children are most acceptable!) for us all to admire. FLY SAFE.

'Hideaway', Lower Loxhore, Barnstaple, N. Devon. EX31 4SX.

Tel: 01271 850456. Fax: Same No. - by pre-arrangement. **EFI**

▶ **Ray Dunno's line up of electric models with T-33 at the top.**

A Good Read

It is still the reading season. You can gain useful information and pleasure from reading about model and full size aircraft and data on the full size that you might wish to apply to models.

Flying Models

Rubber, CO2, Electric & Micro Radio Control, Tips and Techniques for Beginner and Expert, by Don Ross the author of Rubber Powered Model Airplanes. Published by Markowski International Publishers, Hummelstown, PA 17036, USA. Tel: (717) 566 0468. Available from Traplet Publications Ltd (see Contents pages). ISBN: 0-938716-54-9.

With the availability of smaller RC gear there is a resurge of interest in small models (Slow Fly and Park Fly) and an increase in indoor RC flying. To build light models, the techniques developed in the first half of this century deserve comparison with the newer techniques.

Don Ross has crammed into 240 pages explanations, descriptions photos and drawings of how to build and fly rubber, C02 and electric powered models. Learn the ways to build light whilst the mature model builders who know can still remember! There are easy to understand explanations about electrics but the really valuable content is the lightweight building techniques.

This book is available in the UK and in stock now at Traplet Publications Limited, check the advertisements elsewhere in this issue for prices and how to obtain.

Classic Aircraft A Century of Powered Flight

By Brian Johnson. Published by Channel 4 Books, an imprint of Macmillan Publishers Ltd, 25 Eccleston Place, London SW1W 9NF. ISBN 0 7522 1329 6. Price £18.99.

What are the 'classics' in the first century of powered flight? It may be a century too early to say. This publication was released on December 5th, about the same time as an 8 part series on Channel 4 Television. This television series is of a much higher quality than the usual 'TV aviation' programs and this book covers a wider spectrum of aircraft than the TV series.

The book looks broadly at civil and military aircraft and at exceptional ones rather than those most used or most popular. It is an interesting and informative read for both the informed enthusiast and anyone on the edge and wishing to learn more. Buy it and read it and if you have any friends who are not aviation nuts but who show the slightest bit of interest, recommend that they read it too.

McDonnell Douglas Aircraft since 1920, Volume I

By René J Francillon. Published by Putnam Aeronautical Books, an imprint of Brassey's (UK) Ltd, 33 John Street, London WC1N 2AT. ISBN 0 85177 827 5.

This book has been published and reprinted a few times. Keeping it up to date is a continuous task. The USA aircraft manufacturing companies like those in the UK have suffered an continuous movement of companies merging, buying and acquiring others. Sometimes names get added, sometimes changed to new ones and sometimes they just vanish. There must be some intriguing 'family trees' of world aircraft manufacturers.

This book accommodates McDonnell and Douglas before and after they got together plus aircraft by Northrop and Bowlus. Volume 2 which I have yet to see must contain Hughes Aircraft and a few others that were absorbed without their names being added.

Volume One contains so many types. I cannot look at a book like this without thinking: "Which ones shall I build?" there are so many Northrop and Douglas single and twin engined aircraft that are such suitable candidates for electric models. Wing areas are so adequate and tailplanes on so many are big enough to provide more than enough stability. And some of them have so much 'character'. Northrops were amongst the earliest monoplanes without bracing wires or struts.

Apart from all the well known models like the DC-3 and the Avenger and the Skyray there are the less well known but very dynamic types like the Skyshark and the X-3. If you are into civil multis, there cannot be a tidier aeroplane than the DC-7 to provide you with long duration flights.

P.S. McDonnell Douglas now belongs to Boeing.

The Osprey Aircraft of The Aces, series has now got to number 25. These books are more about the pilots and operations throughout the service life of the aircraft than about the aircraft themselves. I know that those amongst you of the 'Crosses and Cockades' following will absolutely love these publications but this writer prefers more history of aircraft design and development - but there are parts of them that I scrutinise very carefully - read on:

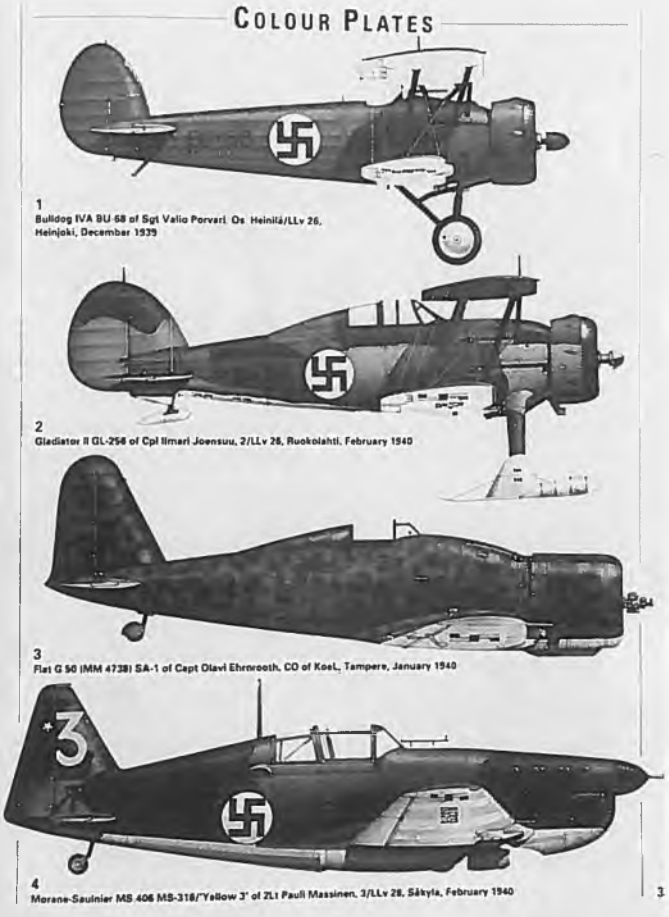
Osprey Aircraft of The Aces - 23

Finnish Aces of World War 2

By Kari Stenman and Kalevi Keskinen. Published by Osprey Publishing, Elms Court, Chapel Way, Botley, Oxford OX2 9LP. ISBN 1 85532 783 X. Cover price £10.99.

Whilst the rest of the world was indulging in WW2, Finland fought its own three separate defensive wars. They did not change sides that often, it was the others! A small collection of Finnish fighter pilots amassed extraordinarily scores, especially when you consider what an unusual collection of diverse aircraft they had, servicing and spares must have been a nightmare. They used aircraft from the UK, USA, Italy, France , Holland, Russia and Germany. Some of these were biplanes and some were sold to Finland because their own country's air forces were not keen to use them.

There is a month by month account of operations, difficulties and successes. Most useful to modellers are colour illustrations of 40 aircraft, almost as many colour schemes and read this list of types: Bristol Bulldog IVA, Gloster Gladiator II, Fiat G.50, Morane Saulnier MS.406, Fokker D.XXI, Polikarpov I-153, Brewster Model 239 (Buffalo), Hawker Hurricane I, Curtis Hawk 75A, Messerschmitt Bf 109 G-2 and G-6. If you want unusual colour schemes for aircraft you think you know, buy this book.



▲ Just four of the 40 colour illustrations in 'Finnish Aces'.

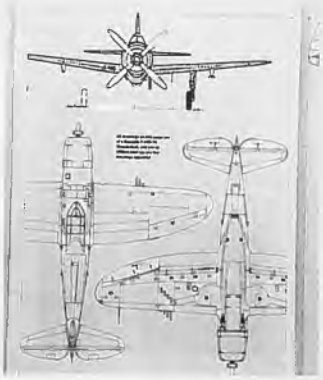
Osprey Aircraft of The Aces - 24

P-47 Thunderbolt Aces of the Eighth Air Force

By Jerry Scutts. Published by Osprey Publishing, Elms Court, Chapel Way, Botley, Oxford OX2 9LP. ISBN 1 85532 729 5. Cover price £10.99.

The Thunderbolt was a very heavy, very big engined single seat aeroplane. It was big for a fighter and had a much slower rate of climb than a Spitfire. It was not as nimble as the German fighters at lower altitudes but it was designed as a high altitude 'escort fighter' for B-17 Bombers. It could fly further than Spitfires and at the heights at which the B-17 operated it was a rock steady gun platform for defending the bombers.

This book contains a monthly blow-by-blow account of the 'Jug's' progress, of both the 'razorback' and later 'bubble top' types. Useful to modellers it also contains 42 colour illustrations of P-47 C, P-47D and P-47M types in a wide variety of colour schemes.



▲ A well drawn 3-view of the P-47 with several side views.

McDonnell Douglas Jetliners

By Robbie Shaw. Published by Osprey Publishing, Tel: 01933 443863, fax: 01933 443849, Email: beagledirect@compuserve.com

ISBN 1 85532 752 X. Cover price £12.99.

Author Robbie Shaw is a traffic controller at Gatwick and travels the world photographing airliners. This writer appreciates airline liveries and big though they are, airliner colour schemes need to be seen on the ground or very close to be appreciated. 130 colour photographs show as many different schemes of almost as many airlines. The variety of aircraft types is wide too, all MD or DC but from the 1959 DC-8 to the 1998 MD-11s. I would not be surprised if there are soon more guys at airports with books on airlines and airliners than there are guys on railway stations with Ian Allan spotters books.

Boeing B-17 Flying Fortress

By Michael O'Leary. Published by Osprey Publishing, Tel: 01933 443863, fax: 01933 443849. Email: beagledirect@compuserve.com ISBN 1 85532 813 4. Cover price £13.99.

'Production Line to Front Line' is the sub-heading. This book traces the bomber from the prototype through a bit of politics and competition to the production line and its development from Boeing Model 299 to B-17s B to G and some derivatives that did not see production. The building of this early high altitude strategic bomber is well illustrated by many wartime publicity photographs and one chapter in service and its crews. A nice touch is the inclusion of 8 full page WW2 posters in colour, all of the B-17 and none of them Boeing's. **EFI**

SHE HAS TWO THINGS LEFT TO CLING TO. ONE IS HER

When the picture was taken, this Honduran girl had just survived the largest natural disaster to hit Central America this century. A mudslide wiped out her home in the Tegucigalpa hills. In a state of shock, she clings to her pet dog - she also clings to the hope that someone, somewhere will help.

The hurricane is over, the relief effort is just beginning.

The disaster may have happened in November, but the need for outside aid is more pressing as time goes by. The hurricane caused immense short-term damage, but the long-term effects could be catastrophic.

The fields are decimated and left infertile. Bridges and roads have been swept aside and access to some regions is extremely difficult. Ironically, though much of the country has been flooded, there is little uncontaminated water to drink. The risk of cholera and typhus is always there, and could reach epidemic proportions.

The people of Central America are resilient and resourceful, but they do need our help to put the basic infrastructure in place so that they can start to re-build their lives.

Don't let her down - please give what you can.

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Speed Controller Installation

Guidance for beginners

WRITTEN BY: STEPHEN METTAM

Part 3: Be kind to your Speed Controller. In ignorance our 'care' for them can do more harm than good.

The first article in this series 'Speed Controllers and BEC' in the November 1998 issue prompted a few questions from some of you. Before these questions were even asked, I had already written the answers to some of them in part two which was intended to be in the December issue (such are the lead times in magazine publishing). That one page got nudged out of the Christmas issue and into January 1999 but there are still a few questions that I have been asked and need to answer.

Sizes, Prices

Until MOSFETS with a greater tolerance became available and at reasonable prices, the designers and manufacturers fitted as few as possible into each speed controller. These expensive items used to be very expensive items so the fewer a maker fitted, the better was the price to us. They were the biggest and heaviest component too, after the circuit board, another good reason to ration them. We have always wanted lighter and smaller speed controllers.

For any given speed controller to able to handle more current (amps) - more MOSFETS need to be fitted, it is almost as simple as that. The controller gets heavier, fatter and more expensive, almost in proportion.

Work

Work is (the consumption of) energy. More energy consumed is more amps burned (used). There are losses in any system of conversion of one form of energy to another. Just 'handling' electric energy in our system of battery, speed controller, motor and the cables connecting them involves losses which we see/feel mostly as heat. Heat reduces the efficiency of some operations. All units have optimum working temperatures (think of your own body and brain), too low or too high and it (you) get less efficient or stop, or don't even start. Speed controllers do not work well if they get hot.

Speed Controllers

Were you wondering when we would get to them? Speed controllers need to be cooled. In normal working operations they get warm and radiate enough heat to stay cool enough. The MOSFETS, the components that are doing the WORK are the only parts that carry all of the current we use. Think about a one kilowatt electric fire, like one red hot bar. That is using as much power as a big motor. A fast climbing F5B model is a two bar electric fire. All that power is passing through the MOSFETS that actually regulate how much gets to the motor. They have a very low resistance so they do not get very warm but ANY resistance will generate some heat - so they get warm - and need to be cooled.

With your speed controller and motor at 'fast' and model 'flat out' to you, the MOSFETS are doing very little work (theoretically none). Resistance is at its minimum. Power through a MOSFET is actually switched OFF and ON a few thousand times every second. At full throttle it is switched off so short a time that you don't even notice and we hope the MOSFET doesn't either. At half throttle it is off as long as it is on and doing the most work. As you start up you may hear a buzz or whine from the speed controller or motor before the motor even rotates. This is a power off/on causing a vibration in components that you can no longer hear when the motor is running. At part throttle it is not the resistance that reduces voltage and current as in a rheostat or resistor but the resistance does increase a little so they get warmer at part throttle than at full throttle, in fact they get HOT.

Aerobatic models

The motors in really powerful models like F5B and pylon racers are either on or off. You will understand why (from my crude explanation above) that although they are using a lot of power, the speed controllers do not get hot.

Aerobatic model pilots are using the throttle up/down all the time. The MOSFETS are working most of the time at about half throttle, things could not be worse for them, they get hot. You may even see some speed controllers (especially the older ones) marked 'Acro' or 'Aerobatic'. For a given voltage rating these have both more MOSFETS (to spread the load) and 'heat sinks'. In some MOSFETS you will see this as a square metal plate sticking out of one end and often with a hole in this plate. On some controllers the MOSFETS are stacked together and these plates stick out like cooling fins - and that is what they are doing. The holes are there because in some cases these plates are screwed to a (usually aluminium) plate to increase both the mass of cooler and the cooling surface area, good but heavy, you cannot have your cake and eat it.

▶ These flat aluminium plates are heat sinks, try to direct a little cooling air over them.

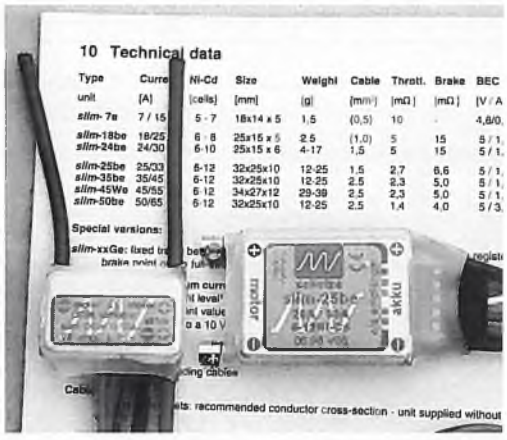
Many speed controllers have an aluminium plate squashed up against the MOSFETS by the heatshrink sleeve. This sleeve does that job OK but it also insulates the plate, preventing or at least restricting the optimum cooling. Some controllers have external and/or finned heat sinks, very good but you need to cool them. The sleeving is there to prevent impact damage and probably ingress of dust - again, you cannot have it and not have it.

One guy was having problems with his aerobatic model. He was running on about 35 amps maximum with a speed controller rated at 35 amps. He thought he had ten minutes motor time at the current he was using but the controller always cut after about six minutes. Most controllers have an 'overload cut-out' that is usually triggered by temperature. I advised him to direct cooling air to the controller. This he did which improved things a little but not enough. I advised him to use a higher rated controller. All this was done on the telephone, I had not seen his installation. He fitted one and soon after this I met him. He told me that he was now able to fly for eight minutes before it cut, so his 50A unit was better but not the solution. In conversation I asked him how he was cooling it and it emerged that he had mounted the controller with Velcro pads as advised in the instructions. I asked him on which side of the controller. "On the flat side of course, it is easiest."

This side is the aluminium plate heat sink. He had without realising it very effectively insulated it with two layers of Velcro and one of plywood and one of balsa - to keep it very warm!

Aerobatic and sports models that are run at part throttle need cooling well. There is little energy loss with modern efficient speed controllers but it is all lost as heat.

- Do not wrap up your controller in foam.
- Secure it with a tie wrap or Velcro but leave the cooling plate facing out.
- If possible keep it away from the motor and battery or at least arrange separate airflow to the controller. **EFI**



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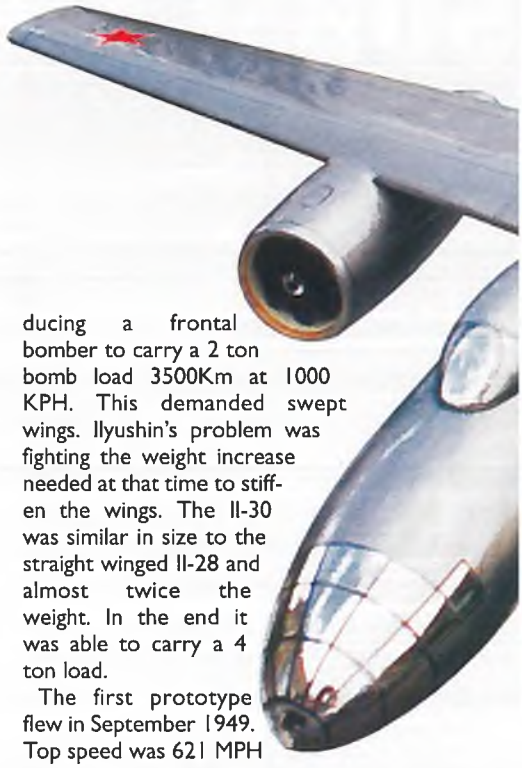
Ilyushin Il

Plan and Construction

REVIEW BY: **BRIAN GASKIN**

Build this quick-build foam and balsa 53" (1346mm) span model for two Speed 480 or AP29 motors and Gaskin 400 EDF units.



In the decade after the end of WW2, all the nations on earth who were still permitted to build combat aircraft, did so at a maniacal rate. Former allies competed for faster, better, bigger higher flying aircraft in 'peacetime' than they had when they were at war - and not even with each other. The 'cold war' era did a lot for prolific development of the jet engine and aircraft to utilize it.

A lot of designers in the former USSR must have been awarded contracts with very similar specifications that were also frequently updated. Every year up to half a dozen manufacturers produced that many similar aircraft. Think back, how many of you can quickly recite the fundamental differences between a MiG 15, MiG 17, Yak 30, and La 15?

The same question can be asked about twin engined medium bombers and their reconnaissance and naval derivatives designed by Tupolev, Yakovlev and Ilyushin - all similar looking aircraft with similar functions.

Ever since the 'Velvet Revolution' and everybody's greater freedom of access, so many publishers have issued books with authentic accounts of the development of these aircraft, often by those actively concerned with their design and construction. These accurate accounts and more accurate drawings than were previously available have led to a revival of interest in these aircraft and this has coincided with the availability to us of viable Electric Ducted Fan units.

Early Jets are generally better suited to flying scale models than more recent combat aircraft; we will probably see a lot more of them EDF powered on these pages in the next few years.

Ilyushin Il-30 History

In mid-1948 Ilyushin was tasked with producing a frontal bomber to carry a 2 ton bomb load 3500Km at 1000 KPH. This demanded swept wings. Ilyushin's problem was fighting the weight increase needed at that time to stiffen the wings. The Il-30 was similar in size to the straight winged Il-28 and almost twice the weight. In the end it was able to carry a 4 ton load.

The first prototype flew in September 1949. Top speed was 621 MPH (1000 KPH). Although this aircraft did not achieve quantity production, it nevertheless makes a nice scale subject.

▲ **It is this big, under the port wing is a one metre rule.**

Built It

As is usual with my models the wing is from a styrofoam chuck glider and obechi covered. (The drawing shows templates for you to cut your own wing blanks and ribs if you prefer built up construction.) The fuselage is 1/16" (1.6mm) balsa sheet wrapped around 1/4" (6.4mm) soft balsa formers with just four stringers. The nose and rear end are yellow foam. Tailplane and fin are built up balsa. Engine pods are 1/64" (0.4mm) rolled ply with balsa lips and foam sheathed. The whole model is covered in aluminium Solarfilm with Profilm windows. I rather like the air to air shot.

Fly It

On Saturday September 12th, we took the Il-30 to our Bickley club field and after waiting about one hour for heavy rain to stop we checked out everything and hand launched into a nice smooth and mild westerly wind. She flew straight out of my hand with Lee commenting "Plenty of power." and "Just putting in some down trim."

It was then that I realised that I had left the

-30

camera in the car! The 2 x 30 yards sprint was fairly quick for this little fatty and some good photos were 'in the box'. the flight was clean and smooth followed by a greaser of a landing.

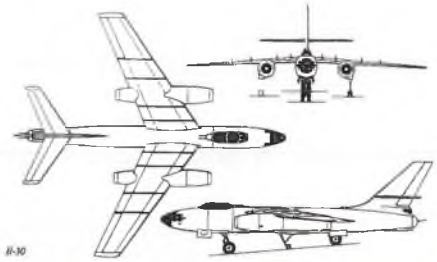
So - I started building the Il-30 on September 7 and she flew on September 12 - almost as good as the one year that Ilyushin achieved. Brian Gaskin. **EFI**

Specifications

Il-30 1949 Prototype Bomber	
WING SPAN	53" (1346mm)
LENGTH	49" (1245mm)
MOTOR	2 x 480 BB Race
EDF	2 x Gaskin 400
ENERGY	7 x 1700 nicads
FUNCTIONS	elevator, ailerons, motors
AUW	3 lb 12 oz (1.7kg)
DUCT LENGHT	12.5" (320mm)

▼ **Brian's Air-to-air shot, see those Profilm windows.**

▲ **Test pilot Lee, grandson of Brian Gaskin.**



▲ **It all started with this drawing.**

MW2723 - ILYUSHIN IL-30

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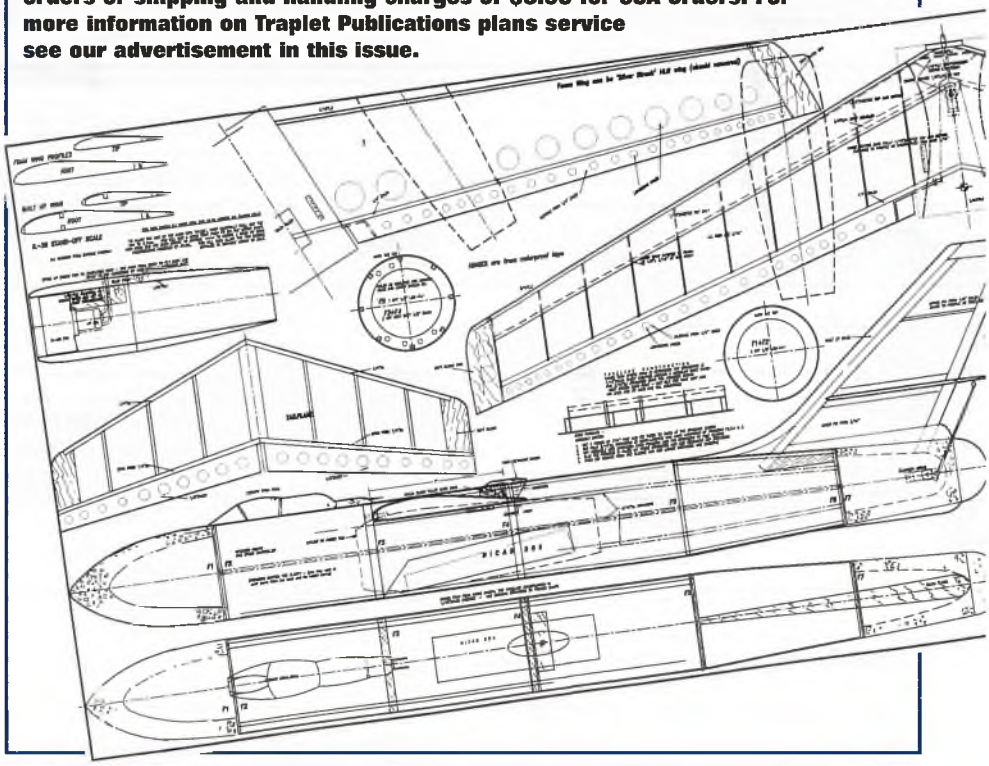


Glöckner Modelltechnik BAe Hawk

KIT REVIEW BY: **GORDON WHITEHEAD**

A lively 850mm (33.5") span ducted fan model for small motors and 10 cells.

I did a huge double-take when I answered a knock on our front door, to be greeted by my next-door neighbour holding a big box, which our postman had delivered whilst my wife and I were at work. "This looks like the sign of a mis-spent youth", quoth he. What I'd forgotten was that your editor had promised me an EDF kit review "sometime", and by happy coincidence he picked a subject which is very dear to my heart, but forgot to mention its forthcoming arrival. He's forgiven this slight mental lapse!

Nostalgia

I had a close association with the real Hawk during a two-year engineering tour at RAF Chivenor, where we operated about 40 of the little beauties. I always enjoyed seeing the Hawks arrive and depart the airfield and during the summer air-show season, the RAF's solo Hawk aerobatic demonstrator would practice his routine twice daily. To improve things even further, I would occasionally bum a back-seat ride in one, and tour Devon, Somerset and Wales during a training sortie. Nirvana! To get to do that, of course, it's an advantage if you are serving in the Royal Air Force!

But enough of this. Back to the little gem which now rests at my elbow, ready for another sortie!

What You Get

The 40 x 10 x 12" box, an impressive size for a 33" (840mm) wingspan model, contains a remarkable set of white expanded polystyrene parts for the fuselage and wings. The consistency and accuracy of the cutting makes me wonder if the parts are CNC laser cut, since the intricacy of the work is stunning - artistic even. The parts dry-fit together exactly, and you get the impression that

▲ **A very complete kit, with only finishing materials not included.**

▲ **This view shows the complexity of the foam cutting, and how the fuselage and wings will assemble.**

▲ **Centre and rear fuselage sections. Note use of off-cuts as sanding blocks for smoothing intake ducting.**

▲ **Nose cone assembly. Aft end is extended to a knife edge using plastic off-cut from ice cream carton lid. Inlet fairings and their sanding blocks also shown.**

this will be a shake-the-box-and-pour assembly exercise - not so!

The foam parts are accompanied by a bundle of excellent quality balsa and spruce strip, pre-cut balsa and ply components, wire and tube for control runs, bags of screws and small accessories, a vac-formed canopy, gun pod/smoke tank, and a set of self-adhesive roundels. In addition, my review kit included a set of white stick-on Red Arrows markings and a Schwerdtfeger 'Imp 400' fan, though these items would normally be purchased separately.

Instead of a full plan, several full-size drawings and sketches on A3 sheets illustrate the important assembly details and there are 2 instruction booklets, one in German which is copiously illustrated with CAD drawn perspective assembly sketches. These are referred to from the accompanying English text-only booklet, so you need both beside you for reference.

I must say that after examining the quality and the clever constructional design features of the kit, I concluded that the model had been designed by a master of his craft. If the flying performance was as good as these initial impressions, then I would be on to a winner.

Assembly

The instructions provide a fully detailed assembly sequence, so I'll only describe the points where I feel I have something to offer. My first hint is that you should retain all of the foam off-cuts until you have finished the model, as there are bits you can use for jigging, for cockpit fittings, for making sanding blocks for internal surfaces and for a fuselage stand.

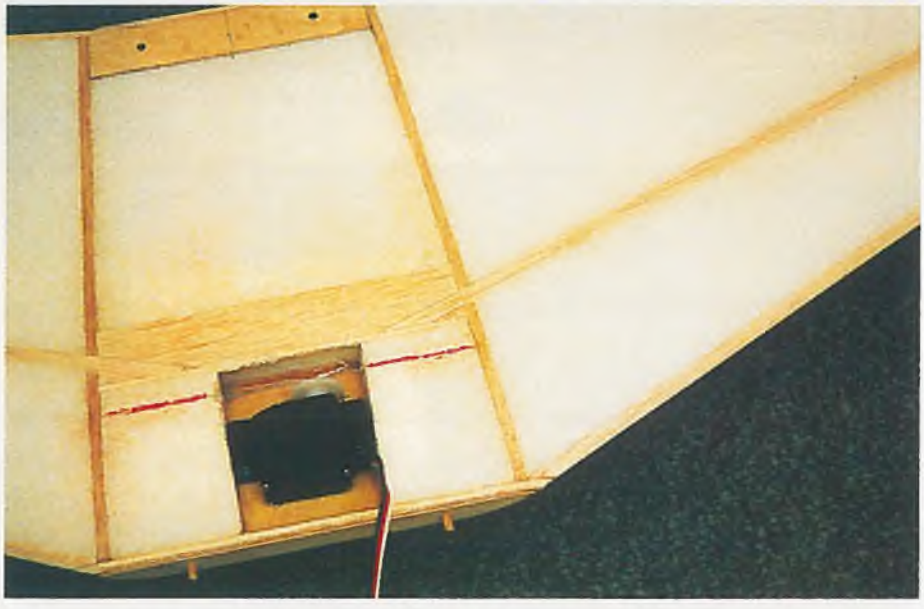
You first assemble the fuselage parts to end up with a nose section, a centre fuselage incorporating the intake duct outer walls and the rear fuselage section. One is advised to sand the intake duct walls smooth before assembly and I first treated this area with surface filler (mentioned later). Then I sanded the surfaces using the duct off-cuts for sanding blocks. One point I didn't spot was that as the Rx and electronic speed controller (ESC) locate inside the fuselage spine, it is advisable to trial-fit them and open up the spine aperture as required, before gluing the centre fuselage halves together. After joining rear and centre fuselage assemblies, you commence wing construction so that you can use the completed wing to locate the wing peg and bolt plates.

During assembly there is only a small amount of shaping to do, mainly on the wing surfaces to fair in the spar caps and on the fuselage nose cone which needs carving and sanding. The intake fairings also need attention but overall the superb foam cutting minimises the amount of shaping and smooth sanding is the main requirement.

The wings have precision cut slots in which you embed spruce spars (which fit exactly) capped with exact fitting soft balsa strip to enable easy sanding to fair with the wing section. Balsa leading and trailing edges are added at this time and the aileron apertures removed and balsa faced; the ailerons are made from balsa TE stock. When joining the wing panels to the centre section one uses the off-cuts from the wing underside to jig in the dihedral.

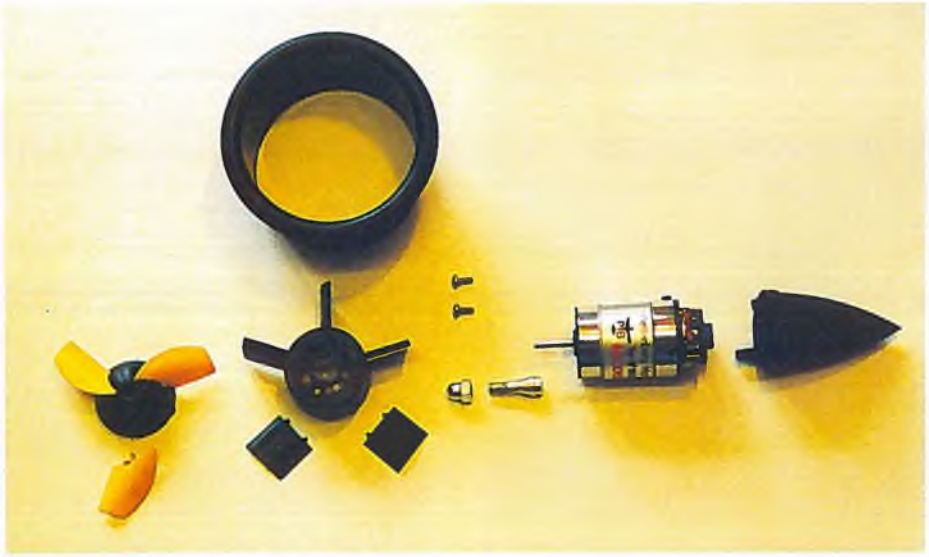
Then you mount the aileron servo and route the aileron pushrods, which comprise thin piano wire passing through fine bore plastic tubing. The method of installing the tubing is ingenious. You make a cut into the wing foam along the curved line of the cable run, and then push the plastic tube into the cut with a screwdriver, subsequently closing the gap with white glue and filler. The trick here is to realise that though the aileron pushrod enters the centre section at the top surface, you can actually route it out to the ailerons via the wing undersurface, to maintain a clean wing top surface (see photo). To get the tube past the bottom spar you bend an arc in the end of a piece of pushrod wire, hook that beneath the spar from the rear, slide the tube on to the end of the hook, and drag it under the spar with the wire. Then press the tube into the curved cut. Hard to visualise without the bits in front of you but easy when they're there - sorry guys!

When the wing is complete and its peg and nylon bolt mounting done, you glue the nose into the fuselage centre section and add the intake fairings which need sanding to shape. My advice is not to try to maximise the intake area by sanding the inner surface wider to 'funnel' the air into the duct. The intake area is generous and you should sand

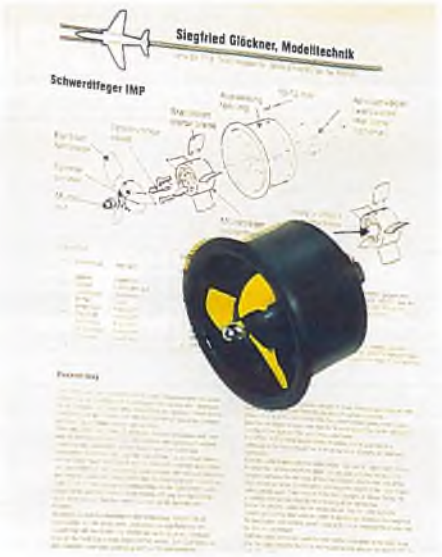


▲ **Aileron servo in position. Drawn line indicates route of pushrod.**

▲ **Wing inverted to show route of aileron snake.**



▲ **Basic Schwerdtfeger parts, and the HP200-20-6 motor.**



▲ **Fully-assembled fan unit.**

the outer surface down in a curve like a Clark Y leading edge, to meet the duct inside surface. This reduces drag and minimises the over scale look of the intakes.

The fin and tail surfaces are sheet balsa and the elevators are operated by wire in tube to plywood horns, as per the ailerons.

The canopy has a balsa bas, which incorporates pilot and bang seats made from spare foam and forms the battery hatch, also covering the aperture through which you insert Rx and ESC. The canopy assembly is secured using a lug and wire clip arrangement, allowing instant access to the flight pack.

Fan Unit

The Schwerdtfeger fan unit requires assembling and the instructions provided are quite straightforward; the WeMoTec Minifan 480 is also catered for. One glues plywood mounting lugs to the fan shroud and plywood plates to the fuselage for strength and to mount the fan unit. The lower half of the rear fuselage is cut away along a marked line to enable the installation of the fan unit and tailpipe.

I must admit to being cynical about using a Speed 400 motor for this application and as I already owned an HP 200-20-6 bought specifically for EDF, in it went. The tail pipe is made from thin card, supplied pre-printed to suit the small Schwerdtfeger and WeMoTec units. You merely cut to the appropriate lines and sellotape it to form a duct - very neat!

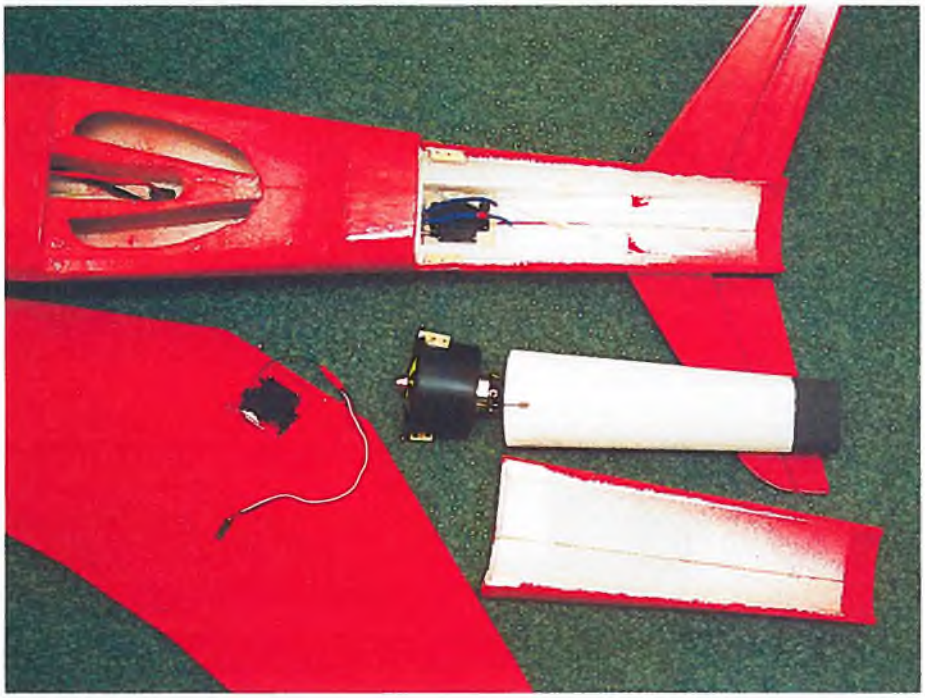
Avionics

The installation diagram shows the elevator servo located above the fan unit, the Rx just in front within the fuselage spine, and the ESC some 4' (100mm) ahead of both, just behind the canopy. The flight battery mounts beneath the cockpit. Thus the battery would connect to the ESC and the motor wires from the ESC would pass rearwards, routing just beneath the Rx and then to the motor. My own feeling is that this arrangement risks interference radiating from the long motor wires and affecting the Rx. Therefore I reversed the Rx and ESC positions. This way, smooth current from the flight pack passes along the wires beneath the Rx to the ESC and the ESC-motor connection is as short as possible. Just my opinion but of course my ESC will cool down more slowly between flights due to its insulated environment. However, moulded vents atop the fuz allow ample cooling air to reach the ESC when in flight. I am using a JR NER 549X Rx, Hitec HS-80 servos on ail/ele, 10 x 1250SCR nicads, and a 30A BEC ESC.

Surface Treatment

The problem with 'foamies' is achieving a smooth finish - if you want one. The instructions give basic advice on covering with tissue and wallpaper paste but I discovered that Siegfried sells a lightweight filler and a water-soluble lacquer made by Rödelmodelbau Technik called 'Styro-Besichtungslack'. I purchased these materials from him by post, and they came with instructions on how to produce a smooth surface finish on foam. Hopefully, Siegfried will include the instructions in the kits as I later found an identical filler by Polyfilla, called 'Light & Easy' and I think that 'water based polyurethane varnish' will substitute for the lacquer.

You commence the finishing process by sanding the foam surfaces smooth. Then you dilute the filler with water to make a thick cream and paint it onto the foam. When dry, you sand the surface smooth and apply a layer of tissue, using the lacquer as adhesive. When this is dry and after a light sanding, you mix up some filler and lacquer to a creamy consistency, brush it on and let it dry. Sanding this should produce a smooth final surface but don't hesitate to add another coat as it is quite light. You're then ready for painting and I used Hobbycraft red spray enamel. I used this process, sans tissue, to



▲ **Fan unit and card tailpipe ready to install. Bottom cover also shown.**

fill and smooth the intake ducts before their assembly. The ailerons and elevators are hinged with Sellotape 'Diamond Tape'. I taped the rear fuselage under-fairing in place with the same stuff, sliced to half width.

Red Arrows Markings and Other Details

The self-adhesive 'Arrow' markings took me less than a couple of hours to cut out with a scalpel and apply. Simple, satisfying, very effective, and brilliant in flight. I also managed to root out some pukka Red Arrows crests from a glow DF Hawk kit.

The vac-formed 'smoke tank' is supplied with a pink foam block filler. To stiffen the moulding, I epoxied the block inside the tank and screwed and glued both items in place, the tank becoming a both launching grip and a landing skid.

Smoke On - Go!

Hopefully without the smoke! The weight 'as advertised' is 22 or 26 oz (624 or 737g) with 10 x 500s or 700s respectively and a Speed 400. I assembled 10-cell packs of 500, 700 and 1250mAh cells, for all-up model weights of 33 oz (936g), 37 oz (1050g), or 43 oz (1220g) respectively. The bare weight of Hawk is more than I'd hoped for but I did want a smooth finish, so expected some weight growth. With around 220 watts input, I didn't expect many problems. Static thrust with the model up-ended on the kitchen scales, was around 17oz (480g). I used foam blocks for positioning the batteries to achieve the specified balance point. Having set up the recommended control throws, all that remained was for me to heave the sleek little beauty into a head-wind to see what she'd do.

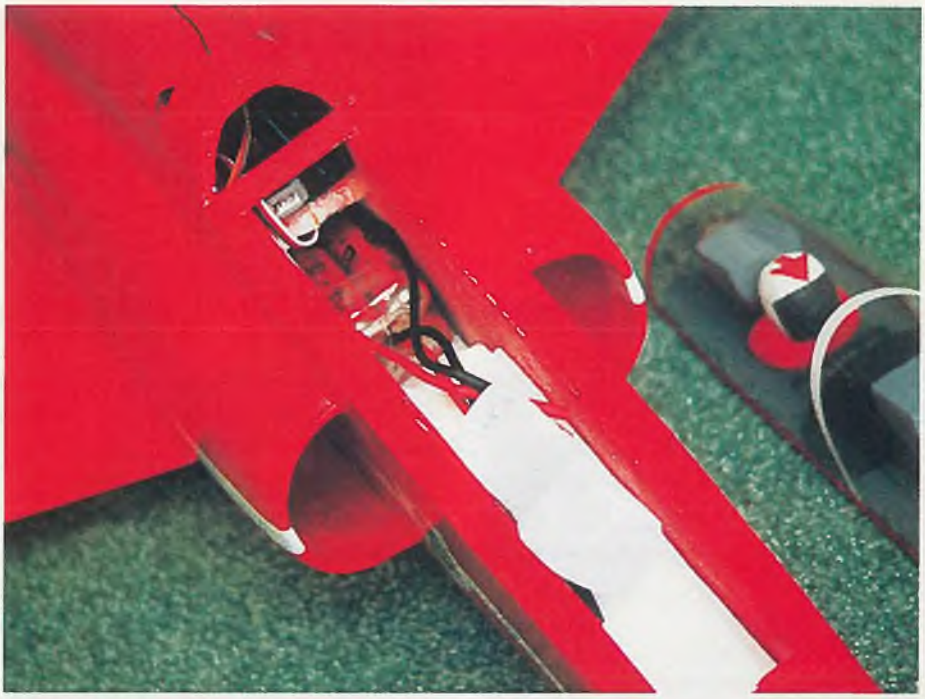
First Flight

Regrettably, a failure. Using the 500 pack for lightness and with the fan singing like a Dust Buster I gave her a good hand launch into a pleasant breeze. The model flipped nose-up, rolled inverted, and fell to the ground in a flat attitude, breaking one wing into 3 pieces. Thinking about what had happened, I decided that the tank unit was too slippery, and that the model had slipped from my hand, rather than being propelled from it correctly. So I glued strips of wet-and-dry paper in place to improve grip. Second, I decided that the CG was too far aft. After repairing the wing (an hour's job with epoxy), and doing some calculating, I re-located the CG some 15mm further forward than before; the model now balances inverted at a point 83mm aft of the wing leading edge at the root, with the flight pack further forward.

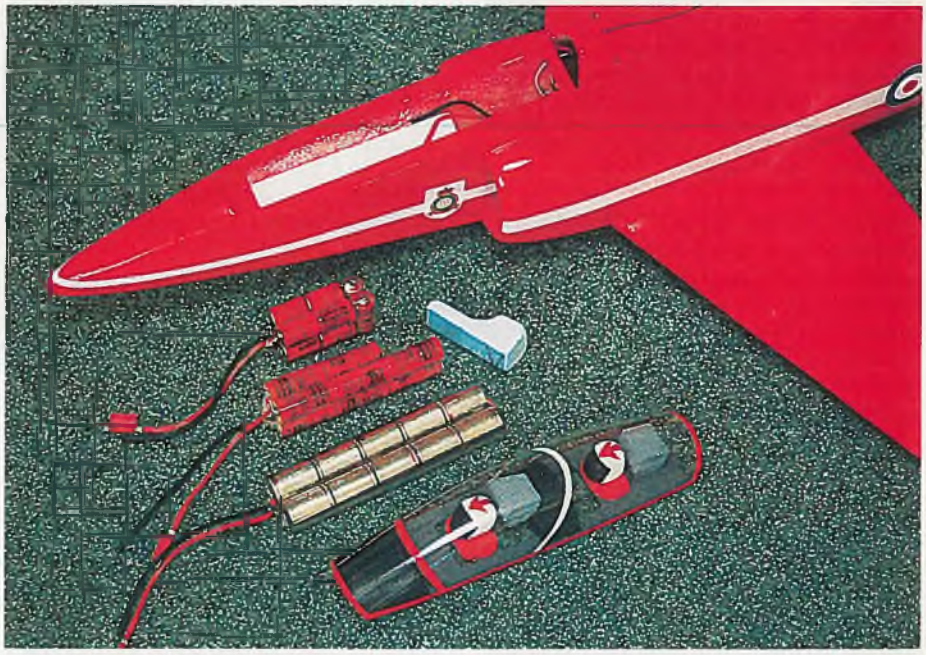
Second Flight Session

With the 500 pack installed, she went away into the strong breeze well enough but with the wings initially see-sawing in vertical left and right banks, under the influence of aileron throws which were far too coarse. She was quite stable and did climb well though, and needed only minimal adjustment of the trims once I'd got her settled down. Elevator response was just right. A couple of circuits saw her well up in the sky but a one-minute run is too short, and I chopped the throttle and circled her to land. No drama here; she handled very nicely on the glide, not overly fast, and was easy to position and flair for a smooth landing. Apart from the sensitive ailerons she was a beauty and looked gorgeous in the bright sunlight.

Clearly there was plenty of thrust available so for the next flight I installed the 700 pack and introduced reduced aileron rates of 75% and 50% (my Tx has 3 rates). Using the 75% setting I launched her and she was perfect.



▲ Flight pack shown as installed before first flight. Moved forward for second and subsequent flights. Rx is just visible in spine. Foam off-cuts used to help position flight pack.



▲ Selection of 10-cell flight packs - 500, 700 and 1250 mAh.

▲ The self-adhesive roundels and white 'Red Arrows' markings are a boon. Note that the sqn crests came from your reviewer's spares box.

▲ **Ready for the off, using the smoke tank as a hand grip.**

Beautifully stable, aileron response just as I personally like it, great climb rate, really pretty in a high speed fly-by and once more the revs began to drop rather too early. I chopped the throttle after about 1 1/2 mins, she entered a nice flat glide. S-turning to lose height I brought her in, again with a very satisfying flair to land.

Obviously, thrust wasn't a problem here - so in went a 1250 pack, taking model weight up to 43 oz.

This time I had no misgivings about the launch; the greater capacity cells obviously suffered less volts drop on load, as the fan was singing several notes higher up the tonic scale. She climbed away smoothly, even better than before and the knowledge from static runs that I had at least 3 mins of motor time meant that I could spend more of the flight in aerobatic mode. The loops are really quite large even when entered from normal level flight and I've never before had a model so easy to track straight during this manoeuvre. Axial rolls and 4-pointers need the nose raising first as there is no rudder. However, I feel that the weight of a micro rudder servo and linkage would not be noticed, though in deference to the BEC I'll not fit one. She does 2 vertical twinkle rolls on high rate and a comfortable single one on 75% rate.

With dead motor, the higher wing loading than before makes no worthwhile difference to her handling during the glide and though she is slightly faster, she is still easy to S-turn and flair to land, with no fear of wing-drop. I had assembled three 1250 packs for this model so was able to carry on in the same vein for another 5 consecutive flights this session, with no complaints from the ESC. I experimented with Derry turns, cubans, wing overs and inverted flight, the latter requiring quite a push on the elevator stick for straight and level. And then I returned home with the model in one piece, and happy as a sand boy.

Model is quite small!

Closing Thoughts

This aeroplane is a real fun machine and ideal for small-field flying. Though I disagree with the CG position and aileron throws quoted in the instructions, Siegfried can rightly be proud of a thoroughly well designed and manufactured product. Regarding performance, once trimmed, she's is a beautifully stable yet manoeuvrable aeroplane with the solid feel and look of a jet and which is delightfully easy to operate as follows; one - connect the batteries and throw; two - enjoy a great flight and landing; three - go back to one!

It is very reassuring to find that even with an apparent 65% weight overload, mainly due to the 1250 pack, not only is the handling excellent, but she climbs away from a hand launch without losing height - admittedly using a top-of-the-range motor; I would not use any other for any EDF model. The sustained climb rate gets her upstairs to a safe height very quickly and she doesn't give the impression of being underpowered in any way. Glide performance is fairly fast, with a good glide ratio.

Overall, the Glöckner Hawk has reassured me that small EDF models really are a practical proposition for regular sport flying and I take her out as often as I'm able for lots of really satisfying JET flying!

Available from: Glöckner Modelltechnik, Lange Str. 77, D-76307 Karlsbad, FR Germany. In the UK from: The Electric Aeroplane Company and in the USA from: UPI. **EFI**

Specifications

SPAN	33.5" (850mm)
LENGTH	38"
WING AREA	210 sq in (13.5 sq.dm)
MOTOR	Speed 400 HP200-20-6
FLIGHT PACK	10 x 500 or 700 10 x 1250
WEIGHT	22 or 26oz (624 or 737g) 43oz (1220g)
FAN UNIT	Schwerdtfeger or Wemotec Mini fan Schwerdtfeger
WING LOADING	15 - 18oz/sq.ft (5-6g/sq.dm.) 29.5oz/sq.ft (9.7g/sq.dm)
STATIC THRUST	10.5oz (3N) 17oz (5N)
INPUT POWER	110W (reviewer's estimate) 220W
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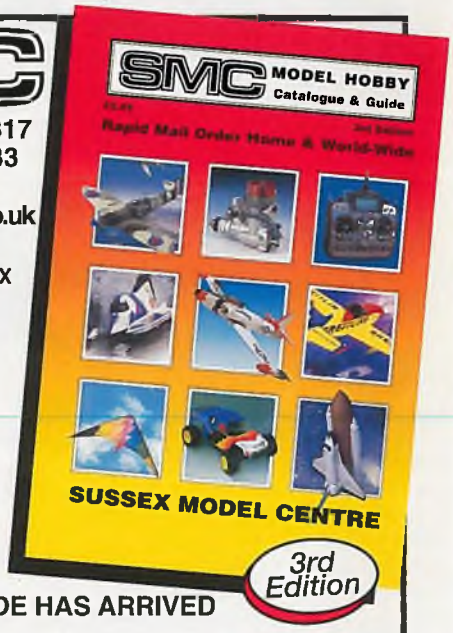

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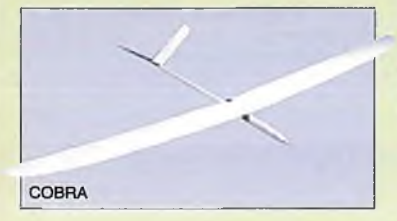

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13.5 x 7 x 5			£14.45	£5.95
14 x 8 x 5			£14.45	£6.95
3.2/4/5mm collets for above props				£2.49
spinners for above				£2.95
216 Prop Set 2.B 15 x 8				£20.95
222 Prop Set 3.B 15 x 8				£20.95
283 Prop Set				£23.95

AERO-NAUT PROP SYSTEM

Size	Blades Plastic	Carbon
7.0 x 6.0	£5.95	£7.95
8.0 x 5.0	£5.95	£7.95
9.0 x 5.0	£5.95	£7.95
9.0 x 6.5	£5.95	£8.95
9.5 x 5.0	£5.95	£9.95
10.0 x 7.0	£6.95	£9.95
10.5 x 6.0	£6.95	£9.95
11.0 x 6.5	£7.95	£9.95
11.5 x 7.0	£7.95	£9.95
12.0 x 7.0	£7.95	£9.95
12.5 x 6.5	£8.95	£10.95
12.5 x 10.0	£8.95	£11.95
13.0 x 6.5	£8.95	£11.95
13.5 x 7.0	£8.95	£11.95
14.0 x 7.0	£9.95	£12.95
14.0 x 8.5	£9.95	£13.95
15.0 x 9.5	£9.95	£14.95
16.5 x 15.0	£9.95	£15.95
Spinners White/Red/Black 40mm		£2.99
45/50mm		£3.45
Ali Prop Hubs 42/47/52 centres		£5.95

Prop Adaptors	Grub Screw	Collet
2.3, 3.2mm Bore	£3.95	-
4, 5, 6mm Bore	£3.95	£5.95

JR SWITCHES & CONTROLLERS

Model	BEC/PCO	Cells	Amps	
Soft Switch 18 BEC	Y	6-10	18	£28.95
With Brake	Y	6-10	18	£35.95
Soft Switch 40 BEC	Y	6-10	40	£34.95
With Brake	Y	6-10	40	£40.95
Mini/Sw40	N	6-12	40	£32.95
Mini/Sw40 W/BEC	Y	6-12	40	£37.95

RC Sw20	Y	6-7	20	£42.95
RC Sw25	Y	7-8	25	£48.95
Pwr/chip25	N	6-12	25	£44.95
PicoMOS 7 Bec. 6-8.4v, 1.5 gramsl				£36.95
PicoMOS18	Y	6-8	18	£71.95
SolarMOS18	Y	6-12	18	£73.95
PicoMOS33	Y	6-12	33	£77.95
PicoMOS36 Bec. brake				£56.95

PicoMOS56 Bec. brake				£75.95
PowerMOS48 Opto. brake				£71.95
PowerMOS85 Opto. brake				£109.95
Race 80 (FAI Pylon) ..	Y	6-8	80	£92.95
PowerMOS80	N	7-30	56	£94.95
PowerMOS120	N	8-12	120	£154.95

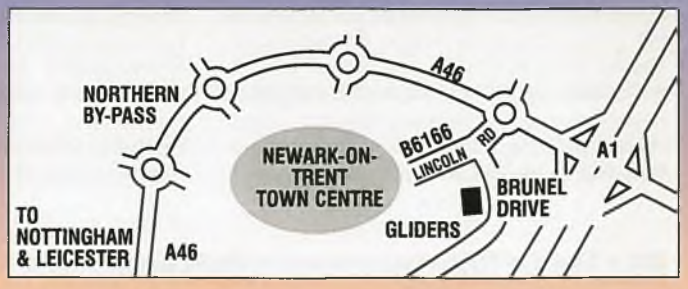
ROBBE SWITCHES & CONTROLLERS

Model	BEC/PCO	Cells	Amps	
RSC210	Y	6-8	10	£19.99
RSC750	N	6-20	50	£99.99
RSC810 mP	N	6-8	12	£44.95
RSC835 mP	Y	6-12	35	£59.95
RSC860 mP	N	7-30	60	£79.95
RSC890 mP	N	7-30	90	£99.95

CHARGERS

MFA timed charger 5/6/7/8 cells	£23.95
MFA 10-16 Cell Conv.-lead	£9.95
TURBOMAT 16 mains/12v	£96.95

ULTRA DUO PLUS II (Max. Charge rate now 5Amp)	£208.95
MC-ULTRA DUO PROFI	£436.95
MC-ULTRA CONTEST	£678.95



Midjet 2

A Tailless Tale

REVIEW BY: **ALAN WHITWORTH**

Evolution is a wonderful thing. A Slope Soarer becomes an IC model that goes electric - and works.

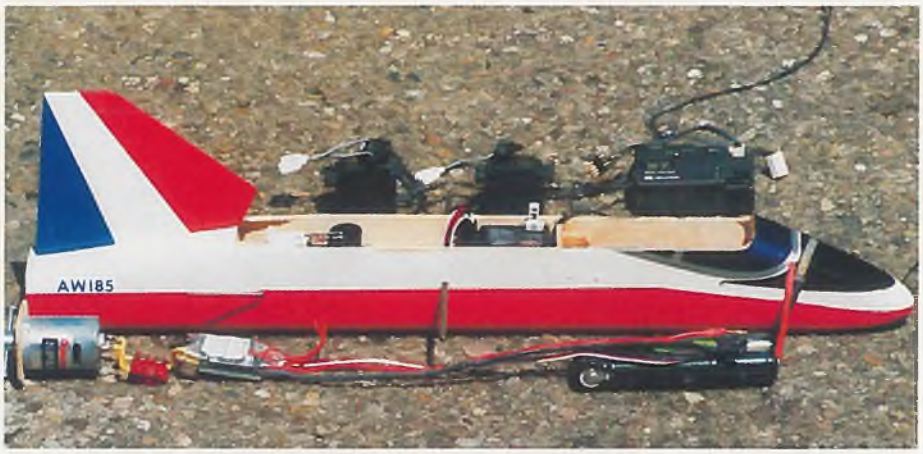
On The Slope

Once upon a time (around 1981) a chap called Les Rudd built a 3 ft span, tailless, jet fighter style slope soarer. The wings were designed to be detachable to enable it to be packed in a small space and it was controlled by elevons using the standard sliding servo device of the time. (This was before Tx mixers were common.) Photographs published in the model press showed a rather nice looking aeroplane reminiscent of the Messerschmitt Me 163. Almost a PSS in fact. Some time later, I discovered Les at one of the shows (Sywell or maybe Cranfield) and bought the plan from him. I studied it for a while then put it away for future reference (as one does!) and promptly forgot it. Some years later, the model was published as a free plan in the second Silent Flight Special and in 1985 mine was finally completed with Sanwa 27MHz radio using two mini (at that time) servos in the ingenious sliding arrangement shown on the plan.

▲ **The original slope soarer.**

Into IC

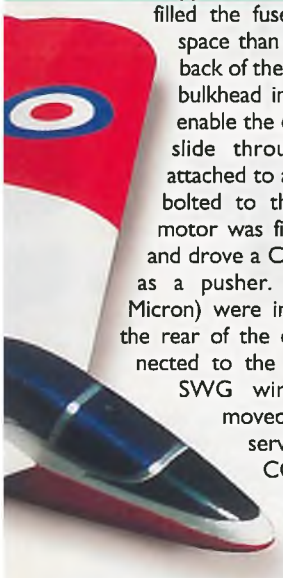
It was an excellent flyer on the right day but I usually picked the wrong one so it was always getting damaged and having to be repaired. On one occasion I launched into the teeth of a howling gale. Before I could reach the single stick, Midjet had completed three-quarters of a loop and buried itself up to the wing root about six inches from my flight bag which I had left well back from the edge of the slope. (In the gully at Callow Bank for those who know it.) The model survived to be repaired again but I started to fly powered models and trips to the slope became infrequent. I fitted a Cox .049 engine as per Les's original plan but when the engine was started the fin vibrated so badly that it could have been used as a reed tachometer. Needless to say, Midjet was not flown in this condition and eventually ended up in the loft.



▲ **The initial electric configuration showing the rear mounted servos, Rx position and the lightweight seven cell pack which required a lot of nose weight for correct CG. Behind the model is the 'lightweight' 27MHz radio originally installed.**

Electrics

During the nineties I became increasingly interested in electric flight and in 1997 purchased a computer program which predicts the performance of electric models (ElectriCalc). One can change the model's parameters and quickly find the optimum set-up of batteries, prop and motor (thoroughly recommended). When the Midjet's details were input, the results were so encouraging that I retrieved the model and started work.



I stripped out the original gear, which filled the fuselage, and found more space than I had expected. At the back of the fuselage was a 1/8th ply bulkhead in which I cut a hole to enable the 6V Speed 400 motor to slide through. The motor was attached to a 1/16th ply plate which bolted to the rear bulkhead. The motor was fitted with a shaft saver and drove a Cox grey 6 x 4 propeller as a pusher. The two servos (JP Micron) were installed side by side at the rear of the original servo bay connected to the elevon horns with 16 SWG wire. They were later moved to the front of the servo bay to help correct a CG problem. Transmitter mixing was used this time with one servo on each elevon. The speed controller (Jeti 30) fitted in the bottom of the fuselage between the servos and the elevon horns. A 12/15 amp blade fuse was installed in the positive lead from the speed controller to the motor. The Futaba receiver sat on top of the battery (7 x 600mAh Sanyo AA) at the front of the fuselage. The battery was attached to the fuselage floor with a small piece of velcro to enable it to be removed for charging. A lighter battery was not required as the weight was needed to balance the model on the wing joiner. After the servos had been moved the total weight came to 19 ounces (540g), only 3 ounces more than the original slope soarer.

It Works

The performance was everything I had hoped. It needed a strong throw with full power on a calm day (a breeze helps) but climbed to aerobatic height very quickly. All aileron/elevator manoeuvres are possible if you have the skill. Judicious use of the throttle gives 4 minutes of aerobatics with enough power left to fly another circuit if required. Final approach is slowed by easing in more and more up elevator and touch-down is usually on the slowly windmilling propeller, hence the shaft saver. Change the battery and off you go again. A 5 x 4 propeller may well give a similar performance with a better battery duration but the original set-up is so nice that I have not bothered to try it yet. Flying this model is now so enjoyable that it flew more hours in 1997 than in the whole of the previous twelve years.

EFI

▲ **The complete model in its current state and Yes! the prop IS held on with a rubber band.**

To sum up, this is the equipment I used:

MOTOR Graupner Speed 400 6Volt (Do NOT exceed 10 amps continuous) SHAFT SAVER EDL and Flying Sparks have both been used

PROPELLER Cox 6 x 4 grey

FUSE 12A or 15A blade type

SPEED CONTROLLER Jeti 30 (now 35) amp with BEC (anything 10 amps or more with BEC is suitable).

SERVOS JP Micron (any micro servo will do).

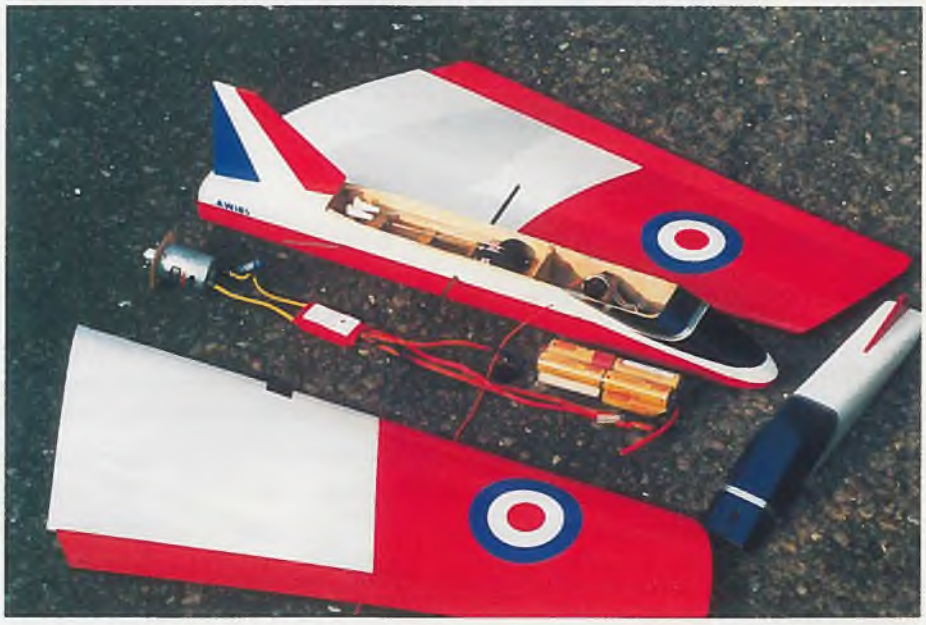
RECEIVER Futaba FP-R103F (this Rx appears to be 3 channels only. When using BEC or a Y lead an extra channel for rudder is obtained)

BATTERY 7 x 600mAh Sanyo AA. Charged at 1.6 Amps for 15/20 minutes with a Hitec CG - 320 peak detect charger.

TRANSMITTER Futaba Challenger - 6 channel (an add-on elevon mixer is installed)

◀ **A view of the interior in final form. The Rx sits on top of the battery when it is in place.**

▼ **All the bits. The final configuration with servos and Rx moved forward and the 7 cell AA pack - note balsa dummy cell to square up the pack.**



Cover Story

SIG Four S

REVIEW BY: **DERCK WOODWARD**

An IC kit model with a reputation for sports aerobatics is built to accommodate one of the top end sports power trains, brushless motor, gearbox and speed controller - all MaxCim.

The Prologue

(With apologies to Frankie Howard!)

My entry into electric flight was traumatic. We lost our flying field - to noise. Now, flying meant a long drive to the nearest flying site or a local sports field. The latter was big enough, but flying a 'squealer' would soon have lead to residential complaints and a lop-sided chat with the local police.

Being a typical modeller, I had all sorts of unused 'stuff' (junk - Sue!) in my workshop. That, and the clues gained from reading model mags cover to cover caused a handy 049 glow powered semi-scale to meet with a S400 motor, some packs of AA nicads and a controller. This flew surprisingly well; I became hooked on not going home smelling funny and became an electric flier!

Software (me!)

My electric flying followed my glow flying - straight and level is a transitory state, and what some describe as 'out of control', my clubmates call "It's just Dereck seeing what happens if..." Does this sound like someone who'd be happy circling a soarer?

Escalation followed our 1993 arrival in the US - the silent flight site was closer to home and less crowded than the local oilfield. Until then, it was low power stuff - but seven cells limit aerobatics. The breakthrough - running my '7 cell' Astro 05G on ten cells, for decent aerobatics. Heck, I was probably only the hundredth to figure that out! Then came KRC 96 and seeing Keith Shaw's Me 35 - a 60" (1525mm) span low wing scale model that flies ten minute aerobatic flights. I watched, muttering something like "I want one". Two years later, I lifted my own 20 cell

◀ The essentials of the Four Star 40 fuselage - Liteply sides and formers form a primary box structure, with square stripwood stringers to make the shape much nicer.

◀ Despite that large - and strong - alloy UC, a 13" prop is getting close to the grass but has not proved to be a problem. The pilot came from 'Pete's Pilots' and is something of a 'Proper Charlie'.

model off KRC's runway, rolled inverted, pushed to vertical for a while, then half-rolled for a pull through into a long four point roll.

After years of flying electrics that were various degrees of letdown, I was back home! This is that journey, as a somewhat different review - we'll look equally at the power system and an easy route to a forceful electric powered version of a glow power model.

Hardware (1)

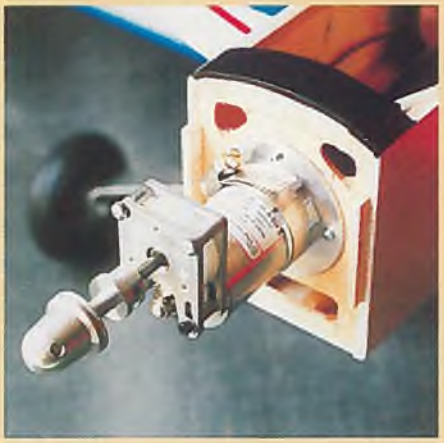
Keith used a MaxCim brushless in that Me 35. That, and another event settled the matter. The Illinois University team won the 1997 AIAA design/build/fly competition - their 12' (3.6m) span, 15 lb (6.8kg) model flying for 18 minutes on 2000mA cells with a

▼ Most Four Star 40's are yellow - not this one! The base finish is Micafilm; the 'Union Jack' is a mixture of Micafilm and vinyl sticky trim. The 'registration' is my AMA number - a birthday present from my Sue. No prizes for figuring out what it stands for!

Star 40

▲ I always put my servos behind the wing in electric models, to free up the overwing bay, which is then filled with nicad cells! Here, FMA S200 minis sit on rails that mount conveniently in the fuselage side lightening holes. The blocks that take the wing bolts are visible at the rear edge of the wing aperture.

▼ MaxCim motors supply this neat motor mount, for positive mounting, and easy motor removal. The 1/8" ply firewall has been perforated to allow cooling air into the nicad bay. Mounting lugs for the new cowl are the remains of the fuselage doublers - next to the top hatch; this was the biggest modification made to switch to quiet power.



▲ The aileron torque rods went in favour of wing servos. A little Liteply with a servo sized cut-out glued to the first ribs out does well here. This placement means that the servos are inside the wing, for less drag, and the servo arm and control horn both move in the same plane - better engineering.

MaxCim - all power on. Soon after I called MaxCim's Tom Cimato to discuss "going brushless".

Tom is right behind the sports flier. He knows we need other things besides power, a complicated two speed switch and a motor run measured in seconds. His product range is simple - two motors, two controllers and gearboxes to achieve the smoothly controlled power a sports flier needs. He also deserves a medal for patience, as every question I e-mailed him was answered promptly and concisely - typical of the high class MaxCim service.

My final choice - a MaxNEO-13Y with Maxu35A-21 brushless speed controller, rated for 35A continuous, 60A peak, a MaxGR2.5 gearbox, motor mount to suit and 20 x RC2000 cells. To be simplistic, 20V x 35A = 700 watts, in a suitable model under six pounds, means impressive aerobatic capability! The system is impressively flexible - it could fly models ranging from eight cells up to 21, by changing just props, gear pinions

▲ Shows everything there is to know about a simple and effective wing structure, with one aileron servo in place. This big wing is very light.

and batteries. Imagine - start with a trainer, then fly four or five models of increasing performance and not another motor or controller on the shopping list - that is the flexibility of MaxCim's motors.

Brushless power does not come cheap - the controllers contain a lot of high grade electronics and the motors are hand made for our purpose, not mass produced in China for goodness knows what other purpose. With no brushes and commutators to wear out, I can look forward to many years of

▲ **A little vanity - rather than the kit 'cowling', I made up this box cowl from the remains of the fuselage side cheeks and a raid on my scrap balsa box under the bench. Here it looks just like a box, but an attack with a rough Perma-Grit sanding tool will soon reduce it to a more appropriate shape to match the rounded top deck.**

trouble free service. No need to carry a receiver battery - MaxCim's BEC easily handles the four servos in my Four Star 40. While BEC is a 'religious issue', it works - a hard argument to counter.

I'm not one to delve into technicalities. I know that brushless motors are better cooled because the windings are stationary inside of the case instead of furiously spinning around on the armature - why there are that many turns of such a thickness, I leave to the designers. I have a vague idea of how the controller persuades the rotating magnets on the armature to spin, but am happy that it does.

What I do know is that every model I have seen fly with MaxCim motors has exhibited superb speed control and, as Rolls-Royce would say, "The power output is - Adequate"!

Sig Four Star 40/MaxCim brushless review

"Walk before you run" is fine for the faint hearted but I wanted into the '20 Cell Club' quickly. A tad of caution suggested a crafty practice before the scale aerobatic ship. A quick look at 40 sized glow models eliminated most due to weight. If you're going to stick a 40 oz (1135g) battery into a model, it better stand some lightening. A twee little number in veneered foam and thick sheet is not a kit; it's an expensive pack of templates!

Sig's Four Star 40 sprang lightly to mind - plenty of wing area and fast building. A Four Star 40 was one of the first models I saw fly in the US - being turned inside out in a tiny amount of airspace with a very modest 40 up front. That settled the platform, now to fit the new 'fuel supply'.

Structurally, the Four Star has an open frame wing with strip ailerons. The fuselage is from laser cut Liteply with sheet tail surfaces and has a fuselage mounted taildragger undercarriage. The kit is well made; all the parts fit as they should and the plans and instructions are accurate and leave little to the imagination. Sig have been in the kit business for a long while and deservedly so.

From the start, I intended to make only those changes necessary to fit my MaxCim motor and a 20 cell nicad pack. The rest was coming out of the box, to prove that it is possible to fly a kit model successfully without a total structural re-design. So, from the front, I made the following changes to accommodate the new power source:

1) The kit firewall is made from two laminations of 1/8" ply - I only used one.

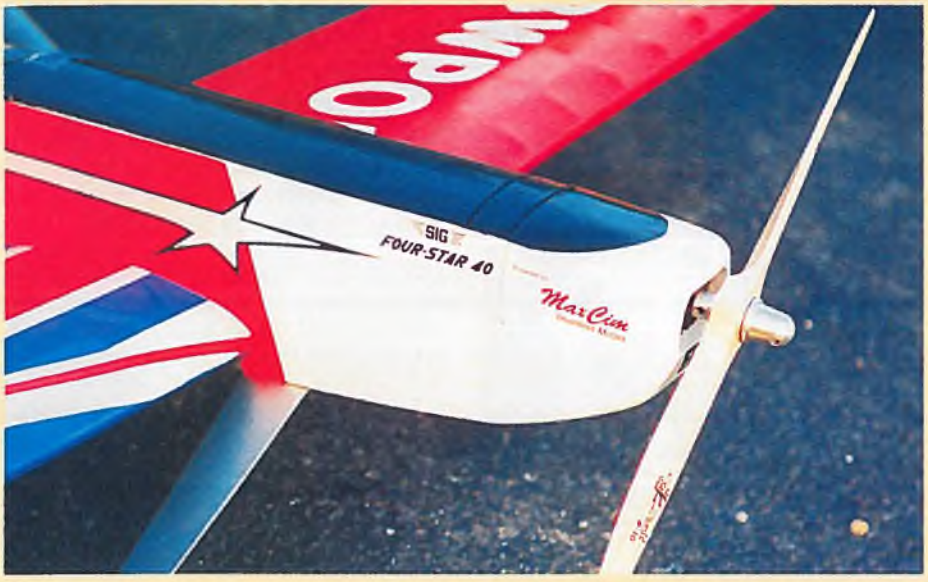
2) The Liteply fuselage doublers were cut down to become locators for the formers and a battery tray.

3) Most of F2 was cut away, while I added 1/4 x 1/8" spruce strip inside the upper edges of the fuselage sides as stiffeners.

4) A ply tray runs from the fuel tank bay back into the overwing area to support the flight nicad.

5) The kit wood intended for the top deck was used to make a removable hatch from just aft of the firewall to the cockpit canopy. I said I would use as much of the kit as possible!

▼ **Fully rounded and trimmed, the cowling now looks the part. Unlikely their oily equivalents, electrics are not bothered by being cowled in like this.**



▲ **The final battery bay - minus the battery, which about fills it! Velcro holds the beast in place, with a double sided Velcro strap to hold it down. The ESC is under the front edge of the nicad tray.**

▲ **What was the wood for the forward top deck became a battery hatch. As I was using this one to get the hang of handling over twice the power I was used to, I figured on plenty of access. It's held down by a rubber band (hooked over the end of the nicad!) and two wire hooks on the hatch.**

6) The overwing space was cleared of RC gear - two wing mounted servos drive the ailerons, the receiver, and rudder and elevator servos went aft of the wing.

7) In order to claim I'd really lost some weight, I didn't use the Liteply fuselage underside aft of the wing. This was replaced by strip cross members.

Other lightening sub-plots included Fibafilm covering, FMA Direct S200 mini servos and a small receiver. Lightweight wheels, of course, though my 'field' dictates I use the size recommended. The result - 92 ounces (2608g) , not much over what many glow powered examples fly at. The motor was easy to fit; the 20 cell nicad pack in a square formation of four sticks of five is tight but manageable. Glow fliers are impressed by that weight and a Zinger 12 x 6-10 wooden prop doing 9000 RPM gains real respect!

The wing is easy to build, with a section featuring a flat bottom aft of the spar. The ribs are cleanly die-cut, the spars fit well and the instruction book is complete, detailed and well illustrated. Building and joining the panels is simple and you are soon fitting the controls. The kit supplies torque rods for aileron drive but I added some Liteply doublers (from leftovers - little extra spending occurred in the construction of this model!) to the ribs at the end of the centre section sheeting, to mount servos without extension leads. The flat wing tips have Liteply stiffeners glued to the last wing rib, while the ailerons were mounted using the supplied Sig 'Easy Hinges'. I ironed the covering down onto the ribs and spars to really stiffen the wing up.

◀ This is the box top colour scheme! Wayne Wilson stretched the wing from 60" to 65", flies well on 16 or 18 cells. Long tail moment gives smooth, honest handling; low ground angle confers predictable take off performance. California's Ron Fikes is happy with the performance of his Astro 25, 14 cell example - it's the same colour as this one!

The fuselage is as much assembly as build! Locator tabs ensure fast and true assembly. The fuselage took the most modification - see the above list - but mine is essentially made from the kit materials. Weight control in e-flight is critical - look at where I put the servos, for example. An existing cut-out provided a handy ledge for the servo rails, rather than adding extra wood. Trivial amounts of weight do add up!

The tail control runs lined up with the kit's pushrod supports - typical of Sig's attention to detail means that the outers are well supported by pre-cut holes in the fuselage formers. My wing servos use straight pushrods with a clevis on one end and a "Z" bend on the other - love it, might never use a torque rod again!

Soon I was bolting the two big pieces together. This method is employed on many US models - hardwood blocks are glued into the fuselage, drilled to match the wings, then tapped for the wing bolts. Once the threads are hardened with thin CA glue, you have a secure and long lasting fixing system. Typical of Sig's attention to detail, the centre section of the wing is ply reinforced to prevent the bolts crushing the TE area. My omitting the torque rods caused no problems here.

The last thing glued into the fuselage was the 1/16" (1.6mm) ply battery tray, after determining the nicad position. A 40 oz (1135g) battery has a big say in CG positioning! After pondering a removable nicad platform, I glued it in place. Philosophy - crash, and that pack is heading forwards. Glue is less fuss and easier to do than screws or bolts, so it got the job.

A brushless controller is no small matter. There's a lot inside that heat sink case to handle the power demands, plus three power wires and five sensor wires at one end to keep things in order, with battery and servo wires at the other. It sits on the fuselage floor, where it is underneath the nicad (and hopefully its escape path, if the worst happens). By now, the firewall had acquired some cooling air holes, so I fitted another cooling hole in the fuselage floor directly under the controller. After much chivvying by Tom Cimato, I fitted a fuse. It is still inside - finding an external mounting point is less important than meeting a magazine copy date!

At this point, with my finished Four Star 40 sitting on the bench, I dropped my 'minimal change' policy. The Four Star series features extensions of the fuselage sides for a 'cowling'. Looks good from the side and is ideal for a sports oilburner - as all glow fliers know, the best running glow engine is upright and accessible. Cowl that engine, mount it inverted and hide all the bolts - you're setting yourself up for grief.

But an electric motor doesn't worry which way up it is, nor does it mind being cowled, as long as it has airflow. So I used the old 'cowl' sides and a raid on my scrap box to build a natty box cowling. Beauty is in the eyes of this beholder!

The System

About now, reviewers induce sleep with descriptions of their flying site, the test flight, how well it glides because the brand new engine seized - oops, sorry, wrong mag. As this has been a different review all along, how's about a flight at a local club open day?

The organisers were intrigued enough to let me fly a demo slot before a largely 'wet power' crowd. The Four Star 40 has a very low ground stance and tracks straight and true - one taildragger that doesn't get overly interesting on take off. So, full power, off the ground in feet, half roll and fly the length of the runway inverted - some 300 feet long and ten feet up (this is a new model. I'll drop the height later!). Enter a steep inverted climb, for a three-quarter loop back to downwind and level. Establish straight and level, for four aileron rolls on around quarter power, then power up into a long vertical for a stall turn. Quiet power it may be - but the howl of that prop at full power in the vertical is something to hear!

Back on centre for three loops, full power briefly on the way up through vertical - though she will loop all the way around on about three quarter power from level, it saves juice to use the throttle all the way around. Tracking is good all the way around - the Four Star 40 is one honest flying model.

Off the last loop, and back to around quarter power, I throw a single aileron roll, then power up to vertical and a half roll into a humpty-bump with a push over. Downwind with a long four point roll into a reverse Cuban and someone from the gallery shouts "How about knife edge?"

So, I oblige - into wind on the left wing tip, level out, a roll off the top and on the right wing tip for downwind. This takes all the power she has - the glow power Four Star 40 is not renowned for knife edge, I'm told. Mine has that neat cowled in front and a lot of power. I follow this with three quarters of an inside loop, switch into one and three-quarter of an outside loop, to exit by completing with one and a quarter inside loops. Anyone else want to discuss "electrics can't do aerobatics"?

Back onto display centre and a sequence of verticals - stall turns with quarter rolls. Four long vertical legs in rapid succession prove that she can cut it still. After that, I toss in a Cuban Eight, Avalanche loop and a Double Immelman. Call for landing and run in. On the break, Derry Turn right (roll left for a right bank) and downwind for a normal landing. Flight time - around six minutes and I taxy off to the pits.

I'm home!

So you want one too! **EFI**

The big bits

MaxCim Motors
57 Hawthorne Drive
Orchard Park
NY 14127-1958
USA
Web page: http://www.maxcim.com,
e-mail: maxcim_motors@localnet.com

In the UK
Fanfare
18 Hillside Rd
Tankerton
Whitstable
Kent CT5 3EX
- handles MaxCim motors, to save you a long drive to 'Noo Yoik'

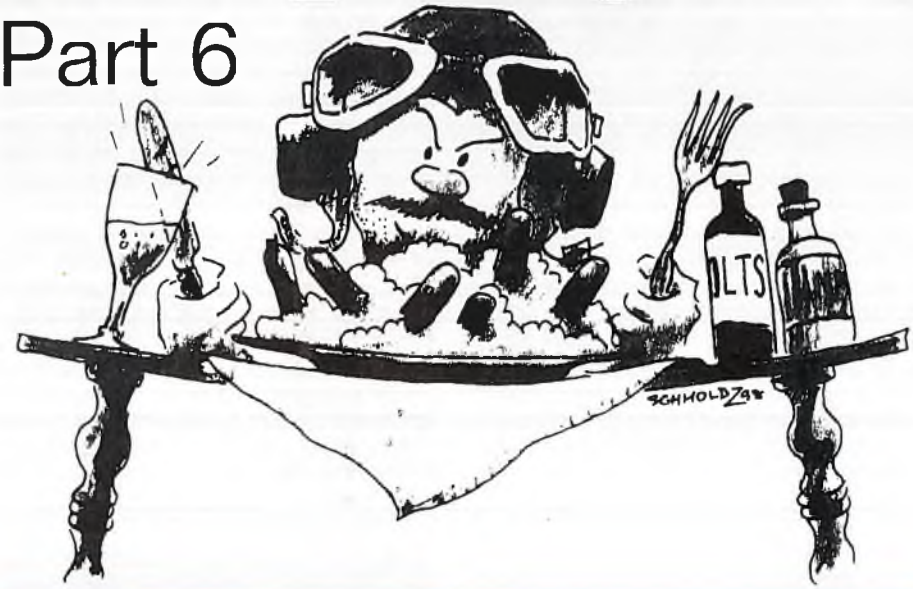
Sig Four Star 40 - if you can't find one in a model shop:
Sig Manufacturing Co. Inc.
401-7 S. Front St.
Montezuma, IA 50171
USA

RC2000 cells:
B&T RC Cells
508 Lake Winds Trail
Rougemont
NC 27572
USA

S200 44.5 oz Mini Double BB servos:
FMA Direct
9607 Dr Perry Rd, #109
Ijamsville, MD 21754
USA
Or http://www.fmadirect.com, e-mail at sales@fmadirect.com

Another Large Helping... Please!

Part 6



WRITTEN BY: **CHRIS GOLDS**

A lot of parts to paint, a lot of shades of colours, a lot of dirt, a lot of wear and then we are ready for the test runs.

Finishing

I attend lots of model shows and I see many different standards of finish varying between not very good and superb. But not often do I see a good representation of a severely 'used' object. At the Model Engineer Show two years ago I was fascinated by the plastic model kit dioramas and how their builders had tried - usually successfully - to show equipment (tanks, planes, guns, emplacement etc) in use: that is, smothered in mud, bashed and battle damaged rather than properly painted but 'pristine' in finish. Further down the display hall I watched with delight as a German World War Two U-Boat (a type VII if memory serves me) struggled to the surface of the man-made pond, under a hail of depth charges dropped by a model Destroyer of the Royal Navy. At the end of the engagement I was privileged to see the U-Boat in close-up. Now, I have never seen a real one so it had to look as I thought it should look - and it really did! Dented, rust streaked, band-stand railings bent, weed, slime, oil-begrimed, it really looked the part. I complimented its Captain/builder and he kindly showed me over his craft. All the nastiness had been painted on and yet it looked so

▲ **Me ...to give scale.**

real! I vowed that one day I would build a model aircraft and achieve that level of authenticity and here was my chance with B-52 number four. I had good colour photos of the real aircraft so all I needed was patience, skill and the right paint colours.

For the paint I turned to the ever-faithful Humbrol Matt range but of the other two 'needs' I do not have an over-supply!

One of the most famous porters to climb Everest once said "Bling pa noon sma fong dong" ... which loosely translates as "first climb a small hill", so I set out to paint the bomb pylons, the bomb beams and the twenty-four Mk82 five hundred pound bombs. These all form a unit hung underneath the wing between the fuselage and the inboard motor pylons; the bomb pylons can each carry twelve iron bombs or six cruise missiles depending upon the mission and I chose the bombs because the CMs are just smooth shapes with little or no character to them as they do not spread their wings until after they are dropped. I looked very carefully at the colour photos of B-52H-165-BW No 60-0060 of the 23rd Bombardment Squadron, 5th Bombardment Wing at Travis AFB during 1968 in order to try to pin down the colours and align them with the Humbrol list. I decided upon the following base colours, all matt:

121 PALE STONE
86 LIGHT OLIVE
116 US DARK GREEN
34 WHITE
66 OLIVE DRAB
98 CHOCOLATE

The undersides of the aircraft except the forward nose section are 34 Matt White while the top and side surfaces are a three-green camouflage much bleached by being parked out in the open as hangar space is only for 'sick birds'. The aeroplane 060 is a wonderful mish-mash of replacement panels bearing the same paint but not the same bleached-ness and number one engine cowling forward part is in dark olive grey - as is the nose - and does not fit the colour

▲ **Port bomb pylon and beam with twelve Mk 82 bombs.**

▲ **Starboard wing with line-up of drop tank and motor pylons.**

▲ **Close-up of nose showing refuelling doors.**

scheme in any way. Of course, with an aeroplane so large (185 feet wing span) the sprayed edge between colours will appear very narrow on a 144 inch model at about 0.1 inch so should I go for brushed edges or try with my limited air-brush skills to achieve a soft edge at every join? One good thing about the H model is that the big 17,000 pound thrust TF 33 engines do not need water injection and thus its consequent smoke dirt is absent from the underside of the wings. Nevertheless they were incredibly dirty aeroplanes and I have set myself a humunghous task in trying to represent one.

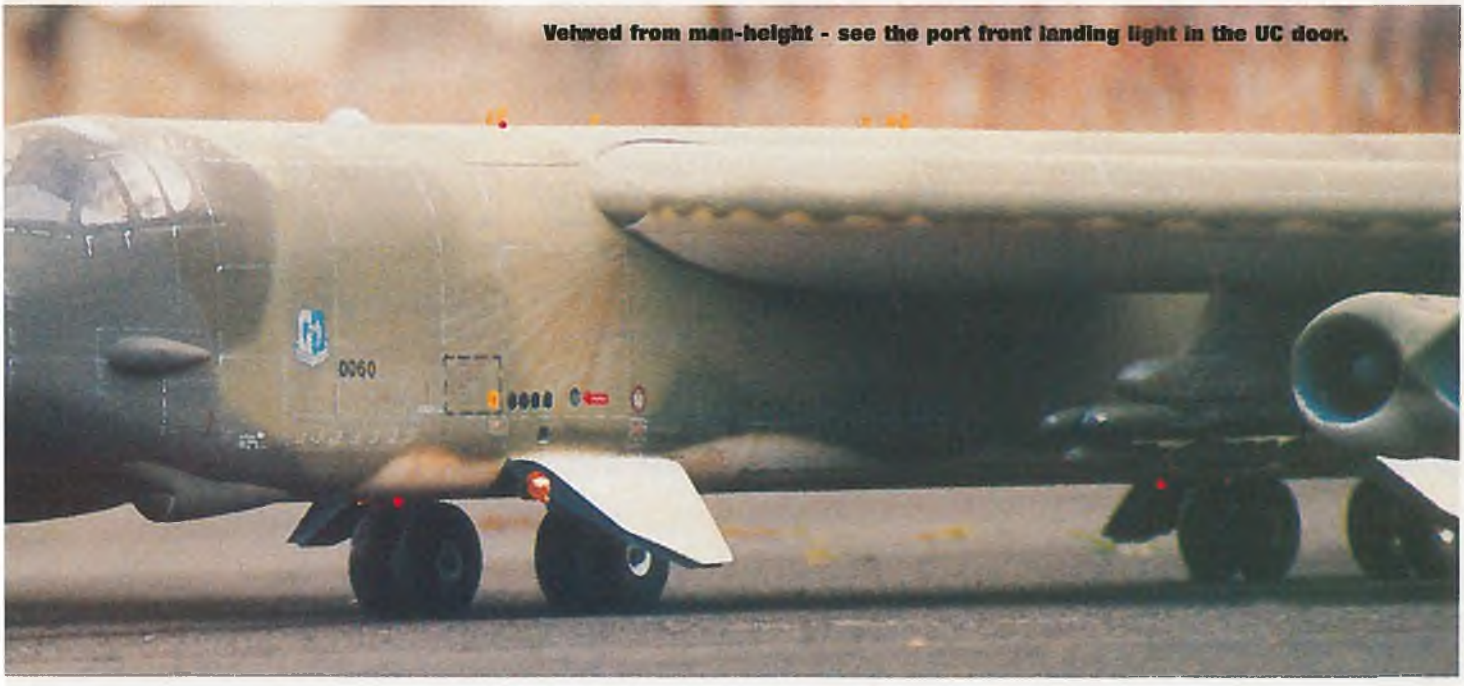
Honest Dirt

If you have not yet tried to 'dirty' a model aeroplane then you are in for some fun when first you try. So, what dirt is the most common? Oil and liquid fuels form the greater part of an aeroplane's untidiness because

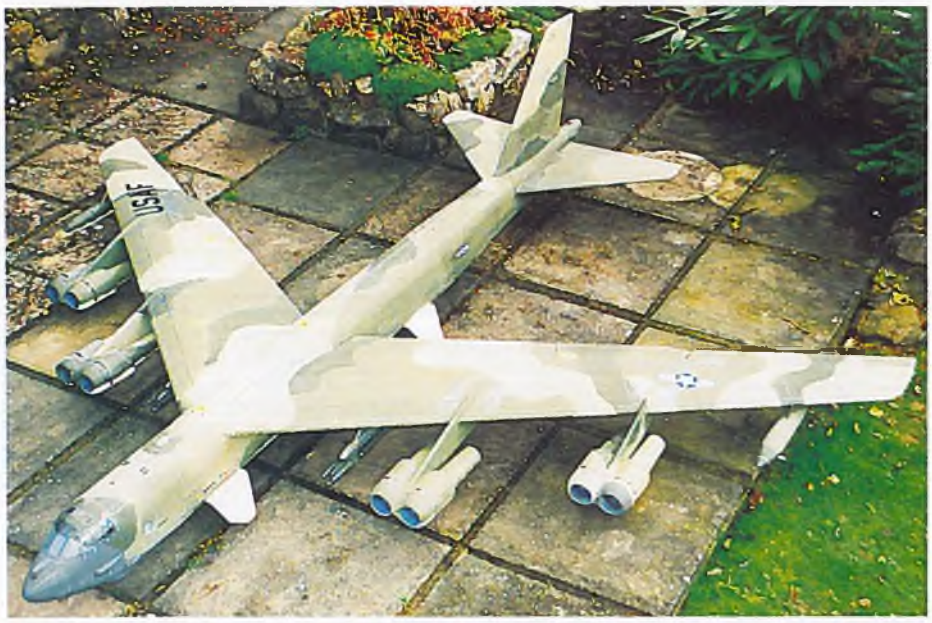
▲ **Fore & aft line showing spacing of four pylons per wing.**

they creep along panel lines and smear rearwards in the airflow. Thus engine compartments will show lots of stains, some hanging downwards but most flowing towards the rear.

Undercarriage: the skin's behind gear bays often show much dirt as the wheels rotating in rainy conditions tend to throw a lot of filth up onto the undersides. Exhausts tend to leave their signature - particularly on an



Velwed from man-height - see the port front landing light in the UC door.



◀ **General shot of the graceful shape.**

▲ **It's that waiting game... test runs, December 5.**

▲ **Port-side showing that massive fin.**

aircraft such as a Hawker Hurricane where the exhaust 'burn' is curved along the fuselage sides by the lift pattern over the very thick wing. Finally, sand blasting! Even away from the desert areas, the atmosphere contains a great deal of suspended nuclei which, when run into at high speed acts as a very effective sandpaper, paring away the paint on any and every leading edge. The roughness of the scratched away paint costs miles-per-hour and I well remember that in Aden in 1963 we covered the leading edges of the wings of our Hunters with clear sticky Fablon (used normally for covering our low level strike maps) to protect the paint. The Fablon was replaced every two weeks or so and we kept our low level dash speed of about 700 MPH by its use.

How was I to go about this task? Obviously I needed to get the paints onto the model before I could overlay them with 'wear'. So my first major job was to make sure that all of the model had been tissued/doped to close the wood-grain and then over-doped with dope/talc mixture, finely rubbed down to give a smooth finish. Next, the whole of the undersides had to be sprayed matt white. I used Halfords spray white acrylic primer then Humbrol M34 white where the spray could not reach.

To keep me from straying from the paint lines I drew the borders in with a charcoal pencil and began by filling in the lightest green which I made up using a combination of 121 and 86. Next came the middle green, again using 86 then the darkest green, 116, was added. At this stage the paint-job looked most odd but there was still much to do which, I hoped, would turn it into a proper looking representation of the real aircraft.

At this stage I realized that I was not painting just one model but five, as the transportation parts - two outboard wings and drop tanks and OB pylons, one front fuselage, one wing centre section with IB pylons and bomb pylons and finally one fuselage rear end with tail surfaces, were each as big and complicated as a normal single model! So to prevent my morale from plummeting to the floor I decided to completely finish the forward fuselage in order to set a standard for the rest. It took me one whole day to complete this 75 inch long section with all the markings and stencilled warnings, bashes and scratches and even a painted representation of the diagonal creases which appear while a B-52 is on the ground due to the great weight of the immense overhang in front of the forward gear trucks. I carefully peeled away the Fablon masking pieces covering the windscreen panels and suddenly the model came to life as Captain Schulz and his co-pilot Lieutenant Goldoschii could once again look out of the cockpit. Peering in with a torch I was very glad that I had put a lot of effort into fully dressing the cockpit with realistic figures - each looking in a different direction - with the eight throttles on the centre quadrant and as many of the instruments as I could paint.

With the first 'piece' finished and dirty I could set about the rest like a jigsaw puzzle. Next came the tail end, then the centre wing and finally the outboard wing panels. I had to wait quite a while before the weather moderated to allow me to assemble the model on the patio to take yet more photos, to do the all- important full power runs and finally to check and correct the packs (4 x 10 x 2000 cells) location to achieve the final C of G. Phew! Now to await good weather to do the vital ground range checks, with motors off then on while we recharge and wait for that long-sought moment when David (video) puts his thumb up, Rob shouts quietly "stopwatch!" and Ron, my co-pilot, says "all clear" and I am left standing there with nowhere else to go!

So, how long did it all take to design, build and finish? Just two days under five months; not bad for a 144 inch span, 26.5 pound, 8 motor monster with retracts, flaps, landing lights, anti-collision lights, a drag 'chute and - oh! yes - a great deal of dirt !

See you next time. **EFI**

▼ **On standby somewhere in England.**

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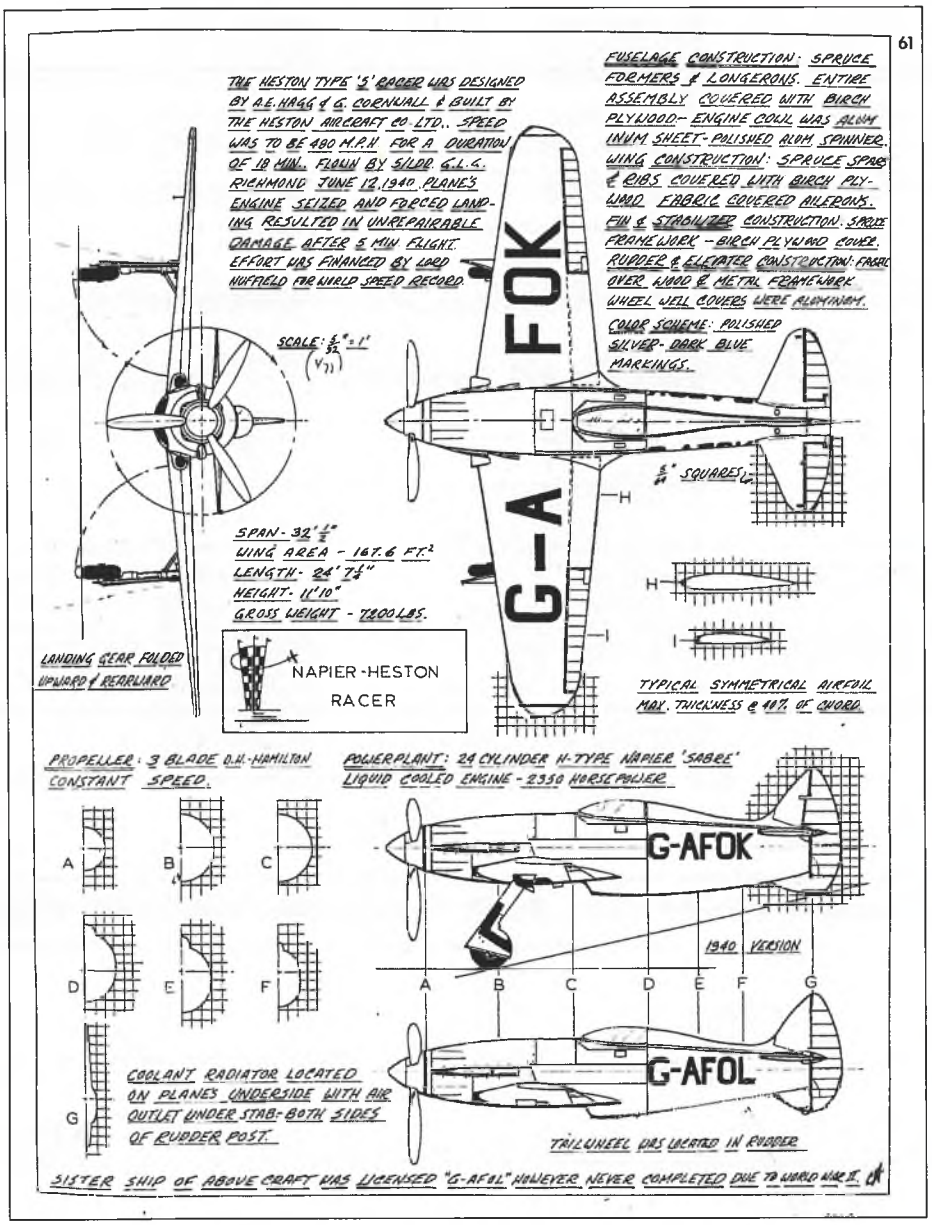
1980

Heston J.5 Racer

PLAN AND CONSTRUCTION BY: ROBIN ANDREW

A 65" (1640mm) span model of this good looking fast 1940 potential record breaker that was overtaken by and almost forgotten by history.



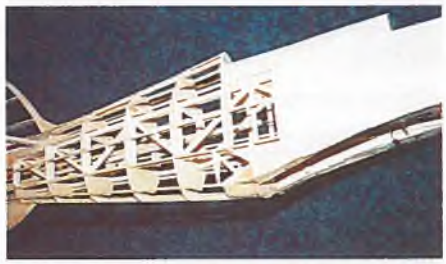
Specifications

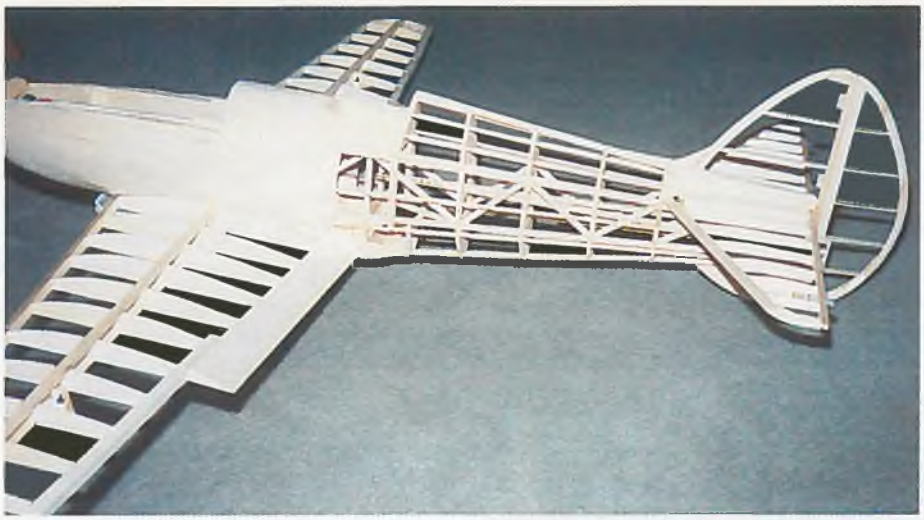
SPAN	65" (1640mm)
LENGTH	50" (1260mm)
WEIGHT	6lb 12oz (3.1kg)
MOTOR	Geist 150
ENERGY	18 x 1700mAh
CONTROL	Rudder, elevator, aileron and motor

History

The big one had a sad history. The J.5 project started in 1938 when Napier wanted publicity for its new H format 24 cylinder Sabre engine and Lord Nuffield was willing to finance a crack at the world speed record. The Sabre is probably the world's most powerful piston aero engine. It developed 2,500 BHP in 1938 and was ultimately pushed to 5,000 BHP. In its reliable 3,000 BHP form it powered the potent Hawker Tempest fighter in the mid 1940s.

Designed by A E Hagg and G Cornwell and built by the Heston Aircraft Company the J.5 is a good example of 'Convergent Development'. It is very unlikely that Heston knew about the Messerschmitt Bf 209 developed in great secrecy, which first flew in 1938 and established a world speed record of 469 MPH (754 KPH) on 26 April 1939. The 'convergent' example is that the J.5 and Bf 209 look so similar, the ultimate in airframe aerodynamics with a liquid cooled engine in 1938. This incredible speed (at that time) must have inspired Heston to progress





the J.5 because with its more powerful engine it had a theoretical top speed of 508 MPH (817 KPH). Wing span was 32' (9.8m) and weight 7,200 lbs (3,266kg). Construction was mostly of wood, covered with birch ply, sixteen coats of dope and well polished. Heston could have used all metal construction but considered the chosen method much quicker.

WW2 overtook the construction but it was completed and flown on June 12, 1940. Despite extensive ground testing to prove the efficacy of the cooling system the Sabre seized on this first flight and the J.5 crash landed, fortunately not injuring the pilot Sqn. Ldr. G L G Richmond but irreparably damaging G-AFOK. This was a busy time so the identical second aircraft G-AFOL was not completed.

Designer of the model, Robin Andrew was inspired to build a model of this beautiful 1940 aeroplane when he read an article about it by Bill Gunston in a back issue of Aeroplane Monthly, June 1976. This article was soon followed with another in the August issue by John Pothecary and R A Clare, both of whom had been involved in the design and construction of the airframe and they were able to contribute additional information and corrections. Over to Robin:

Model Construction

I would start with the fuselage. The rear 'Basic Box' is made from 1/4" (6.4mm) square balsa just like a Super 60.

Lay out top and bottom longerons and add in the uprights and diagonals. When dry, make another identical side. Choose two hard balsa 1/4" sheets and cut two front sides measuring from nose to wing trailing edge (TE). Make up F3 and cut out F2 from 1/16" ply as this stops the flight battery jolting forwards when landing. Position F2 and F3 and glue in place with 1/4" square uprights behind for strengthening. When this has dried, notch the top longeron positions and mount the two rear sides to the front sheet sides. Next make up the rear former which is called the radiator former as this is the hot air exit on the full size. Glue this to the sides and also glue in F2 and F3 by pulling in the nose and hold with a rubber band. When dry, add the fin post. Add the rear top and bottom 1/4" square cross pieces to complete the Basic Box.

Cut two tailplane mounting strips from 3/8" sheet and glue in place on top of the rear longerons. All of the rear 1/8" sheet formers can now be added including the top ones. Fit the cockpit floor and then the 1/4" sheet top and side formers around the cockpit. Cut out F1 from birch ply and drill it for motor holes and any cooling slots. Attach F1 to the sides using 3/16" square behind for strengthening. Complete by fitting the nose top and bottom formers from medium 1/4" sheet. Cut out the leading edge (LE) position former from ply and drill a 5/16" hole in it for the front wing peg. Glue this in place and add any more under nose formers.

Select strong 3/32" sheet and cut into 3/16" wide strips for planking. Start from nose to wing TE. Some nose strips will have to have a taper in order to follow the curvature of the fuselage. Start along the line where the top removable section runs. After glueing the first strip in place, add some soft 1/4" sheet between the 1/4" sheet sides and this strip as this will strengthen the top edge. Before planking the nose bottom, glue in a 1/8" sheet plate across the sides inside to allow the speed controller to sit on it. Now cut out 1/4" sheet fillers to go between the 1/4" sides and the curved wing root. They can be glued in at right angles to the sides as due to wing dihedral, only the outer edge touches the wing. Time to make up the 1/8" ply wing bolt plate; position and fit it in place just in front of the TE. Now notch in the balsa and obechi stringers at the sides and lay them along the fuselage sides all the way to the tail. I used instant glue for this job as it is quicker. The obechi or spruce 1/8" square is used where you think people will pick up the model and grip the tail, at then top and bottom.

Next - the Tailplane

Just normal LE and TE pinned down and notice that the ribs are top cambered. This acts as a lifting section which aids the flying. When dry, place it on top of the rear fuselage, butted up to the fin post. Now cut and make up the fin LE and add in the top of the tailplane. Next insert the fin ribs and small pieces of 1/16" sheet between the base fin rib and the tailplane. This is to aid covering and fairing in the fin joint. The cockpit area has a floor to allow the bolting in of a pilot. Next make up the dashboard former and any top planking not completed. The actual dashboard is a separate 1/16" sheet covered and made up with dials separately. The removable top section is made by cutting out the half formers and pinning them in place by external pins. Then, either roll some sheet around after wetting the outer surface or planking it, just like the fuselage. It is held in place by a front peg made from 1/8" dowel and a rear bolt made from 16 SWG wire and brass tube. This makes into a sliding bolt. I leave the wing root fairing until the wing is finished and nested in place.

Wings

Use hard Balsa for the LE and TE hinge spar. It is best to make up the 2" TE root pieces and glue them to the outer aileron hinge spar before laying them on the building board. Note that the LE is pinned down onto the board at the tip but the root is propped up to meet the contour of the semi symmetrical root. Pin down the LE and bottom

spruce spar and ready made rear spar and then add ribs. Make up the wing tips in place and leave until dry. Now add in the top spruce spar. I added the webbing and undercart blocks later. Don't forget the front half ribs of 1/16" ply which add strength at the undercarriage (UC) position.

Fit the 1/16" ply bellcrank triangles and mount in place the crank assemblies, threading the 14 SWG wire through the ribs using two pieces so that they can be joined in the centre later. This is to allow for the dihedral angle. Now fit the central dihedral brace with epoxy. When dry offer up the two wing halves to adjust them for a perfect fit. Remember to prop up one wing tip for the dihedral angle. Lastly join the two bellcrank pushrods at the centre and add a small L piece to act as a peg for the servo disc. Don't forget the hard 1/4" sheet servo box in order to screw the servo down. Sheet the top and bottom of the centre section to complete the wing. I covered my model in silver Solartex. The insignia is cut from Royal Blue sticky backed plastic.

Undercarriage

The wire bending shapes and the blocks they fit in are all shown on the plan, in location and in cut-away drawings. Bend the 8 SWG piano wire legs to fit into the holes and the channels in the blocks. I retained each leg with three aluminium straps, each secured with two long Futaba servo screws, so you need 12 x 1/2" (13mm) # 2 screws. This undercart is designed to cope with model weights up to 7 lbs.

Installation

The rudder has to be fitted before the tailplane centre fixed section as its LE goes through this. The rudder has a pushrod which is 1/2" square balsa and 14 SWG rod exiting through the radiator rear former. The elevator has a Y fork made from 14 SWG and exits each side under the tailplane. It is best to have at least one adjuster on this so that any error between each elevator half can be corrected. Don't forget to balance the wing laterally and add weight to a wing tip to adjust.

Motor and Batteries

The flight battery on my model was three separate 6 cell packs. They are held in place during flying by a tie-wrap. I used Sanyo N-1700SCRC SP cells. Note that there is room for the flight pack to be moved fore or aft in order to achieve balance. Also I use a 500mA Rx pack and that can be placed in the nose if necessary but mine was placed in the radio bay for correct CG location. My motor was a heavy Geist 150 but as it is run on only 18 cells it only produced the same power as a geared Astro 40. I found it best to use a 14 x 5 or 13 x 8 wooden prop.

The ready-to-fly weight was 6 lb 12 oz (3.1kg). This was made up of a 1 lb 9 oz (710g) wing, 2 lbs 3 oz (1000g) for the flight battery and 3 lbs (1360g) for the complete fuselage including all the equipment. So 6 lbs 8 oz (2.95kg) is possible with a lighter motor but I decided to use a larger motor so that it runs at the lower end of the current curve and gets maximum efficiency - except it was heavier. My previous models were covered in lightweight nylon, doped and sprayed silver and were not as heavy as covered with silver Solartex and used an Astro 40G.

For my safety reason I exited the Rx aerial as early as possible and took all of it up to the fin for maximum length; especially as the model has silver covering.

That completes the building of the Heston Racer, what a pity the full size didn't make more than one flight.

The flying is very straightforward but don't couple rudder and elevator together as I did at the beginning. I found that I was using some right rudder on take-off and once airborne it immediately banked right. I soon sorted it out by separating the rudder from the aileron.

It is a doddle to fly. Just let it run a bit on take-off and then add a little up elevator for lift off, just as if you were flying full size.

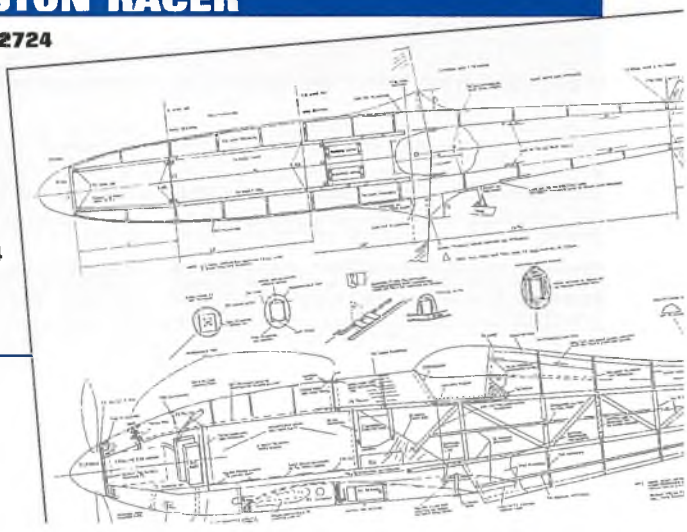
Sizes

If you are using metric dimensioned materials, select the closest to the real sizes listed here.

1/16"	1.6mm
3/32"	2.4mm
1/8"	3.2mm
3/16"	4.8mm
1/4"	6.4mm
5/16"	7.9mm
3/8"	9.5mm
1/2"	12.7mm
8 SWG (0.158")	4.01mm
14 SWG (0.084")	2.13mm
16 SWG (0.064")	1.63mm EFI

MW2724 - HESTON RACER

Copies of plan number MW2724 "Heston Racer" (2 sheets) are available from Electric Flight International (Plans Service), Traplet House, Severn Drive, Upton-upon-Severn, Worcestershire, WR8 0JL. Tel: +44 (0) 1684 594 505. Fax: +44 (0) 1684 594 586. E-mail: general@traplet.co.uk



Dornier Superwal

REPORT BY: **GEORGE MORTON**

George Morton of Dunfermline, Fife has gone electric and sent us these photos of a fascinating looking flying boat.

"As a modeller recently bitten by the clean silent revolution I had to have a crack at something a bit out of the ordinary and scratch-built the Dornier Superwal you see here.

Although as yet unflown (no radio at present) I have high hopes for it. Powered by four Mini Olympus (Rocket) motors in a push-pull configuration, Fleet controller, 14 cells and all-up weight likely around 6 lb (2.7kg). Much valuable advice was freely given by John Swain of 'Fanfare', Whitstable; the model is covered with Solarfilm (wings) and draughting mylar.

"The large radiators top and bottom of the nacelles are of course removable for flying (drag must have been enormous) and I have used aluminium tubing to provide plug-in wing sections." **EFI**

▲ **The centre cover is removed to reveal the aileron servo and the wing fixing tubes.**

▲ **On top of the nacelles are the large radiators that will be removed for flying.**

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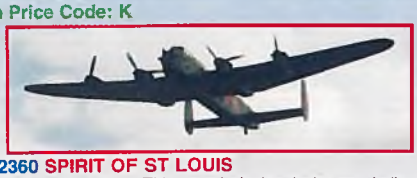
MW2328 AVRO LANCASTER
Designed by Peter Angus. This 50" span 'Baby Lanc' is designed for one .09 2 stroke engine and 3 function radio with a target weight of 37 ozs.
Plan Price Code: K



MW2360 SPIRIT OF ST LOUIS
Designed by Brian Rice. This award winning design was built to 92.5" span for .90-1.20 4 strokes and 4/5 function radio.
Plan Price code: Q

MW2135 EXTRA 230
One of 1987's most dramatic display aircraft is reproduced by Roy Garner. This 60in. span model for four function radio suits .45 two strokes or .60-.90 four strokes.
Plan Price code: L Canopy Price Code: D

MW2381 EXTRA 300
Designed by Roy Garner this is not a beginners model. With 72" wingspan and 20-30 cc engine.
Plan Price Code: R Canopy Price Code: P

MW2154 F4U CORSAIR
An outstanding sport/scale warbird with a 48in. span designed by Pavel Bosak four function radio and .40 two stokes.
Plan Price code: D Canopy Price Code: D

MW2110 JU87B STUKA
Strong manoeuvrable and devastatingly accurate, the infamous Stuka with its evil-looking shape symbolised Hitler's Luftwaffe. Fitting a bomb release mechanism to this model is all that's necessary to completely reproduce this spinechiller.
Plan Price Guide: P

MW2158 P38 LOCKHEED LIGHTNING
By Gordon Whitehead. This 52in. wingspan twin engine model is designed for two .15-.25cu. in. two strokes. It flies as well as it looks.
Plan Price Code: M

MW2070 JUNKERS JU 52
Corrugated skinned three engine airliner. Modelled with a single engine and two free wheeling props. Designed by Paval Bosak.
Plan Price Code: L

MW2307 MESSERSCHMITT ME110
Gary Noden produced this 63inch span model for 2x.25 2-stroke engines and 4/5 function radio.
Plan Price Code: L

MW2105 DE HAVILLAND MOSQUITO
Developed as a bomber so fast it didn't need defensive guns. Our plan shows a B Mk IV with a clear nose and a gun equipped FB Mk IV fighter bomber.
Plan Price Code: P

MW2104 P47 THUNDERBOLT
Used as a long range escort fighter or a fighter bomber it was a well respected aircraft. Plans are available for both 'Bubbletop' and 'Razorback' versions (Please state preference when ordering).
Plan Price Code: P

SPORTS DESIGNS

MW2615 JIANT JABBERWOCK
Enlarged one and a half times from the original drawing and designed for the Tartan 22cc engine many have been powered by ST 2000-3000 size engines. Virtually unstallable, however slowly its flown, this version weighs about 6.5kgs. Cowl and spats available separately.
Plan Price Code: Z+A

MW2364 CLOUDHOPPER
This microlight configured model will turn heads in every club with quite startling flight characteristics and easy construction.
Plan Price Code: Q

SPORT AND SCALE GLIDERS

MW2576 ES60 BOOMERANG
This Quarter scale sailplane is a complex design for experienced builders and features a fully built up structure and an all moving tailplane.
Price Plan Code: Z

MW2509 CRESTED WREN
Designed by John Watkins. At a meagre 13.2ozs/sq.ft wing loading this 1/4 scale beautyis a real floater. Wingspan-3.048m, radio-3/5function.
Plan Price Code: Z+E

MW2505 HARBINGER Mk2
A fine example of this beautiful aircraft for the scale enthusiast. Wingspan-15ft Radio -3/4 function, Weight -18lbs
Plan Price Code: Z+E

MW2308 SCHEMPP-HIRTH GOEPPINGEN WOLF
Tony Slocombe's design of this superb representation of Wolf Hirth and Martin Schempp's aerobatic glider of c.1935. For scale gliderenthusiasts, the wolf is a 'must'. 151" wingspan.
Plan Price Code: P
Canopy Price Code: B

MW2224 SLINGSBY KIRBY KITE
Martin Simon's design. This elegant 1/4 scale sailplane really brings the vintage era of gliding alive. A truly classic design. 11.65ft wingspan
Plan price Code: O

MW2213 ASW 17
Designed by Mike Trew, this classic 'glass ship' is built from wood and can be built to include the fence type airbrakes. 157.5" wingspan.
Plan Price Code: M
Canopy Price Code: H

MW2314 SDZ 30 PIRAT
Tony Slocombe, designer of many beautiful scale model gliders, produced this 1/4 scale gliders, single seat glider with ease of transportation in mind. 147" wingspan.
Plan Price Code: R

MW2327 ORLIK
Another Tony Slocombe plan, Orlik was originally designed in Poland by Kocjan and had the distinction of being the first sailplane to fly from the Wasserkruppe to Berlin - a distance of over 300 kilometres. 139". wingspan
Plan Price Code: Q

MW2370 MU -17 MERLE
One of the greatest problems with scale gliders is transporting them and flying them in low lift conditions. Mike Moore's design has proved to be a winner! 100" wingspan.
Plan Price Code: O

MW2508 SZD 8 JASKOLKA
Designed by John Watkins. With its modified Clark Y section, this is an extremely well-behaved model in the air. Wingspan-4m, Radio-3/5 function Weight-11.6lbs
Plan Price Code: Z+E

MW2131 SWALES SD3-15T
A 1/4 scale model of an almost unique glider for 4/6 function radio. Keith Humber designed this 146.5" span model.
Canopy Price Code: I
Plan Price Code: K

MW2665 MINIMOA 1:3.5
Chris Williams shares his design of one of the best known sailplanes and, using a Quabeck 3.5/12 wing section produces a superb model for both builder and flyer alike. Aimed at the experienced builder, the Minimoa will be a very rewarding scale project.
Plan Price Code: Z+E

MW2669 MINIMOA 1:4
A slightly reduced version of MW2665 to give the builder a choice of wingspans. However, the timeless elegance of this design is apparent at any size. Designed by Chris Williams,
Plan Price Code: Z+A

MW2517 MINI HABICHT
The inspiration for this model, other than its obvious aesthetic appeal, came after a twiddle on the sticks with Plane Sailing's Mini Discus. A small model with full aerobatic potential. This is a true full scale machine faithful to the full size replica at Wasserkuppe.
Plan Price Code: F

MW2553 BREGUET FAUVETTE
Designed by Guiseppe Ghisleri, this elegant V tailed slope soarer uses foam wings and balsa planked fuselage for lightweight and strength. With a wing loading of 15.34 oz/sq ft and the ability to turn inside the smallest thermals, the Fauvette's SD3010 wing section allows the model to perform in a wide variety of conditions.
Plan Price Code: D

MW2557 BLUR
This 36" class slope pylon racer is intended for experienced flyers who wish to consruct a model quickly and economically. Although a standard radio can be used.
Plan Price Code: B

MW2662 VOOMMITT
A compact and aerobatic soarer designed by Stephen Dorling for the experienced flyer! Ideal for the person who needs a small model for travelling and the thrills to excite them on local slopes.
Plan Price Code: J

MW2573 MINI ETSI GETSI
Mike Freeman designed this sleek little slope soarer with the idea of it being fast, manoeuvrable and efficient. The skinned wing and built up fuselage makes it strong and the swept wing adds to its efficiency. The result is everything he was looking for as it will fly in winds from 10-30 mph before needing ballast.
Plan Price Code: H

ELECTRIC SCALE PLANS

MW2709 BRISTOL SUPERFRIEGHTER NEW
Designed by Peter Grange, this easy-to-construct model is an excellent introduction to scale or multi-engined flying. For rudder, elevator and motor control. Wingspan 60" for two 400 size motors and 3 function radio.
Plan Price Code: I

MW2716 BRISTOL BEAUFIGHTER NEW
A scale model of this WW2 night fighter for two speed 400 motors, gearboxes and six cells. Control is by aileron, elevator and motor control. Wingspan 48" (1220mm). Designed by Robin Fowler.
Plan Price Code: K

MW2636 F-117 NIGHTHAWK
Designed for speed 400 motor and 7/8 cell. Built up construction. Requires 2 servos, aileron and elevator and motor speed control.
Plan Price Code: E

MW2455 CORSAIR
Designed by Heino Dittmar. The Corsair is incredibly agile on 600 AA cells, representing a high £/fun ratio.
Plan Price Code: E

MW2668 HORTEN IX
The Horten brothers built many 'true' flying wings from 1930 to 1945, no fins or rudders and no fuselage if the pilot could be accommodated within the wing. They built ver efficient glider, prop driven and jet propelled aircraft. Build your own model of the last Horten 'wing' for two WeMoTec 480 fan units or similiar and 7 or 8 cells.
Plan Price Code: J

MW2651 SOPWITH 1.5 STRUTTER
Try something different with this electric biplane. Suitable for the builder with some experience of built up structures, the Strutter builds into a relaxed yet pleasing model.
Plan Price Code: E

MW2590 DH 108 SWALLOW
Designed by Chris Golds flying wing model of an early jet can be built in a day. Wingspan 45in. with two function radio.
Plan Price Code: F

MW2575 HENSCHEL 132
Semi scale, Ducted fan, 1.2 Metre (47") Aileron / elevator / motor control for Morley Jet-Elec fan unit or equivalent.
Plan Price Code: H

MW2529 HORTON VC
Designed by Rob Bulk. WWII fighter that did not enter service
Plan Price Code: H

MW2494 ELECTRIC CHIPMUNK
Scale RAF trainer, built up wing with scale rib spacing and clever rolled ply fuselage for scale accuracy and strength are just two features of this model.
Plan Price Code: L

MW2469 GRUMMAN F6F HELLCAT
Using lightweight rubber powered free flight methods to construct U.S
Plan Price Code: H

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MW2671 JET TRAINER
Easy to build model using a foam wing from the silver streak chuck glider or one of built up construction. The fuselage is blue foam and balsa. Choice of one or two fan units. Designed by Brian Gaskin.
Plan Price Code: F

MW2649 P51D MUSTANG
1/12th scale model of the famous WW2 fighter for speed. This model is suitable for pilots with little aileron experience. Designed by Steve Kerry.
Plan Price Code: E

MW2453 SPITFIRE
Designed by Heino Dittmar. A purpose built semi scale model of the famous fighter for small, cheap, direct drive motors and 600AA cells.
Plan Price Code: E

MW2589 PUSHY GALORE
Miller Pusherprop special racer. Speed 400 motor/7 cells intermediate builder/flyer.
Plan Price Code: F

MW 2369 ELECTRIC WELLINGTON
Economy , ease of construction, reliable flying is the design basis for Tony Nijhuis' Wellington Superb performance in the air.
Plan Price Code: P
Canopy and Turrets: C

MW2468 HEINKEL He219
Something different from the drawing board of Martin Irvine. The He 'Owl' night fighter is a straight forward design with an easy sheet
fuselage and built up wings.
Plan Price Code: K

MW2635 A10 TANK BUSTER
A-10 Tank Buster for two EDF-600 fan units, two speed 600 8.4V motors and 10 cells, or similar. Controls: flaps, aileron, elevator and motors. Straightforward construction from balsa and liteply.
Plan Price Code: J

MW2592 HEINKEL HE 162 SALAMANDER
An Electric D/F model for the experienced flyer, this Luffwaffe jet uses a Clark 'Y' airfoil and features built up construction for a light-weight but fast model.
Plan Price Code: J

MW2670 NIEUPORT 12
Traditional built up construction, nearly all balsa of this classic WWI biplane. Designed by Martin Irvine.
Plan Price Code: G

MW2446 HANDLEY PAGE HP42
Designed by Ken Williams. This scale model of the 1930's airliner will take off and fly easily on four low-cost motors with gearboxes. Construction is from readily available materials.
Plan Price Code: P

MW2527 KAWANISHI H6K
Designed by Dick Comber, this 53" span flying boat is for four KP 02 or similiar motors and ten cells, with aileron, elevator and motor control.
Plan Price Code: L

MW2533 DORNIER DO17 VI
Sacle WWII German bomber. Convntional balsa construction Designed by Martin Irvine.
Plan Price Code: I

MW2525 ROYAL AIRCRAFT FACTORY SE5
WWI Biplane for 400 motors and four to seven cells, and rudder, elevator and motor control, designed by Stephen Mettam.
Plan Price Code: F

MW2583 PIETENPOL AIRCAMPER
Dale Tattam originally designed this as an all built up aircraft for I.C. powers. He enjoyed it so much he lightened it and built it as an electric version.
Plan Price Code: M

MW2645 SUPERMARINE SEAGULL
Geared WEP Turbo Pen PLus or similiar on 10 cells. Designed by John Thompson.
Plan Price Code: L

SPORT ELECTRIC PLANS

MW2511 HAMMER E
Designed by Paul Rossiter. A clean and very aerobatic model that is tempting many away from I.C.
Plan Price Code: L

MW2650 OPUS
Sports electric soarer for intermediate level. Designed for low cost and economy size motor
Plan Price Code: E

MW2591 POUSSIN
A 'could be scale', about 1920' parasol monoplane for a geared 600 size motor. Straightforward, traditional construction. Designed by Allan Pointer.
Plan Price Code: H

MW2503 L'IL RED ROOSTER
Designed by Nigel Brewer. An Electroslot soarer for Speed 400 motors and a fast build.
Plan Price Code: H

MW2227 ZY-400
An elegant balsa construction electric glider for Electroslot 400 contests or pleasurable duration flying.
Plan Price Code: L

MW2638 HELIX
A 2 metre electric glider with 4 function control for relaxing flying , ailerontraining - or as originally used -as a cheap way of taking aerial phtographs.
Plan Price Code: F

PSS PLANS

MW2500 MIG - 3
Designed by Paul Jansens. An exciting PSS model of this famous Russian fighter. Very attractive and good for light winds on the slope. Wingspan 1.27m, Radio-3 funtion, Weight-1335gms.
Plan Price Code: H

MW2501 LOCKHEED T-33
Span 1.24 metres - Length 1.05 metres - Weight 1190 gms. Exciting PSS model of this Jet Trainer, good in weak lift. Lost Foam fuselage and foam wings. A very practical subject and ideal as an introduction to PSS.
Plan Price Code: H

MW2673 GRUMMAN GULF STREAM

Designed by Paul Janssens. This PSS soarer is a superb subject for those who want an elegant model. Its small size makes it the ideal companion
Plan Price Code: J

MW2673 SHORT TUCANO
An ideal introduction to PSS using all-taditional methods of construction. It's classic RAF trainer scheme will really stand out on the slopes. Can be converted to electric. Designed by Nigel Hawes.
Plan Price Code: J

MW2424 PSS AIRCOBRA
Designed by Neil McHardy, this extremely agile model is a splendid stablemate to the FW190D, 46" wingspan.
Plan Price Code: L

MW2721 MACCHI Mc202 NEW
An ideal first PSS Aileron model, fast, easy to fly and virtually viceless with many good colour schemes to reasearch.
Plan Price Code: H

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1968

Other Pilots' Models

COMPILED BY: THE EDITOR

This is your page. You want to know what other builders and pilots are doing with their electric models and they want to know what you are doing. Send photos and details to the EFI editor at the "ALL CORRESPONDENCE..." address on page 2.

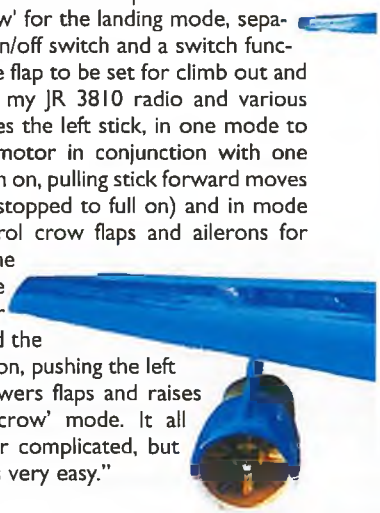
Thermic Myst

Improvisation may be the best way to get the most out of your models. Electric Gliders must still be the largest single type of electric powered aircraft - but there are all sorts of electric gliders.

Clive Learwood of Basingstoke, Hampshire, England sent us photos and details of his Thermic Myst, electric soarer. Clive tells us:

"It uses wings from the 'Mystery Ship' (S7037 section) built up kit from the USA and the fuselage from a Graupner 'Thermic Cloud', with the tail feathers replaced by an all moving tail. Energy at the time the photo was taken, end of August 98, was provided by a Keller 40/10, ten 2000 cells and a 13.5 x 7 prop, using 250 watts (static). All up weight with the Keller and pack is 2.6kg (5 lb 12 oz), wingspan is 3m (117") and covering is Profilm. The motor has now been replaced by a Kontronik Drive 500 set, from F2A Supplies (Kontronik 42/30 motor with 3.7:1 gearbox and Kontronik sensorless controller). Static testing, using the Astro watt meter, shows 380 watts on a Graupner 12 x 7 CFK prop. As yet, due to the weather, this new set up has not been flown, it could be interesting.

"Coming from a thermal soaring background I fly using two sticks, turn on the left and elevator on the right. As the model is 'full house' (aileron, flap, rudder, elevator, motor) this poses somewhat of a problem to combine: full 'crow' for the landing mode, separate motor on/off switch and a switch function to enable flap to be set for climb out and cruise. Using my JR 3810 radio and various mixers enables the left stick, in one mode to control the motor in conjunction with one switch (switch on, pulling stick forward moves motor from stopped to full on) and in mode two to control crow flaps and ailerons for landing. In the landing mode with motor switch off and the crow switch on, pushing the left stick back lowers flaps and raises ailerons in 'crow' mode. It all sounds rather complicated, but in practice its very easy."



◀ Thermic Myst.

▲ **Dimwatt.**

Dimwatt

Clive Learwood also sent in the photo of this Dimwatt that looks so good in transparent film covering. He says:

"It is built from the plan by Tom Hunt at Model-Air Tech in the USA. Speed 400 direct drive, on 7 x 500 cells it's a really quick model. Covered in Profilm lite AUW is 16 oz (454g). Undercarriage was omitted as the model is flown from a rough site."

GaskinAir 540

Brian Gaskin needs no introduction, his models are often in this magazine. His major interest is in EDF models and his Il-30 plan is reviewed elsewhere in this issue. His GaskinAir 540 commuter type airliner uses two 540 Le Mans buggy motors, each with the 'CAM-Prop x 2' fans (each made from two Graupner CAM Speed props) that we have shown before. This pair have the commendable static thrust of 4 lb 3 oz (1.9kg) which is plenty for a 6 lb (2.7kg) model. Energy is from 14 cells.

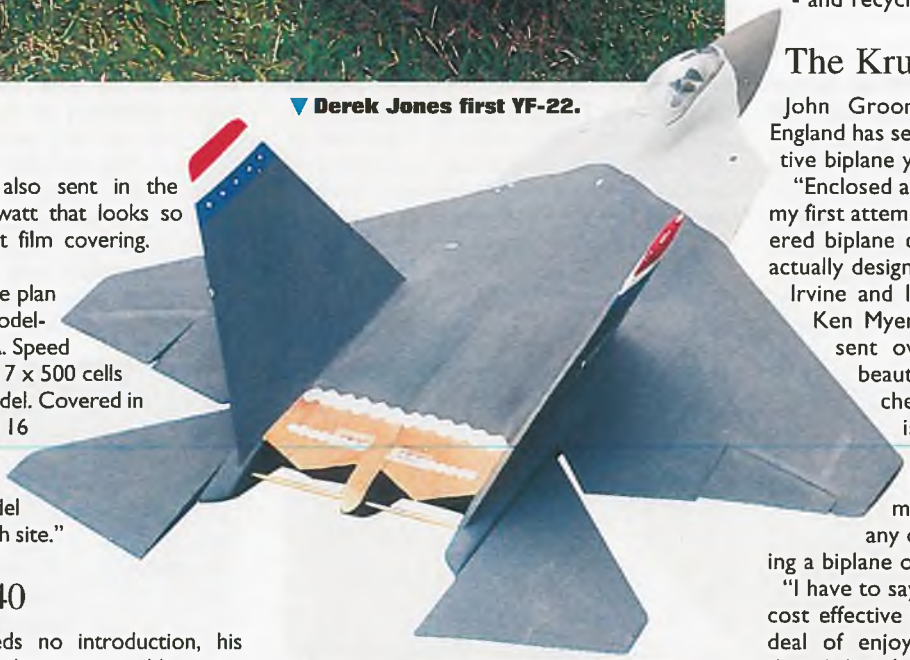
Model airframe details are a span of 54" (1372mm) and length of 51" (1295mm). The 8" (203mm) diameter fuselage of rolled 1/64" (0.4mm) ply has a foam nose and balsa tail cone. The wing is obechi covered foam and tail is light balsa sheet.

▲ **GaskinAir 540.**

YF-22

In the 'Light Fantastic' column of this issue Chris Golds shows you the Derek Jones YF-22 that uses two 540 wet mag motors and Eco EDF units. To quote: "After some initial problems this unusual model now flies well." Here is one of the initial problems, Derek's first YF-22. It struggled to fly and adding cells just made it heavier. The obvious solution was more powerful motors but power costs money so Derek started again and built a lighter model. The original was converted into a much lighter slope soarer and passed on to slope flyer who is delighted with its performance. Derek deserves an award for determination - and recycling.

▼ **Derek Jones first YF-22.**



▼ **John Groom's Krumpler, a Martin Irvine design.**

The Krumpler

John Groom of Cookham, Berkshire, England has sent these photos of the attractive biplane you see, he tells us:

"Enclosed are a couple of photographs of my first attempt at building an electric powered biplane called 'The Krumpler'. It was actually designed a few years ago by Martin Irvine and I noticed an article on it on Ken Myers' Web Site. I got the plans sent over from the ANA. It flies beautifully and is very easy and cheap to build. At the moment it is running on a Graupner Speed 600 8.4 volt motor, an 8 x 4.5 folder and 7 x 1250 mAh cells. No-one should have any qualms about building and flying a biplane of this ilk.

"I have to say that The Krumpler is a very cost effective plane and I have had a great deal of enjoyment from it so far, even though I can't roll it in the way that Martin suggests he manages. Martin tells me that one guy in his own club has built several to the same broad design, but they have been so well disguised that Martin did not at first recognise them. Someone else in Martin's club is apparently building a doubled up version which should be quite interesting."

▼ **The Krumpler.**

▲ P-38 Lightning.

Lightning

Mr P W D Smith of Worthing, Sussex, England sent in photos of his semi scale P-38:

"The photo is of my Lockheed Lightning lookalike, scaled up from a plan in 'Model Airplane News' the USA magazine; construction is all built up (I am not keen on foam). Power is two Robbe 'Power 400/45 motors, 7.2V with 6 x 3 Graupner folding props. I get 6 1/2 minutes power-on with a 7 cell 1700mAh battery. The cockpit is attached with Velcro pads, to aid access to the wiring (motors and servos) from the booms to the pod, the pod space under the wing filled by the 7 cell battery. 3 Hitec servos are used and a Hitec 1003 switch with BEC controls the motors. There is 2.5° of washout built into the wing which makes it a rock steady flyer. Span is 40" (1m) and all up weight is 43 ounces. This machine is moderately aerobatic, loops are large and round, rolls are a bit barrelly but it makes up for that by looking great diving on our strip and whispering by 10 foot (3m) high around 30 MPH (48 KPH). Dead stick landings are so easy."

▲ A Piacentini and the big RC-1.

▲ On the RC-1 the battery is fitted from the front, over the originally fitted Ultra motor.

Lanzo RC-1

Mr A Piacentini of Salisbury, Wiltshire, England has written to tell us about his electric powered copy of Chester Lanzo's 1934 'RC-1'.

"This is a most interesting model, being generally regarded as the very first RC power model. Chet used to fly in allotted fuel comps but this resulted in extensive flights that led to many models being lost. Chet thought that if he could control the model and land safely, he would save the loss of a model and expensive engine.

"Chet went right back to basics and used a spark coil transmitter and simple receiver that worked a relay like actuator that operated the model's rudder.

"The radio was not too successful; the problem was a shortage of range. He was delighted to get an occasional command but the model did not last long so he went on to develop a 12 foot (3.7m) monster the 'Racer', necessary to carry the heavy tube style radio. He did eventually win the first RC comp held in America in 1937 with his famous 'Stick' design.

"My replica of this model flys great and cannot be faulted. Flight times are 10 to 15 minutes with very little power required to fly it. My model had an Ultra motor to start with but now uses an Astro 40 geared."

▲ Chet Lanzo's RC-1 has a distinctive nose.

Specifications:

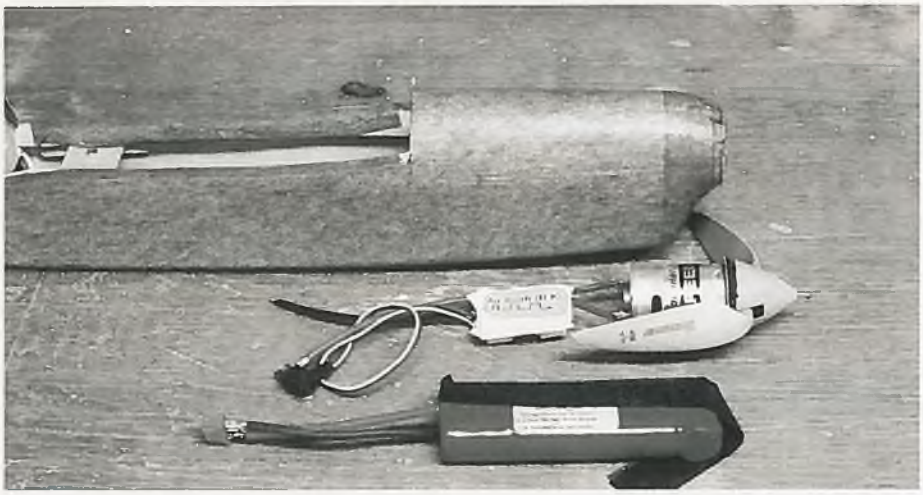
SPAN	84" (2134mm)
WEIGHT	8 lb (3.6kg)
MOTOR	Astro 40G
PROP	12 x 8
ENERGY	20 x RC-2000
RC	JR 3810 Robbe speed controller

▲ Electro 400. Rainer knows how to make his small models look big!

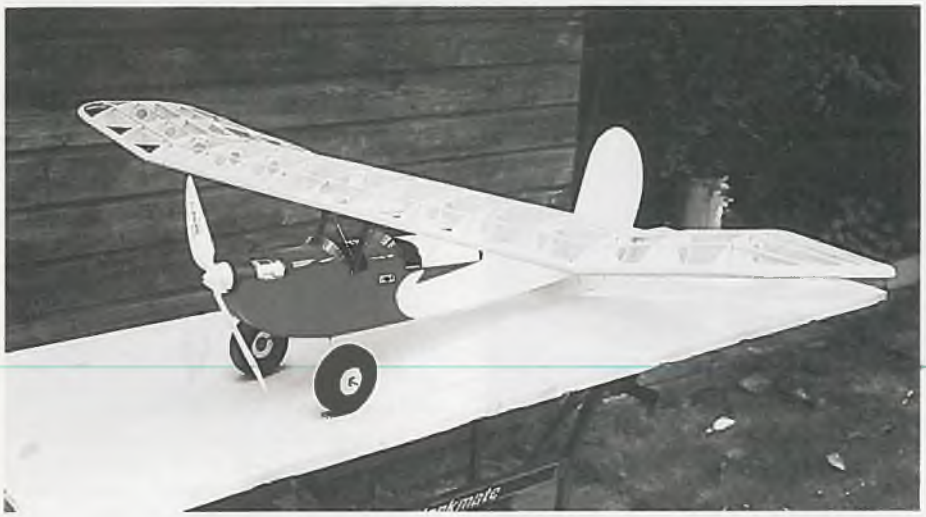
Electro 400

Rainer Krafft of Coburg in Germany is an EFI contributor of electronics circuitry design but the model here is someone else's design so this time he qualifies as just another pilot. However, Rainer cannot not stop fiddling; Eric Leadley of EDL Plans designs light models anyway but Rainer just had to see if he could build it lighter.

"Here are photographs of my latest project, an 'Electro 400' built from a plan by 'EDL Plans'. Even my wife said "That looks nice" (a very precious comment!). Some weight saving was achieved by halving all the balsa thicknesses. 1/32" (0.8mm) was used for the wing sheeting and outer wing ribs as



▲ **The power train by the nose of Electro 400.**



▲ **Allan Pointer's Honey Bee before covering showing wing construction.**

well as for fuselage top deck. 1/16" (1.6mm) balsa was used for wing inner ribs and fuselage sides and bottom. The sheet 1/8" (3mm) tail unit was replaced with a geodetic type construction. With even more micro RC gear another 1/2 ounce to one ounce (28g) could easily be saved.

"Model details, weight is 480g (17 oz) 20 oz was stated on the plan. Micron Rx and two Hitec HM 80 servos, power pack is 7 x 500mAh nicads. The soft start switch is the one (Rainer's design) featured in EFI a while ago. Motor is a Speed 400, 6V. The covering is 'Litespan' and one coat of clear dope.

"The Electro is still waiting for its first flight. The weather in November is wet, wet, wet, so I will have to let you know about its flying characteristics."

Honey Bee

Allan Pointer of Southampton, England, designer of 'Poussin' (MW 2591 in the Plans Service) has written to tell us about another of his designs:

"In my article about 'Poussin' I mentioned that I had built a 15% larger 'Lazy Bee'. In the course of some 300 plus flights, I have played around with it somewhat, fitting a Speed Gear 600 motor and building a wing with inboard ailerons (pretty useless unless coupled with rudder). This 55.2" (1402mm) span 'Bee' fitted with the Speed Gear motor has proved an ideal combination and has been admired and applauded by fellow club members so much so that my enlarged plans have been borrowed and there are now 4 of these 'Bees' flying in the club.

"Other club members on seeing the flying characteristics have expressed a desire to have one but have been put off by the Bee's ugly appearance (their words not mine) so in my spare time I've designed a prettier version of the enlarged Bee which I've renamed 'Honey Bee'. As you can see, it is an open 2 seater with a parasol wing. It flies just as well as the other one and has a wing loading of 9.6 oz/sq.ft (29g/sq.dm).

Autoplane

Ladislav (Laddie) Mikulasko of Dundas, ON, Canada, a prolific builder of scale models of little known aircraft has sent photos of his Hordern-Richmond Autoplane built by the Heston Aircraft Company in 1936; a three seater powered by two 40 HP Continental flat fours, only one was built.

"The model is a scale model of English light plane called 'Autoplane'. The model has a 62" (1575mm) wing span and flying weight is 2.5 lbs. It is all balsa construction. I am using two geared Speed 400 motors connected in parallel. One 8 x 1700mAh battery gives me 15 minute flights with ease. Construction is all balsa." EFI

▲ **Autoplane by Laddie Mikulasko.**

▼ **Autoplane with lightweight pilot and passenger.**

Airline Shippin for RC Planes

REVIEW BY: **GRANT CALKINS**

Some of you will have had problems as an airline passenger transporting even the smallest models - and there are restrictions about box sizes but it can be done.

▲ **Figure 1. Airline shipping box for RC planes, plus the author.**

Introduction

As a relative newcomer to RC, I was enthusiastic about attending several popular Fun Flys both near my California home and in the Midwest as well. Nearby events were easy, just pack the plane(s) and gear into the van and go. But where airline travel is involved, a new set of problems presented themselves. How could I get my planes there safely? How would an airline handle them? Could I pretend they were golf clubs and check them as luggage?

After checking with several airlines and the AMA, I determined that anything larger than a Speed 400 racer would not be accepted as luggage, carry-on or otherwise. I needed to design a special shipping container that would be large enough for several planes plus equipment, but light and strong enough to be economically shipped as 'cargo' by an airline. It should be easy (and cheap) to build out of common materials as well as be very protecting of the delicate contents. As it turned out, it was easy! The box is 5' x 2' x 1'(1525 x 610 x 305mm) and weighs only 26 lb (12kg) - and it is strong. It can hold at least three planes. It rolls out of airports like luggage and fits neatly into the 'extended trunk' (fold down rear seat) of a car. Please see Figure 1.

The shipping container described herein, containing three planes and miscellaneous equipment, has experienced two long-distance trips this year, and past with flying colors. Shipping damage to the box itself was minimal, but did result in upgrading the hinges and angle brackets to those described herein. There was no damage to contents whatsoever.

Materials

You can build this RC shipping box in a single day. You will need two 8 x 4' (2440 x 1220mm) sheets of 1/4" (6.4mm) luan plywood, 28' (8.5m) of 1 x 2 (25 x 50mm) lumber, wood glue, and assorted screws, latches, casters, and handles. For tools you will need a saw (circular saw or saber saw preferred), drill and power screwdriver. Finishing is to your personal taste - I just gave mine two coats of clear urethane.

Construction

This box is made in 'reinforced monocoque' style, wherein the skin (1/4" luan plywood) takes most of the loads but is reinforced inside by a skeleton structure (1" x 2"). There are no unreinforced butt joints. Key is the use of luan plywood. It is very fibrous, strong yet light. It typically comes finished on one side only - the other side is a little rough. Using wood paneling, pegboard, pressed wood, etc, just won't do - they are usually too weak and/or too heavy.

Begin by cutting two 5' x 2' (1525 x 610mm) rectangles from the 1/4" luan plywood to make the top and bottom. Then cut two sides to be 5' x 1' (1525 x 305mm). Finally, cut two ends to be 2' x 1' (610 x 305mm). Take care to cut straight lines so the fit will be good.

The reinforcing is exactly the same both top and bottom (see Figure 2). Cut the 1" x 2" to lengths so that a simple frame fits on the inside of the top and bottom and leaves 1/4" (6.4mm) space all around. The long side of the frame(s) goes full length; the short sides simply fit between the long sides. Assembled, the frame's outside measurements form a 4' 11.5" (1511mm) x 1' 11.5" (597mm) rectangle.

Position the 1" x 2" on the underside of the top, and glue them down using wood glue.

g Box

Reinforce the glue joints with countersunk wood screws (3/4" flat head) inserted from the outside. Repeat for the bottom piece.

Next, glue and screw a 5' x 1' sidepiece and both 2' x 1' end pieces to the bottom. They should fit reasonably flush with the outside of the bottom all around. Then glue and screw the other 5' x 1' sidepiece. Also, use glue where the sides and ends butt together, and hold them together with tape or braces until the glue dries. Don't attach the metal corner brace yet.

Now, trial fit the top into (yes into - the 1" x 2" slip past the sides and ends) the bottom/sides/ends assembly (See Figure 3). Sand it to fit snug and not push out the sides or ends. It should not fit too loose, as it can't assume enough of the 'bending moment' loads that way. When it fits correctly, attach four hinges at 1' (305mm) spacing (outside) on the rear side of the top and side. Use 4" (102mm) Tee Hinges as shown in Figure 5. Screw the short side (top of Tee) firmly to the top of the box (and into the 1 x 2 frame inside) using #8 x 3/4" (19mm) flat head screws. Attach the long side (stem of Tee) to the side of the box, using two #8 x 3/8" (10mm) pan head screws at the top and 1/4" x 3/4" (or use M6 x 20mm) bolts, nuts and washers out at the end. The #8 x 3/8" screws are short enough to avoid interfering with the 1 x 2 frame (when the box closes) and the bolts will avoid it altogether. Then attach the two latches to the front side. The latches should require a little effort to latch the hasp - this locks the joint up nicely! Finally, remove the top and attach the four metal corner braces on the inside about 3" (76mm) from the top in the places shown in Figure 4. Use 6-32 x 1/2" nuts and bolts, with the nut on the inside. You're almost done.

Drill two holes in one bottom end (not both ends) for the detachable casters, and attach the casters (during shipment you should store the casters in the box). The holes must penetrate, and be approximately in the center of the 1 x 2 frame inside. At the other end, attach a pull (or push) handle as shown. Finally, it's a good idea to attach small metal corner protectors to all four bottom corners (the top's slip joint doesn't lend itself to accommodating these corner protectors). Finish with your favorite wood sealer or paint (I used two coats of clear urethane sealer). Attach two locks keyed to the same key, and add appropriate stenciling (DELICATE CONTENTS - PLEASE HANDLE CAREFULLY is what I used). Affix your name and address to the box. That completes your RC plane shipping container.

Packing Your Planes

This container was designed for free-form placement of your wings, fuselages, etc, in any way they will fit. It's a good idea to place any miscellaneous items you plan to include (charger, tools, etc) in the box against the sides or bottom before anything else goes in. Then, place your wings and fuselages in any manner they fit. Use a few styrene peanuts to insure they don't rub against each other. Then, fill the entire box with peanuts to keep things from moving while still allowing some shifting as needed. Before closing, throw in a few paper bags so that you will have some place to unload lots of peanuts at your destination, and a bungee cord to keep the trunk of your rental car closed. When the top of the box is closed tight, you have a pretty safe and secure package to take to the cargo terminal of your favorite airline.

Your Neighbors are watching!

I built this box one weekend when my wife was away visiting her Mother in Arizona. As the box was nearing completion, a neighbor wandered by with a funny look on his face. "Grant, it looks like you're building a coffin (laugh). Incidentally, we haven't seen your wife around for several days - is there anything you want to tell us!?". Please assure your spouse that only the planes go in the box - she can still sit next to you in the cabin!

Epilog

On July 9 I placed three planes and other various equipment into the box, filled the spaces with styrene peanuts, and drove it to Southwest Airlines' cargo facility in Los Angeles. They handled it so quickly I neglected to remove the pop-out casters. In less than 24 hours it was waiting for me at the Detroit airport, minus one caster. The rented car with fold-down rear seat contained the box perfectly, with a bungee cord employed to hold the trunk closed against the top of the box. All planes were perfect! Several fellow flyers marveled at how I could travel 2000 miles by plane and take three good sized planes with me! After the 3 day fly-in, I used the several shopping bags I had packed to hold the peanuts while I repacked the planes (and considerable items I bought from the RC merchants at the field!). Latching it up once again, I drove it to the Detroit Airport at the same time as I boarded my plane back to Los Angeles. When I arrived in Los Angeles, the box was waiting for me! No damage, no significant handling rash, great experience! **EFI**

Grant Calkins of the Channel Islands Condors and Muroc Model Masters (Edwards AFB, CA)

Grant Calkins is President of Casino Operations Co. in Westlake Village, CA, and a dedicated electric RC modeler. He can be reached at Email address: CasilloOp@aol.colll.

▲ **Figure 2. Typical corner joint, top and bottom.**

▲ **Figure 3. Top makes a snug and strong fit.**

▲ **Figure 4. Box open, showing frame and skin.**

▲ **Figure 5. Use four Tee hinges for strength.**

▲ **Unpack at your hotel**

Quiet Scale

MARTIN IRVINE

You should be reading this in the midst of winter. If you don't have a project underway (if not - why not?) perhaps something here will inspire you.

▲ **Marc Thomson's 6 foot (1830mm) span Canadair CL415 twin, two geared Astro 05 motors on 16 cells.**

▲ **Fw 190 - photo 1.**

Models

The first set of photos are of Eric Wedseltoft's Fw 190. This was built from Brian Taylor plans and comes out at 9 lb (4.1kg). The wing span is 60.5" (1540mm) and the wing loading comes in at 32 oz/sq.ft (98g/sq.dm). For power he is using an Astro 40 with the new 'Superbox' and a 15 x 8 three bladed prop. The battery pack is 21 x 1700SCRCs. With this set-up, the motor draws 25 amps (about 60 watts/lb) and spins the prop at 5600 RPM. The retracts are Rhoms. It is done in a Mediterranean colour scheme.

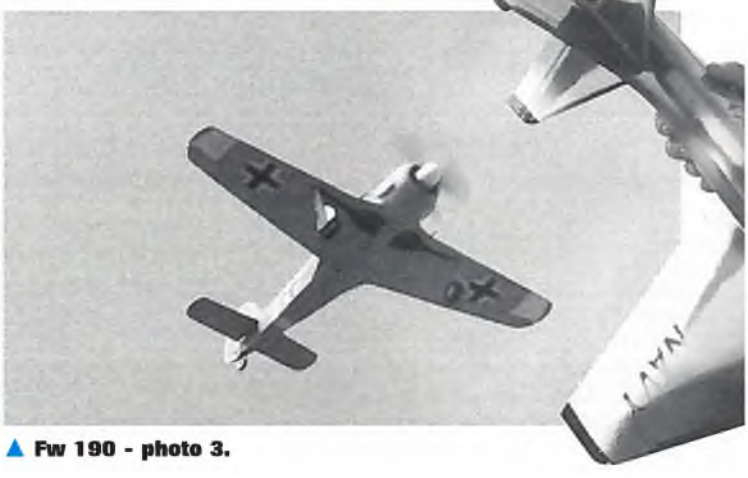
I saw the test flight at Halton Hills, west of Toronto, this past August. Photo 1 shows the model ready for start up. Photo 2 shows the model shortly after lift off. Eric kept ahead of the tip stalls ("Hey Eric, at least you know it does knife edge!") and once the plane had some altitude, photo 3, it was quite well behaved. Unfortunately, the landing gear, which works flawlessly on the bench, refused to lift the wheels. It still looked great.

At the F5 World Championships in Germany this past summer, Bill Hamilton, the Australian team manager, brought this ducted fan Skyhawk. It was an all molded model developed by Mani Riederich, one of the F5B team. It flew well on a Plettenberg 200 fan motor in a WeMoTec fan unit and 10 x 1000SCRs. There may be a kit available at some point.

In the coverage of the Mid-America meet a few months ago, I had a picture of Chris McHugh and his little Waco SRE. At the Whitby funfly (east of

▶ **EDF Skyhawk.**

▲ **Fw 190 - photo 2.**



▲ **Fw 190 - photo 3.**

▲ **Albatros DV.**

Toronto) Chris's dad (sorry, I forgot the name) brought the framework of this Albatros DV. It is about 1/7 scale, so wingspan is about 50" (1270mm) and the area is 4.5 sq.ft (42sq.dm). There has been a lively discussion about power systems but I think he has decided on an Astro 15 geared and 12 cells. This has always been a favourite airplane of mine (I designed and built a 1/12 control line version 30 years ago) and I look forward to seeing it fly.

More Publications

Actually the Albatros leads me into the next subject - more documentation. Every now and then I like to talk about good sources of information. For the Albatros, the best source is the Smithsonian book written by Bob Mikesh on the restoration of their DVA, 'Stropp'. This is a fascinating look at the inside of the airplane as you are taken step by step through the stripping away of fabric and damaged wood and the slow reconstruction. Page after page of drawings by Bob Waugh and spectacular photos make this a perfect modeller's documentation package. It is published by the Smithsonian Institute Press, Washington DC, 1980 ISBN 0-87474-633-7.

I like visiting 'remainder' book stores. These buy up the end of stock books from publishers and then sell them for about 1/4 of their original cost. Two of my most used volumes were found this way.

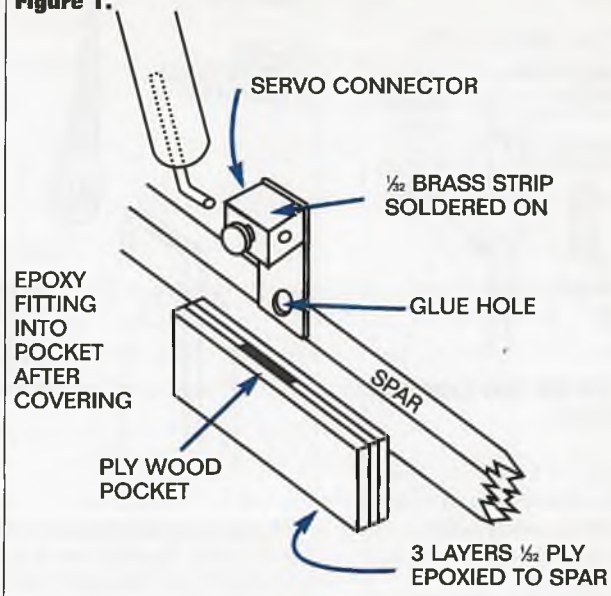
First is 'The Complete Book of Fighters' by William Green and Gordon Swanborough. Some of you may recognize these names as the editors of Air Enthusiast (which has since become Air International). One of the regular columns in that magazine was 'Fighters A to Z' and another was 'Model Enthusiast'. 'The Complete Book of Fighters' is a compilation of all the former and a good sampling of the colour profiles of the latter. Nearly every aircraft has a three view (by Dennis Punnett) generally as accurate as any. They are of necessity small, (about 2 x 3"), but they may be the only drawings available of some airplanes. There are also many cross sections of airplanes, usually ones that were the subject of an article in the magazine. My copy is a reprint by Salamander Books Ltd, London 1994, ISBN 0-86101-643-2. An excellent book and highly recommended.

Second is a similar book by one of the same authors, William Green. 'Warplanes of the Third Reich' has every front line aircraft and prototype flown by the Luftwaffe between 1933 and 1945. There are histories, excellent three views and a few pages of colour profiles. My copy is a reprint by Galahad books (1990), and the photo reproduction, while OK, is not as good as it could be. The original was a Doubleday book (1970) ISBN 0-88365-666-3. Another highly recommended book. Look for it.

Strut Fittings

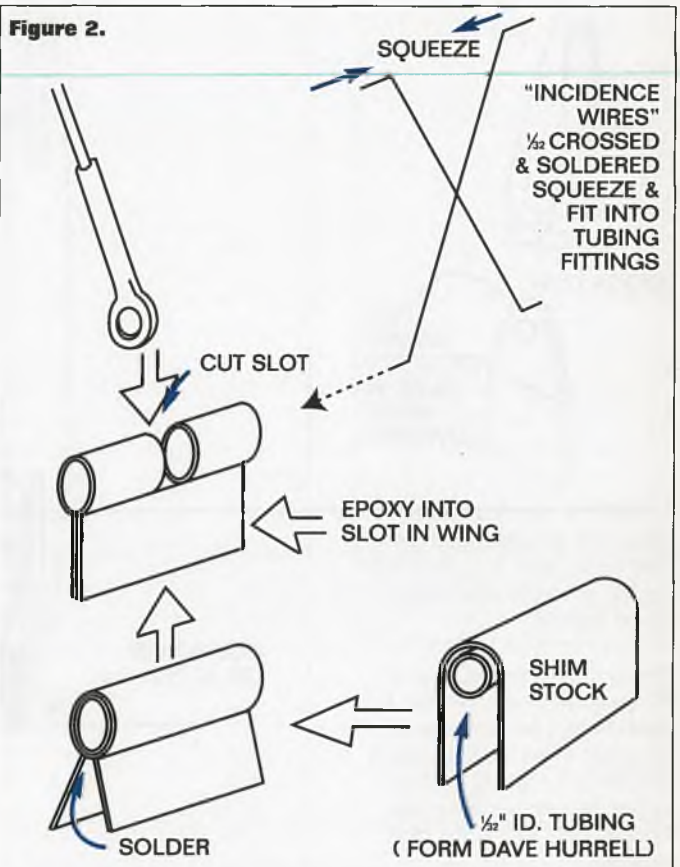
I like biplanes but I don't like strut fittings. Because of that, I collect ideas for strut endings.

Figure 1.



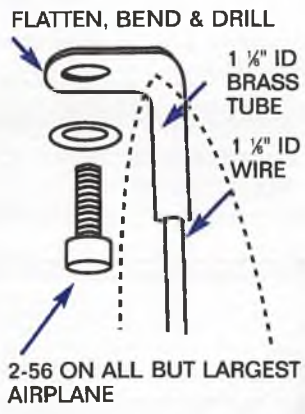
Fitting 1 is what I have been using on my Hawker Fury. Because the set screw is not removed, there is no fumbling around for small bits that can get lost in the grass. Once tightened down there is no rattle. This fitting is a little clunkier than some but that is compensated for by its convenience. The Fury doesn't need the extra strength, but these struts make the wings quite rigid.

Figure 2.



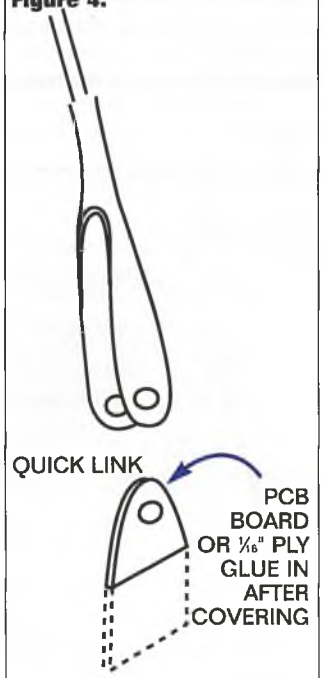
Fitting 2 is from Dave Hurrell who used it on his Halberstadt fighter, in the Traplet plan book. The fittings are pretty easy to make but what is really slick is his method of holding everything in place with the incidence wires. These form an 'X' and by springing them in place (the cross over is soldered) the four ends of the struts are held in place. You do need to be careful as any mis-alignment makes the wires difficult to insert. If that is the case, consider short lengths of fuse wire. They will be in shear and so quite strong.

Figure 3.



Fitting 3 is the classic. Easy to make and strong and rigid, it results in a lot of fiddly pieces that are a pain to deal with every day.

Figure 4.

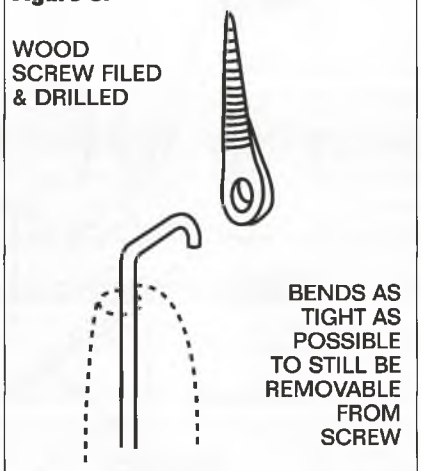


Fitting 4 is easy and convenient but the strut wood has to end a long way from the wing as the quicklink needs space to be opened.

This is a collection of most of the good sport ones. By that, I mean fittings for struts that are not going to use scale rigging. If you are going to rigging, then a system like the original is best. For now, let's look at the sport versions.

I divide struts into two categories - those that have to be solid as they are providing structural strength and bracing, and those that are just on for decoration. I prefer that the struts add to the airframe strength as otherwise they are just so much drag. All of these impart structural strength, some more than others.

Figure 5.



Fitting 5 can be used only if the other end is firmly attached, but it is quick and requires no additional hardware. A variation of this is good for cabane struts.

Figure 7.

Strut fitting 7 is drawn as for a light plane but this could also be used for 'V' or 'N' interplane struts. Struts that can be sprung into place can dispense with some of the nuts and bolts that are often the bane of the scale modeller's existence.

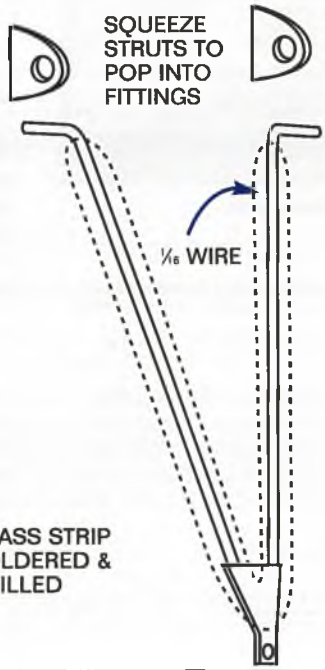
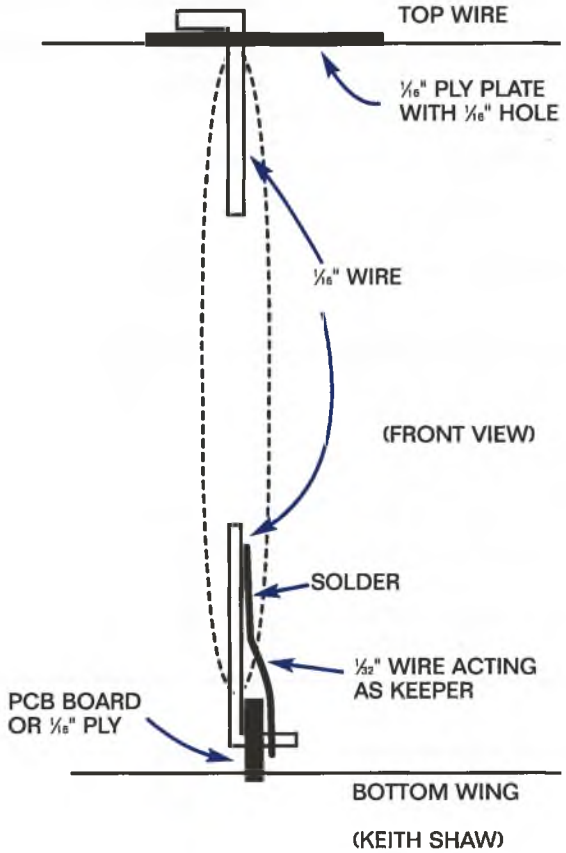
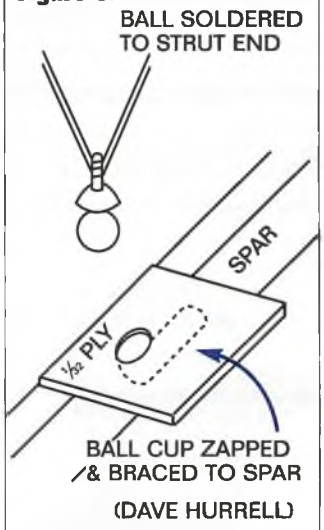


Figure 6



Fitting 6 is a combination of something Keith Shaw uses on his Stearman (bottom of the drawing) and an idea I had some time ago that may be someone else's too! The top of the strut is a 90 degree bend in 1/16"wire which fits in a slightly oversize 1/16" hole in a ply plate in the top wing. The strut plugs into the hole and swings down 90 degrees. The plate now holds it in place. The bottom plugs into a lug projecting from the wing and is held in place by a length of 1/32 wire bound and soldered to the strut wire further up. This acts as a keeper to prevent the strut from vibrating out.

Figure 8.



Fitting 8 is also from Dave Hurrell. He used it on his Tabloid I believe. I wouldn't trust it for much strength but I must admit that it holds the bottom wings on my little Nieuport 12 very securely. I have drawn it with a 'V' strut, like the Nieuport, because otherwise it would rotate and so be unsuitable for single struts unless pinned in some way.

Like the series on structures, this only scratches the surface of possible solutions. Modellers are wonderfully inventive people so I would guess that we could triple the number of ways of attaching struts shown here.

Now go and build! **EFI**

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MANFRED MALTEN

Fans with Formulae

Part 6: Basic Theory and Practical Tools for Design and Construction of your own EDF units.

Power to all our Fans!

So far we have waded in basic theory along a predetermined Scope Of Work, which for your convenience is repeated here together with intermediate results which we need to proceed. This avoids having to spread out umpteen previous issues for bits of info necessary to go on. One concession though - for units and designators the 'box' contained in the July 98 issue of EFI ought to be opened next to this, as repeating it for every article would inflate the series beyond reason.

Scope Of Work, Constants

T = mdot * (c4 - c0) = 3.5 [N];
c4 = 40 [m/s]; c0 = 0 [m/s];
Rho = 1.2 [kg/m^3]
Pi =π = 3.1415

Derived results:

mdot = T/c4 = 0.0875 [kg/s];
Vdot = mdo/rho = 0.0729 [m^3/s];
A4 = 0.0018 m^2
d4 = 0.048 [m] = 48 [mm]
As = 0.0027 [m^2]

ds - 0.060 [m] = 60 [mm]; rounded to account for cross section of rotor and stator which obstruct the flow to some extent.

These are some of the ingredients which we need for the next design step, i.e. to calculate the necessary input power and to determine other operating conditions for our electric motor.

Input power

A ducted fan is an energy converter, and so is the electric motor which drives it. Together they transform electric energy supplied by the battery into kinetic energy contained in the airmass leaving the tailpipe.

On this planet all conversions entail losses, meaning that we have to invest considerably more electric energy than we eventually harvest in the form of thrust and speed.

As these latter two are our design goals, we best start from what we want to have and backtrack the conversion process from the nozzle all the way to the motor leads. Starting with the required input power to the rotor, this will allow us to select the required motor with some degree of confidence.

To commence: As in a bicycle pump, the air contained in the cylinder does not voluntarily move out at the business end, some pressure has to be exerted. The faster we want it to exit, the more pressure has to be applied. The exit velocity achieved is a direct result of the difference between the pressure inside the tube and ambient pressure. Of course, once the piston hits bottom that's the end of it, a new load of air has to be admitted for another stroke.

Inside an axial compressor, of which a one-stage ducted fan is about the least sophisticated version, this admission of air occurs continuously, and instead of an outside force applied to the piston the pressure build-up has to be effected both in the rotor and in the stator (or flow straightener as they are sometimes called).

The pressure rise achieved together with the nozzle area determines efflux velocity, it also determines if and how much the exit cross section can be reduced before backpressure causes the rotor to stall. If you happen to have access to an EDF equipped model you may want to perform this little experiment which is likely to destroy some illusions. With the system in operation, approach the exit opening with one open hand while holding the other some distance in front of the intake so as not to obstruct the inflow of air. Even before you actually cover the nozzle you will feel air coming back out of the intake, a sure sign how little backpressure it takes to upset the system and that there is not much pressure available to play with, which underlines the importance of avoiding losses in the ducting.

Necking-down of the nozzle therefore is of only theoretical interest to us, it only comes into play when the fan unit provides an excess of thrust and some of it can be sacrificed in the interest of a higher flying speed. With electric impellers, especially in the small and economy class, we are far from being able to afford any sacrifices. We therefore design a constant area type system, wherein: Ao = A4. And it goes almost without saying, that there is no use in trying to get in more air up front than can get out at the rear, meaning that the funnel shaped or exaggerated 'elephant ear' side intakes one sometimes sees are as unnecessary as any gaping hole front intake in a straight through system. They do nothing but increase the frontal area and thus increase drag.

The necessary pressure rise is proportional to the exit velocity and to the airmass being moved and can be calculated in the following steps:

{1} dp = 1/2 * rho * ce^2 [N/m^2]; pressure difference dp [N/m^2] between entrance and exit is one half of air density rho [kg/m^3] times the square of exit velocity c4 [m/s].

This pressure rise has to be performed continuously on all air passing through the duct, i.e. on volume flow Vdot every second. The product then of pressure rise times volume flow constitutes the yield of the compressor stage comprised of rotor plus stator.

Because this conversion process is not one hundred percent efficient, motor shaft power has to be correspondingly higher to cover the aerodynamic losses of the system, i.e. by the efficiency factor etaDF of our one stage fan, which is defined as:

{2} etaDF = dp * Vdot/Ps [-]; which can be solved for the motor shaft power Ps [W]

{3} Ps= dp * Vdot ~ 1/etaDF [W];

The motor itself is not one hundred percent efficient either, i.e. it takes in more power than it delivers at the shaft, how much depending on its electric (resistance) and mechanical (friction) losses, as expressed in its efficiency factor etaM [-].

{4} Pin = Ps/etaM [W]; cast in one formula, electric input power then finally becomes

{5} Pin = 1/2 * rho * Vdot * ce^2 * 1/etaDF * 1/etaM [W];

With this formula developed we come to an important point in our design process. We either stay realistic or even a bit pessimistic concerning fan and motor efficiencies and by this self-restraint earn a chance to come out better than envisaged, from which aircraft performance can only profit. Or we deceive ourselves in assuming values beyond reach and thus pave the path to disappointment or even failure.

Ducted fan efficiency etaDF

Let's face it - our one stage compressor has little chance of beating any world records. Due to its small size, all the manufacturing toler-

ances turn out huge compared to a full size fan engine. To pick out only one source of losses, we may well keep the tip clearance to better than 0.5mm in our 60mm fan but this would still compare to about 15mm in a full size fan, and clearly the big ones do much better than that. We therefore can never hope to match their efficiency.

Over the years I have checked up on a lot of small, home-built electric ducted fans, both by making my own improvised thrust and velocity measurements at meetings and by taking the word of model builders who I know are "on the level". I fed these data into my computer and evaluated the EDF for efficiency. To give you the result in a nutshell: In the small Speed 300 and 400 sizes, i.e. diameters up to 65 mm, overall efficiency very rarely approached 45%, i.e. etaDF * etaM < 0.45.

Taking motor data published by the manufacturers for granted although some may well be suspected to be on the optimistic side, this would call for a fan efficiency of etaDF ≈ 0.6, which would be quite an achievement in this size. I would feel much more comfortable with 55% for the fan, and with etaM ≈ 0.7, giving the motor the benefit of the doubt - and change it for a more efficient one if it turns out to be a dud.

Ready for the shock? Inserting everything into {5} we come up with a necessary input power of:

Pin = 1/2 * 1.2 * 0.0729 * 40^2 * 1/0.55 * 1/0.7 = 182W!

Earlier we had foreseen 8 to 10 elements in the battery both for lightness - BEC possible - and for reliability, 12 V being the safe limit anyway for 3-coil armatures. Considering the voltage drop under load and assuming 1V for each cell, Pin - 182W would mean motor currents between 23 and 18A.

An input power of 182W is certainly asking a lot of a 115g ferrite motor, but as the batteries to be used for this size fan unit and aircraft are either 500 or 700 mAh, maximum 800 mAh, in other words, have capacities from 30 to 48Amin, flight duration with currents around 20A would be from 1.5 to 2.5 min only, which would keep the heating period down for the motor, but also be reason enough for disappointment.

Luckily modern control units allow to reduce power after the initial burst which is necessary for a safe launch. This can be done the sooner, the lighter and cleaner the model is built and finished. This will extend flying time, and close to 4 minutes can therefore be achieved.

Accepting the importance of building light, the high input power becomes tolerable because it will allow the model to gain height immediately after take-off, then throttle back, turn around, use altitude and gravity for acceleration for an impressive low pass over the field and zoom up to altitude once more. Duration and a dynamic flight performance depend a lot on judicious stick wiggling.

For a lower input figure the alternative of course would be to reconsider the scope of work for a somewhat more modest efflux velocity like 35m/s. This may sound less exciting all of a sudden but there is some benefit in it.

The models we have in mind are small. Small models always look faster than they really are, so the flying speed obtained from 35m/s at the tailpipe may not look so much slower than that from 40m/s. Applying the 2/3-rule we may be talking about the difference between 23m/s and 26m/s of airspeed and the odds are that nobody will note the difference.

To facilitate the choice and to lead into the next chapter - below together with the original 3.5 x 40 layout are tables for two more alternative systems for comparison.

EDF Type Designator	**3.5 x 40**	**3.5 x 35**	**4.0 x 35**
thrust	3.5	3.5	4
efflux velocity	40	35	35
center body diam.	34	34	34
shroud diam.	59	65	68
exit diam.	48	55	59
Pin from 8V —> I[A]	22.8	19.9	22.8
Pin from 9V —> I[A]	20,2	17.7	20.2
Pin from 10V —>I[A]	18.2	15.9	18.2
phi 0.4 —> RPM [l/min]	32400	25825	25500

Interesting to note, that after swapping the figures both EDF 3.5 x 40 and EDF 4.0 x 35 require the same input power.

More interesting, the EDF 3.5 x 35 fan swells up in diameter by only 6mm compared to the EDF 3.5 x 40 but consumes about 3A less current for the same thrust, and reducing current consumption by about 15 percent certainly is an advantage not to be put aside provided we can accommodate the larger diameter.

Decisive however may be the very last line of the table, which has to do both with fan geometry and motor selection and lists the necessary revolutions for the fan. Obviously not too many motors are available which are able to turn a fan at the 32400 1/min required for EDF 3.5 x 40. We may have to come down a bit with our c4 requirement if we want to use an economically priced motor.

With this last line we have transgressed however already into the next chapter, so we will delay the decision concerning what to do with c4 simmer until next time. **EFI**

DERECK WOODWARD

Over Here!

Get more out of your flying and get more out your models too by putting a little more into them.

On the other hand - a 'true' scale DVIII? This is Keith Shaw's 1/4 scale version at KRC 98 - nearly seven feet (2.1m) span with a 26"(660mm) prop. Model is 'scale' down to the offset fin as per full size. Keith's research indicated that the type was not very fast, until he saw a 'late production' rotary powered DVIII fly at Rhinebeck Aviation Museum, and go vertical for several hundred feet into a torque roll. Here, model attracts all of Keith's considerable attention to landing at KRC 98

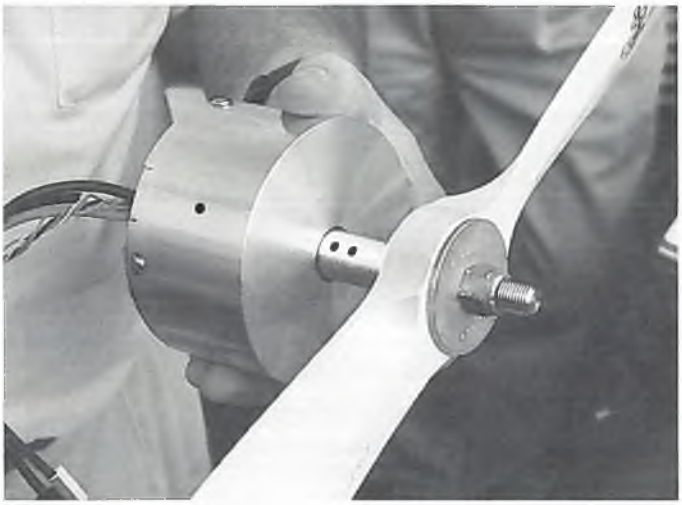
The weather "Over Here" was kind well into winter - making up for the spring gales that totalled many weekends. One Sunday in late November, we expected to be frozen off the field, instead we flew all day in a pleasant near calm. While this maintains proficiency over the winter - much better than crashing a model due to being rusty post-winter - a down-side is that the old nails get hammered more while the new ones don't get built as it is too nice to stay home. For example, my Longster Wimpy is showing wear from two years of constant flying; even her wheels are sloppy on their axles

Thumping down onto our somewhat rough field takes its toll! Wimpy is due for new wheels and UC, and Pandora just got a great new composite undercarriage - would you believe a holiday souvenir from England? They are distributed by Chris Foss Designs, under the name 'Alpha Wing', are made in England and come in four sizes. I've got a 'small' on Pandora and a 'standard' on the 'Four Star 40' - and are curved, somewhat like the Sukhoi aerobatic types use. They are made from a gray material and really work - the one on the Four Star takes rough grass landings of a near six pound model with ease.

I picked mine up from 'Hobby Stores' near Cambridge, they are well worth looking at too, especially if you share my dislike of wrestling with wire gear, which changes shape after the first landing. Not cheap, but I have a feeling they could outlast some models!

Working indoors

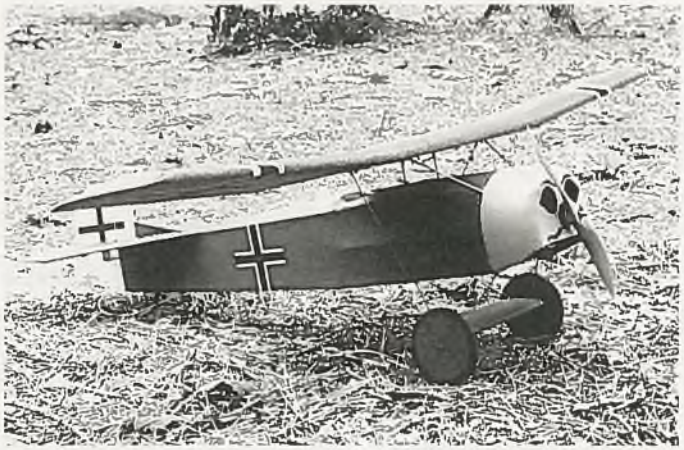
The new project is now more than just numbers and ideas! Somewhere handy - snappily titled 'Fig. One' - is the new design. The side view is of the symmetrical sectioned 'hotter wind', I might make the eight cell version as a 'flat top' to move the project along. Another idea is to get some tapered



▲ This is the new MaxCim brushless motor from Keith Shaw's DVIII - there are only three in existence. Keith Shaw flies one on 36 cells in the Fokker DVIII; Jack Sowle has one in a Goldberg Sukhoi and this demo! Apart from a mount at the rear, this is it - direct drive at around 4,000 RPM. Power, as a certain carmaker says, is "Adequate". More details when forthcoming.

foam cores and part sheet them, so it will build fast and still look like it has ribs. Tapered wings look neat on aerobatic models, rather than 'Hershey Bar' wings (another neat US term, for 'Brits' etc).

Wing section on the baby version is a 'real' Clark Y - not flat bottomed. This will allow a spot



▲ Pick an unmistakable prototype - then eliminate all its cranky habits! Bill Bowne's Fokker DVIII (more like a D7 7/8!) is instantly recognisable but the lower UC, bigger fin and rudder and dihedral turn a tiger into a pussycat. Bill reckons the Mini-Olympus geared S400 model even sounds good on low passes.

of inverted - 'Clark' has a 'Super' side to his boring image after all. The design is such that the low weight will be easily repeatable, so that seven cell lovers can join in the fun too. The fuselage will be like my Longster Wimpy, with an open framework of spruce longerons and balsa shorterons, with 1/64 ply front doublers. Not intended as a basic trainer, she will have enough performance to interest the experienced flier having a dabble in quiet flight, or be great fun at the upper end of the power range. Just have to build a couple now!

It's never too early -

If you live within travelling distance of Winston-Salem, North Carolina, highlight your 1999 calendar on May 1 & 2. This is a novel format - Saturday at the Mocksville site of the Winston-Salem RC club, near to local motels. Sunday, over to the Riverside Aeromodelers Club field near King, NC, with its superb runway. The contacts are Colin McKinley on 336-924-5890, John Mountjoy, 336-722-7609 and Randy Covington at 336-983-9126. Sorry - no e-mail addresses. The RAMS event is in its third year, so they have had a crafty practice! See y'all there (Sue will get me for that!)

The E-flight Attitude

So, you fly a decent aerobatic model, around 80 watts a pound or more and an undercarriage - try this. Slow up into wind to around your approach speed, at around forty feet high and far enough out so you can see what happens from the side. Apply full power, raise the nose slightly, pause, a half roll left to inverted and climb steadily. Did she cope all right? Yes - good, a half roll to inverted just after take off will quell any comments about boring electrics.

You just proved that your model will climb inverted off a half roll while accelerating from slower speeds. As the model doesn't know how high off the ground it is, it will do this at ten feet as well as at fifty. Practice is as above - raise the nose, roll over to inverted with minimum drag, and keep the climb angle and heading. You need a good feel for the model's reactions before reducing the air/ground interface to little. You might even read this, shake your head and decide not to bother. I put this trick together with glow models years ago, starting high and working it down to low level. But - not in turbulence, not at unsuitable sites and not if I don't feel up to it.

Knowing when - or if - you are ready for this is down to you, but it goes like this. Take a deep breath, check controls and get her rolling. Has to be a good start, to get the frame of mind established from the off. She's running straight and on full power, but don't rush the lift off - you don't want to get airborne with low airspeed into a steep climb, that will tend to cause her to roll some without much help.

Ease off the floor, accelerate and establish a positive rate of climb. Now half roll, release the aileron input and squeeze on the down, pretty much in one fluid move. Don't push all the way to get clear of the ground - a steep climb will kill that all-important airspeed and make life uncomfortable.

Keep just enough forward stick to maintain that gentle initial climb with wings level. Climb another twenty feet or so before establishing a steeper climb - I use about thirty degrees with Pandora and her 250 or so watts, the Four Star with around 700 will actually go vertical if I choose. I balance climb and speed to gain height and upwind distance, pull through to level and upright for a downwind roll sequence. Once she is thirty feet up, all she's doing is climbing inverted - and that isn't too hard.

On a calm day with a decent site, I have done this low enough for the wingtip to be around two feet off the ground at the quarter roll point. That was at the Prince George's RC site, with a runway to give me a line to fly, no turbulence and smooth grass. The 'goofers gallery' thought she was rolling in without my help, but that club has now stopped regarding electrics as something for slow old gliders. From there on, it is back to whatever aerobatics you fancy. A last thought - I used to do this with glow engines, and it is much more exciting knowing that the engine could stop at a critical moment!

We all need one

Even though I have been accused of spending little time 'straight & level', I usually have a 'relaxer' model. My Longster Wimpy is ideal for ambling around the patch when it is calm, and will stand the odd loop or roll when boredom strikes. Mostly, I like low fly-by's when the pilot's scarf can be heard banging on the rear decking (took us a while to figure what the noise was!).

Choices - vintage/old timers can be a handful, being designed for free flight thermalling, not flying landing patterns. The current trainer conversions are good - led by Sig's LT25 on ten to sixteen cells - and being enjoyed by skilled pilots. But why not build a scale model? Pick a type designed for economical single seat flying, as these translate well to model sizes. Stick with a simple monoplane, forget rivet counting, search for the 'atmosphere' of the full size - and you're a scale pilot!

One of those quietly following this route is John Swetland from Duluth, Minnesota. John's models have appeared at several northern fly-ins, but I don't know if he has published any yet. I'm working on him

▲ Bill Bowne's grass and transmitter give scale to the 'bones' of his cute little Fokker DVIII. All balsa, spruce wing spars, waiting for a Litespan wrapping.

▲ **John Swetland and his delightful large scale Aeronca C-1 for Astro 15G and twelve cells. Two piece wing spans 88", comes off in two halves for transport, tailplane detaches too. She hasn't got her dummy engine yet - one of electric's great advantages being one can test fly a model like this, then add the more delicate detailing to an airframe that isn't soaked in oil.**

though! His Aeronca C-1 is remarkable in many ways - for starters, it is not a small model at 88" (2235mm) but the wings are two piece and are held in place using CF rod joiners and functional rigging wires of 36lb (16kg) braided fishing line. The tail surfaces come off too, with two socket head screws and links for the four closed loop control wires.

The wingspan is 'MAA Legal' if that does anything for you - but the power is all of 12 cells! Thanks to Astro's versatile 15 on a 3.69:1 Superbox, this swings a 16 x 6 prop. If you're not familiar with Aeroncas, they are just 'big models' and John bears this out by flying her plenty - no hangar queen for occasional competitions. If you are familiar with the type, I bet you identified her right away and John likes them so much that he also has a Speed 400 version!

E-fliers collect models! When I flew glow, I never 'filled up' my four model memory transmitter - on Thanksgiving Day, 1998, I had six ready to go electric models, one more just needed radio fitting and the Kolibri indoor was only minus a servo. Electric sports models last longer! John too adds models as time goes on, while the older ones fly on too. His 'Parapolska' could be a 1930s sports aircraft but is a freelance design. A Graupner S600 on a 3:1 box lifts this 66" (1676mm) span, 50 oz (1.4kg) model with 650 square inches (42sq.dm) on nine cells.

Notice how big the 'airframe' numbers are? And how small the 'power' numbers are? His next project is the evergreen 'Pietenpol' - 81" (2057mm) span, quarter scale and also for a Superbox/Astro 15 combo. Hopefully John will publish - he seemed uncertain that anyone would be interested in the Aeronca, for instance. Half of the US e-fly scene maybe? Hopefully, folk would build from published plans as John intends - 'wet' power has a long tradition of 'improving' models by upping the designer's flying weights, to the detriment of flying qualities.

At the other end of the scale -

If you fancy a scale model but don't want the hassle of fat fuselages, high undercarriages and small tails - change them! It helps if you pick an aircraft that is easy to recognise - which is the route Bill Bowne went with his Fokker DVIII parasol. I did one of these to true scale years ago and it was a little piggy to keep upright on landing, Bill figured this and shortened the UC legs, amongst other 'scale sins'.

▶ **Another of John Swetman's demonstrations that a little power can haul a lot of model - 'Parapolska' (Loosely 'Polish Parasol' - I think!) is 66" span for a geared Graupner S600. All red film finish with Polish chequered markings. Hiding in the long grass behind her is another of John's 'own designs' - I don't know much about it, but imagine a tailless Lazy Bee...**

The result is instantly identifiable, handles good on the ground and airborne and makes Bill happy. Mission achieved! If it looks familiar to long time UK modellers - the dear old Veron Fokker DVIII kit had many similar 'fixes' applied to it in order to come out with a good flying three channel model. Come to think of it, I bet that one and it's sister kit, the Sopwith '1-1/2 Strutter' would convert well to electric - anyone know of one 'Over There' (from here, that is).

Vitals of Bill's Fun-cker DVIII - 245 squares (16sq.dm), 21 ounces (595g), S400 6V on a Mini-Olympus gearbox and an APC 9 x 6. Electronics are a Futaba AM set with Viper ESC and a pair of FMA sub micro servos. Structure is all balsa - 1/8" (3.2mm) square longerons, with minimal 1/16" (1.6mm) sheeting, though the wing spars are 1/8" spruce. Interestingly, the cowl and UC sub-wing are carved from blue foam. Those convincing wheels are 1/4" (6.4mm) balsa on bearings from pushrod tubing, with a little thin ply at the centres. Covering is all Litespan, including the markings.

Bill did mention saying some naughty words as he assembled the model in a jig to set up the struts for the centre section. Test flying was done without much scale detail fitted, not being sure how long the model might last - but he reckons it is easy to fly. Once sorted out into a safe, reliable flier, she got a pilot, scale guns and so forth.

Unlike another DVIII, which became an awesome celebrity during 1998, this one gets by on 8.5A and seven cells. Not a lot, reckons Bill, at some 48 watts/pound but it flies fine though not too much in the way of aerobatics.

Or just build what you fancy

Like Jim Poynter did. Let's run through 'EMFatic' - a different model, if ever there was one!

The wing is a conventional balsa and spruce structure with a flat centre section and dihedral on the tips. It is four feet (1220mm) span by 12" (300mm) chord - Jim prefers the hard sums to be easy. That intriguing inverted 'V' tail is a top hinged open frame of balsa permanently attached to 5mm carbon fibre tube booms - these are glued to the wings, the tail servos being mounted in the wing up against the booms.

The fuselage is pretty much just two rails to secure the motor, gearbox, undercarriage and nicad and is removable. This enabled Jim to fly a variety of nicad packs, finally ending up with a 10 x 1000mAh pack and a 10 x 8 Master Airscrew wood/electric prop. Handling appears pretty normal, according to Jim. No further reports, but this model proves that you don't have to stick with the good old order of things to have fun.

Finals

If there's a lesson from these models, it is that designing one's own is not that hard and it gives a lot of satisfaction. Once you have mastered the skills of flying and have a few models hanging from the shop walls (and a few more in plastic bin liners, if unfortunate!), take the building skills you have learned and cross your favourite type's shape with a known good flying model's 'numbers' and join the fun. After all, there are so few electric designs around compared to the oily brigade. Why not add to that number?

On the taxiway

We modellers are great at re-inventing the wheel. I go out with my fleet every weekend; fly them with the same guys who are still wondering why they perform like they do. Despite my gear sitting out there in full view, they still have to beat along the path I have just dragged myself along.

▲ This is a beautiful sky - it's blue, the sun shines, the breeze barely stirs the leaves and there's a model aircraft quietly flying across it. If it wasn't for the aerial, it could be a full size Aeronca though it is John Swetman's 88" C1 version on a low pass (a fast one perhaps?).

Guess I am the same - Peter Wilson's Westland Whirlwind plan sits in my shop as I dream of two geared Astro 035's onto a Sig LT25 - I could build a Beaufighter or Mosquito straight away, I'm the only one stopping me.

There's method to it though - some of the local glider guiders fancy being aerotowed, and this would give me a neat twin and a model that will not balk at a glider on a string behind it. The LT25 is a good flying model too, one reviewer even suggested that it is really an electric model in disguise!

So maybe we do re-invent the wheel. But while you're doing it, try and make it a little better perhaps? Maybe we sports fliers might be the "trailing edge of technology" but we are having a ball back here.

Congratulations

- To John Ogier, who flew an electric model in the 'Standard' aerobatics class at the 1998 Nationals. This could well be a first - marked by a brief appearance in another magazine, with minimal details. Mostly, in an event where models are very 'same-ish', John's model is a yellow canard! It is pretty big, so must have more than seven cells, the prop is on the nose and it's a taildragger. We need more details - does anyone know this pioneering fellow?

Back next month with whatever is going on quietly in sports flier land. As always, your contributions to: 11159 Captains Walk Ct, N. Potomac MD 20878 or Traplet Towers, whichever comes handier. **EFI**

▲ Jim Poynter's EMFatic is, well, different! 48" model actually flies quite normally, not that highly powered but you wouldn't mistake this one in the pits. Model is a mixture of balsa and CF tubing, power is a Graupner S600 BB on a 2.5:1 gearbox.

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