

Electric Flight

INTERNATIONAL

MARCH 1999
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**SCALE
BUILDING
TIPS**

21st century model building

Electric Instruction

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CONTROLLERS

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PLUS MOWTA 5 AEROBATIC & GASKIBUG EDF PLAN REVIEWS
AND AVRO VULCAN EDF DEVELOPMENT

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Electric Flight

INTERNATIONAL

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Editorial

**Model goods costs, are we being ripped off?
Safety precautions we should take and how do you build?**

Safety warning

We tend to believe that electric flying is so much safer than some of the other model flying routes that use volatile fuels. I'm sure it is but there are still dangers and need for caution – sometimes, great caution.

Recently one prominent British model flyer sadly suffered the loss sight in one eye. His reaction is remarkably positive, he has said something like: "Lucky really, could have been both, please warn others who use lead acid batteries."

He was handling a lead acid battery, the terminals were shorted and the battery

exploded; some part or parts were blown into his eye. No modellers handle car and leisure batteries more than electric flyers. We so frequently pick them up and of course our heads are immediately over them and only an arm's length away. We also fit connectors or clips to them frequently and our faces are sure to be close and our eyes open and looking at the battery. This happens every time we charge them for use or use them for charging our flight power packs.

Yes, OK, you have been doing this for years and have never even heard of an acci-

dent, until today, let alone experienced one. Don't have one. Learn from the mistakes of others. If you proceed with care you never will have a problem. Take precautions, this is easy when you know what the dangers are.

The above accident has brought forth a flood of tales of 'accidents' with lead acid batteries. None of these report anything as serious as the loss of an eye – but they could have been. So where are the dangers?

Big explosions and minor bangs are reported. This is the ignition of gas, probably a mix of Hydrogen and Oxygen and most probably generated and given off during charging but always there. To ignite this we need a spark, almost unavoidable as we connect but the worst (biggest) sparks occur as we shakily attach spring clips to the terminal posts on the battery. Attach positively to reduce this but most of all try to eliminate the presence of gas. Be sure that the screw-in

plugs are screwed in. Replace any broken ones. Dispose of batteries with cracked cases that may leak gas and most important NEVER connect to a battery that has a plug removed or missing. Lead acid batteries 'gas off' as they are being charged (or probably over charged) so I shiver now that I remember how many I have seen in private and commercial garages with the caps removed during charging, so that they can gas-off into the atmosphere. Whenever charging, ensure adequate ventilation.

Other reports are of explosions of batteries triggered by sparks from welding nearby and battery caps popping out during 'jump starting' vehicles with inadequate batteries, where the currents demanded from batteries would make even an F5B flyer wince.

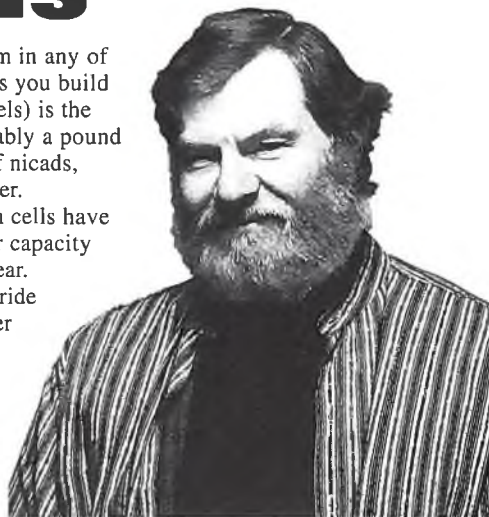
Potentially dangerous? Yes, but it need never happen. Eliminate the possibility by taking head of all the "Do not's" above. Happy Flying.

Fuel Cells

The heaviest item in any of our models (unless you build really strong models) is the power pack, probably a pound or two or a kilo of nicads, maybe even heavier.

Nickel Cadmium cells have got lighter or their capacity greater, year by year. Nickel Metal Hydride cells have a greater capacity for the same weight and the newest of these are OK for all but the more demanding motors. There

are better rechargeable ones like Lithium et cetera, that are available but not commercially viable to the regular flyer. 'Fuel cells' fit into this category too.



Scientists have been making fuel cells for years to supply us with electric power for space satellites and more mundane products like motor vehicles. Reports of 'revolutionary cheap power' have been leaking out for years but nothing that WE can use has yet been made available.

These new cells that could replace our batteries at a fraction of the weight may be with us soon. When research gets taken away from scientists and handed over to development engineers or chemical engineers the green light that we can see begins to grow a little brighter. These fuel cells are rumoured to be available in the not too distant future for a man carrying electric aeroplane. Small fuel cells of possible use to us, with a higher capacity

than that of nicads may soon be available to us. I wonder what the price will be?

Prices

This is about prices of other things, or to be more correct – costs. Every reader in Europe must be aware of the 'Euro' – whether his country is inside the system, like most European countries or outside it, like the UK.

There is no politics in this written note (I would not dare!) but it is an observation of costs – to us, for our goods. The fuss over the Euro has made so many of us aware of the complications of currency exchange and differences in 'values' or costs or prices

between countries. This note applies equally to those well outside the system, like those who live in the USA or Australia. In fact the differences are more apparent in these countries – or continents if I may be permitted to attach Canada and all of South America to the USA (I did not do much geography at school).

It is just that the Euro and the arguments for and against joining the system make cost differences more apparent. It is now so easy to compare price differences in different countries without the arithmetic. Those amongst you who check prices in magazines from different countries or travel abroad and visit model shops (always top of my 'Places To Visit' list, just ahead of aviation museums and art galleries) will have noticed cost differences and grabbed any items you thought were cheaper you will have avoided items more expensive than those at home.

A lot of readers in the USA have noticed that imported magazines like *Electric Flight International* cost about twice as much as magazines published in their own country. The same is true for USA published magazines imported into the UK. If you check the cover prices of each and check the exchange rates and do the sums, each costs about double on the other side of the pond – whichever side you are on. The conclusions must be obvious, the publishers are not ripping you off, the price increase is due to the cost of transportation and everybody handling it on the way has to have his cut, we all of us have to live.

The EEC has made most of Europe into one big trading area, no import or export tariffs and this is intended to foster no preferential treatment and no unfair trading. There is even legislation to make all this 'fairness' work. Back to square one – it is so easy to compare prices.

"The grass is always greener on the other side of the fence." There are always better prices – somewhere. You will always get better service – somewhere. You will find that there is a dealer who specialises in your particular sphere of interest – somewhere. You may even find that there is a dealer who stocks everything you need – somewhere. If you live

near one of these, you are lucky. If you live near a dealer who is all of these, you are one of the luckiest model pilots in the world.

If you don't, it will cost you – something. It may cost you time, or convenience, or frustration, or money. Money/costs/prices started off all this script. Compare prices and then work out the costs to yourself. You may spot a 'good deal' in a magazine or hear of it from a friend. If it costs you £50 in petrol to drive there to save £10, was it worth the trouble? Even if it cost you £50 in petrol to save £50, was it worth the lost day spent driving?

This writer once paid a premium for a guaranteed one day Air Freight service. I thought the goods were lost. It cost a small fortune in telephone calls abroad to the supplier and to the airline and to the courier and to Customs and Excise and to the shipping agent at this end. The 'one day service' turned out to be 51 days and a hefty sum to pay the postman at my door for Import Duty. Imagine my relief to get all these model goods at last. This relief was however brief, three out of six model kits were damaged and no recompense was ever received from the insurance company or the original shipper. Add that up: original cost plus transport plus telephone calls plus import

duty. Lost time that could have been spent doing other things for 50 of those days must be considered too, plus loss of faith of others who expected some of those kits must have cost something other than money. There is a lot to be said for buying what you need from the shop in your town.

If you Mail Order from abroad, do all the sums. There may be costs for shipping (postage), export duty or tariff, import duty, Value Added Tax (sales tax) and you may have additional charges by your bank for currency exchange and for bank transfer of funds and/or for handling cheques. The fees charged by so many persons and organisations for handling my chunk of money does not cease to amaze me, every time I import a model flying item I cannot buy anywhere else. There have been occasions where peripheral costs have exceeded the price of the product – so I pay more than double.

When everything is priced in Euros it will be even easier to compare prices and evaluate costs but consider all the additional costs as well.

If all other things are equal it is reasonable to suppose that real costs to each of us will level out, the further from the source that you live, the extra price YOU pay is for transport. This can only apply to European countries within the

EEC. The same must apply within the USA. It is when companies or persons within these groups trade outside the group that complex international tariffs muddy the waters again. We cannot ever have a truly level playing field; the costs to each of us everywhere will not be the same but the prices to each of us will be fair.

Your Views

You will of course have read the Contents pages, to see what you are getting this month and where is your favourite column. I would like you to contrast the availability to yourself of different building techniques and materials. Check Ian Monty's views about model construction in 'Design Philosophy' with traditional techniques used by others, like Martin Irvine's methods for building models of 85 year old aircraft and materials used by others for EDF models of very recent aircraft. You can use very new techniques or very old techniques for building scale models of both 100 year old originals or this year's fastest combat aircraft or newest airliner. I would like your views on this..

This Month

You may have noticed in the last few issues the 'Guidance' articles, some for beginners and some containing information that may be of value to the more knowledgeable. 'Electric Instruction' is a new mini-series written by Christer Eklund that will provide valuable information to model flyers already well versed in model flying but new to electrics. It will enable them to select appropriate power trains or enable them to design models appropriate to these power trains.

This editor is still asked frequently by IC flyers: "What is the equivalent of an X size motor?" ...and so I ask them: "Start at the beginning, what type of model do you want? How big is it? What is it likely to weigh? What do you want it to do? The IC engine may not have been an appropriate and efficient way to use the power it was developing, let's get it right this time," and I am asked again "But what is the same as an X engine?" I hope that this series will make it easier for you.

I know how some of you find it easier to juggle numbers and end up with finite sizes and numbers for every dimension of the model and every component. Some of you find it easier to 'see' the tasks an aeroplane needs to perform and see lumps of energy and what they can do. Some of you just wish to be told to use an 'A' motor with a 'B' prop and 'C' number of 'D' type cells for an 'E' model and it will fly.

There will be in *Electric Flight International*, series after series for beginners. One or other series will be easier to understand for some of us. This series by Christer is bent towards those with some understanding of mechanical engineering. Even your editor is understanding it so far and his mechanical engineering almost stopped when he left school a long time ago so it should make things easier for a lot of you. If it does not, check through some back issues of wait for some more. However you think, one of our mini series will make it easier for you. **EFI**

Current Affairs

New components and models, especially for the Slow Flyers.

Hacker Model Production

MacGregor Industries are now importing into the UK the new range of Hacker Model Production kits. They offer a wide selection of Almost Ready to Fly (ARF) and Almost Ready to Cover (ARC) RC kits, but there is also a nice collection of small scale rubber kits which cry out for RC conversion, using micro radio. With over 20 kits in the Hacker range there are far too many to reveal all at once, so this month let's just focus on their glider and electric glider kits, extracted from their press release:

Timothy

The smallest electric glider in the Hacker fleet, the 1.5m (5') Timothy offers good performance from a basic, low cost electric set-up. You'll need a Speed 400 size motor, a seven cell pack and, of course, a three function (minimum) radio. Of all wood construction, Timothy is ready covered in conventional heat shrink covering, so any repairs can be easily fixed without great expense. Adopt a Timothy for just £79.25 rrp.

Sting

This sleek fibreglass bodied machine spans 1850mm and zips into the air with any good Speed 400 class motor, and a 4:1 gearbox. As with all Hacker ARF kits, Sting's flying surfaces are pre-covered in a popular brand of heat-shrink film, so any bubbles or wrinkles that may develop can be shrunk away with just a few strokes of a heat-gun or iron. A snazzy graphic sheet and a bag of accessories top off this great value for money kit, which costs just £90.80 rrp.

Erebia

Perhaps it's just as well that Erebia sports high vis 'spotty' graphics, as it will soon climb

to a dizzy height using any standard Speed 500/600 motor and 7 cell battery combination. The biggest electric glider in the Hacker series, Erebia spreads her wings to 2080mm. Like Timothy, she is of all wood construction and comes ready covered in white heat-shrink film. This provides a great base for the 'spot' stickers provided, or you can add you own. Let your imagination run riot! Erebia costs £104.60 rrp.

Look out for the distinctive red Hacker kit boxes at your local model shop. In case of difficulty, please contact MacGregor Industries on 01753 549111 for details of your nearest Hacker stockist. The full range of Hacker kits can be viewed in the latest MacGregor Industries 'Retail Price List & Information Sheets'. To get a FREE copy, simply send a 73p stamped addressed A4 envelope to:

MacGregor Industries Ltd.,
RETAIL PRICE LIST, Canal
Estate, Langley, Slough,
SL3 6EQ.



▲ Sting



▲ Erebia kit of parts.

◀ Erebia.



▲ Timothy.



▲ Minicraft Orbital Sander (IMB5611).

Orbital Sander

Small power tools may not have originally been intended for model builders but they certainly are useful to us.

The new Minicraft 100 watt Orbital Sander has what they call a 'unique pen grip'. You will see from the photo that it is fatter even than a Mont Blanc pen but what is important is that you can grip it between forefinger and thumb for delicate pen-like work. There are many final sanding jobs on a completed structure that require a small sanding block that is difficult to manoeuvre without colliding with something else. If you need to, this tool may also be used in palm or pistol grip positions. The rubber base pad is flexible enough to accommodate some contour work. Change of sanding pads is quick too, they have velcro backs.

Weight is 500g (18 oz) and pad size is 68 x 48mm (2.7 x 1.9"). RRP in the UK is £39.99 and coarse or fine pads cost £2.99 for 5. For free catalog and list of stockists call 07000 646427238.

Servos

They are still getting smaller and better! There some extremely small servos for the smallest exotic indoor models that remain expensive but the affordable and available ones are getting smaller and better. There are not so many servo manufacturers in the world so we often see the same servos with different brand labels. If you wish to be sure that a servo is compatible with your Rx, buy the same brand and you know that the connector/plug will be sure to fit too. Graupner (JR) have just announced their new 'smallest' servos. Prices quoted are in Deutsche Mark, if you have not already done so, please read the 'Prices' part of this month's Editorial. The zero in the type number means that it is ball raced for increased torque and rigidity at a slightly higher weight and price. Each has 45° movement each way.

Servo	Pico	Pico	Pico-Power	Micro Power	Micro Power
	bush	BB	BB	bush	BB
Part No:	5114	5116	5118	5125	5117
Idle current	4mA	4mA	4mA	4mA	4mA
Max current	0.63A	0.66A	0.75A	0.44A	0.96A
Torque	6.5Ncm	7Ncm	10.5Ncm	15Ncm	17Ncm
Speed	5.4g	5.6g	6.2g	8g	10g
Size mm	23 x 10 x 16	23 x 10 x 16	23 x 10 x 16	23 x 11 x 16	23 x 11 x 16
(LxHxW)					

Catalogs

You could be forgiven for thinking that these items deserve to be in 'A Good Read' - the book reviews column. I must confess I was tempted to include them but they are not books, they are catalogs of model goods. Of course, all the items included are not new but this is the first time that new items have been included in

▲ 'Modellers Handbook' by Ripmax.

these publications. Each of these catalogs includes some brands exclusively imported into the UK by the name on the cover and some goods are common to these and many other catalogs of importers, distributors and shops. The variety of goods is very broad and includes a lot of electrics. Publishing and printing is expensive and they are too big to give away.

The cover price on the SMC catalog is £3.95, for more information ring the hotlines:



▲ 'SMC Model Hobby Catalogue and Guide' by Sussex Model Centre.

(01903) 207525/233817/213723 or fax: (01903) 202933, international is +44 1903 202933.

Ask at your dealer for the price of the Ripmax catalog or telephone: 0181 282 7500, or fax: 0181 282 7501, email ripmax@compuserve.com or check the website: <http://www.ripmax.com> **EFI**



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 send 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.

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 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.

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 18th

F5D pylon racing in conjunction with F3D, Sport 40 and Quiet 500 at RAF Cottesmore, UK. Entries to Maurice Barker (01772) 431520 at least two weeks in advance.

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 9th

F5D pylon racing in conjunction with F3D, Sport 40 and Quiet 500 at Elvington, UK. Entries to Maurice Barker (01772) 431520 at least two weeks in advance.

May 9

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

May 13 to 16

F5B World Cup, Militky Cup, Pfaffikon, Switzerland.

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 10 mins from the M25, J3, close cut grass and no restrictions on airspace. Hot food and refreshments available on site. Entry will be £5 per car. All electrics welcome especially the ducted fan, scale and performance end of the spectrum. Entry will be by pre registration only. Odd number frequencies only. Registration will bring travel details, a map and list of frequencies. Contact: Brian Gaskin, 157A Main Road, Sutton-at-Hone, Kent, DA4 9HW. Tel: 01322 865701.

May 22 to 23

F5B World Cup, Oberpullendorf, Austria.

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.

May 29 to 30

F5B World Cup, Prato, Italy.

May 30

Spring Mt Trashmore Electric Fun Fly will be held on Labour Day Weekend, 1999. The event will be a one day meet, on the Sunday, but the field will be open on the Saturday (and we'll probably be there Monday, if you can't tear yourself away). The site is in Rockville, just north of Washington, DC, USA, with easy access from the Beltway via I-270. Being in a largely built up area,

there are plenty of the usual restaurants around, and even a donut shop across the street. No camping on site unfortunately, but there is a campground around ten miles away. We have one short tarmac strip, if the wind co-operates, and enough grass space to operate most types of electric sports models. The biggest model flown off the grass is probably Mike Stewart's 82" Spitfire.

June 6

Hayes DMAC Fly-In, Sunbury on Thames. Contact: Dave Chinery, 0181 573 4687.

June 13

F5D pylon racing in conjunction with Sport 40 and Quiet 500 at Middle Wallop, UK. Entries to Steve Wheeler (01920) 830147 at least two weeks in advance.

June 13

BMFA F5B League event. No venue yet! Contact: Mike Proctor, tel 01904 489386 or email: mike@mproctor.demon.co.uk

19 to 20 June

F5B World Cup, Praha, Czech Republic.

June 26 & 27

BEFA International Festival of Electric Flight, Middle Wallop, Hants, UK.

June 27

Chester MFC RC All Electric, Roodee Racecourse, Chester. Open Duration, Vintage, Scale and Aerobatic competitions. Enter on the day. Extended sport flying. Vendors by pre-booking only. Contact: C. R. Filtness, 26 Raymond Street, Chester. Tel: 01244 378476.

July 4

BEFA Carrier Event and Fun Fly, Sunbury on Thames. Contact Dave Chinery, 0181 573 4687.

July 4

Malvern Soaring Association Open Thermal and 7 cell Electrosport Contests. Open contest starts 10 am, Electrosport about 12.30 pm.

Pre-entry essential with two frequencies, £3 by 28 June, plus SAE if confirmation is required, to: Nick Neve, Eynhallow, The Purlieu, Upper Colwall, Malvern, Worcs, WR14 4DJ. Tel: 01684 561160.

July 10 & 11

Wings and Wheels Model Spectacular, at North Weald Airfield, Nr Epping, Essex. Two day spectacular includes displays of RC models of all types including jets, helis, boats and cars. Only 5 minutes from junction 7 off the M11 and easy route from A414 Chelmsford road. All enquiries: tel/fax 01684 562038 or 0836 297168. Designation Ltd, PO Box 102, Malvern, Worcestershire WR14 1LR.

July 11

BMFA F5B League event. No venue yet! Contact: Mike Proctor, tel 01904 489386 or email: mike@mproctor.demon.co.uk

July 17 to 24

(Provisional date) F5B and F5D Euro-champs, Karlsborg, Sweden, at a former military airbase. Karlsborg is about 200 km east of Gothenburg and 300 km west of Stockholm. Official contact: Bo Sjöberg +46 503 315 17.

July 18

F5D pylon racing in conjunction with F3D, Sport 40 and Quiet 500 at RAF Barkston Heath, UK. Entries to Maurice Barker (01772) 431520 at least two weeks in advance.

August 14 & 15

Inter-Ex 14, The Show for unusual models, Nederweert, Netherlands. Contact: Modelvliegclub Nederweert, p/a Schoolstraat 6, 6031 CW Nederweert. tel: 0495 460043, fax: 460044. Website: <http://www.wxs.nl/~jell/mvhome.htm> Email: jell@wxs.nl

August 22

Greenacres Model Aero Club,

Electric Fun-Fly, Walsall Airport, Off Bosty Lane, Walsall, West Midlands, UK. Signposted from Junction 9, M6. Pilots briefing 0930 hrs. Flying from 1000 to 1800 hrs. Entry £2 per Tx. Free parking. Refreshments on site. Trade stands welcome. Further details from 01922 404658 and 448873.

August 29

NATS Cranwell? (format may change) Contact: Mike Proctor, tel 01904 489386 or email: mike@mproctor.demon.co.uk

September 12th

F5D pylon racing in conjunction with F3D, Sport 40 and Quiet 500 at Elvington, UK. Entries to Maurice Barker (01772) 431520 at least two weeks in advance.

Sept 17 to 19

KRC, Pennsylvania, USA. Contact: Durell Leister Sr. 116 Falcon Way, Plymouth Meeting, PA 19462, USA. website: www.krc.org email: durrlyl@aol.com

or: jhickey@netcarrier.com

September 19

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

October 10

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

October 15 to 17

F5B World Cup, Open Swiss Nationals, Ambri, Switzerland.

October 17

F5D pylon racing in conjunction with F3D, Sport 40 and Quiet 500 at RAF Cottesmore, UK. Entries to Maurice Barker (01772) 431520 at least two weeks in advance.

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Second World Air Games. All types of flying including some model categories (no electrics last time). Further information on the website: <http://www.fai.org/wag/> **EFI**

Letters To The Editor

Some of you have views of your own and wish to express them. There are also messages that may be of interest to other readers. If you have any; post, fax or email them to the editor, to the addresses on page 2.

Sir,
Happy New Year to you all!
I've just read the editorial in the Jan 99 issue and have to say that I totally agree with the sentiments expressed about the flying at Olympia.

Shane Harding and myself were in attendance all week with our design Slow-Fly models, which we have developed over the last 6 months for F2A Supplies.

To say that they were well received by the public would be the understatement of the century!

After every slot (the flying was extremely well organised this year by Gary Rawlings of Ripmax) Shane and I were besieged by interested modellers. We could have sold our models hundreds of times over.

No noise, no choking fumes, just lots of relaxing fun.

We even managed to convert die-hard IC man Dave Horton (of Daisy Mae fame) to the delights of Slow-Fly.

He is now the proud owner of a Simprop Taube, which by his own admission, he has fallen in love with!

Julian Beckett

Below is a message from Robin Fowler, designer of the Bristol Beaufighter, a plan and construction article for which appeared in the December issue of Electric Flight International.

Sir,
Following the December publication of the Beaufighter design a few matters could do with clarification in reply to some comments made by fellow modellers.

1. I don't have trustworthy measuring equipment, so the calculation of the current drawn by the two Speed 400 motors was made by flight time and capacity of power batteries. The stated 10 amp draw is therefore the average over the flight and not the peak static draw, which is probably in the order of 16 amps.

2. The stated 1000mAh batteries are the smallest likely to give a satisfactory performance if you choose shorter flight times (5 to 6 minutes) and a lighter airframe. My choice was to go for longer flights.

3. I did not state that I could supply the plastic mouldings that are needed for the Beaufighter as I did for the

Whitley the previous month but I would be happy to supply a set for the princely sum of £15. The set consists of front fuselage and cockpit in clear, nose cap in white opaque, navigator's cupola and two bottom sets of rear engine nacelles in clear, and an updated pair of top sections which now include the above engine positioned airscoops in white opaque. The set makes for lightness and a great saving in time. My apologies for not making this clear in the article as I realise that this omission may have put some of you off building this great little model.

To further save both you and your valiant editor time and trouble you can write direct to me at: 25 Linwood Road, Ware, Herts. SG12 7JQ. On receipt of your cheque, name and address, I will get the set to you as quickly as I can.

Robin H Fowler

Sir,

I feel I want to drop you a line of encouragement and thanks on your mags 4th birthday. It is also a good reminder for me, as four years ago I was visiting my son at RAF St. Athan before Christmas and he took me into

Cardiff and in a shop I saw the first issue of Electric Flight International.

I might say that I had done a bit of free flight scale back in the 70s and had more or less given up modelling for aviation art. One look at the new EFI and I was hooked. I HAD to get back into modelling but even more than that I had to learn about electric flight and Radio Control.

The real difficulty is impatience and learning to fly the real problem. But building is something else - fabulous!

I built a Humming Bird from the plan and it came out 16 oz lighter, although I had increased the wing area and fitted ailerons - got to start somewhere! I built a Spider Glider which was totally lacking in response and a Lazy Bee which I haven't flown yet. The Steve Kerry Mustang (P-51D) in EFI (March 98) really excited me and I felt I had to build one - only I thought I would quite like to do one 1/12th scale (37") span.

The fuselage and tailplane are finished and just the wing to go, the snag is that every time EFI comes out, I want to start something new. I used to meet Chris Golds at the Guild of Aviation Artists but haven't seen him for years, his articles in EFI really got me itching to build EDF models.

Will send you pics of the ultimate P-51D when it is done, meanwhile - thanks for a super mag and bucketfuls of information - Thanks.

Cedric dela Nougerede **EFI**

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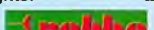
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Speed Controller Trimming Device

REVIEW BY: **CHRISTER LAGERSTEDT**

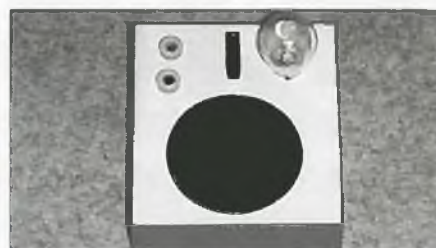
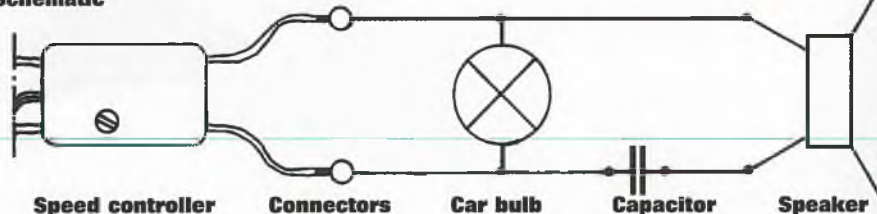
A useful tool, mentioned in the article 'Balsacraft Bristol Blenheim kit review' also in this issue.

I like to build my own electronic speed controllers. I build from a series of designs in a German magazine. There are designs for all kind of models from slow fly indoor models to 30 cell 'hotliners'. The controllers use SMD components but no micro controllers. That means you have to trim them to your receiver. For this I use a small device with a speaker and a car headlight bulb. The good thing is you can concentrate on twisting the small trimmer on the controller and trim by ear. You also know that the output FETs of the controller are fully on when the sound from the speaker goes out and the bulb is shining fully.

Components
 Small 8 ohms speaker
 Car bulb 12 volts 15-20 watts
 Capacitor 0.1 μ F
 Banana sockets

The components are soldered together and mounted in a small box, glue one up from plywood. This shouldn't take you more than half

Schematic



▲ The whole unit in its box.

an hour to build. To trim, you connect your speed controller to the device and to a receiver. Advance the throttle stick two or three notches and turn the controller pot until you hear a humming from the speaker. Check that the sound stops when you pull the stick back to full low and also stops at full throttle position. At full throttle the bulb should be fully on. Note that some controllers have separate pots, one for trimming 'stop' and one for trimming the full speed position. **EFI**

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Quiet Scale

MARTIN IRVINE

A little advice for your safety and more valuable tips for rigging biplanes and parasol wing models.

At last summer's Mid America Electric Fly, Larry Marshall launches John Kauk's Model Designs Hawker Sea Fury powered by a direct drive Astro 05.



Fuses?

I recently had a lively discussion with a fellow modeller about the need for fuses. He was for enforced fusing while I was against it.

The conclusion I came to years ago was that, unless I am trying to get the last millivolt

out of a pack, a fuse is a good idea because it may save me doing something silly and destroying equipment. On the other hand, it doesn't provide the complete security many believe. I am aware of accidents prevented, and accidents caused, by fuses. For this rea-

Figure 15.

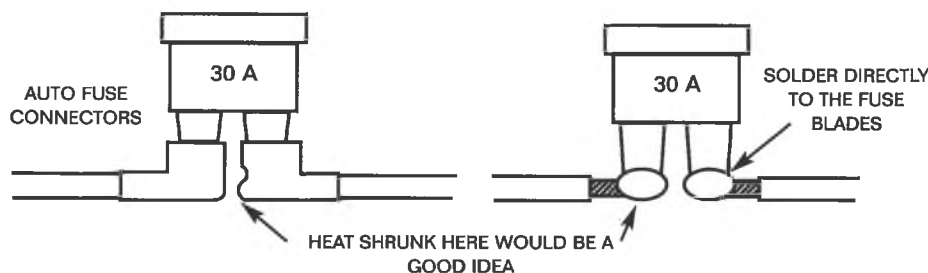
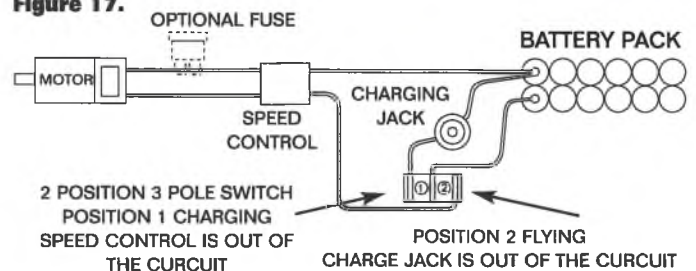


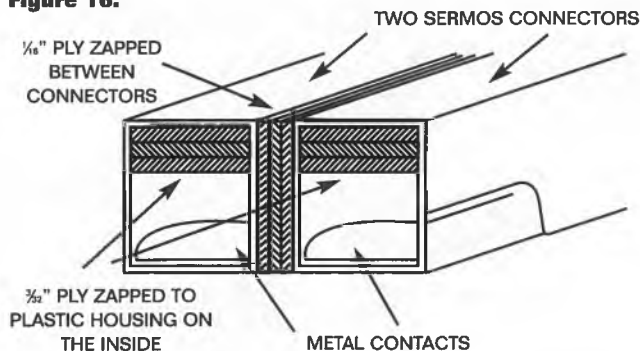
Figure 17.



son, I recommend them, particularly to beginning electric modellers but I understand and support those that fly competitively without them. I think it's a matter of personal responsibility. (This statement will probably generate all kinds of mail, from both sides of the argument!) (See Fig. 15)

While the Anti-Fuse League is

Figure 16.



ATO AUTO FUSE WILL BE CORRECTLY SPACED & A SNUG FIT

gathering to step on me, I'll give them something else to get riled about. Power switches: "Yet more losses! Just learn some safety discipline and you can do without them." Well, sort of, but there are a number cautions of which most people are unaware. I once heard Steve Neu, of the USA F5B team, comment to someone who was looking at his ready-to-launch model: "I don't trust it. Why should you?"

What he meant was that electronic parts can fail unexpectedly and you should always be

aware of this. I'm not suggesting that we should expect such a failure but just like radio equipment failing, it can happen. I know very little about electronics (as long as the smoke stays in the equipment, it works - if it escapes, the part stops working) but my understanding is that if a mosfet fails, it fails "on". With a motor connected this is obviously a hazardous situation.

Another caution comes from Doug Ingraham, who is heavily involved in the design of Astroflight speed controllers

and so knows lots more about this than I ever will.

Apparently a switched on transmitter, moved over a plane with a plugged in battery, can cause the speed controller to come to life even if the receiver is off.

How does this relate to scale models in particular? Well, a lot of scale models have semi-permanent battery packs which are not unplugged at the end of the day. With sport planes, we often charge outside the plane and can transport "disarmed" but with, say a WWI rotary engined model, the battery is probably inaccessible. The solution is a power switch, which, when wired as the diagram shows, allows us to charge the battery in the plane too. When switched off, the motor is PHYSICALLY disconnected from the battery, so start-up is impossible (see Fig. 17).

Suitable switches are available from most electronic stores. It doesn't need to be rated anywhere near the amperage most models draw as it is not switching the power on, just carrying it. 5A is enough. If you can't find a 5A switch locally, Kirk Massey at New Creations carries them. He'll even wire up a harness for you if you don't trust your own soldering.

A neat little combination of fuse and switch can be purchased commercially from John Sermos or it can be made as outlined in the diagram (Fig 16). When the fuse is inserted, the now fused circuit is completed. With the fuse in your pocket, the motor cannot start.

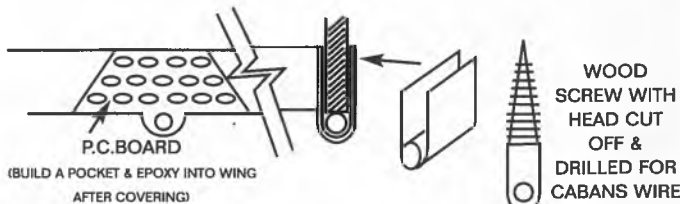


Figure 3.

Cabanes

As a follow up to the column on interplane struts, I have gathered a number of suitable cabane fittings for sport scale modelling. For real scale fittings, you have to go with what the original used and that is often very specific to individual aircraft. For sport scale, something here should work.

Fig. 1 shows the old time classic rubber band system. There are a couple of points to look out for. While it is easy and shock absorbing in a crash, you can't use it with interconnected ailerons as the flex inherent in the system will move the ailerons and screw up the trim. If for some reason, you really want rubber bands and 4 ailerons, put a servo in each wing and connect them with a "Y" connector. It is better for parasol models.

If you bind and solder the joints, there will be a lump under the wing which will bruise the centre section sheeting. You will need some way of protecting the wing.

I like to mount all cabanes so that they are removable. If you are using wire, a pair of brass tubes mounted securely allow the struts to be removed for covering and finishing. If you have ever tried to cover around a completed cabane, you won't ask why I like this set-up.

Fig. 2 shows the heart of the wing attachment I use frequently. A piece of 1/32" (.030" or 0.75mm) brass strip approx 3/8" (9mm) wide by about 1" (25mm) long is bent around a length of wire the same diameter as the strut wire (A). Pinch it closed in a vice (B) and lightly tap the loop over to one side (C). Drill it out for the mounting bolt and solder in the wire. Trim with a file and Dremel tool.

The rear hold-down is a tab mounted in the wing. Again, if you can make a mount that can be SECURELY attached after covering, this will be easier. Sometimes you can cover the bottom, attach the lug firmly to the spar, and then cover the top surface. If the fore and aft wire

Figure 1.

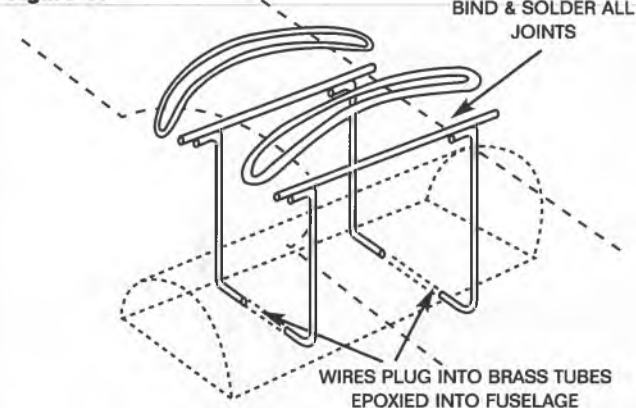


Figure 2.

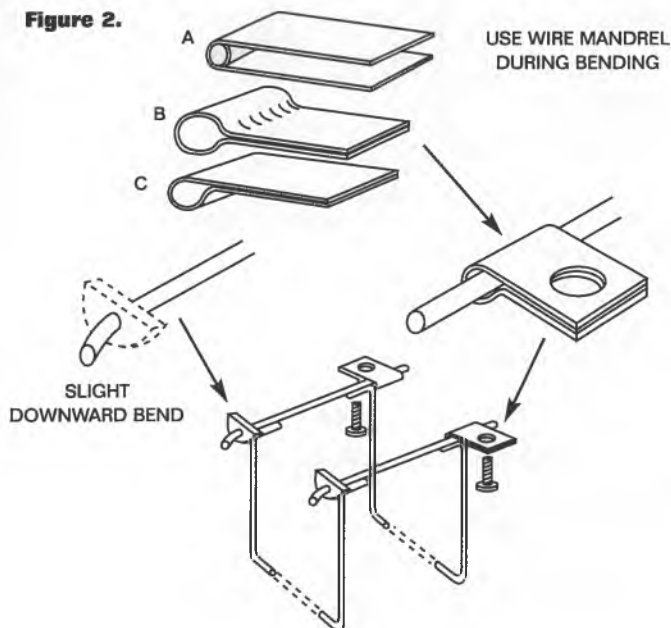
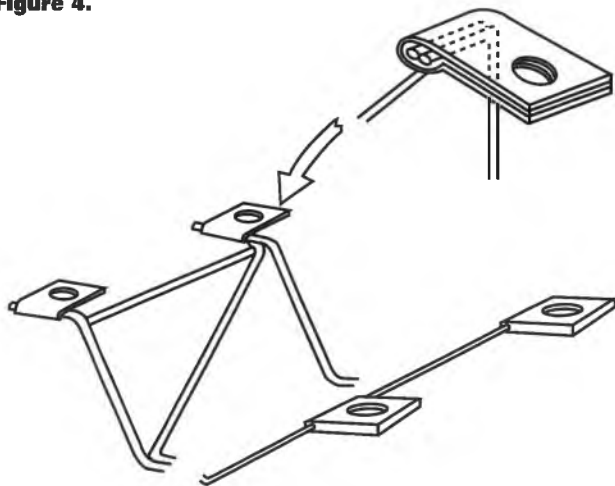


Figure 4.



has a slight bend in the very end, it will be a little more secure, although this probably isn't too important.

The lugs can be made from printed circuit board epoxied to the spars, or brass shim stock wrapped around some tubing. For the latter, the cabane wire slides into the tube, but don't bend the wire as suggested above or it won't fit. Another lug I like because it is fairly repairable, uses a wood screw with the head cut off and the shank drilled out for the cabane wire.

Fig. 4 uses 4 of the strip stock clips. If the cabane has "N" struts, one of the clips will need room for two pieces of wire. I solder two pieces together as a mandrel and form it as mentioned above. Note that there is a fore and aft wire to stabilize the "other" strut.

Fig. 5 is different from the usual fuselage mount in that it is vertical arrangement. If you are trying to build a top hatch for replaceable battery packs, this frees up the fuselage rather than having to work around cross bracing. With the lack of cross bracing, the fuselage sides have to be a little heavier to maintain stiffness. This helps as it provides a little meat for the mounting as drawn. Make sure of the ply reinforcement on both sides of the vertical strips as you have essentially cut the fuselage sides right through!

The nice feature of this mounting arrangement is that when plugged in, there is vertical movement for incidence adjustment. However, be sure that the wires are very well epoxied in place. Consider adding a short anti-pullout wire soldered to the ends of the cabane wires. The slot will have

to be twice as wide to accommodate the extra width and a strip of spruce or basswood will be added as the wires are glued in to fill the extra space.

A lot of designs call for using electric "eyes". These are cheap and strong and pretty convenient. Unfortunately they are rarely the same size as the common wires we use and the eye itself is pretty big. You will

Figure 5.

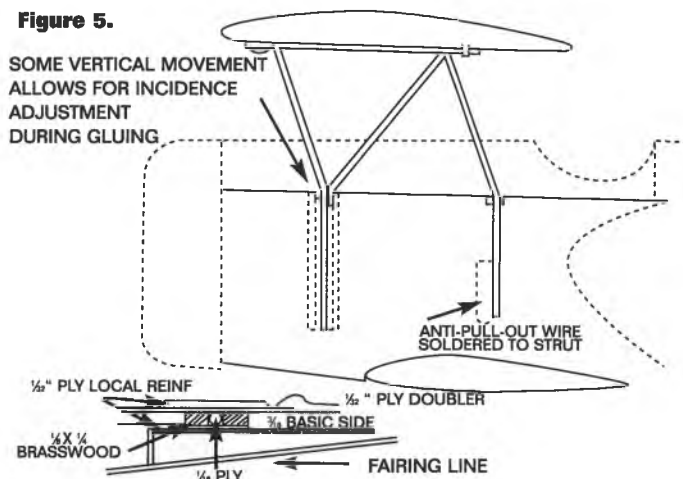
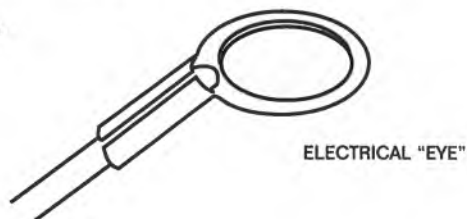


Figure 6.



need a fairly large washer under the bolt head. A plus for this type is that you can move up

and down a bit to adjust the wing for side to side and incidence alignment.

ROUGH GUIDE

USE 1/16" WIRE FOR 7 CELLS, 1/32" FOR 8-24 CELLS & 1/8" FOR OVER 24 CELLS

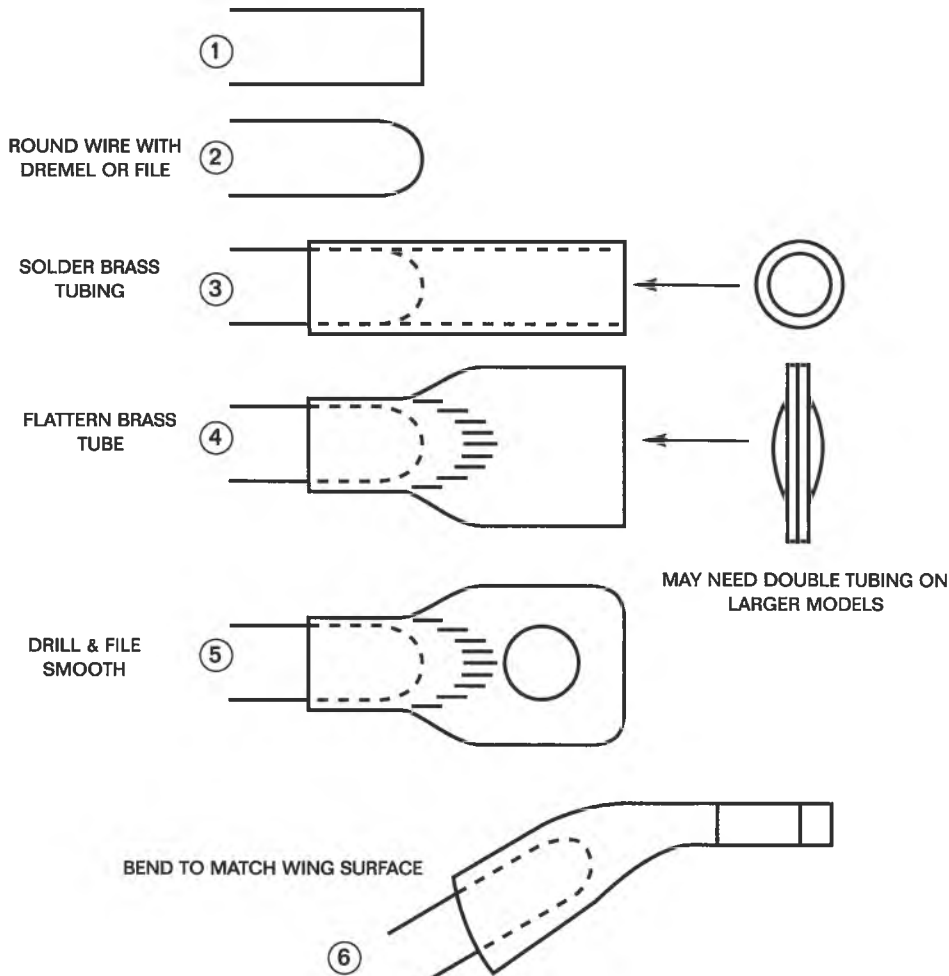
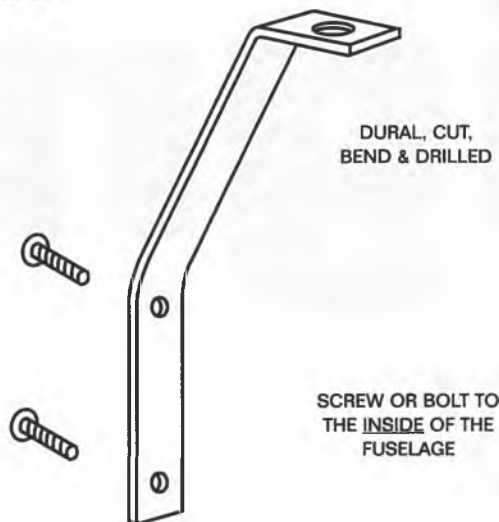


Figure 7.

Figure 8.



I prefer the homemade version. Fig. 7 shows how to make one out of brass tubing. Make sure that there is enough meat for the mounting bolt's hole. You may need to use a double tube in order to get a strong enough end. Rounding the wire and making bends smooth and gentle helps prevent stress risers and points for fatigue.

Another variation is to make the struts out of dural (Fig. 8). If the metal is cut accurately, this is a good, stiff arrangement. The challenge is the accurate cutting. It's not difficult but it does require care. If the bolts holding the strut to the inside of the fuselage are into blind nuts the strut can be added after the fuselage is

covered. If the holes in the strip are slotted, there is some room for vertical adjustment, again for side to side and incidence alignment.

If you are building a plane that has no centre section (Fig. 9) the struts have to be functional as without them the wing see-saws side to side.

One possible structure, if you really want to avoid functional struts, is shown in fig. 10. The plate marked "B" has to be wide enough to stabilize the wing. Frankly, I wouldn't bother. Just make the struts work.

Figs. 11 and 12 show better ways to deal with this type of cabane. In fig. 11 the wires are locating wires only. They do NOT carry any flight loads.

Figure 9.

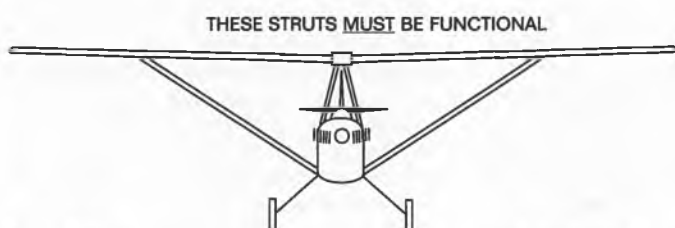


Figure 10.

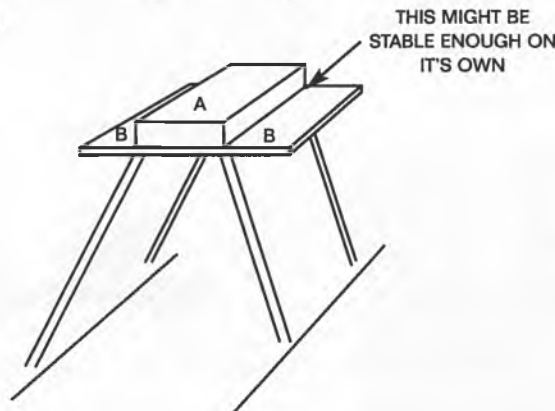


Figure 11.

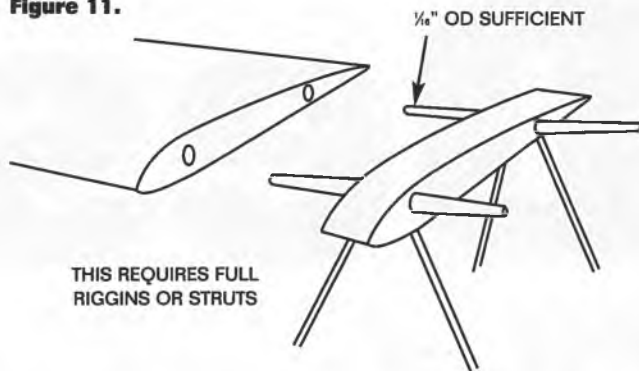
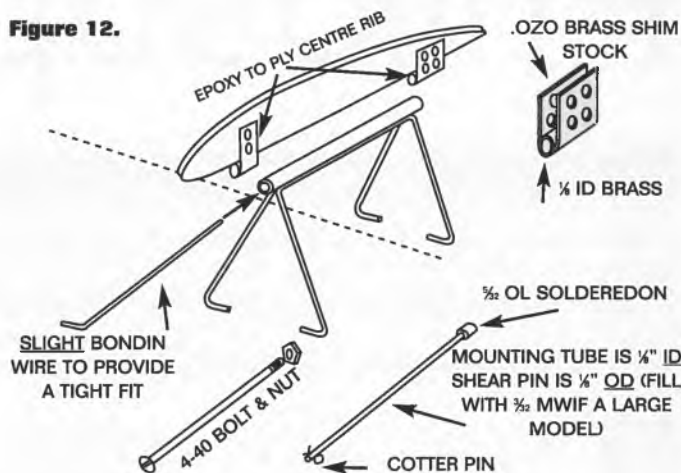


Figure 12.



They are there only to locate the wing root, while the struts or rigging take the flight loads. The two piece wing has a couple of advantages most people don't consider. There are no dihedral braces, just local reinforcement, and the wing panels are only half span - easier to transport.

In fig. 12 the wing is in one piece. It is attached to the cabane like a giant hinge with a "pin" made from wire with a slight bend for a friction fit or a long threaded rod or a cotter pinned shear pin. This is a case where I would try to build the wing so I could cover the bottom of it, epoxy the strut fittings and then cover the top surface. Again struts or rigging take the flight loads.

Once the struts are bent, most will need some sheathing to flesh them out to scale dimensions. The classic method is shown in fig. 13. I use basswood rather than balsa. It is only slightly heavier than balsa and is much easier to carve and

sand to an accurate section.

Most people sheath the struts as shown on the left in figure 14. This requires lots of clothes pegs. The variation on the right is much easier as the two thin pieces effectively clamp the basswood strip inserted. It cuts the assembly time in half.

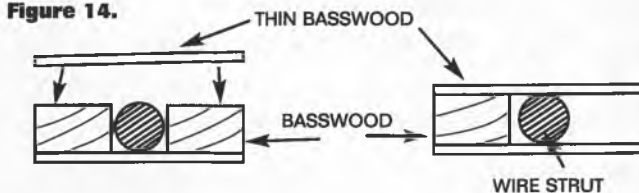
As I mentioned in the column on interplane struts, this is not a comprehensive list of ways to make a cabane. You people are too inventive for that! If you have a method you have that has worked well, is fairly easy to build and use, please write or e-mail me and we can all learn.

Martin Irvine, 1331 Rockwood Dr., Kingston, Ont., Canada K7P 2M8. e-mail: mirvine@kos.net EFI

Figure 13.



Figure 14.



Design Philosophy

WRITTEN BY: **IAN MONTY**

Each of us has his/her own favoured building techniques. Ian thinks we do not take full advantage of modern techniques and materials.

This article has been written to share with you some of the ideas we have been working on for several years. This work was started in 1993, initially by Ian Monty and at a later stage by Tony Twohill.

Design Philosophies for Building EDF Airliners

It is our belief that a large proportion of designs of semi-scale electric model aircraft have failed to jump to the next design generation. All we see is adaptations of IC model construction techniques. It seems interesting to us that in this age of materials and technology many models are still constructed with the traditional 'butt gluing of wood' type approach. One only has to look through the back issues of EFI (and other comparable electric model magazines) to see this. It is a revelation to find that a large percentage of the magazine space which is available for model description, is used to describe old technology 'glued wood' type projects.

On the other side of the spectrum there are modelling fraternities that have arisen to the challenge of developing better assembly techniques and succeeded wonderfully. Two such examples are model electric helicopters and cars. It is obvious from the descriptions and photographs that every component is well engineered and assembled according to a clear specification. Very little gluing of one component to another occurs. Everything is engineered to ensure that the assembly, operation and maintenance can be done with ease and certainty.

It was the above perspective that provided the inspiration for writing down several

design philosophies for the construction of a model Airbus A320 airliner. They were:

- no balsa wood in the construction of models
- a simple, lighter and stronger airframe construction
- 'meccano' in principle. No glues required in the final assembly of aircraft (epoxies in composite materials and composite sub-assemblies are acceptable)
- aircraft and components assembled according to detailed bill-of-materials (standard systems behind the design)
- each component be re-produceable and capable of replacement
- no surface finishing on external aircraft surfaces
- models must be easily, quickly and totally capable of disassembly for ease of maintenance and transportation.

In our work these design philosophies are rigidly adhered to despite many temptations to deviate. Most scale aircraft should be capable of being designed employing these same philosophies with the modeller enjoying the pleasures of design and construction.

We believe more energy in the model workshop should be directed toward devel-

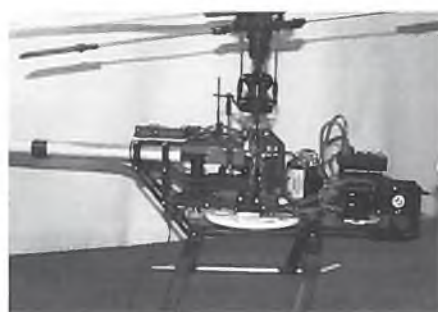
oping a better technology for the construction of electric models by solving technical problems in the area of 'component assembly'. This is the key area for the development of electric aircraft models. There exists a large number of industries dedicated to developing the other technologies we require in the areas of materials, batteries, motors, fans and control systems. You need go no further than your keyboard and the internet to retrieve this information.

There is not sufficient space in this first article to fully expand on our design philosophies in great detail. These will be the subject of future articles. However in brief they are:

1. No Balsa Wood

It was decided to no longer use balsa wood in the construction of models. It is balsa wood's inconsistent mechanical properties that cause the major problem. Mechanical fastening is also difficult. The only reason balsa has evolved as the traditional material of construction is its relatively cheap cost, low density and its ability to be easily shaped. Surface finishing was always an additional requirement. There will be many who will strongly disagree with us. However we believe it is a construction material that should be used less in favour of the alternative materials that are readily available, and which are consistent in their mechanical and surface finish properties. Aluminum, carbon fibre rod, plastics and styrenes would be included in a basic list of alternative materials. They are all readily available, and with the exception of carbon fibre rod and some types of plastic sheets, all are relatively cheap.

▼ A helicopter built as if from a Meccano set.



▼ Tradition construction.



2. Simplicity

We need a simple, lighter and stronger airframe construction. The number one enemy for designers of electric models is wing loading. One answer is to design every aspect of a model's airframe so that if any one part failed, that part could be disassembled and replaced in a very short time (on the airfield). The designing of the airframe would not then include any redundant strength. This is one rationale for the suggestion that materials other than balsa can be used to achieve lower AUV's as opposed to 'traditionally constructed models'.

3. No glues

We decided to use no glues required in the final assembly of aircraft (epoxies in composite materials and composite sub-assemblies are acceptable). Glues have an important role to play as a non-mechanical fixing devices. However we believe their use should be in defined areas of component sub assembly and composite material manufacture. They should not represent the mainstay of aircraft assembly. It is our belief that glues fall into two main categories. The desirable glues include aerosol adhesives and pre-laid glues such as those present on double sided tapes. The less desirable glues (from an assembly and design quality control point of view) include super glues and epoxies.

4. Assembly Doctrine

Aircraft and components will be assembled according to detailed bill-of-materials (standard systems behind the design). Working with computers to design model aircraft is a great pleasure. Many tools are now readily available to the modeller including spreadsheets, CAD, email, inter-

net and statistical analysis packages. We are of the opinion that any modellers who are not using such tools are doing themselves a grave injustice.

Model Design

One simple system that assists with model design is described below. Using something like Microsoft Excel, create a parts classification and coding system. The minimum field definitions for the system should include part number, weight, description, unit of measure, material class, section, length, surface finish, cost, manufacturer's part number and CAD drawing file name. A simple and effective part numbering system is a six digit numeric field. The part number might look like the following, 12-34-56. Characters positions 1,2 indicate the aircraft type, 3,4 determine the aircraft sub-assembly type and 56 is the next available sequential number. For example 12-34-56 might mean A320 Airbus, flap subassembly, component number 56. Another work sheet should be used to create a material class coding system and a raw materials mechanical properties database. Every part number should have a drawing available on computer.

Once this has been developed, ensure every raw material that enters the workshop has been correctly identified and entered into a database as described above.

Such a system makes design and construction easier because:

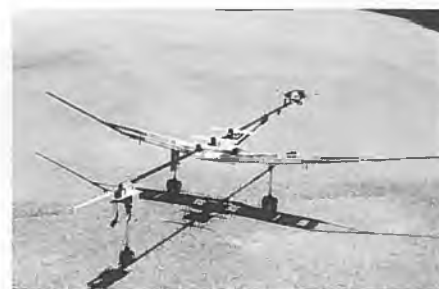
- Bills-of-materials can be quickly produced before any work is started in the workshop. It takes a lot of guess work out of values such as AUV's
 - Searching and sorting on selected fields (such as material class and item weight) allows very quick perato analysis. This data can sometimes be surprisingly interesting
- Statistical results begin to provide some interesting emperical laws.

Servicing

Each component must be re-produceable and capable of replacement. Often the work that goes into making just one part can be equal to or greater than the work involved in making several identical components. The best example of this would be vacuum molding. A mould is simply made and many tens of components can be produced in a short space of time. The modeller's skills are utilised in the design of the mould and researching the properties of plastics available.

Finishing

No surface finishing will be applied on external aircraft surfaces. Trying to get a clean looking surface finish to any model is important. If painting is the choice of surface finish, the idea that appealed to us was to use the actual outer skin itself as a protection barrier and put the paint on the inner underside of the skin. This also has the advantage of giving the model a constant reflective appearance.



▲ A320 frame assembly.



▲ A320 totally disassembled.

Facility

Models must be easily, quickly and totally capable of disassembly for ease of maintenance and transportation. There is perhaps nothing more frustrating than attempting to put a model into a 'undersized' vehicle (perhaps the number one cause of hangar damage). Once at the airfield, there is nothing more frustrating than not being able to fly after a mishap because repairs are going to involve several hours of reconstruction. It was this reasoning that is responsible for the above design philosophy.

Conclusion

The aim at the beginning of this project was simply to make a electric ducted jet airliner. This project then evolved into a vision to make available components and kits of commercial jet airliners. The chosen name for this enterprise is 'Airliners New Zealand'.

After putting some of the above philosophies into practice we have achieved some results. The work is far from complete and it may be that other modellers wish to register their interest with us.

The best means of communication is via a website (which should be up and running by the time you read this) with regular updates and the facility for registration of interest. Two email addresses are currently available:

monty@install.co.nz
john.swain1@virgin.net

On that subject I would like to thank John Swain of the UK and the group of people in New Zealand (who know who they are) for their assistance in our work.

Meccano is the Trade Mark of The Meccano Company Limited. Microsoft Excel is the trade mark of the Microsoft Corporation. **EFI**



▲ A320 assembled. It is intended to replace the WeMoTec Eco Fan II EDF units running on 14 x 1700mAh cells, with WeMoTec Mini Fan 480 units.



▲ The neat tail of the assembled A320.

Nosewheel Steering

WRITTEN BY: **GRANT CALKINS**

Make a steerable nose wheel without a extra servo and steer your plane on the ground without adding any extra weight.



▲ Aileron bracket.

I reasoned that the handlebar should move about the same amount as the ailerons. Figure 2 shows a 1/8" (3.2mm) balsa bracket fixed to each aileron. The height (lever arm) of this bracket is the same as the width of the aileron - this assures a 1:1 relationship between aileron and handlebar movements. The grooves on the rounded underside of the bracket keep the line from sliding off. The back of the bracket is deliberately straight to accommodate plastic tape.

The black tape on the bracket is very important. For alignment purposes the line needed to be attachable anywhere along the bracket, able to 'slip' in emergencies, and yet be removable. Electrician's tape is the perfect answer.

Alignment

I start by setting the nose wheel to a slight left-steering angle. Then I connect the left line from the left handlebar to the left aileron bracket - not too tight. Then I pull the right line just enough to straighten out the nose wheel, and connect it to the right aileron bracket. Test the initial alignment by pushing the model on the runway. Once it tracks straight, or nearly so, that's good enough. Press the tape firmly around the line and bracket.

Steering on the Ground

I wanted the system to be quite sensitive so that, at lift-off, the aileron stick would still be near neutral. Otherwise, clearing the runway would be followed by an immediate left or right bank - pretty dangerous. Thus the 1:1 relationship mentioned above. On the runway, simply move the aileron stick left or right to make the model turn left or right it's that simple. Do this gently during the take-off roll, because (just like the traditional nose wheel/servo method) it's easy to over correct. If you find your set-up is too sensitive, just decrease the height of the aileron brackets.

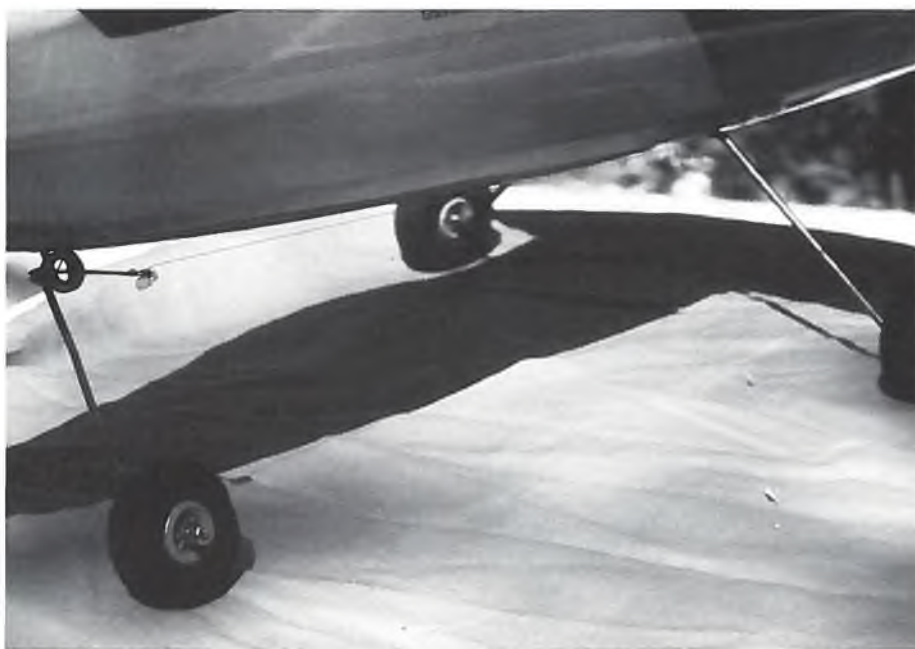
Grant Calkins, Channel Islands Condors and Muroc Model Masters (Edwards AFB, CA) Email address: CasinoOp@aol.com.

EFI

Introduction

I didn't think I would need to steer my Heinkel 162 Salamander electric ducted fan jet during take-off. I figured it would roll straight enough long enough for it to leave the ground. But it didn't. This plane required a long roll to ROG and by then it was in the weeds beside the runway. This plane does not have a rudder. Obviously I needed nose wheel steering. But, this EDF powered plane was already 'on the edge' weightwise and adding a steering servo and it's associated wiring would have just made matters worse, possibly preventing it from flying at all. The system described below works just as well as your traditional nose wheel/servo set-up, and is cheaper and easier to build.

▼ Set up for steerable nose-wheel.



How to Do It

I noticed that the plane already had steering - its ailerons - but they aren't effective on the ground. Interestingly, the ailerons seemed to move in the right directions - if they could somehow be made to also turn the nose wheel.

My solution was to connect the ailerons to a 'handlebar' attached to a steerable nose wheel using 12 lb fishing line (see Figure 1). The line is weightless, practically invisible, and imposes no drag. The handlebar is just a length of light piano wire epoxied to the nose wheel. The fishing line is first attached to tiny balsa blocks then inserted through the loops in the handlebar, then run close to the body back to the ailerons. But how to 'actuate' the line to get the right movement?

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GasKib

Plan Review

REVIEW BY: **BRAIN GASKIN**

Or it could be called a GASKIDOODLE or a NOODLEGASKI - anyway it went together easily and goes very well, being very quick, with a simple hand launch.

The German WW2 Fieseler Fi 103, better known to the rest of the world as the V-1 and more commonly known in the UK as the Doodlebug, became much feared by Londoners in 1944. The V-1 launch sites were captured in France and the development site at Peenemünde in northern Germany. At the latter, Russian and American personnel raced to grab as many of whatever remained of the advanced (and not very) guided long range weapons.

When I was first shown one it didn't impress me much, next to a four engined bomber but I was only four years old at the time! The big fight was over but many of these 'flying bombs' were tested and devel-

oped even further both in the USA and the USSR. These were all very similar to the original Fi 103 but Brian has used a little imagination here. If the V-1 had been developed much further it might have looked like this - anyway it fitted in with his 'Russian family collection' of 1998. End of editorial note - over to Brian.

Construction

The fuselage is carved, sanded and hollowed out yellow foam in a 1/8" (3.2mm) birch ply sandwich, i.e. a ply profile with foam both sides. The underside of the fuselage rear has a 1/8" balsa plate. The wing is

from an Avicraft Hacksaw with the tips cut off (in hindsight it would look better with the roots cut off). This wing is obechi covered white foam and 1 inch (25.4mm) holes bored root to tip 1/2" (12.7mm) apart. The duct is 1/64" (0.4mm) rolled ply, sheathed with foam and with a 'Tupperware' lid intake lip. All this is epoxied to the fuselage top and the tailplane and fin mounted on top of that. The hump on top of the duct covers the elevator micro servo. With one micro servo on top of the wing, the aileron servo arm is so shaped as to give 'up' aileron only on each side.



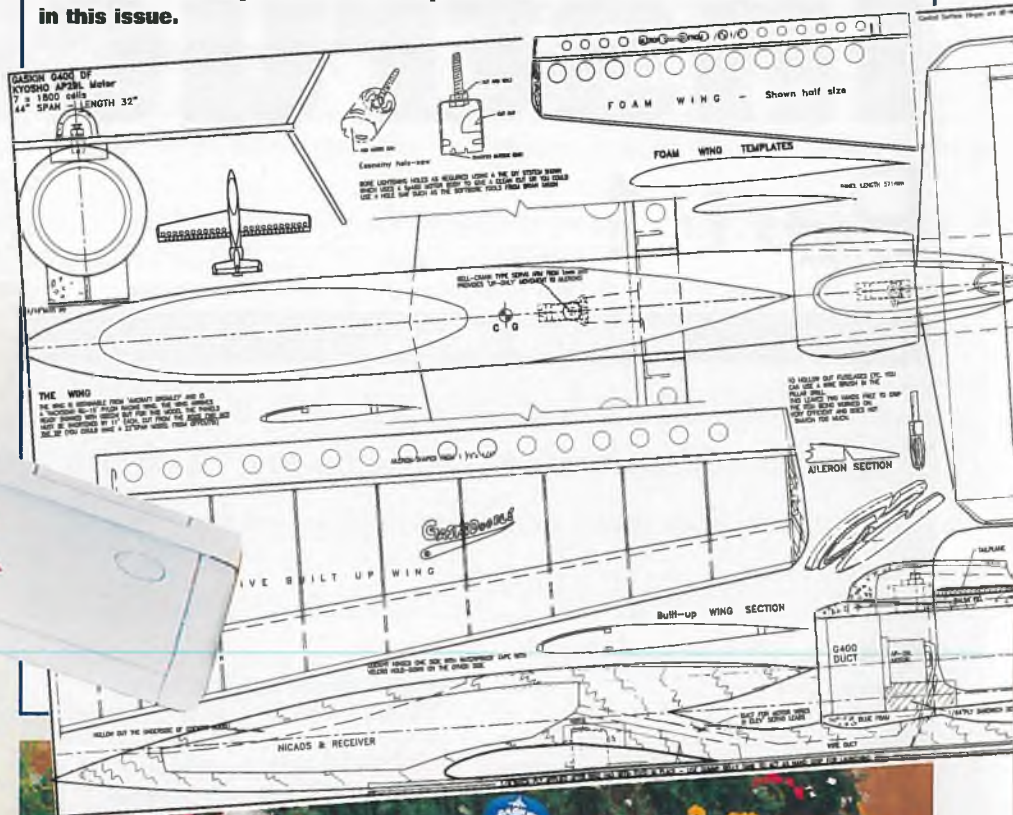
▲ Demonstration pilot Lee installs a fresh battery pack.



MW2727 - GASKIBUG

Copies of plan number MW2727 'Gaskibug' 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

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Power comes from an AP29L, as used in the Kyosho T-33 but here driving a Gaskin 400 fan running on 7 x 1700mAh cells. Efflux diameter is 2 1/2" (64mm). The covering on the whole model is aluminium Solarfilm.

Flying

As already mentioned, it is very quick, much quicker than the Kyosho T-33 which uses the same AP29L motor in their own fan unit. She is stable yet extremely manoeuvrable, motor runs 'flat out' are in excess of six minutes (that is an average of 17 amps). It seems that the motor does not have to work very hard because of the fine pitch of the Gaskin fan and tolerates a small efflux hole thus increasing the efflux air velocity and so makes for a higher top speed. This said, the acceleration out of the hand does not suffer. All round this is a successful model and it looks good. **EFI**

Specifications:

SPAN:	46" (1170mm)
LENGTH:	31" (787mm)
WEIGHT:	2 lb 5.5 oz (1065g)
WING:	10 oz/sq.ft
MOTOR:	Kyosho AP29L
ENERGY:	7 x 1700mAh
EDF:	Gaskin 400



▲ Brian's 'Russian family collection', the other two ARE scale models.

Electric

Instruction

Part 1

WRITTEN BY: **CHRISTER EKLUND**

Every Beginner needs to know and some more
Experienced Builder Pilots need reminding - what size
motor and how many cells they need to get the desired
performance out of a model.

Batteries, motors and speed controllers

The main problem for the electric flier is how to get enough power. With an IC motor you can always get an additional 100 or 200 watts by adding some nitro to the fuel, thus adding no weight to the model. It is not that easy for the electric flier, who has to check the weight very carefully and be sure that every gram is doing its job - and that the margins are working for the pilot and not against. This situation is similar to the one the aviation pioneers faced a hundred years ago and that is its fascination for me.

The purpose for my writing this is to give some engineering assistance to my fellow playmates, thus hopefully reducing some frustrations the electric fliers might feel when they have to guess or ask others for advice about what propeller will fit to a certain motor with a certain number of cells.

Some calculations are necessary, although not complicated. A programmable calculator, like HP 11C, will save time but is not absolutely necessary. But the calculator must handle exponents, the button is marked y^x or x^y .

About Batteries

The battery is the fuel tank of the electric plane. It supplies the power in the form of current and voltage.

All electric power transmission benefits from increased voltage and decreased current. This reduces the losses which transforms into heat, the energy should be used to achieve the speed and height of the plane, not to burn and destroy motors or speed controllers. The bat-

teries used are almost without exception of Nickel Cadmium type - NiCads.

Different tests have been performed with SANYO cells type N-1400SCR and N-1700SCRC. I have compiled a lot of tables from tests of duration and voltage of these cells into diagrams 1 and 2. Diagram 1 shows how many minutes a cell is able to supply at a certain current. For example: at a current of 29 amps, a SANYO N-1700SCRC will last for 3 minutes, but at 17 amps it will last for 5 minutes.

Diagram 2 requires some explanation. A fresh charged cell has a voltage of about 1.4 volts. Once a current is drawn from it the voltage falls, partly because of discharging, partly because of the internal resistance. The internal resistance of the above cell types is about 7 milliohm. In a seven cell pack the total resistance will be almost 50 milliohm. Multiply this by the current squared and you have the power loss in the battery pack. With a current of 20 amps, the power loss is 20 watts! No wonder it is burning hot after a hard flight! Resistance multiplied by current gives the voltage drop over each cell. The voltage is also, due to discharging, gradually decreasing with time, as shown in diagram 3. Diagram 2 shows the average voltage during discharging, somewhere around the point T/2 indicated in Diagram 3.

Bear in mind that the curves are drawn somewhat low, in order to give some margins for the calculations. Also remember that the cells must be well cycled to perform at their best. You may very well find cells performing better with use than when they are new. It is also well known that cells must not be too cold in order to perform to satisfactorily. Something for the winter flyer to bear in mind.

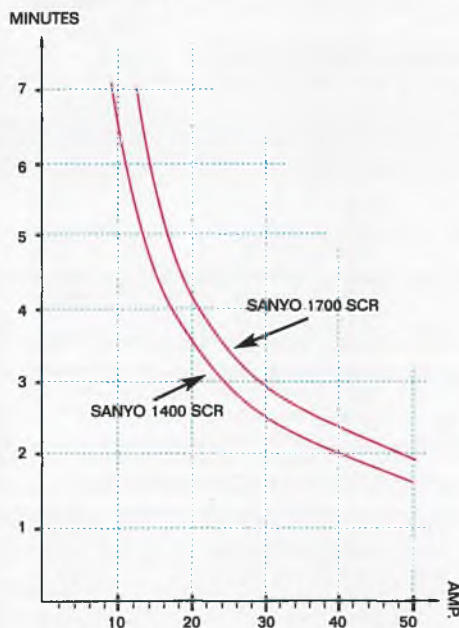
About electronic speed controllers

The power flows from the battery via the controller to the motor. If you fly with a Speed 400 motor and 600mAh cells, a simple on-off switch might be sufficient but with Speed 600 motors and bigger a 'switch mode' speed controller is necessary. This controller is continuously switching the current on and off, more power is supplied to the motor by increasing the on-period and decreasing the off-period. At full speed the controller is on continuously.

There are two types on the market, the low-rate and the high-rate control. The term rate refers to the switch frequency, where low-rate means 50 Hz (governed by the frame rate of the radio receiver) and high rate means 1000- 3000 Hz or more. A low-rate controller is cheaper and smaller but suffers from a serious drawback, it is reducing the efficiency of the motor at part load. This is due to losses in the magnetizing of the motor, a complicated story which I will not try to explain here.

Instead I performed a simple test, by running a Speed 600 ferrite motor with different frame rates, 50 Hz and 3300 Hz. The test rig comprised a Graupner Speed 600 8.4V motor, a propeller 8 x 4, a seven cell SANYO 1400 mAh NiCad pack and a controller with four MOSFET's in parallel. The gates of the MOSFETs were fed from two different pulse generators, with 50 and 3300 Hz respectively. By simultaneously measuring current, voltage and RPM over a range of 7000 to 9700 RPM I was able to draw curves as shown in Diagram 4, showing the required input power to turn the propeller at different RPM. Look at the difference in power consumption at 7000 RPM, it is 12 Watts or 2.5 amps. That is a difference of 2 minutes endurance of my ElectriCub at cruising speed. Later I redesigned the high-rate controller, enabling me to perform the test with other frame rates but I did not find any significant difference in performance between 1000 and 6000 Hz. You may also note that there is no difference in efficiency at full speed, the reason is that at full speed there is no longer switching and consequently no

Diagram 1.



difference in the performance between low-rate and high-rate.

The state-of-the art MOSFET transistors used today have an internal resistance of 7 milliohm, by paralleling four of them the controller has a total resistance of 2 milliohm. Older controllers may have 4-5 times higher resistance. Don't forget cables and connectors, they all add up to the total resistance.

About Motors

The motor transforms the electric energy from the battery into mechanical energy at the motor shaft. All power transformations suffer from losses, we say that the efficiency is less than 1. The losses transform into heat, the greater losses the warmer the motor will be. The field magnetism may be destroyed by overheating, so there is good reason to get the right size power pack.

The motor shaft speed may be calculated as follows:

$$\text{RPM} = k(U - IR)$$

RPM = Rotations Per Minute

k = dynamo constant

U = voltage at motor poles

I = current through motor

R = resistance of windings and brushes in the motor

Suppose you have purchased a Graupner Speed 600 8.4V motor Part No: 3301, you will find on the box the following data:

Nominal voltage 8.4 volt

No load speed 15,500 RPM at nominal voltage

Idle current 1.8 ampere

Blocking current 70 ampere (at 8.4 volts)

Ohms law determines that the motor internal resistance is:

$R = 8.4/70 = 0.12$ ohm. Thus: $15,500 = k(8.4 - 1.8 \times 0.12)$ which gives $k = 1894$. Now the RPM for the motor may be easily calculated for any voltage and current.

If the above motor is fed with DC, 7 volt and 17 amps you will find that $\text{RPM} = 1894(7 - 17 \times 0.12) = 9394$

If it is fed with 8 volt and 15 ampere DC: $\text{RPM} = 1894(8 - 15 \times 0.12) = 11742$

The shaft power is calculated with the formula: $P = (U - IR)(I - I_0)$

P = shaft power, watts

I_0 = idle current

I = actual current through the motor, and U and R are the same as before.

If we look at the examples above the power will be:

$$P = (7 - 17 \times 0.12)(17 - 1.8) = 75.4 \text{ watt}$$

and $P = (8 - 15 \times 0.12)(15 - 1.8) = 81.4 \text{ watt}$ respectively.

The power input is 119 and 120 watt respectively, a difference of 1 watt only when the output increases 6 watt. The motor efficiency is 63.3 % and 67.8% respectively. It is obvious that the efficiency improves with increased voltage and decreased current. The above motor has its maximum efficiency of about 70% at a current of 11 amps.

The idle current given by the manufacturer refers to the motor operating at the nominal voltage. If the motor is operated at a much higher voltage the idle current will be somewhat higher, if you want to make a more accurate shaft power calculation you may measure the idle current at the higher voltage and use that figure in your calculations.

About Power Trains

When you have a NiCad pack, a speed controller and a motor, you may easily find out the entire system performance. You make a table on a piece of paper where you enter from the top: current, NiCad voltage, cable losses, motor voltage, motor RPM, power in, shaft power and efficiency.

In the example shown below I have used a seven cell SANYO 1400 mAh NiCad battery, a Graupner Speed 600 8.4V motor Part No: 3301, and a speed controller which together with cables and connectors have a total resistance of 20 milliohm.

NiCad volts 8.26 8.05 7.84 7.56 7.35

Cable loss 0.1 0.2 0.3 0.4 0.5

Motor volts 8.16 7.85 7.54 7.16 6.85

RPM 14320 12600 10870 9015 7290

Power in (w) 40.8 78.5 113 143 171

Shaft power (w) 24 54.5 75.8 86.6 89.3

Eff. % 59.3 69.5 67 60.5 52.2

The NiCad voltage at a certain current is found in Diagram 2 and multiplied by the number of cells. The cable losses is the current multiplied by cable resistance, in this case 20 milliohm, by subtracting cable losses from NiCad voltage the motor voltage is found. RPM and shaft power is calculated as described earlier and drawn into Diagram 5, showing the available shaft power at different RPM. As can be easily seen, the efficiency of the motor is best between 10 and 15 amps, but it falls fast outside this limits. It is not sensible to run the motor at more than 20 amps as more and more of the power transforms to heat. By this method the practical limits of any motor/NiCad combination may be found with only a little effort. Best of all, no computer is needed. **EFI**

Diagram 2.

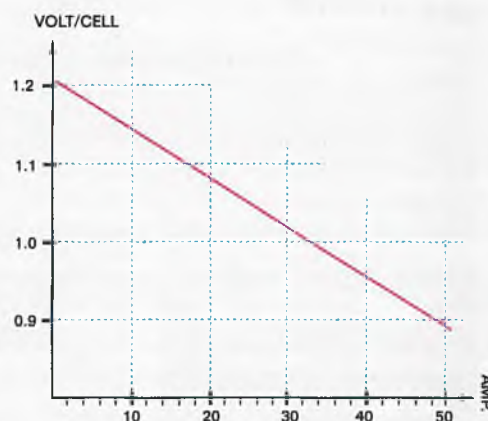


Diagram 3.

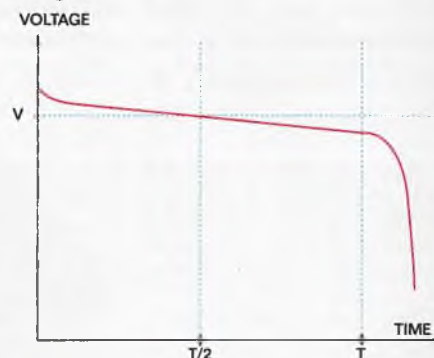


Diagram 4.

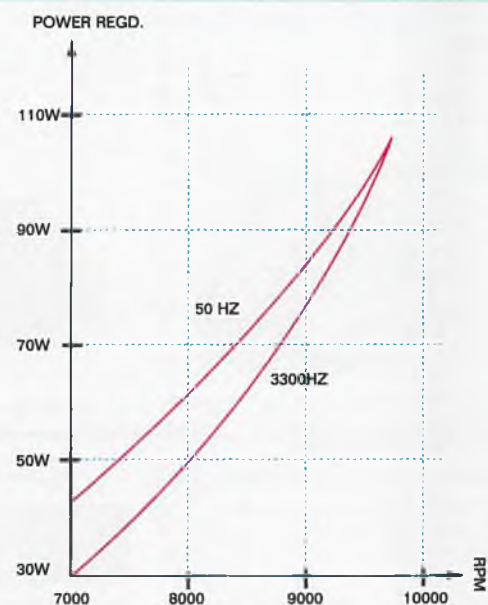
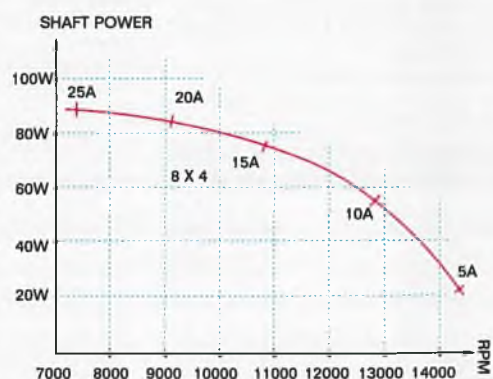


Diagram 5.



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13.0 x 6.0		£7.95

FOLDING PROPELLOR SYSTEM

	Collet Bore			Blades
DIA x PITCH	2.3mm	3.2mm	5mm	Only
6 x 3	£5.95			£3.45
6 x 6		£8.95	£11.95	£3.45
7 x 3		£9.95		£3.45
8 x 4.5		£9.95	£11.95	£3.45
8 x 6		£10.95	£11.95	£3.95
9 x 5		£11.95	£11.95	£4.45
9 x 7			£11.45	£4.45
10 x 6			£11.95	£4.45
11 x 7			£13.95	£4.45
12 x 10		£11.95		£4.95
12.5 x 6 x 5			£14.45	£4.95
12.5 x 6.5 x 5			£14.45	£4.95
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 Pron 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	
All 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

Model	BEC/PCO	Cells	Amps
Soft Switch 18 BEC ..	Y	6-10	18
With Brake ..	Y	6-10	18
Soft Switch 40 BEC ..	Y	6-10	40
With Brake ..	Y	6-10	40
Mini/Sw40	N	6-12	40
Mini/Sw40 W/BEC	Y	6-12	40



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 grams!				£36.95
PicoMOS18	Y	6-8	18	£71.95
SolarMOS18	Y	6-12	18	£73.95
PicoMOS33	Y	6-12	33	£77.95



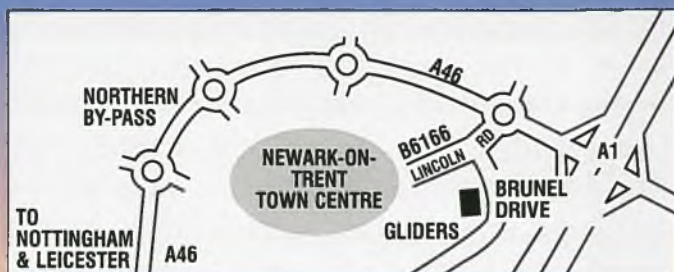
PicoMOS36 Bec. brake				£56.95
PicoMOS56 Bec. brake				£75.95
PowerMOS48 Opto. brake				£71.95
PowerMOS85 Opto. brake				£109.95
Race 80 (FAI Pylon) ..	Y	6-8	80	£92.95
PowerMOS80	N	7-30	56	£94.95
PowerMOS120	N	8-12	120	£154.95

ROBBE SWITCHES & CONTROLLERS

Model	BEC/PCO	Cells	Amps
RSC210	Y	6-8	10
RSC750	N	6-20	50
RSC810 mP	N	6-8	12

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



Vulcan

Mk 2

WRITTEN BY: **CYRIL CARR**

This Vulcan has had a long development history. Cyril Carr now has a successful EDF model with a very satisfactory performance.



► Cyril's daughter shows just how big is his Vulcan; there is a lot of wing area there.

B

▼ You can see the impeller/rotor/fan inside the intake.



The real Vulcan was always an impressive aeroplane and still has an almost cult following amongst British aviation enthusiasts and modellers. This large model inspires similar awe whenever Cyril appears with it. Your editor has seen this model several times, usually at Middle Wallop each year and each time it is better than the year before. Cyril has been determined to not neglect this model until it is perfected. He has persevered with its development and come to some conclusions that will be of value to any of us wishing to build EDF models.

History

When first spotted, this model looked very close to scale from above and had one early Electro Jet Technologies EDF unit with both intake and exhaust in a trough in the underside of the body. Tactful questioning revealed that 'power on' provided no more than an extended glide.

One year later - or was it two? Cyril flew the model at Middle Wallop, powered by a Keller 70-4 motor in the tail with a 9 x 6 prop. The prop spinner was the model's scale like tail cone. It had a bungee assisted launch (how else can you launch a model with a large prop in its tail?) and flew very convincingly. In the air the prop was quite invisible and a lot of spectators who saw the model flying before they inspected it on the ground assumed that it was 'jet' powered. I look forward to seeing it at Middle Wallop again this year. Below is Cyril's description of its present state - Ed.

Development

I am sending you information about the latest developments with my Vulcan B Mk 2. As you know it flew originally at 8lbs (3.6kg) weight with a Keller 70-4 motor pushing at the rear with a 9 x 6 propeller and providing 4.5 lbs (2kg) static thrust on 16 x 1700 cells. I have converted the model to take 2

▼ The original model, quite accurate scale from above but with a single fan in a trough in the underside.



WeMoTec Eco Pro fans with Ultra 930-6 motors and 24 cells.

The model now weighs 10lbs (4.5kg) and both fans produce a total of 4lbs (1.8kg) static thrust installed. This thrust is when the nicads are fully charged and the current is 30 amps. An estimate for the input power is 900 watts. To my amazement the model flies equally well with this arrangement with an excellent rate of climb and 5 minutes duration with power on most of the time.

It seems clear that the ducted fans improve with forward speed - as everybody keeps saying. Each intake is close to scale and 130% of the fan blade area (excluding motor) and the



▲ Some of the many hatches removed to show the (black) EDF units and access to the battery bay. Also visible is the launch hook.

rear ducts are 21.5 inches (546mm) long with 90% area. Each rear duct has a circular section at the rear of the fan unit and then gradually flattens to exhaust the air from both aircraft nozzles.

On my thrust measuring device (which is pretty accurate) I cannot detect any static thrust loss from the long ducting with 90% exhaust area. Shorter ducts (with the same exhaust area) do not do as well and I conclude that the taper angle in the duct must



▲ The exhaust duct partly removed to show how it flattens and fits the scale-like tail pipes.

be gradual to minimise losses. It also seems to be very important to ensure that the fan receives air which is not turbulent. In other words it must not be affected by poor intake ducting. Tests revealed that using the intake lip produces an extra 6 oz (170g) of thrust. Without the lip the fan unit is much noisier and this seems to indicate that the air is more turbulent and produces losses. When 2 intakes are used to feed one fan the air does not like changing direction too quickly so any bends in the ducting should be gradual otherwise it just produces turbulence at the fan. **EFI**



▲ One whole Vulcan with only slightly oversize intakes and jet pipes.



▲ Long tail pipes, different materials, different diameters.

Balsacraft Bristol Blenheim



Kit Review

REVIEW BY: **CHRISTER LAGERSTEDT**

An all built-up kit for an outstanding 60" (1524mm) span model twin that flies well on seven or eight cells.



The reviewer

I am a modeller from Sweden, interested mostly in scale models and water planes. For the last couple of years I have been involved in the design of some of my son Martin's electric models published in EFI, Henschel 132 ducted fan model and the Spruce Goose flying boat with eight 8 Speed 400 motors. We have also been to England to fly our models at Stubbers Lake, Old Warden and Middle Wallop. Shortly after returning home this summer I got an e-mail from your Editor who asked if I would be interested in doing a review of the Balsacraft Bristol Blenheim. What do you answer to such a question? As I had met the designer Pete Nicholson and was just trying to make up my mind which one of his designs to build, I just hit the answer button and wrote "Yes Please".

The kit

It comes in a cardboard box with some nice pictures of the model, the full size aircraft and a WWII operations room. The box contains two very clear CAD drawn rolled plans, several sheets of CNC cut lightply and balsa parts, some marked bundles of balsa sheets and strips, vac formed parts for the motor nacelles and gun turret, decal sheets and all necessary accessories for the model like horns, hinges, Bowden cables, screws

◀ **Kit contents.**

neim



and motor cables and connectors. More on these last items later.

Also included is a very good instruction manual together with assembly drawings and parts list. I was impressed by the manual. It is very well written and if you follow the instructions you shouldn't have any problems with the construction of the model. BUT as the manual says, this is not a beginners plane. You should have built and flown a couple of conventional balsa models before you tackle this one. The manual prompts you to identify and mark all of the CNC cut parts before you separate the parts from their sheets. This is easily done as all the sheets are drawn in the parts list.

I found a couple of minor mistakes in the kit. I have been in contact with Balsacraft and they told me that some of the mistakes already had been dealt with and that the others will be rectified as soon as possible. More on this later.

The Wing

You start the construction with the wing. It is needed later on when you fit the wing saddles of the fuselage. The wing is built on the prejoined bottom balsa skin. The manual tells you to join the balsa sheets with cyano or balsa cement, the latter being easier to sand. I prefer to use Aliphatic glue; tape the sheets together using masking tape. Fold the sheets to open the joint. Add glue and fold the assembled sheets back flat on the building

table. Scrape off the surplus glue with a shaped balsa chisel. Add another masking tape, let dry and sand.

Now you have to transfer the spar and rib positions to the bottom skins. The starboard outer wing plan has rib position extension marks to make this easy but these marks are missing on the centre section and port tip plan. Balsacraft will add the marks to the plan before the next print run. If your plan hasn't got the marks, it is easy to draw them in. By the way, I cut my plans in parts to make construction easier. I wish all designers would lay out their plans to make it easy to separate wing and fuselage plans without losing some information.

The full height spar is glued to the bottom sheet and the rib halves, trailing edge, false leading edge and infills added. The manual tells you to use mostly cyano glue for the construction but I have found THIN cyano less suitable for lightply parts. Medium thick cyano can be used but I did most of my building with thin SUPER PHATIC glue as I am a bit allergic to cyano, makes my nose run.

The centre part of the wing is built first. It includes rolled paper tubes for the wiring to the motors. Wing rib W2 should have a hole in it for this tube. This is illustrated in the assembly drawings but the hole is missing in the rib. This will be rectified in the next run of kits. If the holes are missing in your kit, it is easier to drill the rib before gluing it in.

When the centre part of the wing is ready except for the top planking, you pin one of the outer bottom panels to the board, butt the centre section to it, packing it up to give the correct amount of dihedral. After adding spar and ribs to this outer panel you do the same with the other tip panel.

Before you add the top sheeting you have to fit the aileron control tube outers. I added some extra support to get a smooth run of the tubes. It is also smart to put in two pieces of string for pulling the motor cables later on. The wing centre section tapers in both planform and thickness. The top sheeting will have to take up some double curvature. I glued the rear part of the sheeting with medium thick cyano and used white glue and a lot of pins and masking tape to fit the planking to front ribs and false leading edge. The outer panels are easier to plank but follow the instructions so you get the right amount of washout.

After you have cut out the ailerons and faced them and the recesses with balsa you have to glue on some 0.4mm ply reinforcements for the motor nacelles. I found it a little hard to bend the ply round the leading edge so I used some cross grained plywood instead.

The Fuselage

The fuselage is built around a central structure of battery box and some formers. All parts are CNC cut and fit together perfectly. Glue the battery box on a flat building board protected by plastic film. It is vital that you get this structure straight. Watch out when you add the formers F3 and F4, they are of similar design but different sizes. Don't ask me how I know!



▲ Wing centre and one tip.



▲ Wing and nacelle structures (not attached).



▲ Fuselage in jig.



▲ Bend the balsa to follow the curvature of the formers.



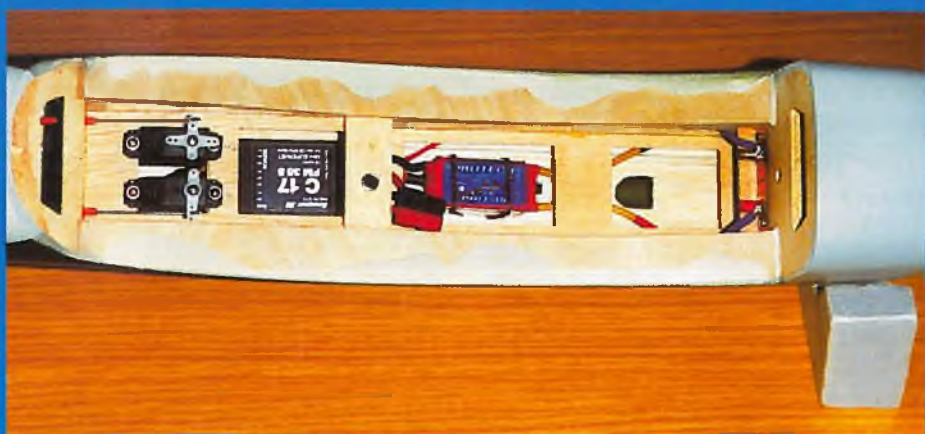
▲ The 0.4mm ply reinforcements to which the nacelles are glued.



▲ Engine nacelles wrapped in ply and fuselage/wing planked.



▲ Bare model, filled and sanded.



▲ Radio equipment fits tidily, missing is the battery pack.

Now you have to prepare the fuselage sides. The plan shows that the sides are made from three CNC or die cut balsa parts. The parts list shows only the middle and bottom parts and the top 1" (25 mm) balsa sheet was missing in my kit. Balsacraft have told me they have added this part to all the kits in stock. If these parts are missing from your kit, make them from 3/32" balsa.

After I had glued the sides to the centre of the formers and joined them at the tail, I used my self-adjusting fuselage jig, you have to bend the balsa to follow the curvature of the formers. I use a mixture of water and ammonia to wet the balsa and used masking tape to hold everything together until dry. Then I glued the sides to the rest of the formers.

The part of the fuselage under the wing should be separated from the rest and glued to the bottom of the wing. The instructions tell you to plank all of the fuselage bottom and then cut out the under wing part. I found it easier to separate this part first and plank it after the structure had been glued to the wing. The bottom sheet is from 3/16" (5 mm) balsa and needs the water/ammonia treatment to make it easier to fit.

When all the fuselage planking sheets are glued, there is a lot of planing and sanding to do to get a nicely rounded fuselage. Be careful at the nose so it will be symmetrical.

The Tail

This is CNC or die-cut light balsa parts and only needs gluing together and leading and trailing edges shaping. I didn't glue the tail to the fuselage until this was covered, primed and painted.

The Motor Nacelles

The structure is made from CNC cut lightly parts and planked with a rolled piece of 1/64" (0.4 mm) plywood. The nacelles are glued to the 0.4 mm ply reinforcements on the wing. Then you have to trim the vac formings to make them fit and glue them to the wing.

Covering, Painting and Marking

You can cover the model with tissue, Litespan or even Solarfilm. I personally think a wartime bomber should be finished in a matt paint scheme and wouldn't use a plastic film finish. I covered the tail parts with lightweight tissue and the rest of the model with

▲ I covered my heated building shed with old newspapers and turned it into a spray booth.

1 oz (25 grams) fibre glass and epoxy. If you are careful with the amount of epoxy you use, this will give a light and durable finish. The model was primed with a car spray primer and painted with Humbrol enamels using an airbrush. I like to spray paint my models outdoors but the Swedish winter isn't really suited to that. As I felt a certain pressure from the Editor, I covered my heated building shed with old newspapers and started to spray.

You get a British marking decal sheet with the kit. As I am a Swede I like to finish my models in the markings of one of the Scandinavian countries. Sweden never used the Blenheim but Finland did. I took the ferry over to Helsinki to visit their aircraft museum and got a lot of help from the staff so now my model is marked like a Finnish bomber from 1942. I also got several pictures from a Finnish modeller via the Internet. By the way, the Finnish swastika had nothing to do with the Nazi swastika. It derives from the personal symbol of the Swedish count von Rosen who donated the first aircraft of the Finnish air force in 1918. That is before the Nazi party was founded in Germany. After WWII the bad name the Nazis had given to the symbol forced it to be changed to a round insignia.

You may find the wing markings a bit small. They were originally 4/5 of the wing cord but the Finns found out they made good targets for the opposition so they were changed to a size no more than one metre in diameter. The markings are a n d



numbers were masked and sprayed with the airbrush.

The plan says the all up weight will be 1880 grams (66 oz). The weight of my model is 1950 grams (69 oz). I think the reason is the fibre glass and epoxy finish. However it gives a more durable model.

Drive Components and Electronics

The Blenheim is designed for two Speed 600 8.4V motors with Graupner 8 x 4" Slim Props. A complete drive pack with motor, propeller and adapter is available from your local model shop. Please note that the Blenheim requires two packs. I know that the designer uses Speed 600 ECO motors for his model but I used the standard drive system. The ECO motors give you a little

more time in the air but slower speed.

I was supplied with a 7 cell RC-2000 flight battery and a PRO 35 electronic speed controller by PROTECH. The controller seems to be of European origin and can be used with 6 to 10 cells. It has BEC so you don't need a receiver battery. The controller can take up to 35 amps so it should be good for a twin Speed 600 model. To set the starting point you turn a small potentiometer on the controller. I used my Speed Controller Trimming Device for this. The Editor might publish the schematic. The controller was attached to a small sheet metal holder so a stream of cooling air could pass over it. The holder sits at the top of the fuselage and I added a small non scale air scoop to direct air to the controller. The air exits through holes in the gun turret.

The flight battery came with TAMIYA model car type connectors. As I don't think this type of connector is suitable for electric flight I changed them to my standard connector for up

(see flying the model) and a small Graupner JR receiver. You need this size of servos for this model. The aileron servo needs a short extension cable to the receiver. You can fly the model with ailerons and elevator only but I chose to use rudder as well.

Modifications

There really isn't need for any modifications except the exchange of connectors. However I couldn't resist the temptation to glue some small tubes to the nacelles structure and solder up a pair of plug-in landing gear and wheels. I don't intend to use them for take-off and landing but the model really looks nice standing on the runway. I think it would be possible to install retractors in the Blenheim. Someone should try that. My flying field is a bit too rough for small retracts.

Flying the model

It finally stopped raining and/or snowing and we got a calm day for the first flight. The temperature was three degrees centigrade below freezing but that has never stopped a Swede from flying model aircraft. The battery was cycled a few times and fully charged. The radio system was checked and both propellers were turning the right way. Nothing more to do but fly.

Son Martin hand launched the Blenheim. The model climbed a little too steep so I had to hold some down elevator to let it gain speed. It looked very nice in the air. Something wasn't quite right. The Blenheim was very reluctant to stop turning when the ailerons were neutralized. I had to give opposite aileron to stop it banking and level it. After some circuits I decided to land. Once lined up it was easy to control the descent with throttle and the model made

an acceptable landing although hard frozen ground isn't that good for landing model aircraft. I much prefer soft grass.

Post flight examination showed that the ailerons didn't neutralize. They stopped at perhaps 25% deflection. I am never too happy with a bent snake aileron drive. It worked alright at home but out in the cold weather the friction in the system increased.

Back at home I polished the inside of the tubes in the wing with my electric drill, a snake inner and some rubbing compound. I also changed the aileron servo, Hitec HS 85 BB (2.7 kg.cm) for a Hitec HS 225 BB (3.9 kg.cm). Now the drive to the ailerons was working much smoother. However, if you intend to fly much in cold weather it might be wise to install two small servos with direct drive to the ailerons.

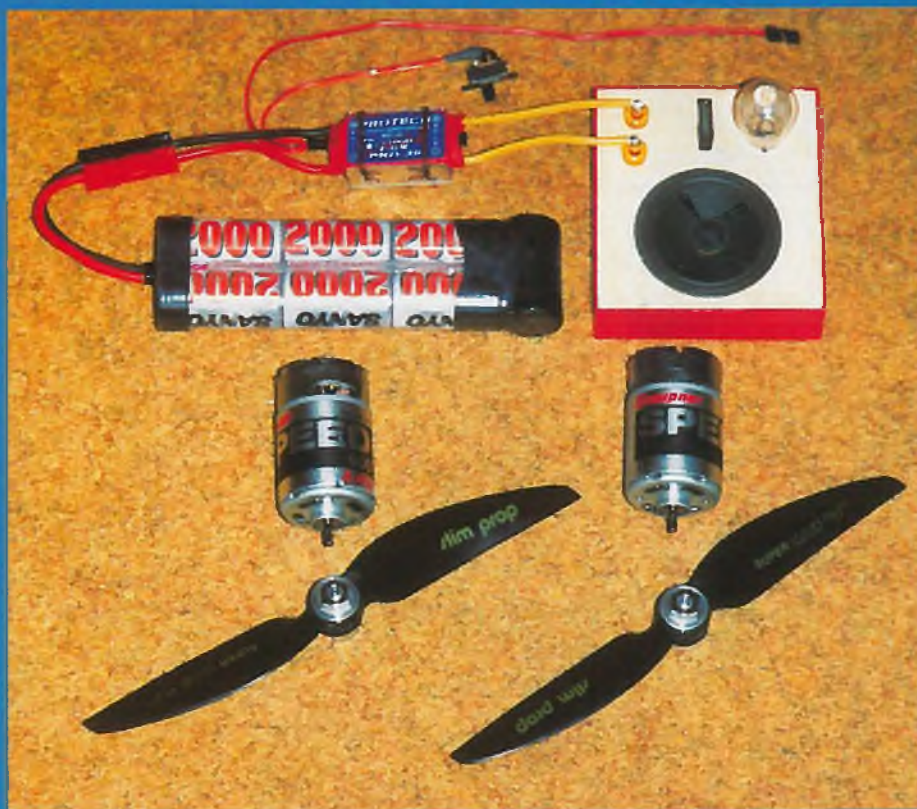
Next day came with perfect flying weather. Almost calm air, the sun was shining and the temperature a little lower. The Blenheim was launched again. Still needed a bit of down elevator until speed was up. Now the model was fully controllable and felt very nice to fly. The original Blenheim was a fast aircraft and you shouldn't fly the model too slowly. However the stall is straight and the model recovers easily. The power from the two Speed 600 motors is more than enough and the speed controller worked without any problem. The low temperature prevented me from exploring the full flying time capability of the motor/battery combination. I didn't want to make a dead stick landing on the very hard frozen ground.

▼ The drive sets (motor, prop and adaptor), battery pack and Protech Pro 35 speed controller used in the Blenheim, plugged into the 'Speed Controller Trimming Device' describe elsewhere in this issue.

to 10 cells, the ANDERSON POWER POLES or SERMOS type connector. The battery is made up from cells joined by spot welded metal straps. For a high current model I really prefer end to end soldered cells. Two speed 600 motors connected in parallel and with 8 x 4 Slim Props take a current of about 28 amps. The battery construction might be OK for this model, otherwise one could solder the cells.

The kit comes with cables and connector from the motors in the wing to the speed controller. As this connector was of the TAMIYA type too, I exchanged it for a pair of 4mm gold connectors. You have to be a little careful where you put these connectors. There isn't much space between battery and wing.

I used Hitec HS80 servos for elevator and rudder, a ball bearing HS85 for the ailerons





▲ This is not a carpet, it is a frozen lake used in winter as a giant model airport.

Conclusions

It has been great fun to build this model. The design is very clever and you get a well rounded fuselage without any need for strip

planking. The model is interesting to build even for a modeller more used to designing his own models – and much faster to build. the result is a good looking scale model in a size easy to transport and a good flyer. I am so impressed with this model that I ordered two kits of the new Balsacraft Focke Wulf 190 for myself and my son Martin. You may hear more of the Fw 190 later.

Availability

Balsacraft Model Designs kits are now available world-wide, ask in your model shop or contact:

Ripmax Plc., Ripmax Corner, Green Street, Enfield, UK-EN3 7SJ.

Website: <http://www.ripmax.com>

RRP in the UK is £59.99. **EFI**



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1959

Cover Story



B-52H

REPORT BY: **THE EDITOR**

After almost six months of designing, building, testing, painting and more testing – the B-52H was ready to fly.



▲ Port (left) wing in its custom made box. Notice the scale engine nacelles, jet exhaust stains, flap, aileron, drop tank and retractable wheel.

Chris Golds has told you everything about this model in his series 'Another Large Helping... Please!' He has an obsession with the BUFF (Big Ugly Flying Fellow) as the big one became known to her crews.

So Many

He is so fascinated by this leviathan that he has already built one small(ish) 60" (1.5m) one for eight Cox 020 glow motors

◀ The whole tail in four protective sleeves.

► The wing centre fitted to the fuselage. You need labels to avoid confusion.

and one 17' (5.2m) span one for eight OS46 VRDF/Thorjets. That was all before he saw the light one day on the road back from Chivenor – and he went completely electric. After a brief test with a pair of Gaskin 400s to see if electric fans would actually fly a model, his first REAL electric jet was another B-52. Chris is a brave man; when only a few of us were even considering Electric Ducted Fan units, one at a time – maybe two, his first serious electric model used eight.

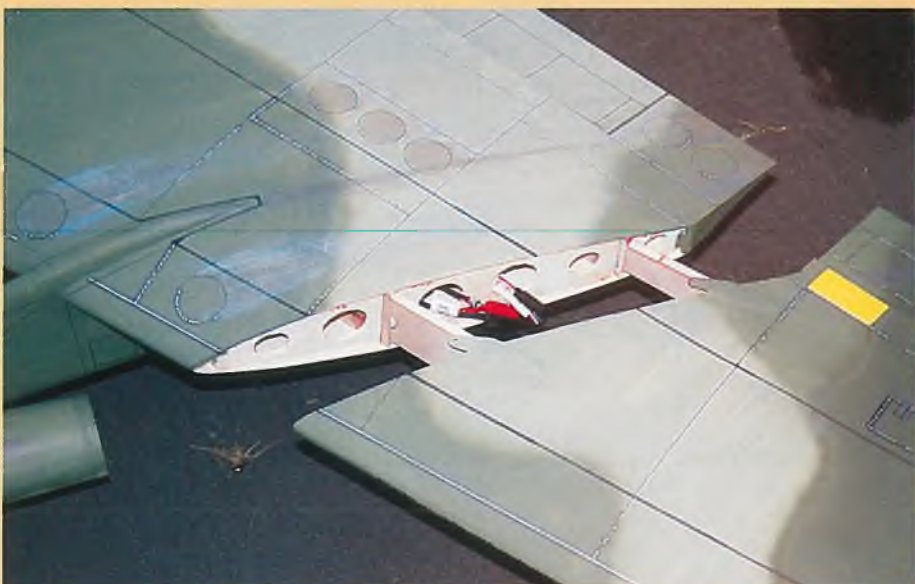
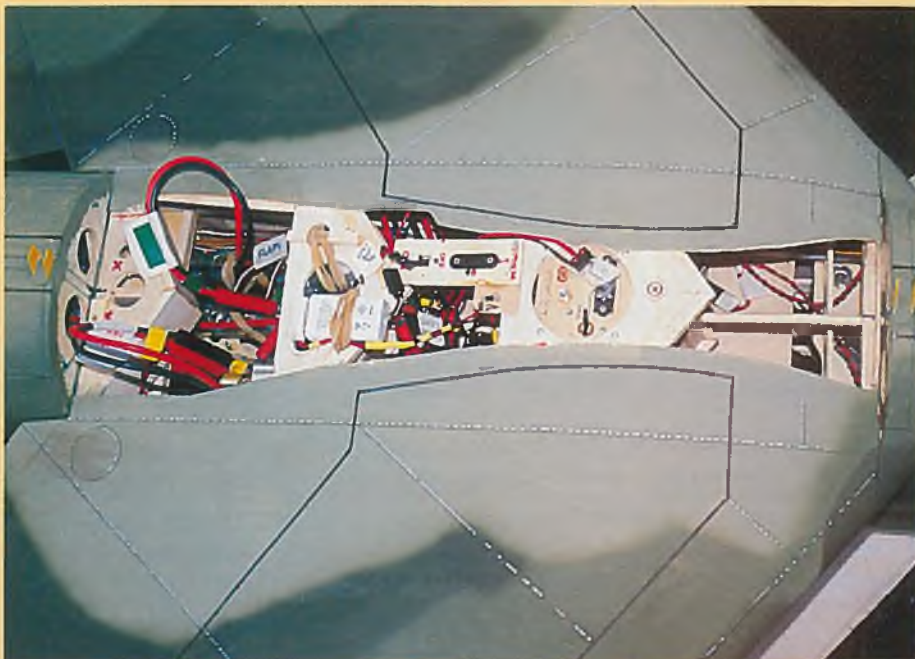
That model taught him a lot about EDF units and we are fortunate to gain all that knowledge for free just by reading his articles in this magazine. After the B-52 he built several more interesting and unusual models, pushing forward the frontiers of EDF knowledge. If you are a regular reader you will be familiar with the products of this prolific designer/builder; several of his plans are available from our own Plans Service and from other similar services in the UK. His first electric B-52 was 'cartoon scale' (his terminology) and rationalised for model flying. Dimensions were adjusted somewhat but it was very recognisable as a B-52. This B-52 was sold on to make space for his next few models. Its current owner is Mal Tomlinson, he loves it and you may have seen Mal or his demonstration pilot Pete Barrow flying it at several UK shows last year.

This is his fourth B-52

Chris rang to tell me the B-52 was finished and ground tested. "What else do I need to do?" he asked. "Fly it." I told him. He telephoned me on Friday to say that the weather forecast was favourable for Saturday. Mal (now a B-52 FANatic) had already expressed a wish to "...see the next one fly." So I informed him too. We left my place very early on Saturday morning, for a long drive. The English weather has a well deserved reputation for unreliability. We started out on frosty roads, hoping to not meet any of the fogs so typical in early December. We watched the sun rise very slowly into a clear sky and arrived to find Chris with the model already packed into his spacious van and ready to travel to Chivenor.

Read Chris's account of the flight test. The photo shoot on these pages was concerned with the way model is packed and goes together. More minor damage, or 'hangar rash', usually occurs in storage and in transportation than on the flying field. Every airframe component was boxed separately and models this big break down into still big major components. His van inner walls are covered with brackets and hooks with labels like 'Swift tailplane port tip'; once you have a system that works, stick with it. This time every part was in a box or in a paper sleeve.

Boxes were unloaded and parts lifted out or protecting sleeves removed. The wing



▲ A helper slides on the wing outer.
▼ Chris makes every connection.

▼ A lot of intricate detail is included like guns and well worn rivet heads.





▲ Armament was attached for the photo shoot but removed for the first flight.

centre section with four inner motors was fitted to the fuselage centre before its nose and tail was added. The entire tail includes fin and tailplane and is bigger than most of the models the rest of us fly. Wing outers, each with an outer pair of motors and a drop tank are slid onto the joiners. These and every other part fitted has a spaghetti of coloured cables to connect 8 motors, navigation lights, landing lights, retracts fore and aft in the fuselage and out in the wings, flaps, ailerons, elevators and the rudder. Then there are two power battery packs, Rx battery, navigation and landing light battery and two speed controllers. You know, some readers complain to me

▼ Lights on – ready to roll.



▲ The model is lifted for Chris to install the drag 'chute. By this time helpers were feeling the cold, Ron Laden holds the tail and David Brock the starboard wing.

that removing rubber bands that retain the wing, to get at the power pack, is a tiresome chore!

This was my first opportunity to examine the finish. It is painted to look like one particular well used B-52. There are panels off other aircraft or from stores, whose different history is apparent from the different weathered finish or not quite matching

paint scheme. One of Chris's 'day jobs' was as a painter of aircraft – not with a spray gun on an aeroplane – but with a brush and





▲ "What have I forgotten?" - or at times like this, maybe he has a word with someone else.

oil paints and canvas, he is an Aviation Artist. So he is very skilled at including all the detail that looks so convincing. I hope you can see in these photos the jet exhaust stains and smears of oil and aviation fuel from so many of the covers all over the aircraft. Also where paint has worn away from constant rubbing by ground crews or debris at hundreds of miles per hour. This was a very true-to-scale model, it could have spent forever in a museum.

As the model was assembled the cloud cover intensified and the wind increased - and it got colder. The first power check did not 'sound' as flat out as I expected but the model was in a big wide open space. I'm used to models that I cannot even assemble inside at home, looking quite insignificant on an airfield. Perhaps the noise is less impressive too?

I was standing upwind, camera ready, about where I estimated it would lift off. Take off was aborted, see Chris's account.

Now it is all over I can understand why Pete Nicholson test flies his scale models in bare balsa without even a coat of sealer, before spending as much time finishing the model as it took to build it. If things go wrong, he has saved a lot of time. If adjustments need to be made, they do not spoil the finish. **EFI**

▼ Not wishing to waste power taxing, the three man team carries the model to the runway.



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Cosmotech

Gearbox Evaluation

REVIEW BY: **RAINER KRAFFT**

This neat and compact epicyclic (planetary) 4.5:1 gearbox for 400 size motors is installed in a model for evaluation.



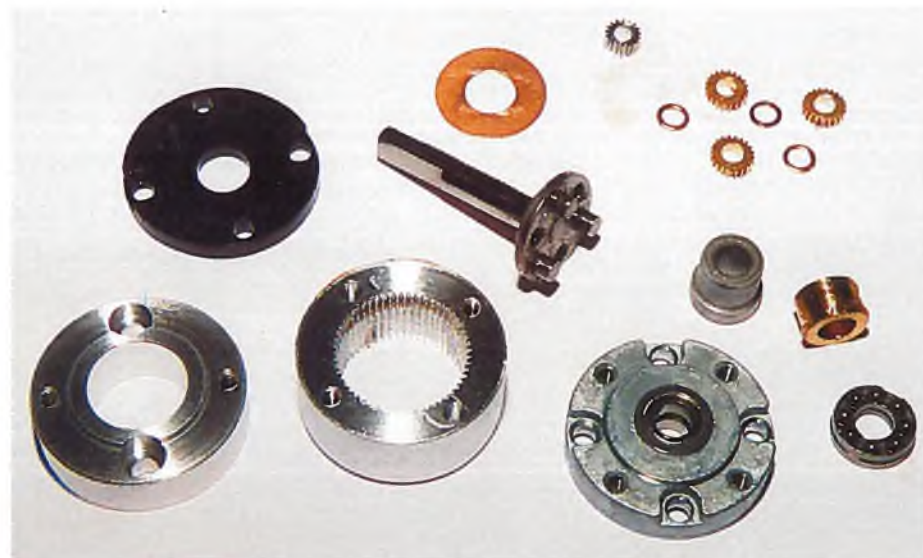
▲ The Cosmotech as it arrives, compared with a 20p coin, 21.4mm or less than 7/8" across.

As It Comes

The gear itself comes readily assembled for non-modelling purposes. This means that the bearing is a plain brass bush and the thrust race a brass washer. By just turning it under some axial or radial load you feel a considerable resistance. Obviously this is not a state you would like to use it in. The supplier has recognised that better bearings are required to convert it to an efficient gearbox and hence my sample was supplied with a small bag containing two flanged radial ball races, one axial ball (thrust) race and the pinion.

A brief assembly instruction in a partially amusing English (why should I damage the motor shaft in order to press the pinion on) gave you an idea about the assembly process. The original plain bearing is carefully removed by tapping with a small hammer onto the bush whilst supporting the front part of the gear box. Inserting the two flanged bearings is easily done when you warm up the gear box housing either on an electric cooker or with a micro flame. The final assembly is quickly

▼ The gearbox dismantled. The two flanged ball races are installed and the ball thrust race is on the extreme right. Above this are the two original bushes.



done. If you want to reduce the mass of the gearbox there is still quite some material you could remove. Having said this I wonder whether there aren't any better ways of saving 5g. One of the photographs shows the power train as it was for the first flight checks. The enormous switch is one that I currently had at hand. Rated at 30A it is a total overkill considering that only 5A were drawn so this is one typical example where I could have easily saved 10g. The unit was installed in a model that you may have seen a few years ago in an article about a flight switch design. It does look its age but still flies well.

Power train Configuration:

- Speed 400 6V with 4.5:1 planetary gear box
- 7 cell well used 500mAh Nicad
- 12 x 7 Aeronaut prop

The first question to my local dealer was about the prop. Checking in several catalogues about any hints for a suitable motor-gearbox-propeller combination led us to choose a 12 x 7 size. I did not know what to expect (the hope was for a rocket launch with 10 minutes motor run time). Before setting off to the flying field I measured the current consumption in static conditions. With the 12 x 7 prop it drew about 4A with a not fully charged Nicad.

On a freshly charged battery it drew about 4.5A. That is roughly 50% of the current consumption compared to the direct drive with a 6 x 3 prop. Obviously it is also only half the power put into the model, ignoring the increased prop efficiency of the larger prop and the gearbox losses.

Flying

On one of the few winter days when it was 0° but sunny I went out to the field with high hopes and a fully charged Nicad. Everything was set up, switched on and off it went. How did it go? Slowly! My initial instinctive pull on the elevator to climb away was rewarded with a high nose flying attitude and no climb. So, forward with the stick again and very gently climb away. As I said before, only 50% power into the model does not transform it into a rocket.

The Mini Challenger is also a model with a relatively fast section and when flown slowly as happened when using a slower turning large prop it can't climb very briskly. However, the motor run time was 6 min 30 secs and eventually I reached at least the same altitude as with the direct drive. The larger prop with its large torque had its impact on the straight flying ability but after a few notches right trim it was back on a straight line again. When the motor cut off I had to retrim it again to circle with sticks central. Total flying time was 12.5 minutes. The last 30 seconds powered flight was just enough to keep it flying level. A week later I met a club mate and borrowed a 13 x 7 Graupner Propeller that he intended to use on a 10 cell hotliner. Luckily the 4mm collet has the right size. A static run with a freshly

▼ The power train tested.



charged 500mAh Nicad gives a motor run time of 4 min 20 sec. Then the unexpected happens. It's a bank holiday and the sun is shining with virtually calm air, 3° warm. Quick charge up and off to the field.

The first launch sees a different model climbing away. The climb is much steeper, I guess it's almost the same as with the direct drive. Lots of right trim under powered flight required to compensate the torque. I climb 3 times rather than once because it was a bit hazy and I didn't want to lose the model. Total motor run time is 4 minutes and total flying time about 11 minutes. So what to do now? Using an even bigger prop for a faster climb and accept a shorter motor run time? It looks like there is a limit of what could be achieved in terms of flying time with this motor and a 500mAh pack. It's probably those Physics things again that say something like "energy into battery = energy out to the model". Shame that you can't get more out than you put in. There is one advantage after all, using the gearbox. With its additional sewing machine sound I can hear better when the motor is slowing down or when it is about to cut off. This gearbox however is nowhere near as noisy as some others that I heard.

Conclusions

I am still not 100% convinced about using a gearbox in this model. Everyone recommends gear boxes it so it must be true. Maybe it requires a higher revving motor to get the air-speed with this high gear ratio or maybe it needs a slightly lower gear ratio with the 12 x



7 prop. As always there are a lot of parameters to play around with. That's probably where the computer programs come into their own because it is not feasible to buy a dozen props and 5 gearboxes to try a sufficient number of combinations. After all, this model was built for £15 worth of materials and uses a cheap motor. It's supposed to be a low cost model. But for £40 for a gearbox and the propeller plus adapter etc., one could buy some more Nicads or get a better motor. I will still keep flying it with the gearbox and try various props as and when I can get hold of them. Maybe Dick Whitehead could run his computer program which I believe he tested a

▲ Mini Challenger test vehicle mit Helfer.

while ago for me to come up with a good estimate for my model.

Footnote

Your editor is still flying the 'Little Star' (reviewed in the April 1998 issue of EFI) for fun and in Electrosport 400 competitions. He uses a Graupner 12 x 10 prop and a 4:1 ratio gearbox with a Speed 400 6V motor on 7 cells. This indicates that Rainer should be using a 12 x 10 prop or even 13 x 10 or 12 x 12 to optimise performance. **EFI**

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Mowta 5



Plan and Construction

REVIEW BY: **MIKE FREEMAN**

A 1.3 metre (51") span sport aerobatic model with aileron, elevator and motor control, of conventional construction and that uses no expensive materials or equipment.

Introduction

I was bitten by the electric bug in the mid 1980's when I acquired an MFA Olympus unit and built myself a six foot span powered glider. It wasn't long before I was thinking about using the Olympus unit in a smaller sports aerobatic model.

The first model I designed and built, called Mowta 100, was a one piece affair with a foam wing and an all moving tailplane. This model was included in the September 1988 issue of RCMW in Mick Reynolds 'Charged Flying' column.

Following quickly on the heels of the 100 came the Mowta 5 featured here. This has the same wing span and platform shape as the 100 but has a built up wing to keep the weight down. The wings are mounted on the bottom of the fuselage and are removable to make transportation easier and to allow the batteries to escape in the event of a mishap. The wings are held in place with rubber bands around hidden dowels to keep the exterior looking 'clean'.

I chose a V - tail because they were not very popular in the late 80's and I wanted this model to look distinctive.

Interested in building one? The construction is quite straight forward. Although the original used an Olympus unit there is no reason why a gearbox could not be grafted in and details are included on the modifications required to the motor plate to suit a low cost Graupner Speed 600 FG3 gearbox. I am sure other gearboxes would be just as suitable and easy to fit.

The following construction details are not exhaustive, they explain the general idea and elaborate on the slightly unorthodox items when required.

Wing Construction

1. Make up both main spars and join with the two dihedral braces.
2. Pin bottom cap strips, LE and TE sheeting to the board for the first wing.
3. Pin the spar to the board (through the sheeting) and add ribs R1 to R11, LE and TE.
4. Wedge the LE bottom sheeting whilst drying.
5. When dry remove from the board and repeat for the second wing.
6. Add aileron bowden cable outer and $\frac{1}{8}$ " (3.2mm) sheet reinforcement to each wing.
7. When set cut off the bowden cable outer flush with the underside of the wings.
8. Pin one wing to the board with the washout and add the top sheeting and capstrips.
9. When dry remove from board and repeat for the second wing.
10. Make up servo hatch, add the tips and make up the ailerons.
11. Sand down ready for covering.

Fuselage Construction

1. Make up the formers as shown on the plan. These are very straightforward with the exception of F2. This former both

locates and restrains the motor plate. The slot up the middle of the former locates the motor plate and the shoulder at the top of the slot and the thrust bar restrains the motor plate. Once the motor plate is in place the Thrust Bar

▼ The fuselage is constructed entirely from flat balsa sheets.



▼ A 540 motor and Olympus belt drive, any reducer or gearbox will fit.



▼ Two holes provide adequate cooling.



Aerobatic

slides in between the two $\frac{1}{2}$ " (0.8mm) ply former facings and is screwed to the spruce strips in the former thus securing the motor plate. If required the ply facings on F2 can be increased to $\frac{1}{8}$ " ply for added strength.

2. Make up the fuselage sides and doublers as shown on the plan.
3. Make up the motor plate as shown on the drawing.
4. Mount the motor plate into F2 and F3 and glue F2 and F3 into the fuselage sides along with F1, F4 to F6 check for correct alignment in plan and check that the motor plate and fuselage sides are level.
5. Add $\frac{1}{8}$ " sheet top and bottom on the fuselage rear.
6. Add composite longerons and the hatch forward of the wing LE.
7. Add the $\frac{3}{16}$ " (4.8mm) sheet and $\frac{1}{2}$ " ply strip and the cockpit on the top.
8. Add the $\frac{1}{2}$ " ply facing to F1 and the tail block (this needs to be removed to fit the tailplane).
9. Sand down ready for covering.
10. Remove the bottom hatch and the motor plate and glue the two $\frac{1}{8}$ " x $\frac{1}{4}$ " (6.4mm) spruce strips to the ply on the top sheeting. Check the motor plate is a good fit.
11. Add the $\frac{1}{8}$ " sheet wing seats.



► It is better to launch from the run.



Tailplane

1. Make both halves of the tailplane ensuring they remain flat until set.
2. Sand down and join the two halves with the two dihedral braces.
3. Glue the tailplane into the fuselage and add F7 and the soft block.

Covering and installation

1. The original was covered with Solartex on the underside of the wings and fuselage and Litespan on the remainder.
2. The aileron servo is 'servo taped' to the ply base in the wing.
3. The Rx and elevator servo are servo taped to the fuselage sides.
4. Position the RC battery to achieve the correct CG.

▼ Designer and model.



Flying

Assuming the CG is at its forward location for first flights and that everything moves the correct way and by the correct amount, head for the flying field. It is best to carry out the first flights with a bit of a breeze until you are familiar with the launch.

The original flies best with a retimed 550 motor, 7 Sanyo cells and an 11 x 8 prop, but it also goes well with a standard 550 motor and an 11 x 6 prop. The motor control on the original was a simple on/off switch. The Westbury Products unit with the BEC facility now fitted works very well. There are now a lot of effective low cost speed controllers available.

It is necessary to launch from the run, to get up to flying speed. There is no problem with the low wing, just hold the fuselage aft of the wing TE with your thumb and forefinger and support the model on the palm of your hand.

Once away Mowta 5 climbs out well, a bit of right trim is sometimes required at the launch to counteract the torque, I have tried different thrust line settings but find it

◀ Complete model - see the neat wing band fixing?

best to leave the side thrust at zero and use the transmitter trim until the initial power surge has stabilised.

I like a nose heavy feel during the glide phase. If you prefer to have a floating glide then please add a couple of degrees of down thrust when building the motor plate.

Control response is very crisp, and there is no neutral stability so this is definitely not a model for the beginner or faint hearted.

All the usual roll and pitch aerobatics are possible, and any combination. Consecutive manoeuvres are also within the capabilities of this model, as are hesitation rolls (if a little barrelly without a rudder!) The inverted performance is not brilliant but it will fly upside down with a fair amount of down elevator fed in.

The relatively large prop has quite a torque effect on the model; you will find you need to throttle back at the top of a loop otherwise you will get a flick roll off the top (a nice manoeuvre in itself!).

Flight times vary depending on how the model is flown. When doing aerobatics 7 to 10 minutes are possible, and by climbing and gliding back down, climbing again and so on, the flight time can be increased to 12 to 15 minutes.

I must admit I prefer the aerobatics and don't mind the few extra minutes waiting for the next battery to charge.

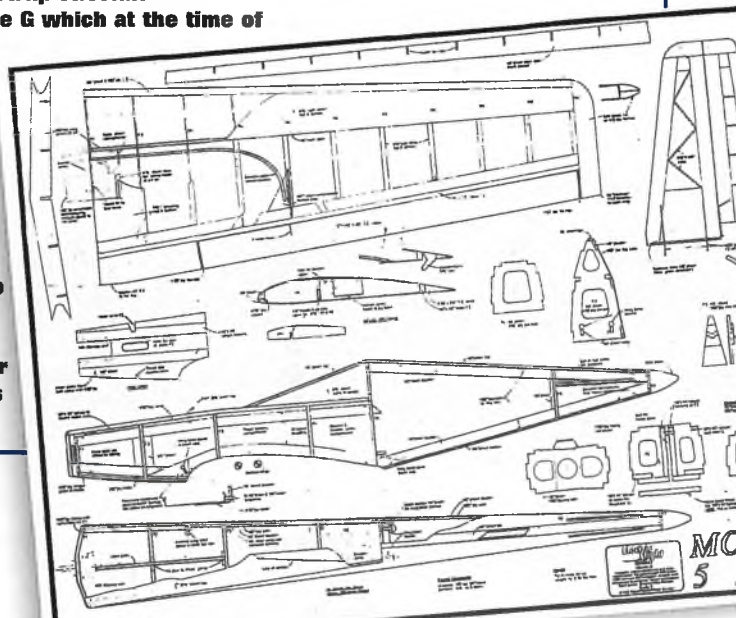
The crash resistance of this model has been tested on several occasions, usually any damage can be site repaired, more often than not it breaks up into its component parts and a new set of wing bands has it airborne again.

When landing I find the best way is to come in low and slowly ease back on the stick to stall the model onto the ground thus keeping the skidding to a minimum. You could fit an undercarriage if you like but watch the weight! **EFI**

MW2647 - MOWTA 5

Copies of plan number MW2647 'Mowta 5' 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

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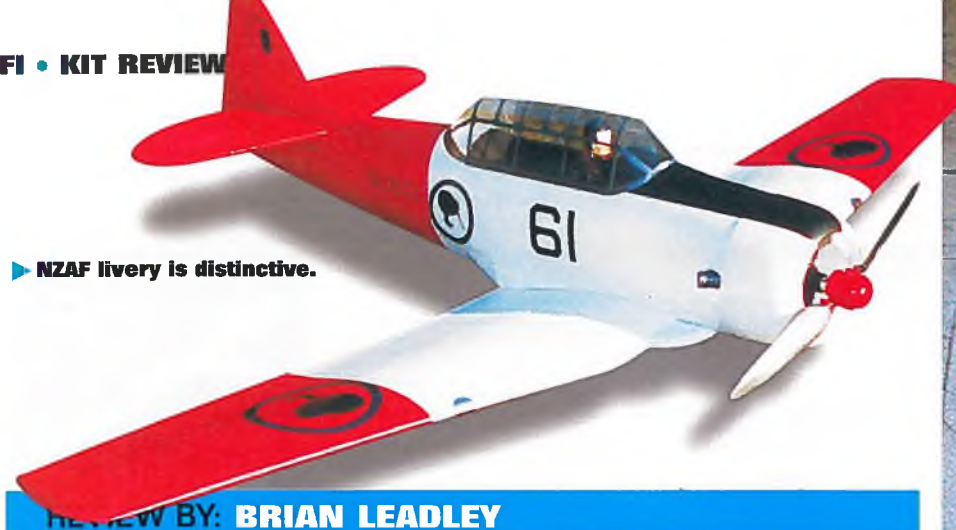
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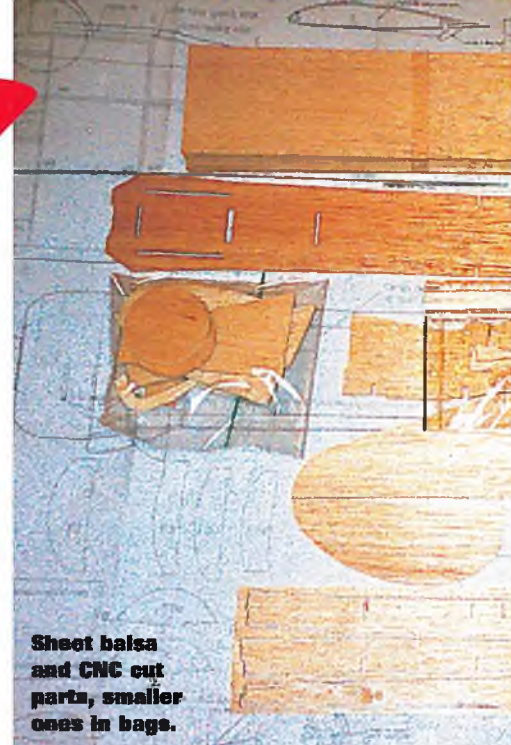
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► NZAF livery is distinctive.



REVIEW BY: BRIAN LEADLEY

A kit for builders but all parts are CNC cut for accuracy and ease of construction - 39 inch (1 metre) span model for geared 600 motors and 7 or 8 cells.



Sheet balsa and CNC cut parts, smaller ones in bags.

RBC AT6 Te Kit Review

Before Starting

I first saw this kit in the Current Affairs column of the November '98 EFI, I have always liked the Texan, but prefer the name Harvard. There used to be one based at our local airport until it was sadly closed two years ago for re-development. I was always surprised at how big they were for a trainer.

The Harvard

I was really pleased when I received the kit to build as a review model. My first impression of the model was the photograph on the box. Every model of this aircraft I had seen up to this time had been like the box, in the American colours, or all yellow. I determined even before opening the box that I would be using a different colour scheme so I was looking for one before I started building.

The Kit

On opening the box, the first thing to notice are the plans. There are two of them and they are enormous. Each and every part of the model is shown on one or the other sheet. The only disappointing is that with all this detail, only one half of the wing is shown (I hate having to oil the plan to build the 'other wing'). The building instructions are all on page two of the plan. Next, a look at

the wood, which is very good quality and it is noticeable that all the sheet balsa provided is 4" (102mm) wide. The individual pieces for the wing, fuselage etc., are contained in their own plastic bags. Finally there are the moulded clear canopy and the motor cowl, both in clear PETG (the same material that bottles are made of, this is a better material than ABS, it's tougher). The canopy is supplied smooth so the canopy details need to be fitted later. This kit is a pre-production version, so there may be slight variations in subsequent ones.



▲ Wing bottom sheet, mainspar and ribs.

The Build

So now down to business, commencing with the wing centre section. All the sheeting is pre-cut to the different lengths required for wing centre, wing outers and fuselage. Join the necessary sheets and when dry sand the joints, it's much easier now than when the wing is built. I have even gone back to the 'old' ways and used balsa cement for this as I find it sands better than PVA or Cyano glues.

The Wing

Mark the position of the mainspar on the bottom sheeting and cyano in place, ensuring it is straight (I deviated from the plan here and added 0.4mm ply dihedral braces on both sides of the spar at the joining point). Do the same process for the outer panels at this time. Note, I did not cut the sheeting to the plan shapes at this stage. I prefer to build then cut rather than cut, build and then have to add if the shape is wrong.

The CNC cutting is accurate so the remainder of the first stage of wing construction was done on the coffee table whilst watching telly. It is that easy. A piece of card cut to the correct angle positions the ribs in the right place. The ribs are cyano'd in position at the centre part only at this time. When all the ribs are in position the sheeting at LE and TE are pulled to the ribs and cyano'd. Fit the false LE and then cut the sheeting to shape. An extra riblet (not on plan) is required at the inboard end of each aileron, faced with Sellotape on one side

before glueing. This makes it much easier when cutting out the ailerons later. I then joined the outer panels to the centre section and installed the aileron control outers, don't forget the scrap pieces for the aileron horn support.

Fitting the upper sheeting does require the building board to ensure the panels are straight and true. The outer panels require 3mm of washout. When laid flat on the centre part of the ribs, the TE is approx 0.4mm off the board, so the tapered piece needs to be this thickness inboard plus 3mm for the correct washout. I used Evostik for the top sheeting over the ribs and PVA at the TE. Evostik makes it easy to skin the top surface but needs to be left to dry properly, otherwise the washout disappears. When dry (the following day) I removed from the board and glued the LE of the sheet to the false LE with cyano. Sand the LE and TE sheeting straight and fit the balsa TE. The LE is supplied as cut strip but the TE has to be cut from the 3mm sheet balsa sheeting, as with the strip balsa required for the fuselage. Do not fit the LE yet.

The Fuselage

Put the wings to one side and start on the fuselage. This is constructed around a 3mm balsa keel which is supplied in two halves. Take care when joining these because if they are not straight and accurate, the fuselage will never be straight. Slot the basic front end together and hand hold whilst running cyano into all the joints, leave off the ply fire-wall for now. The larger formers are supplied in two halves which need to be joined together before fitting. I always glue 3 x 6mm (1/8 x 1/4") across these for extra strength. Slot the rear formers onto the keel and hold in place with 3 x 6mm longerons, ensuring the formers are square. Glue in place with cyano F5 to F9 and fit 3mm balsa to top and bottom and shape to formers. These are cut from sheeting provided.

Next come the 1.5mm (1/16") fuselage sides from F3a rearwards. These will require

▼ Fuselage frame and formers.



▼ Motor and gearbox fitted to F1.



xan



▼ Wing after top sheeting and cutting of ailerons.



▲ Wing underside showing finger grip holes for launching.



▲ Cowl trimmed and fitted.

to be soaked before fitting, if possible put softer balsa round the top. Cyano the sheeting as you go, glueing first one side to F7 and then do the other side in the same way. Pull and glue both sides together at the rear, this ensures the rear end doesn't finish twisted, (like mine did and I had to cut and glue again). Cut the sheeting to shape and fit second layer of 3mm balsa top and bottom.

The front 2.5mm balsa is shown on the plan as fitted in one shaped piece. This I found very difficult to cope with so I fitted it in four separate pieces. The fairings at the wing TE of the fuselage have to negotiate a 90 degree angle and no matter how much soaking I tried, they still cracked at the corner. Offer the wing up to the fuselage and adjust the fit to suit before fitting the 0.4mm (1/64") ply wing seatings in place. Leaving the wing in position, fit also the undercarriage

▼ All the constructed parts trial fitted.



wells followed by the wing leading edges. Remove the wing, fit tips, (glue only as far as LE of aileron) sand to shape. Cut out the ailerons, fit the horns and the wing is ready for finishing.

Fit motor and gearbox to F1 and glue in position, trim cowl to size and trial fit. Plan says glue in position but I fitted it with hardwood blocks and small screws.

▼ Fuselage with wing removed to reveal speed controller, power pack and elevator servo.



I trimmed the canopy by marking out the outlines on an A4 sheet of photocopying paper, then carefully cut these out with a scalpel, give them two coats of Humbrol Metal Cote and glued in place with my wife's craft glue.

Other Bits

Round edges of tailplane and fin/rudder and fit in position, ensuring it is square with the wings.

Fit the rear fuselage fairings and shape.

Finishing

Finishing is a personal choice, remember my 'Before Starting?' My search ended with the New Zealand livery. It fitted in with the fact that I had red and white paint handy. The only problem was, where on earth (or somewhere near) do I find roundels with a Kiwi Bird on them.

Fitting the radio gear is so simple it's almost a non event. There is only one servo in the cavernous fuselage and one in the wing for ailerons.

Flying

Despite all the bad weather we have had recently with either rain or wind, Saturday 9th of January turned out to be very tempting for test flying a new model. The forecast was for 18 to 20 MPH winds with showers, so I was hoping they would be wrong (again). Those who know me will be most surprised that I even think about flying in January.

The kit recommends eight cells for the power but being mainly an E-slot flyer, all my battery packs are only sevens. Driving to the field with the usual apprehension about trying a new model - but slightly more so this time 'cause it's someone else's and my first review model.

When I arrived at the field, I was really pleased to see that my friend and test flyer Paul was also braving the cold. With a fully charged flight pack I carried out all the usual checks. Range was good and all the controls moved in the right directions. Then I had to wait, Paul was actually flying his own model. By the time he was ready, I was down to the second knuckles, but only on one hand. The model was assembled and I carried it out to the field, was it getting more windy, was it really this cold or was it just me? At last everything was ready, motor on, now launch. As I mentioned earlier, most of my flying is E-slot and the first launch proved this, resulting in a low slow return to earth in ten yards. The second attempt was more powerful after a few steps for momentum. This time the model climbed away well. Once in the air, gain some height and check the trims, a click of right aileron to keep her straight and the elevator didn't need touching, so the CG is obviously in the right place.

With the wind now blowing between 10 and 15 MPH (16 and 24 KPH) the Texan was flying really well, even though she only had seven cells and on 1/2 to 2/3rds throttle. It had been mentioned that this model was



▲ Ready to go.

hard to stall, so let's try. Plenty of height, cut the motor and gradually feed in up elevator until it was full up. The model slowed with the nose well up and all that happened was the nose then dropped with no sign of tip-stall and the recovery was very quick without using the motor.

This was followed by some gentle aerobatics. The rolls were a little barrelled but the intended barrel roll was elegant, long and slow. Loops are straight and either tight or large depending on the amount of elevator used.

After a couple of low passes for the camera it was time to try a landing (after approx 6 1/2 minutes the batteries were fading). The glide is quite quick and flat so it needs to be lined up well out but when flared at the right moment, is reasonably slow on landing. A really pleasing and successful first outing. By this time I was really cold and anyway I didn't have another battery charged but I was highly satisfied.



▲ Looks great in the air.

Conclusions

This is a good quality kit, both in materials and the construction. The accuracy of the CNC cutting of parts (they all fit where they are meant to) make it quick and easy to construct for the average modeller who has built before. The construction makes up into a light but strong model. The power train I used with seven cells proved very adequate for mere mortals but those with a need for speed could use the recommended eight. The controls are positive and sensitive at the recommended throw settings. I have used the exponential facility on the ailerons, making it less sensitive around the centre.

A really good model, from a producer new to the UK which looks the part in the air and represents excellent value for money. I

am looking forward to many flights with the Texan and I recommend the kit to anyone. I love these WW2 planes, I must try some more of the RBC range, Curtis Hawk, P-51D Mustang and there are rumours of a Spitfire and a Beaufighter!

Equipment used.

2 x Hitec 80 servos.
Speed 600 8.4V with 2.5 to 1 Master
Aircscrew gearbox.
Kontronik Easy 3000 controller.
8 x 2000mAh Sanyo cells.
Jeti mini 4 channel Rx.
Aeronaut 12 x 10 Prop.

Comment from RBC Kits

This was the first pre-production kit and the mainspar was indeed wrong. Somewhere the CAD became corrupted but I have corrected it. You do not need to strengthen the mainspar, I fly mine built to the drawing with no problems. Also strengthening the formers is not necessary. The fairings from 0.4mm ply do crack a little but when glued on they can be sanded flush with the fuselage.

You don't have to build the wing on the plan, just draw lines on the 1.5mm balsa.

The front 2.5mm balsa behind the cowl: the plan gives a layout of how I built it, a lot of builders do it their own way.

I will adjust the drawing with your comments to make construction easier and also include some views of the dummy wheels and wheelwells. **EFI**

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This superb almost ready to fly trainer comes complete with 2 400 Motors and propellers etc. It is so simple to build it should be ready to fly in one evening. The smiley flies slowly and is highly stable. No sanding or painting and no mess. Requires a 7.2v Nicad Motor Switch and R/C Gear (3 Channels).

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The Petrel 400 is a very attractive 55"

Electric Powered Glider for this popular speed 400 type motors. It is very

easy to fly and is the ideal introduction

to R/C Model Flying. The kit is of

traditional construction with most

parts pre-cut and numbered and a

comprehensive hardware pack is also

supplied.

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SCALE PLANS

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



MW2381 EXTRA 300

Designed by Roy Garner this is not a beginners model. With 72" wingspan and 20-30 cc engine.

Plan Price Code: Q 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 strokes.

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

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 unkillable, 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 beauty is 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



MW2224 SLINGSBY KIRBY KITE

Marin 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: Q

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



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 Wasserkuppe 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 MINIMOIA 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 Minimoia will be a very rewarding scale project.

Plan Price Code: Z+E

MW2669 MINIMOIA 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 tussle 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 BREQUET FAUVETTE

Designed by Giuseppe 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: G

MW2557 BLUR

This 36" class slope pylon racer is intended for experienced flyers who wish to construct 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

ELECTRIC SCALE PLANS

MW2709 BRISTOL SUPERFRIEIGHTER 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 huge £/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 similar 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

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

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: G



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

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

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.

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 lifeply.

An Electric D/F model for the experienced flyer, this Luftwaffe jet uses a Clark 'Y' airfoil and features built up construction for a lightweight but fast model.

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

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.

Designed by Dick Comber, this 53" span flying boat is for four KP 02 or similar motors and ten cells, with aileron, elevator and motor control.

Saale WWII German bomber. Conventional balsa construction.
Designed by Martin Irvine.
Plan Price Code: I

WWI Biplane for 400 motors and four to seven cells, and rudder, elevator and motor control, designed by Stephen Mettam.

Dale Tattam originally designed this as an all built up aircraft for J.C. powers. He enjoyed it so much he lightened it and built it as an electric version.

SEAGULL
Geared WEP Turbo
Pen plus or similar on
10 cells. Designed by
John Thompson.
Plan Price Code: L

Another quick build profile scale design of the first rocket fighter by Chris Golds. A built up fuselage with 1/64th ply sides keeps it light but strong.

Designed by Paul Rossiter. A clean and very aerobatic model that is tempting many away from I.C.

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

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

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

DESIGNED BY NIGEL BREWER. An Electroslot soarer for Speed 400 motors and a fast build.

Plan Price Code: H

This is what might have happened to the V-1 if the Russians had ever used it. Easy to carve foam model. Option of built up wing. For aileron pilots. 7 cells.

U.K.: £1.00, Europe: £1.55,
World Wide: £2.85,
U.S.A.: \$4.00



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 function, Weight-1335gms.

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

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

An ideal introduction to PSS using all traditional 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.

Designed by Neil McHardy, this extremely agile model is a splendid stablemate to the FW190D, 46" wingspan.

An ideal first PSS Aileron model, fast, easy to fly and virtually viceless with many good colour schemes to reasearch.

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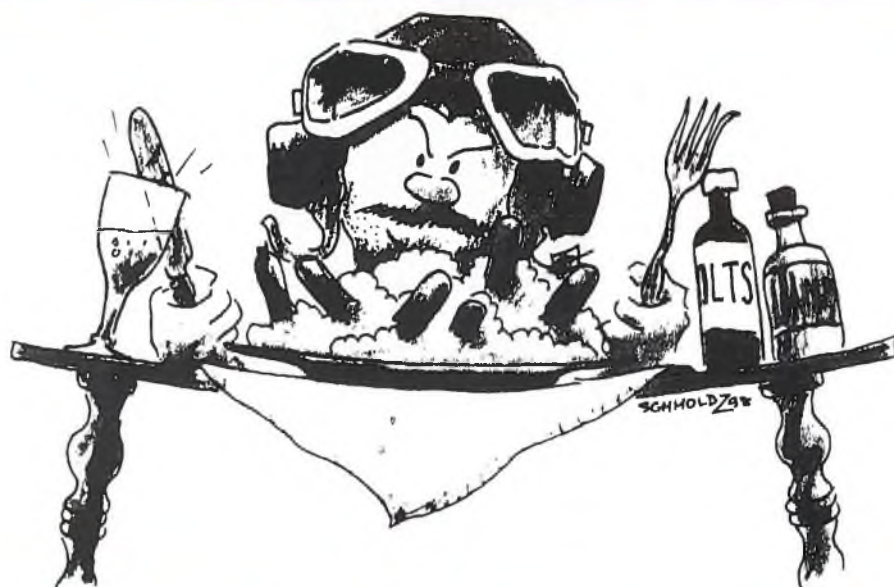
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[illegible]

Marshall's eye view.



Another Large Helping... Please!



WRITTEN BY: **CHRIS GOLDS**

After 5 months of building, painting and static testing the B-52 is at last ready for its test flight.

Flying

On Saturday 5th December 1998 we assembled to make an attempt at our first flight even though I thought that the model was somewhat short of thrust as revealed by bench tests. During the ground range tests of seventy-five yards aerial down – very severe for any Tx and Rx system but one I have used for years past – we experienced some signal loss when the motors were running but this was cured by extending just one telescope of the Tx aerial so we decided to go ahead and try to fly.

▼ Both jockey wheels just clear of the ground.



▼ Bombed up and fuelled up.



► Full power and rolling...

After a top-up charge of the 40 x 2000 cells (in two banks of 20 each) I lined up on the runway in weather perfect except for a grey overcast sky. With full power on all eight motors the B-52 trundled forwards fairly smartly but it was soon obvious that the acceleration was insufficient as Ron Laden – my co-pilot – counted off the seconds of take-off run. My previous electric B-52 eventually took only 4 seconds from brakes-off to lift-off so I had decided that 7 to 8 seconds would be about time if we were not yet off the ground. Ron called "NINE!" and I aborted but the motors stayed at full power and the nose wheel steering swung the model to the right and towards the grass. At that moment the signal re-established and the motors ran down to my cut throttle demand. Phew! So, back to the workshop for more tests and an attempt to squeeze more thrust from the installation; also I changed the speed controllers back to two RS analogue 100 amp units. Stephen Mettam had come to watch the flight and take some magazine photos with Mal Tomlinson along to compare the performance and appearance of the B-52H and my previous one – now owned by him. Stephen suggested getting some accurate 'voltage at the motors' figures so two days later I devised a method of inserting a plug into an inboard pylon in order to measure the volts at the motor. I had asked Stephen what sort of figure to expect from 10 cells and he said "Oh! about nine to nine point five" so I ran a 4 motor bench test and read 9.7 volts steady at full power. I rang Stephen and he remarked that 9.7 volts was a good figure so that left me with one sad conclusion. That if the volts at each motor were good then the fault had to lie with the design of the divergent intakes. So I dug out the intake test rig which had started all my experiments in 'Gape' and carefully opened out the first part of the intake to parallel. The result was a larger 'mouth' but visually it did not look like a dustbin which I wanted to avoid at all costs. A test run of the modified test intake gave an increase in thrust of about 2 ounces so if I pursued this mod on the B-52 I could hope for another 16 ounces of thrust. I rigged up for an 8 motor bench test – with great difficulty because of the size of the model and the hailstorm that the test produced. I measured about 7.5 pounds static thrust (a long way from my planned 10 pounds). In despair I re-telephoned Stephen (he really is very considerate over my endless calls for advice!). And I asked what would be the effect of more than 10 cells per motor. Strangely, he had just received an E-mail from the USA wherein a mad American was already running Plettenbergs on twelve cells and was building an F-14 with which he hoped to achieve better than 1 to 1 thrust to weight. He is even contemplating 14 cells per motor! I did say he was mad! To cut a long story short, I fitted twelve cells per motor (48 cells in two packs of 24) and achieved 11.3 volts at the motor AND I



reamed out the intakes so that a bench test of all 8 motors revealed 9.75 pounds of static thrust – enough to go with! This gave a TWVR (thrust to weight ratio) of 34.5% and I felt sure I could fly – and throttle back in cruise – with this. So along came Sunday 20 December 1998. A thorough ground test at 75 yards with motors off, at cruise and at full, gave NO control glitches and we started a top-up charge. A young ATC cadet (from the gliding school) came over to us and said "that will never get to Iraq!". Little did he know the truth of his statement!

With everything ready, off a good top-up charge to 39.5 volts, I waved to our video man and went to full power. The model leaped forwards and despite the crosswind was easy to steer straight for take-off. At about 6 seconds she came off the ground and was climbing strongly enough for me to discount the possibility of aborting and to continue to climb to the down-wind position. Except that she did not bank but began to put her nose down – despite everything I did with the stick – and got steeper and steeper – until she impacted at a good sixty degrees of dive into – of course – concrete. BOOM! less than 10 seconds flight for five and a half months of work!

I am writing this final part of ALH.P next day, this being the earliest that I could tackle the task without crying! But some lessons could be learned:

- There was plenty of thrust at an AUV of about 28 pounds.
- The C of G felt OK. and in the few sec-

onds that I had, all the flight controls answered as they should – until signal failure.

- Probably the cause was signal loss – possibly 8 Plettenbergs on the 12 cells each was more than the Rx could cope with despite very good suppression on each motor including a diode across the motor terminals.
- A 'scale' model will always weigh more than you plan for – this one was 3 pounds (1.4kg) over the planned AUV of 25 pounds (11.4kg).
- A really satisfying standard of 'dirty' finish could be achieved but with MUCH labour.

So, there we are, another large heap of matchwood.

Do I give up and begin to collect stamps as my wife advises? Or do I face the grisly task of stripping the carcass of hardware and clearing the workshop bench?

At times I think that complicated multi-motor RC model electric jets are great morale breakers. But surely someone has to stand on the edge and try to see if 'it' will fly? I have been thinking of another B-2 – but this time EDF so... Just before this goes to print, I have started cutting for a 96 inch (2.4m) semi-scale B-2 for 4 x Plettenberg/WeMoTec 480 Mini Fans with retracts, elevons and coupled drag rudders. If it is successful (?) I will turn it into an EFI plan as requested by The Editor so start saving up for the Batman suit!

FLY SAFE. EFI



► Lift-off with plenty of poke...

How much intake do we really need?

WRITTEN BY: **KIT MILFORD**

His experience with full scale intake design conflicts with the accepted practice of model EDF designers, is there really a difference?

Most so-called 'scale' electric ducted fan models at the moment are flying around with enormous air intakes, which completely spoil the scale appearance. If you ask why this is so, you will generally be told that it is necessary in order to get enough thrust out of our feeble electric ducted fan units. To his enormous credit, Chris Golds has asked himself whether this is true and has found that the answer is "NO" (see his 'Gape' article in EFI, November 98). Although I am a complete novice to EDF flying, I do know a bit about airflow, having spent my entire working life in the aero-propulsion business; on reading Chris' article, I asked myself whether the centrebody in his B-52 intake was the vital key to success and couldn't see any reason why it should be. Clearly there was only one way to find out, to do what we used to do at full scale and run a test.

It seemed to me that what Chris had really done right was to use a good lip section on his intake bellmouth. He keeps on saying that he is no mathematician but you don't

need much maths to figure out an ellipse with a 2:1 length-to-height ratio as recommended by NACA long before they were renamed NASA. Despite his protestations Chris clearly knows what a good intake should look like and his sketches illustrating the November article show something very close to a 2:1 ellipse. So I made a pair of intakes, with 2:1 elliptic lips and throat diameters of 56mm (the same as Chris' B-52) and 51mm; the latter had the correct area for a 1/10 scale model of the Hawk, although of course quite a different shape. I chose the Hawk because it is a fighter-style aircraft but has a small engine and therefore a small intake and would presumably be the most difficult case to model correctly, also because I designed the intake for the real Hawk back in 1972 and thus had all the dimensions readily to hand. I used simple card ducts to join the bellmouths to the fan unit, with a wall angle of 4 degrees; this gives the same diffusion rate as we used on the Hawk, although I don't now remember how we chose it. Disposable plastic cups have the same angle, so I was able to use them as formers although they weren't quite big enough

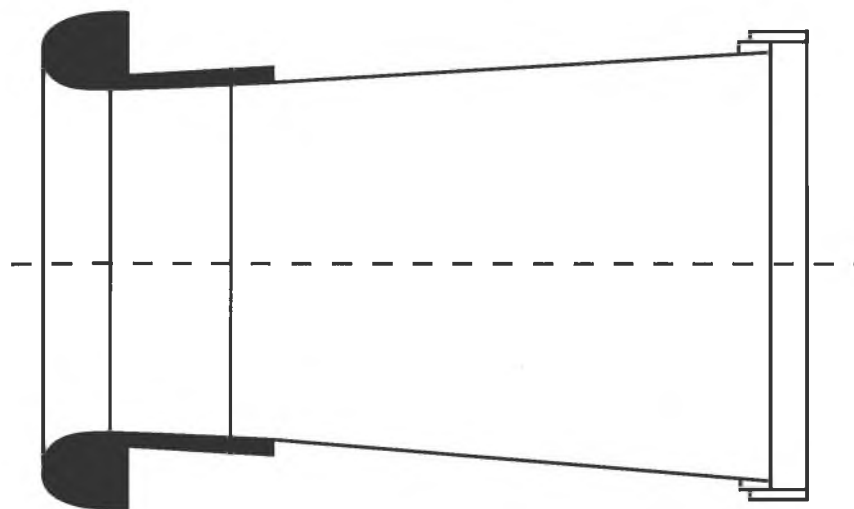
to make the actual ducting. Figures 1 and 2 show the intakes and ducts that I tested; I also tested the standard 69mm bellmouth intake for comparison. Note that it is important to fasten the various parts together with sellotape because about half of the thrust acts by pressure reduction on the bellmouth and can remove it forwards; this actually happened once or twice during the tests.

Like Chris, I only use WeMoTec fan units but unlike him I don't buy them in eights - I only have two so far. I intended to do the test on a Speed 480 Race but unfortunately last week I blew up its speed controller by soldering the connecting leads with an unsuitable soldering iron, the first time this has happened to me - BEWARE! The only spare motor I had was an Astro 020 which I bought about six months ago thinking it must be The Best; I was horrified to find that Astro only claimed 20,000 RPM on the WeMoTec fan, which (if true) would give less thrust than a Speed 480 Race. So I put it on one side until now. However, it is a beautifully made motor and Astro have a high reputation, so I thought I had better try it.

I installed it on my usual test bed set-up, with a dummy fuselage carrying the fan, controller and receiver and sitting on wheels, pulling against an electronic postal scale. The initial results were not too bad for 8 cells (the Astro cannot take more) but had rather a lot of scatter between runs. I thought I might be getting excessive friction, so I built a little gantry from Meccano and suspended the whole fuselage by four short vertical cords; this ought to get rid of friction. At this point I also discovered that the motor produced quite a lot more thrust when the throttle trim button was pushed forward; I had been running with the trim fully down up to this point. I then repeated all the tests with three or four runs for each intake set-up, with the results shown in Figure 3.

As you can see, there is still some random variation, but I can assure you that it was worse before I built the anti-friction gantry! The apparently low thrust with the 56 mm intake must be due to poor workmanship on my part, as I can see no other reason for it. The smallest intake produces at least 97% of the 'standard bellmouth' thrust, so it would seem that there is no longer any excuse for the gigantic intakes we have seen on so many models in the last few years. This presumes that a proper elliptic intake lip will be fitted, with a contraction area ratio of 1.25 (minimum) to 1.3; the equivalent diameter ratio is 1.12 to 1.14. The lack of a respectable lip is

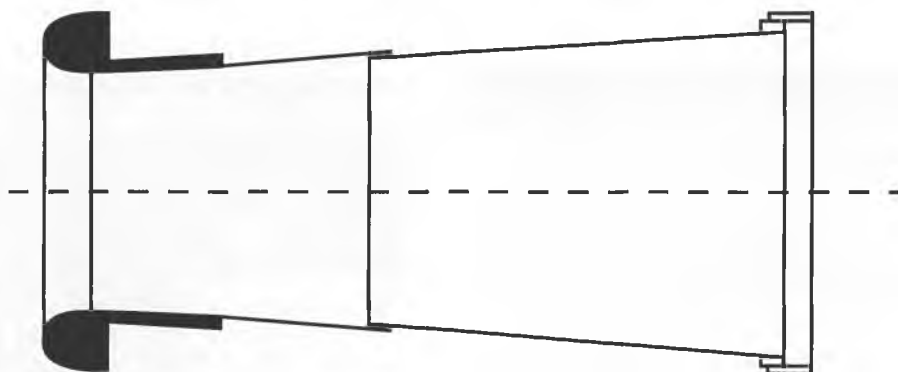
FIGURE 1



56mm bellmouth and conical duct.

ake area

FIGURE 2



51mm bellmouth and conical duct.

probably at the root of the apparent need for a large intake; if an excessively sharp lip is fitted, the flow will separate and the 'discharge coefficient' may fall as low as 0.6. The swallowing capacity of the intake will be reduced in the same ratio, so the intake area must be increased by up to 70% to compensate. Quite apart from the dire effect on 'scale' appearance, this is a very inefficient

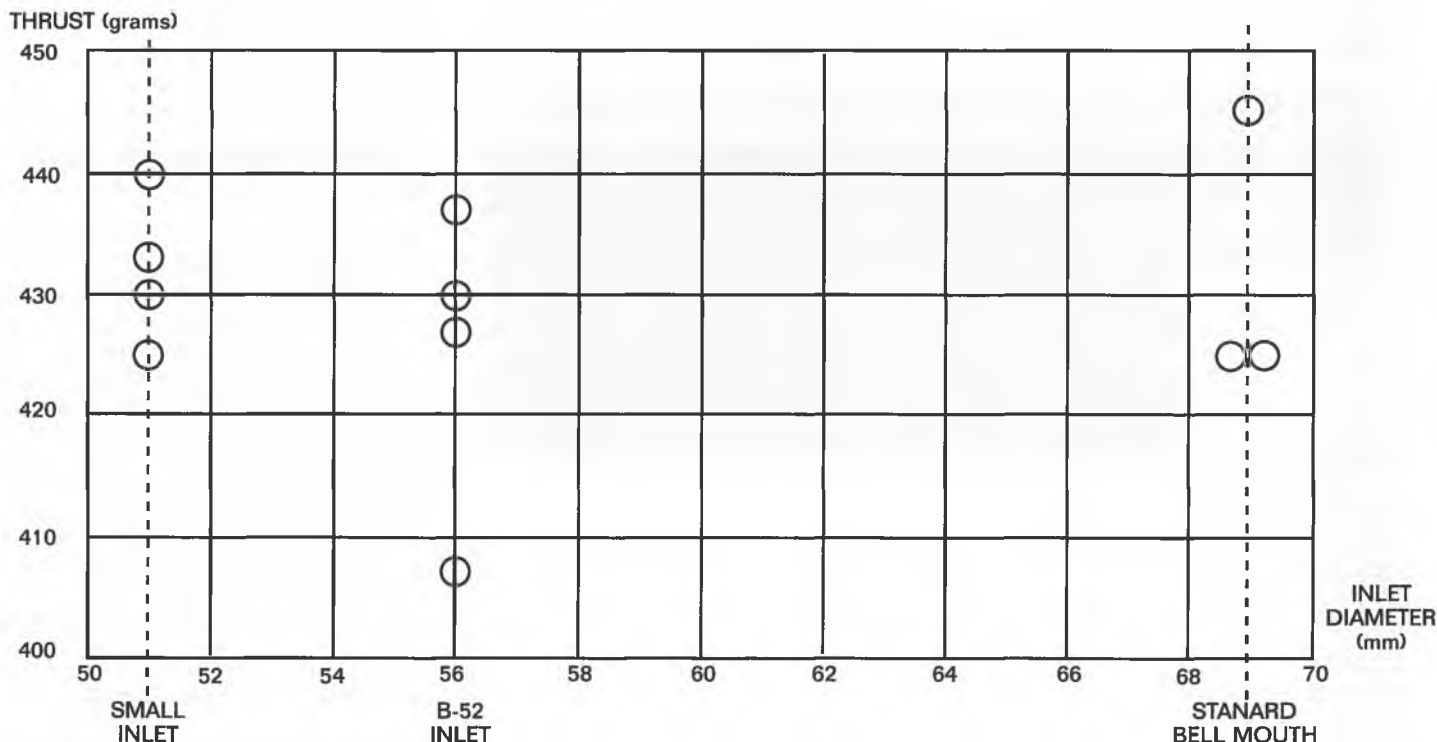
way of going about the design, as Chris has already pointed out.

All of this applies to an intake with an essentially straight duct. A side intake design such as the Hawk (and many other single engine fighters) requires an S-bend intake duct, which requires equally careful design. On the Hawk itself we shaped the intake to do nearly all the diffusion (area increase) in

the straight bits, first in the front part alongside the boundary-layer diverter and then in the two ducts diving in towards the centre line. Between these two parts of the duct there was a bend which had a very nearly constant area, thus avoiding the combination of area-increase with curvature. Although the details differ, most successful intakes (such as the F-16) follow these design principles and they seem to be equally valid for models. I suspect that the failure to follow these simple rules is at the root of the apparent need for large intakes, which has been plaguing scale enthusiasts for so long.

These tests have also given me a 'first look' at the Astro 020 which I have not seen reviewed elsewhere. The thrusts I measured were well ahead of any other 400 - 480 size motors on 8 cells, as indeed they should be, considering the price of the motor. Of course they are much less than the Plettenberg on 10 cells, but the weight is much less as well. The WeMoTec fan unit with Astro motor, complete with its controller, weighs 140 grams on my scales; the equivalent Speed 480 Race package weighs 155 grams, to which must be added a speed controller such as the Gordon Tarling at 29 grams (with leads) making a total of 184 grams. I don't have a Plettenberg to weigh for comparison but I suspect that the overall thrust/weight ratio of the Astro with an 8 cell power pack may not be too different from that of the Plettenberg with a 10 cell pack of similar endurance. As the old saying goes: "You pays your money and you takes yer choice." I hope that the beautiful workmanship of the Astro, and the absence of brushgear will pay off in the long run. But I really would like some response from Astro as to how the controller should be supported, and how much cooling air it needs. **EFI**

FIGURE 3



Thrust versus Inlet diameter.

RcCad

A Software Review

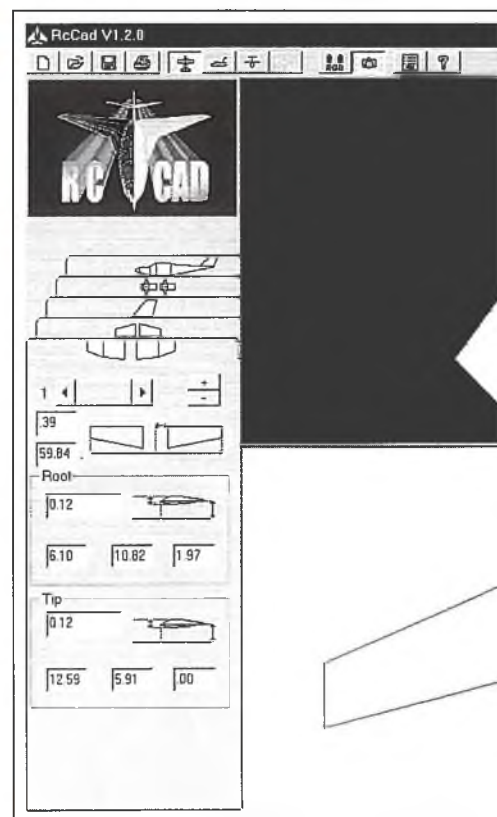
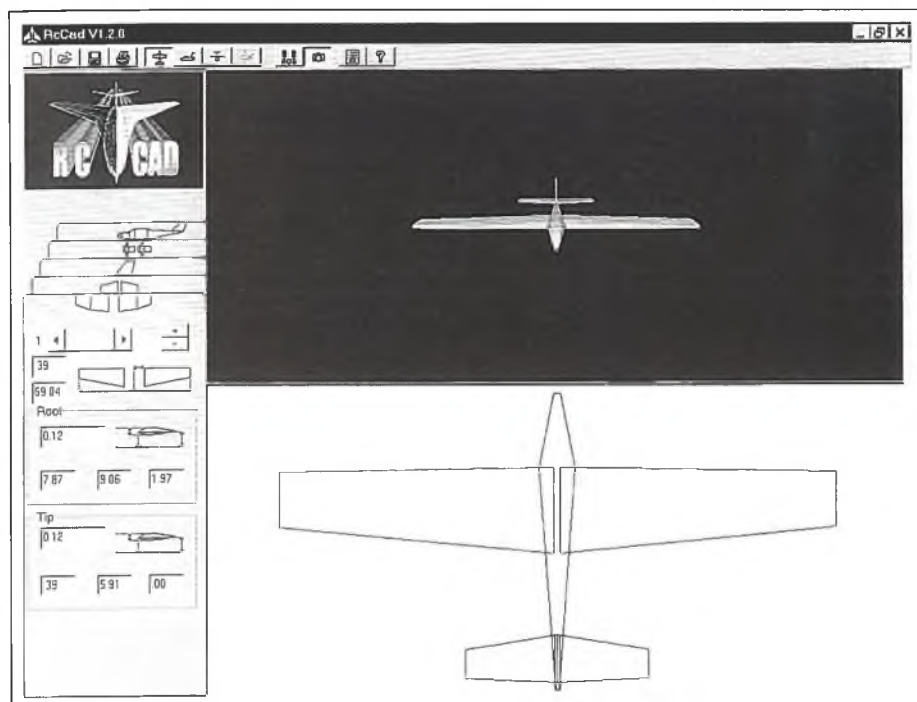
REVIEW BY: **STEVE KERRY**

Do you use a CAD application but cannot see your model designs in 3D? Here is very available software to swiftly show you what you are designing

RcCad is an exciting new piece of software that deserves a place on every modeller's PC. It offers a three dimensional model on your screen, and lets you play with the outline and configuration until you get a shape you like. Grab a wing tip and move it around, change the chord or span, adjust the size and shape of the tail and add engine pods or a twin-boom fuselage if you want. The design can be rotated in real time and viewed from any angle, so you can keep changing things until you are satisfied. It sounded good to me, but I wanted to try it for myself and see if it would live up to its promises.

The file is about 3MB in size and requires Win95 or Win98. I downloaded the demo

version from <www.rccad.com> and installed it to my hard drive. I devoted a few minutes to reading the help file (why don't more people do this?) then spent the next hour or so designing various planes. Sure enough, I could turn the basic shape into a Speed 400 biplane or an Open class thermal soarer. This was fast, easy and fun. I could see exactly what my designs would look like while flying overhead or performing aerobatics and if I wanted to tweak things a bit more it only took me a few seconds. I could also enter the measurements of an existing design and see what it would look like if I changed the wing position, dihedral, sweepback, etc. The software allows different wing/fuselage colours, so I could try out some basic paint jobs as well. I could even make the fuselage transparent and lay out the



▲ **Move the wings a bit, pull the tips back!**

radio components (and create a few custom shapes for motor and nicads).

Okay, I had a neat design on the screen that made me want to rush to the building board. Clicking on the Print button would give me a full size printout (this may take a lot of paper, depending on your design!) There was also a VRML save, so you could share your work with other users. But what I really wanted was a DXF output so I could transfer the design to my usual CAD package, and work on it there. This was not available, although a couple of emails to the designers has seen it incorporated (note that the DXF output will only work with the registered version). I was particularly impressed with the speed of response from the designers, they encourage feedback and will respond to comments from users.

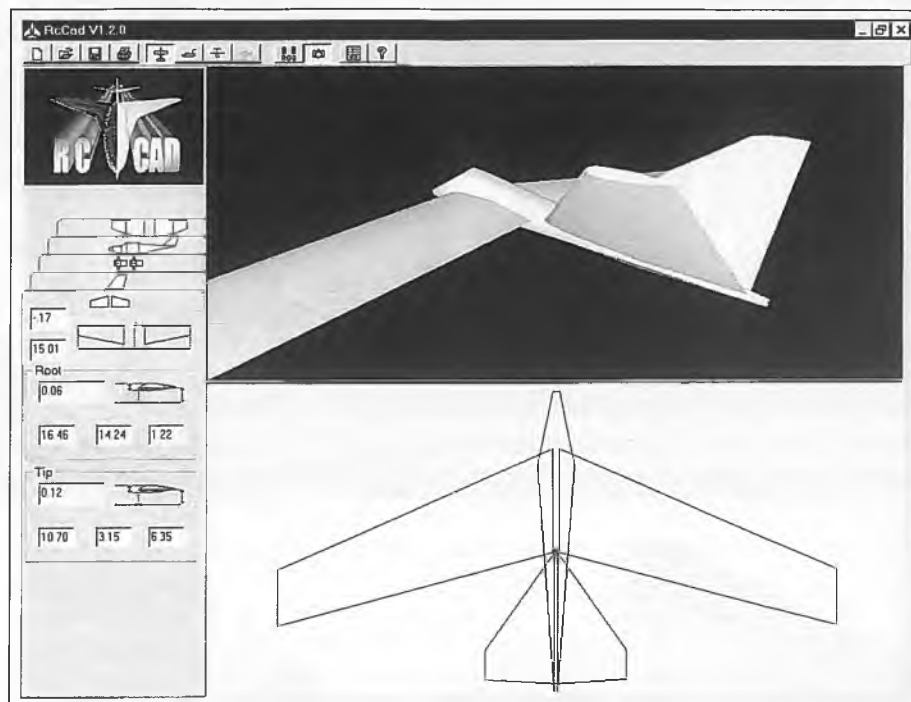
◀ **Every time you start RcCad, you are presented with this generic design.**

So is there anything RcCad does NOT do?

It does not allow you to draw in the construction details such as formers and ribs. It will allow you to draw your design but you must export the shape to another CAD package and work out your construction details from there. I don't have a problem with this, there is a variety of CAD software on the market already and I would object to buying and learning another system.

It does not calculate the CG position or predict the in-flight performance of your new design. Again, there is other software available that can do this.

The fuselage sections are limited, although you can combine multiple fuselages to make



▲ Zoom in on the tail, move the LE forward, and add some dihedral to make a V-tail. Remove the fin by setting the height to 0.

a complex shape. An SE.5 for instance would need a square section, with a second fuselage shape forming the curved top decking. More flexible options will be added by the time you read this, but the vast majority of scale subjects can be modelled already.

In summary, I love this package. It allows me to design a new plane and fiddle with the outline, then transfer the shape to my CAD package in a fraction of the time it would otherwise take. The V-tail design shown here was created and saved as DXF files in less than 3 minutes. You can also use it to 'improve' an existing design to suit your tastes.

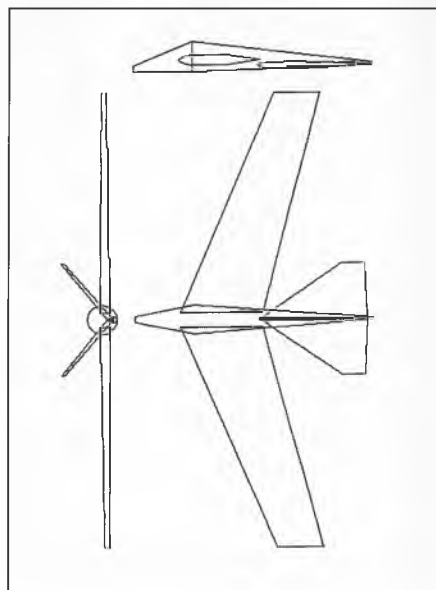
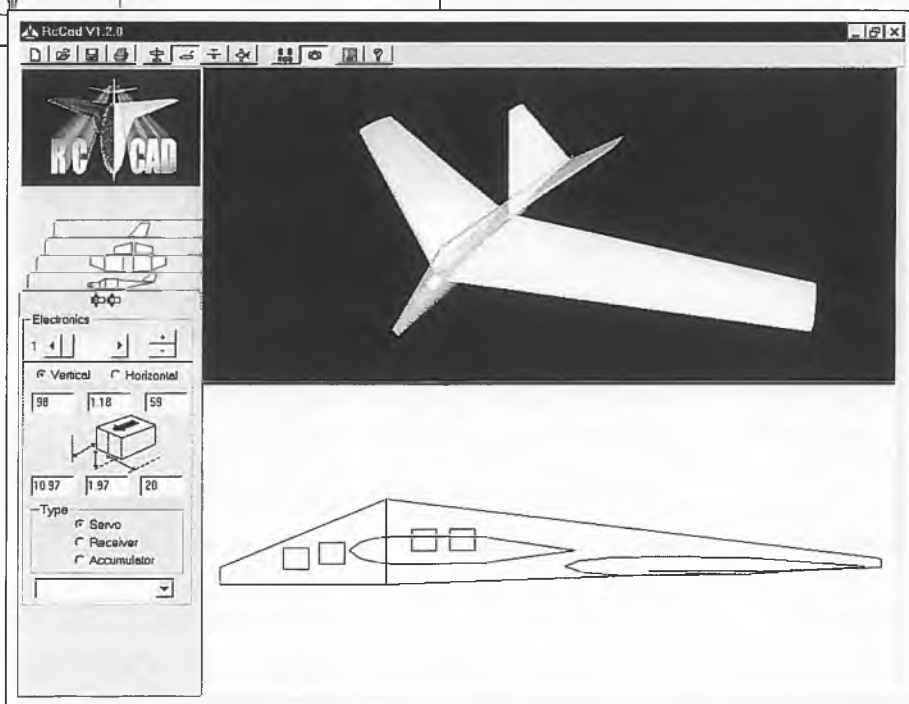
▼ Make the fuselage transparent so you can plan the radio layout.

Once you progress beyond kits and start to design your own models (or at least modify existing designs) you will love the abilities this package has to offer. Check out their web site, new features are being added all the time. See what other people have done, then download the demo and try it for yourself. If you send in a design of your own, you might even win a free copy of the registered version.

For those without internet access, RcCad will soon be made available on CD. Fax them on: +41 21 728 97 34 (Switzerland)

Or write to:
Aventure New Media SARL
Senaleche 23B
CH-1009 Pully
Switzerland **EFI**

▼ The DXF output, neatly organised in a CAD package (not supplied).





The Light Fantastic

CHRIS GOLDS

The need to fly economically - and some of your own excellent models.

Fuel Awareness

Are you sitting comfortably? Then I'll begin. Once upon a time a brave young fighter pilot was warding off the Queen's enemies single-handed!

We were flying an operation called the 'Beihan Patrol' where pairs of armed Hunters would fly a thirty mile long patrol line, one low to the ground and the other five thousand feet above him; this way both could cover the other's tail for the expected Migs from just across the border. The army medical site in the wadi below us had been strafed only a few days before and with no radio contact between aircraft and ground, we had not known that, as the Hunters went to the north end of the line, the enemy aircraft (a 'Moose' - a sort of Harvard size and shape ground attack aircraft) had dashed across the border and machine-gunned the red cross marked medical station.

As the Hunters turned south they saw smoke in the distance and rushed towards it. By then the Moose had fled and the army were furious - to use a polite word!

We had to be on patrol on time, to relieve the previous pair so

that solid fighter-cover was there from before dawn to after dusk, week after week. So when my number two's engine went sick on take-off, I pressed on as a singleton, shouting to Air Traffic Control to fix for either a new number two to catch me up or for the next pair to come up early, because I would be burning fuel a lot quicker than planned for because I could not afford to fly at slow patrol speed for fear of getting jumped ...and faster - much faster means more, much more fuel burned.

Needless to say, there was no spare aircraft for my wing man and the next pair were late on station. So I was actually climbing up away from the wadi before the next boys were on patrol. But, I was very low on fuel and with one hundred and sixty miles to go (if I went around enemy territory, which we were forbidden to cross) as my 'bingo lights' came on I knew I was close to being "soon deep in the horse-dung". With no

choice I turned south and flew across the mountains where the enemy lived as I climbed to about thirty thousand feet. I dared not go any higher as my gauges were by now reading less than I was supposed to be safely taxiing in with! I throttled to idle and lowered the nose to keep my speed up to something half-decent in case Mister Mig might take a look, though this was very unlikely up that high as they usually stayed low down.

I watched my last few fuel pounds dwindle and thought about getting ready to eject as the mountains were not the place to force-land a jet fighter. But at last I could see the sea and knew from the angle of descent that I could probably make it. At forty miles to run I still had about ten thousand feet in hand and then I knew I was OK - as long as the donkey kept braying!

I landed with nought-nought and my crew-chief had VERY raised eyebrows when he gave me the Form 700 (log-book) to sign ready for my next sortie. "Just the fumes left Sir!". "I

know, Chief and most of them were coming from me!"

In my new love of electric ducted fan flying I have had to re-learn to be fuel-conscious as just when you need more power to get you around the final circuit you find it running out! What a terrible feeling! I quickly learned to use a stop-watch to count down the minutes and seconds of the safe sortie time (calculated from bench tests of motors running). But then I had to get a LARGE digital stop-watch to attach to my Tx 'cos I could not see the small figures on the original one which Lauri, my thoughtful wife, bought for me. But even more important was to learn to throttle back ALL the time unless full power is needed. This is to reduce the amperage drain and thus to stretch the 'fuel' as far as

◀ Carlo Mapelli's beautiful Piaggio 808.

possible. I look forward to the not-too-distant-future when brushless motors will be inexpensive and widely available and matched with zirconium-lithium-basalt-cadmium batteries (or some such exotic mixture) giving ten times the capacity and amps available than cells now in use. This way we will be able to achieve the thrust available from ICDF units coupled with the very low weight of liquid fuels. Until that time we will all have to practice 'fuel awareness' and I will have to further restrain my throttle thumb to ensure that I don't flame out with forty miles still to fly! So, to business.

Your Models

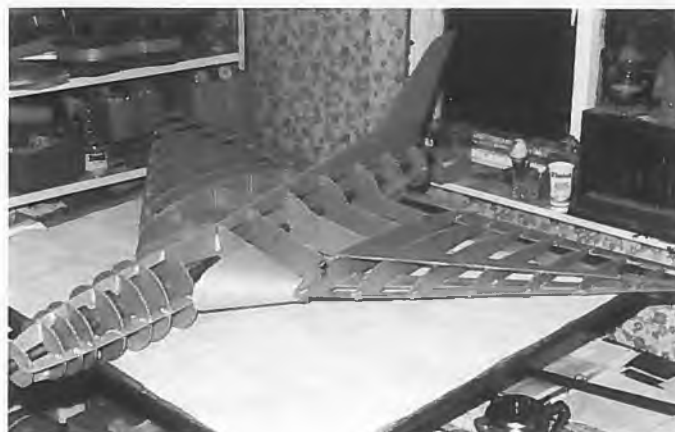
First comes a long and newsy letter from Carlo Mapelli who has been Italian Scale Champion several times and had not considered DF until he started to read this column and now takes EFI as his 'preferred' magazine. He is working on a 1/4 scale Scottish Aviation Bulldog and has asked me for help with obtaining authentic paint samples; for these I have turned to Martin Gay of St. Athan who has promised complete assistance even down to the authenticating paperwork.

With the Bulldog photos came some of a beautiful twin EDF model of a Piaggio 808 of some 55 inches (1.4m) span weighing 82 oz

► Cardboard mock-up of Bill Lucy's Avro 707c.

(2325g). Carlo reports a good powerful performance on 10 x 2000 cells for the 2 x AP29 motors with aerobatics available after "only a slight dive for speed". He ends his letter by saying that he has dropped strong hints to his wife and daughters about his upcoming birthday – the hints contained the address of Plettenbergs! Ciao Carlo and please keep in touch!

Next comes news from Bill Lucy of Blakenhall in Cheshire about a long-time love affair with the Avro 707 mini-delta of the early '50s. During a visit to Cosford Museum (I heartily recommend a day there to view some very rare specimens) he saw and photographed in great detail the Museum's 707c version (WZ 744) in order to model it for EDF. Bill is a balsa basher by compulsion and decided to build a proof-of-concept model from corrugated cardboard using a one inch copper pipe as a mandrel to build upon. Many of us have used such a method and it works very well even if you don't know what to do with the cardboard version afterwards! I look forward to hearing of a successful first flight of this 'scale model' of the Vulcan bomber, though in real life the 707c was too late to contribute much by way of aerodynamic lessons to



▲ Bill's delta ready to finish, a Feast of balsa!

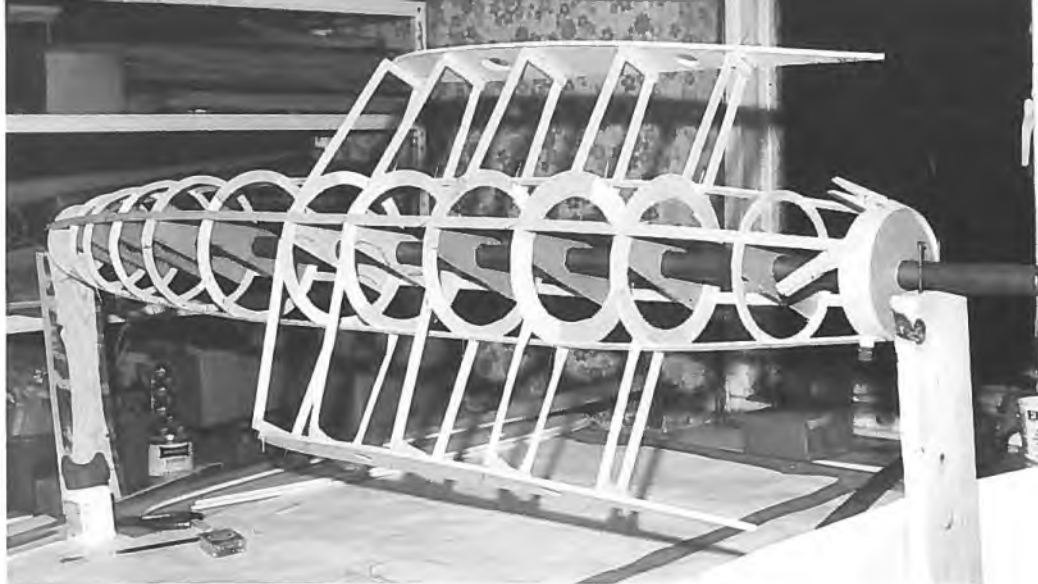
the eventual 'Bomber Command Great White Hope'. Well done Bill, please let us have your good news when it comes. Basic details of the model are: span 60 inches (1.5m), predicted weight 6.5 pounds (3kg) and wing loading 18 ounces per square foot, using a Speed 700 BB motor on 16 x 2000 cells turning a 4.25 inch (108mm) fan.

I was delighted to make contact with Bernard Dereudre from Saint Denis near Paris when he

sent me a photo with a letter. The model is from my EFI plan of a profile Me163 'Komet' of which quite a number have been built and very successfully flown. Bernard's son Olivier is his test pilot and is very pleased with the 'powered egg's' performance – I should think so too! With a Plettenberg it has 'oodles' of power. I managed to send Bernard some plans of mine published in other magazines so he has plenty to build over the winter. He is an ex-railway man (retired) and thus should know where to look when searching for spar material! Please let us know the results of your future EDF models especially your hoped for Chilean Hunter (I had to paint one once when I was searching

▼ Carlo's neat access to power pack.





▲ The 707 in basic skeleton showing the one inch copper pipe mandrel in use.

for the eventual whereabouts of my RAF Hunter XE546 which I think went to Chile). Merci, Bernard et Olivier. Bon Chance!

I received a letter from Steve Graham of Huntingdon asking for information about my Horten IX plan - I hope I have sorted his problem. Steve also asked about a B-2 Stealth Bomber and this brings me to the end of my column for this month. You will possibly have heard or read about the untimely demise of my

latest B-52H which went in spectacularly on take-off when - I suspect - I lost radio signal. Not all eight Plettenbergs were totally dismantled so after wiping away my tears I decided to try another B-2, this time for EDF and incorporating the knowledge gained from my Horten IX and YB-49. Both of these models use coupled drag-rudders to give some yaw then roll to assist the elevons and I hope that I now know enough to successfully get through the dreaded first flight unscathed. If it is successful, I will turn the B-2 into an EFI plan (requested by the Editor) so this

might answer your second question Steve. Well, that's it for now folks. My new year's resolution:

To bash more balsa, fumble more foam, allocate more amps and voluptify (I think that is the technical term) more volts. Oh! and to survive first flights unscathed!

Fan-word of the month: FAN-TASMA - phantom, scarecrow or ghost (in Spanish). McDonnell F4 Fantasma sounds rather odd to me!

Stop Press

I have been using Brian



▲ Bernard Dereudre with his 'test pilot' son Olivier and their Kome

Gaskin's hole making tools in producing the B-2 ribs and I have employed a hand-held battery drill instead of a pillar drill. I have had perfect results with this method and I strongly recommend these tools as an addition to your EDF armoury!

FLY SAFE.

Chris Golds
Hideaway, Lower Loxhore,
Barnstaple, N.Devon EX31 4SX
Tel:01271 850456.

Fax: 'phone to arrange. **EFI**



Fans

Morley 'Jet Elec' Fan	£15.00
Adaptors & Fittings for Super 400 + 410/12	£3.00
Mini Fan 480	£25.00
ECO Fan II	£30.00
ECO Fan Pro	£35.00

Motors

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DERECK WOODWARD Over Here!

Sports flying is fun - but it can be different. Dereck shows us some conventional models that are so different.

Better straighten one thing out - that recently mentioned big Hornet is, of course, Peter Wilson's superb Whirlwind, as featured in EFI. As writer of this lot, and a 'Whirlwind' lover, I can't resist another photo of Peter's creation. I have a copy of the plan and keep trying my Astro 035G on it - two of them, 20 cells and 10" props would really move this fighter. Apart from the adventure of building three fuselages, there's no reason to avoid twins any more. You can have your heavy metal warbird now - retracts, a battery of cannon barrels, the lot, and it will look the part even more with twin props. Aerobatics are still on, too - I've seen a full sized Mosquito do an airfield long barrel roll!

So - why not?

Multi motors are spreading across electric flight. The first Multiplex 'Twinstar' to show up at our patch met with a lot of curiosity - here was a twin that was assembled much the same as the 'Wingo' - which is now an established sight both at Mt

▼ **Westland's nearly had a winner with the Whirlwind - Peter Wilson's version is one! Electric flight takes twins out of the 'tricky novelty' class and makes them into practical sports models, but with more wire! Peter's model doesn't need expensive motors or gearboxes to succeed - you don't get much more basic than a pair of Speed 700s.**



Trashmore and around the US. However, while 'Wingo' is a slow, gentle flier, the 'Twinstar' is a capable aerobatic model that will loop, roll, fly inverted and spin.

They are being 'got at' too. One is flying on two Mini-Olympus gearboxes - itself enjoying an upswing in popularity. This would provide better

▲ **This is a freelance idea for a home for a geared \$400 - from the fertile imagination of Ron Fikes, who built this after seeing an electric autogyro in a magazine. Ron fancied the shape, so used it for a fixed wing model instead. If there's a plan, it is not only on Ron's bench; it's likely drawn on it!**

performance and duration for what is a pretty hefty model - maybe even better with a wooden wing, as the Twinstar's foam wing is heavy to start with and more so with gearboxes. Rumours abound of folk adding undercarriages and even another pair of motors to what is a popular model as it leaves the box.

The point to this - a twin is now so feasible as an electric

sports model that you could have one as a second model, or even a trainer! All that is needed to convert many models to twins is to hang a motor on each wing, run out the wiring and fair in the nose. The cautious might start with a high winger - 'Twinstar' flies just like any other high wing aileron model - but there's no reason why a low wing aerobat wouldn't do as well.

A clever trick is the thrust-line - 'Twinstar' appears to have distinctive upthrust to its motors. One hopes for a deluge of mail on the subject of where to point them! Once you've built a twin - well, four, six or even eight start and run as reliably as one! In the meantime, Multiplex just took the twin out of the province of the brave and hopeful and put it into the back of half the cars on our flying site.



While we're talking twins

Here's one, not only a twin - but a waterplane to boot. This project took plenty of time, thought and effort, but the result is well worth the effort put in by designer Andrew Tickle. The gestation of 'Sea Spray' is a story on its own, so here's how this graceful model evolved.

For starters, Andrew admits that its predecessor had to be the worst model he ever designed! It was hard to lift off the water and totally unpredictable in alighting - though floating inverted figured prominently. Undeterred by this inauspicious beginning, Andrew plotted his ideal flying boat. His first requirement was duration enough for many watery touch and goes in a flight - anyone who has flown waterplanes will agree that manoeuvre is the most satisfying aspect of a flight. Long duration was obviously essential, and this led to the heart of the model - an efficient, high aspect ratio wing.

Andrew 'borrowed' the wing from Astro Flight's Viking's, well known for good handling and efficiency, with its 8 1/2" (216mm) chord and slight undercamber. More area was needed - so the span was stretched to ten feet. Naturally, the spars were increased in size to cope with that 40% increase in span. Figuring ailerons wouldn't work too well on this long wing, Andrew elected for polyhedral and ample vertical surface area - good choices, as 'Sea Spray' can roll rapidly from a 70 degree bank over to the opposite 70 degrees. The polyhedral also keeps the wing tips clear of the water during take off and 'splash and go'.

The floats are from 2" (51mm) white foam and four feet apart - there is little small about this model. The tailplane is three feet span, while the fuselage is a 1/4" (6.4mm) square frame covered in 1/16" (1.6mm) balsa sheet - all eight inches wide (203mm) by 12" (302mm) high of it. Ahead of the 1/2" (13.7mm) deep step,

the balsa is skinned in 1/64" (0.4mm) ply while a hatch in the upper nose deck allows battery replacement.

Power is surprisingly modest. Andrew spent \$56.00 on two Master Aircscrew motors with 3:1 gearboxes turning 12 x 8 props at 4800 RPM. On fourteen cells and 20 amps, this produces three pounds of static thrust - good for a seven pound model. While slightly under 50 watts per pound, twins produce more thrust than the equivalent power put through one prop. These power units proved fine for initial flights off land using removable 'beaching gear', with 12 minutes per charge. Wing loading is a mere 10 oz/sq.ft (30.5g/sq.dm) - so now you have a proven set of numbers for one of your own.

Water flying meant a 200 mile drive to visit Andrew's son, who has the decency to live near a lake - good family organisation here. With that in mind, 'Sea Spray' was first leak tested in a friend's swimming pool close to Andrew's home. Taxy tests on 14 cells went well but

◀ Andrew Tickle provides scale to his ten feet span 'Sea Spray', at Horseshoe Lake in California. Those props are 12" diameter fold-ers from Master Aircscrew, as are the motors and gear-boxes. Shot shows how polyhedral keeps the wing tips well clear of the water. Model is ten feet span; the floats are fully four feet apart.

▼ Andrew Tickle's 'Sea Spray' banks gently over a California Lake in the early dawn - ten feet of wing makes her easy to see in flight.



the local geese were not acting friendly, so take off was planned to stay well away from them. A hundred yard run had Sea Spray off in leisurely and positive fashion for an uneventful test flight. The second flight used 16 x 2000mAh cells. Andrew tried taking off with full up, lifting off easily in 20 feet.

In the next ten minutes, Andrew let her cruise up to around 1,000 feet, still clearly visible in the dawn sun. A lovely model, but she will remain 'unique' - Andrew has no inclination to draw up plans. However, I've

◀ 'Sea Spray' ready for another trip from California's Horseshoe Lake. She flies effortlessly on two Master Aircscrew geared motors at 280 watts, turning 12" props at 4,800 RPM. You'll have to 'do it yourself' if you can't resist a 'boat like Sea Spray' - Andrew Tickle has no intentions of publishing his design, I'm afraid.





▲ **My new toy - fuselage of my 250% version of the 'Gloucester Auster' Bostonian rubber model, with its MAT beltdrive and S400. One development problem is that rubber models tend to have short tails and long noses, as the motor is a long rubber band and this eases balance. I'm going to assemble and cover her as far as possible, then juggle the heavy bits for balance. In future, I draw a plan!**

given you all the details Andrew was good enough to provide, and there's plenty of the basic information about waterplane hulls around, so there could be a similar model in your future.

another cute little model, but never bothers drawing up plans so it is unlikely to appear in print.

One new project elbowed its way to the top of the winter heap - Great Planes' 59' (1.5m)

span CAP232. It's for the lot down the corridor; hopefully our esteemed editor will not mind me mentioning this crusade to enlighten RCMW's 'oily' readers. The 20 cell MaxCim set up from the Four Star 40 is going into this project - if you're wondering what prediction program suggested this, it was my desire to put 700 watts into this extremely aerobatic semi-scale kit. I'll deal with other issues later!

Quick tip! Decent wire is not cheap - so keep those short pieces you'll end up with sooner or later. I used a couple when replacing the plug on the Twinstar's wiring harness with an Astro 'Zero Loss' connector. The Astro solder fitting wouldn't take the two wires of this parallel circuit harness, so I dug a couple of short scraps of 16 SWG wire out of the bits box, soldered them to the existing harness and hence to the Astro socket.

Park Fly - who needs foam?

Got a parcel from Tom Hunt at Modelair-Tech - our quiet young lad has just released his new wood framed park fly. No kit, but as the model is mostly 1/16" (1.6mm) and 1/8" (3.2mm) stripwood, that is hardly a disadvantage. For those who haven't seen his plans, Tom has taken a few techniques from rubber power and adapted them to produce a whole range of model plans. Rooted in S400, they have now spread all the way from a 20 cell biplane to the 'Slowmowatt' for a geared Speed 280 motor on seven 350 cells.

MAT also sells the geared 280 motor and gearbox specifically for the Slowmowatt. This will fly the model for around ten minutes on seven 350mAh cells - not a bad deal! The full package includes the geared motor and prop, plan and 'Doculam'

Working Indoors

Not a lot to report really. The new aerobat is still just a growing CAD file - but it has undergone waistline shrinkage when I figured there was too much space around the nicad pack. The urge to start building one from half done plans was tempered by the fact that I am half way through a 250% 'large scale' version of a 16" span Bostonian rubber model for a geared S400. Instead of drawing up my usual fully detailed plan, I blew the 'full size' drawings up on a copier and got to work.

Not a bright idea - I don't build well without the details! For example, I managed to build most of the fuselage - but it was missing any way of fastening the undercarriage onto it. Like I said, not bright. The new model will now feature a fuselage mounted composite UC - the two I picked up on holiday in England have been superb in service, on both the 3 lb (1.4kg) Pandora and the 5 1/2 lb (2.5kg) Four Star 40.

On the other hand, Ron Fikes, that prolific electric flier from California, regards a plan as something other folk need. His 'Tubby' has 300 square inches (19sq.dm) and 21 ounces (600g) hauled around by a 1.85:1 Graupner gearbox and S400 on seven 500AR's. I know it says 'Guppy' on the model, but Ron says the name has evolved - don't ask me! As before, Ron has produced yet



▲ **All strip balsa - even the ribs - servos mounted on the outside and that cute little S280 gearedrive from 'Titanic Airlines' up front, this 12 ounce, 51" floater is the other end of 'slow fly' from Tom Hunt's Modelair-Tech.**



▲ **With around 20 watts full out, Tom Hunt's prototype 'Slowmowatt' is about the cheapest way going into slow-fly - Modelair-Tech sell the plan, gearedrive and that see-through covering for \$46.00.**



▲ Now is this not a shape to turn heads? Lester Garber's 'DC12' three channel autogyro has real rotor control - no sneaking in the odd rudder or elevator for our Lester! Model has been seen in action around the northern e-fly meets, reliable and tough little bird to fly.

lightweight laminating film to cover the model with for around \$46.00. MODELAIR-TECH's address is PO Box 1467, Lake Grove NY 11755-0967, or <http://www.modelairtech.com> if you're that way inclined.

Not ready for two props?

So how's about a prop and a freewheeling rotor? Here's our column's first autogyro - a 'real' one with direct flight control from the rotor. No cheating with rudders or elevators here, and many hours of flight-testing and dogged persistence to back it up.

Lester Garber is the driving force behind DC12 - a true direct control electric power autogyro. The name? Well, it runs on DC electricity and has Direct Control - so 'DC Squared' but it's DC12 for short. All too often recently, I've had to tell you that there aren't any plans for models I've shown you, but for this one there is not only a plan but a 35 page manual, with instructions, photos and drawings, for this one!

Details - 18 oz, 35" (900mm) disk diameter, 2.69 oz/sq.in (11.8g/sq.cm) disk loading. Power is a Rocket 400 (similar to a 6V S400, maybe a tad hotter) on a Mini-Olympus box and seven 500AR cells. The structure is a full range exercise in building techniques. The

rotors are hot-wired from blue foam, then vacuum bagged with fibreglass, while the tail boom is a carbon fibre tube. The rotor pylon - which provides needed side area - is balsa but attached to the tailboom with aluminium fittings. The critical part of the design is the machined alloy rotor head - this is the control system as well. The landing gear is vacuum-bagged fibreglass, while the overall structure is designed to roll with 'landing irregularities'.

Lester's building manual is the standard of a major manufacturer, rather than 'cottage industry'. It details the development of the model - the example described in the manual has several hundred flights behind it with no major mishaps or changes - takes the builder on a tour around the airframe and its equipment requirements, then sets off to see one through the building process. For an example, hot-wire cutting and vacuum bagging the foam cored rotors is detailed completely from needed equipment to final finishing.

For this confirmed balsa basher, the manual was a one-stop intro to many new construction ideas. It is well laid out, professionally printed and bound - and well worth the \$20.00 US price, from: Lester W. Garber, 2324 East 5th St, Duluth MN 55812. Lester's e-mail address is: lgarber@d.umn.edu

While not a quickie project, this will get over the many hurdles that Lester had to overcome. He doesn't pull any punches over the crashes that the development process involved, that autogyros have to be handled correctly to fly well - but for anyone who fancies an autogyro or just loves unusual ideas, this manual is a 'must-read', well worth the price and it will take you straight to a fully developed model.

On the break

Never mind anyone else's - this is my meeting! Sunday, 30 May, is the date atop Rockville's Mt. Trashmore - just north of Washington, DC. It's a one-day event, though we'll open up for flying on the 29th. Aim is to fun-fly until it is too dark - or the night fliers run out of lights. The only comps will involve a high degree of spectator hilarity - maybe a timed run at ten loops and ten rolls in

one flight. Another possibility is to round up a panel of judges, and let the brave have a one-flight shot at impressing them with their flair for exciting flying. Now that should produce some real flying demos!

Hopefully, this month's grab bag has inspired all to do something different. Remember - going around in circles means doing the same thing all the time! Info on my meeting, your photos of what you're up to, or anything you fancy discussing to: 11159 Captains Walk Ct., North Potomac MD 20878 or Traplet Towers, e-mail to weekendpilot@juno.com. See you all next month folks. **EFI**

▼ Rotor pylon of Lester Garber's DC12 direct control 'gyro. The three rotor head follows fullsize practice closely, rotor operates in true autorotation, 18 oz (510g) model relies on the good old British Mini-Olympus gearbox.



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1997, offers. 01664 852614, fax
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Leicestershire, email:
Corin.Rathbone@dial.pipex.com
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evenings, Midlothian.

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save months of building time,
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0411 213744, Manchester.

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cell 2000 and free 12 cell 1400,
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only used thrice, needs money,
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948 3301, Richmond, Surrey.

ELIMINATOR 100 glider,
unwanted kit, cost £140 new, no
reasonable offer refused.
Andrew 01265 52182 after 6pm,
Northern Ireland.

MORONIC type, £25, with
engine, £55. Hawker Hurricane
kit, 50" span, £40. Puppeter,
£80. Zlin 84" span, £80 15-25cc
car engine, tuned pipe, £30.
Bungee, £10. Boat and radio, no
Tx, £40. 0181 697 1164 London.

ROBBE Futura SE, third place
heli at Potting Cup, Webra 70,
Rossi pipe, carbon frames, hol-
low main shaft, JR 4231, 400,
2700G servos, SPCM, Rx, gyro,
£1,200. John 01394 283261
evenings, Suffolk.

FOR sale Futaba FC18 V3.1 Tx,
NIB, unused, £175. Skysport 6,
vgc, £45. Little Star E400 electric
glider, vgc, £100. JR PCM 10 Tx,
vgc, £220 ono. 01745 887687 N.
Wales.

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610637, Cardiff.

NICHOLAS Beazley NB4, proto-
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Scale International May/June
1998, third in popular scale at
Scottish Nationals, £190, com-
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would convert to electric. 01274
873069, West Yorkshire.

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0151 6258209 or mobile 0410
887272, Merseyside.

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tion, £45. Astro 15, new
condition, £50. Graupner Speed
700T with Olympus, belt driven
gearbox, special adaptor, £23.
Ken 01274 562659, W. Yorks.

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Magic, vintage model for 40 to
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convert to electric power. 01274
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WANTED

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fiers for Multiplex MPX Pico-
Servo Best Nr. 5088, will
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Pinelands, South Africa 7405, +
27 21 531 3949, email:
laing@mweb.co.za

WANTED Mini Ellipse and/or
Sambal gliders, v tail (preferably
new), good price given. 01706
656612, Rochdale.

NEEDED plans, photos, docu-
mentation, model kits, featuring
Dewoitte D500, D501, D510,
D510A and D513 series (RAF),
also a copy of the hard back first
edition censored version
"Fighter Pilot" by Paul Richie
(no 1 Squadron, France 1939-
40), 59th Squadron Operational
History 1939-1945. Hilary
DeMaio, 4415 Brushy Hill, San
Antonio, TX, USA 78217. Email
hdemaio@worldnet.att.net

WANTED 40 damaged engine
spares. 0151 6258209, mobile
0410 887272, Merseyside.

WANTED a canopy for the SAS
Duralene Aggressor sloper. Bob
01384 397532, West Midlands.

WANTED model of Comper
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60" approx, prefer airframe only,
but will consider airframe +
engine. 01563 860336,
Kilmarnock.

WANTED Skysport 6A micro
Rx, mini servos, speed con-
troller, 400 600 motor, flight
pack, charger, glider kit,
untouched, pensioner wishes to
fly again. Derek 01248 670320,
evenings, Gwynedd.

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