

Electric Flight

INTERNATIONAL

APRIL 1998

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SCALE LIGHTWEIGHT

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Electric Ducted Fan Models

Regular column starts this month & how to get more out of your Gnat

THE MAGAZINE FOR SWITCHED ON MODELLERS



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Editorial

We've 'gone monthly' and as Spring arrives we cover models shows, product reviews, and how to get more out of your models - plus a few explanations.

Nürnberg Toy Fair

Toys? They are to some of us but this is not an explanation for that reality or misconception - depending on which side of the fence you are standing. (Your editor is sitting ON it!)

Nürnberg is the world's biggest Toy Fair, a trade show for major manufacturers to sell to buyers for the big stores and chains of stores. The manufacturers need to know if their planning is correct for the goods to be offered for sale next Christmas, or do they need to adjust designs and production plans. The same applies to the category 'model construction, hobbies and crafts' into which Model Aircraft fit. This is also why so many products we see in February are not available for many months.

Each year, visitors who meet at the show or acquaintances who meet soon after, ask the same questions: "What is new?" "Did you see as much new as last year?" "What is the new trend?"

Early answers are usually hesitant, possibly negative - but on reflection they usually remember quite a lot. The 'electric scene' is the one that has been developing faster than any other in recent years - and fortunately for us, this continues. There was a lot new for electric fliers and most of it is in the 'equipment' area this year.

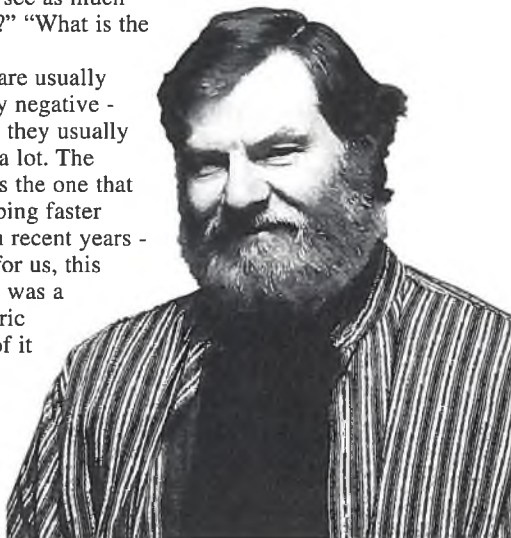
I have not hesitated to publish the news of small-

er RC gear for the past several years. This has usually been the product of the 'cottage industries' and I am sure the very smallest and lightest will always be available from these sources. The larger manufacturers are always slower moving and often unwilling to follow a new trend until the smaller more versatile cottage industries have pioneered and proved the viability of a market area. There are very few of the smaller manufacturers at big trade fairs like the Nürnberg Toy Fair - we must wait for Sinsheim and Dortmund to see what innovations they have - so 'trends' at Nürnberg are positive and promise us reliable supply of that sort of product at the right price, because all the big manufacturers and traders are competing for our business. New trends were developments in two significant areas, small RC gear

and Electric Ducted Fans - not the fan units but models for them. Possibly more important but still too isolated an area to make much impression on the whole electric flying scene were new Kontronik motors and speed controllers.

Fierce competition for supremacy at world championship F5B and F5D level has led to the swift development of brushless motors and controllers. The significant manufacturers in this field are Aveox, Kontronik, Lehner and Plettenberg, which I stress are placed here in alphabetic order! They have all succeeded in achieving more power for less weight with lighter faster revving motors, high ratio gearboxes and lighter speed controllers. Some have gone to 'sensorless' controllers too which simplifies installation and reduces weight further. This is good news for all of us. Next year, or the one after, we all have the opportunity to buy better lighter motors. In parallel with this, the same manufacturers and others too have developed heavier (but still lighter than brushed ones) slower revving high torque motors that some pilots will prefer. Wait for reviews of these wonderful motors.

The Current Affairs column contains new and similar products too - that were not at Nürnberg but some of which we gained knowledge of during the same trip that included the big trade fair. There will be even more new products revealed at the above mentioned shows. Sinsheim will have happened by the time you read this but you may have time to visit Dortmund. This is an enormous market with hundreds of traders of all sorts of models. Aircraft are in a hanger sized exhibition hall and include a lot of electrics. If you have the time, check the 'Diary dates' page and consider a visit.



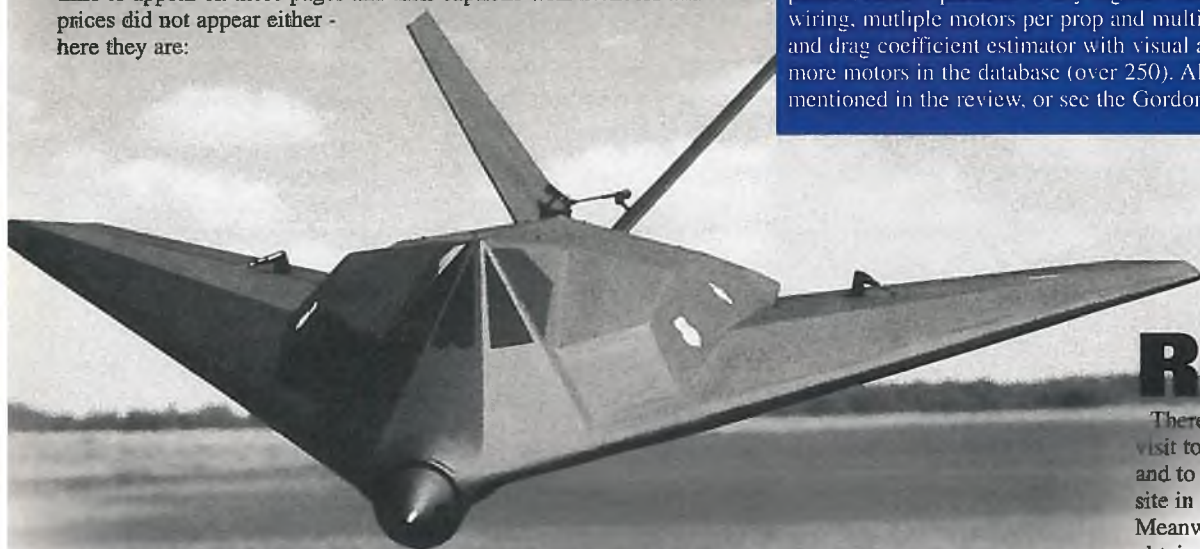
New cells

I'm sure we are all waiting for someone to discover or develop the equivalent of Perpetual Motion in cells. Great claims are made for new discoveries. When these are more closely examined, some do not come up to OUR expectations. Two new cell types have been brought to my notice and I have looked more closely. Either may be useful to us later, keep an eye on them. There was a time when NiMH (nickel metal hydride) cells were not worth considering - look at them now. There was a time when nicads (nickel cadmium) cells were no good for motors - what else would we use now? What else indeed? Ecology conscious governments are likely to legislate against the manufacture and use of our most available energy source for electric motors and we will need a replacement for nicads in a few years time.

Rayovac have already grabbed a large chunk of the battery market in the USA and in recent months launched a "major assault on the UK rechargeable market". (Their words - not mine.) Rayovacs are rechargeable alkaline cells. They claim higher voltage and greater capacity than nicads and are sold ready charged but examine carefully the claimed performance. An AA size cell has a capacity of 1900mAh operating on a load of 16mA. This is a high capacity for a weight of 21.6g, three times that of a 600AA but the load is lower than we ever use. The capacity for continuous use at 308mA is 1050mAh, still good for its size but 1000mAh AA nicads are

Lost numbers

The Editorial in the last issue contained a note about the time taken by "whichever country's" postal service, to get the plan to the Traplet offices. That was not the end of the story! It was CAD redrawn in the UK and this plan was on the same disc as the plan for the Me 163 Komet also featured in the last issue. Your humble editor who should have been keeping an eye on things was at this time in Nürnberg gathering news on new models for the report that appears in this issue. So - reduced images of the plans were not available in time to appear on these pages and their captions with numbers and prices did not appear either - here they are:



F-117 NIGHTHAWK
Plan MW 2636,
Price £5.00, postage
in the UK £2.00.

ME 163 KOMET
Plan MW 2648,
Price £5.50, postage
in the UK £2.00.

available to perform at that sort of load, say a computer Tx. Nicads have a long life, perhaps 1000 cycles. Rayovac cell capacity reduces with charge cycles, after 25 cycles its capacity reduces to about one third the original.

Rayovacs will not deliver the current or provide the capacity we need for use with our motors but you may wish to use them for radios. The operating voltage is 1.5V so use say 6 in a Tx instead of 8 nicads - a good direct replacement for dry cells. Remember that capacity will reduce with number of cycles and only charge them with the correct type of charger. Keep an eye on them, they will improve and one day they may be of use to us for motors.

Another cell we may hear more of is the 'Aluminium cell'. Claims like "can be recharged more than 3000 times" and "20 times more

power" and "one twentieth the cost of conventional batteries" imply life cycles three times as long as our nicads and imply cells one twentieth of the weight and of course extremely cheap. I was imagining that at last we could store as much energy in a battery pack as IC filiers get out of the same size can of glo fuel...

Investigation of these claims for just what we need revealed the wrong answers! The claims originated from research work being conducted in Finland. The government there is said to have imposed an embargo on release of any more information, the incredible discovery was too valuable for anyone else to get a 'look-in'. I know that this is the April issue but this story is months earlier than that. We must wait to see if this revelation is true and if the properties are as successful as claimed.

Motocalc

You will see a review in this issue for the software so useful to designers and pilots who want the most out of their models. The most cost-effective way to fly is to buy only the parts you need. Motocalc 2 was reviewed, has taken a long time to get into print and since then versions 3 and 4 have added facilities and information to aid your selection of parts for successful flying.

In addition to the items reviewed you now have: selectable Imperial or metric input and output, full-power rate of climb and power-off rate of sink prediction, level flight throttle and duration prediction with throttle control, 'motor designer' to predict the effect of different motor windings, support for multi-bladed propellers, series - parallel, or any regular combination of motor wiring, multiple motors per prop and multiple props per motor, lift and drag coefficient estimator with visual airfoil selection, many more motors in the database (over 250). All this for the same price mentioned in the review, or see the Gordon Tarling advertisement.

Robbe

There will be a report of a visit to their factory in Germany and to the Robbe distribution site in the UK in the next issue. Meanwhile, you may wish to obtain some of the new kits announced and wonder where to get them. Some modellers - and dealers, have been wondering about the supply of Robbe products.

Robbe Schluter UK extend their product range

Robbe Schluter UK are pleased to announce they are now the sole UK distributors of the Robbe Modellsport range of products.

They will be handling all Robbe Modellsport products including Aeroplanes, Gliders, RC Cars, Boats and the FC Series of radio. Also available will be the extensive range of accessories, much of which has not previously been available in the UK. The full range of Robbe Schluter Helicopters and Novarossi engines will continue to be fully supported.

Their retailer 'next day delivery service' will continue and they will shortly be holding open days for the Trade to view their full product range at their new premises: Robbe Schluter UK, 53a Hinckley Workspace, Southfield Road, Hinckley, Leicestershire, LE10 1UB. Tel: 01455 637151 Fax: 01455 635151 For further information, contact Trevor Wallinger. **EFI**



Weather

Perhaps this sub-heading should have read 'Excuses'. One habit labelled as 'typically British' is to talk about the weather. This editor is an exception to this rule - but not today! I had volunteered to build/fly/review a few models last year and the weather has been so poor and these models are all lightweights. I dare not fly them for the first time in the turbulent and terrible conditions that have existed on each day that I have been at home. There have been some nice moderately calm days but I have been miles away on every occasion. I'm sorry but you will have to wait for these reports. Some are ARTF models and for these the Air Test is the most important part of a review.

Current Affairs

At the same time that big manufacturers release new products at the big Trade Shows, other new products are still appearing for us.



▲ Minicraft P3 Cordless power tool being used (perhaps incorrectly!) in 'pistol grip'.

Cordless Power Tool

The larger D-I-Y cordless tools have been using 'our' size cells for years so it was only a matter of time before cordless tools would be made available for our more intricate work. There have been small cordless tools too but the Minicraft P3 Cordless has a few advantages. It is easier to use for our size of job and is designed to be gripped in 3 ways – each according to the job. There is the 'pen grip' for close up work, the 'palm grip' for sanding, cutting and carving and the 'pistol grip' for drilling. Another advantage is the use of NiMH cells for much longer operating time. The keyless chuck will accommodate 0.4 to 3.2mm shafts. For a Minicraft in the UK telephone: 07000 646427238.

Microbe

This is another kit from the Dutch company 'Computerfreeswerk'. The last one was called 'Fun' and this one looks as if it deserves a similar name. All the Microbe kit parts are CNC cut so there are only a few spars for you to cut. Building time is claimed to be a

matter of a few hours as most parts are a press fit needing just spots of superglue to bond it together. The kit contains all the parts needed to build the complete airframe including superlight wheels, wheel axles, control rods, control horns, windscreen, thin ply, balsa parts etc., all you need is a radio, motor and covering of your choice. Flight performance is said to be excellent in any weather from calm to Beaufort force 5. It flies like a Speedy Bee and is so compact that designer Rob Bulk says you can put it in your car and have fun at lunch-time. You might need aileron experience before you fly this one.

Wingspan is 700mm (28"), weight is 500g (18 oz) and suitable power is a Speed 400 motor with or without a gearbox and 7 or 8, 500mAh cells.

▼ A brace of Computerfreeswerk 'Microbes' by Rob Bulk.



Hitcher 4

This 70" (1780mm) span electric soarer for geared Speed 400 motors and 7 cells is intended by designer Graham McAllister for competition or sport flying. It has a Selig S4083 wing section, 405 sq.in (26 sq.dm) area wing and control is on motor, rudder and all moving tail.

Available from: Graham McAllister Designs, Silent Aviation Works, 60 School Road, Wales Village, Nr. Sheffield, S26 5QL. Telefax: 01909 774220. Price £59.



▲ Hitcher 4

MacGregor/JR XP-642

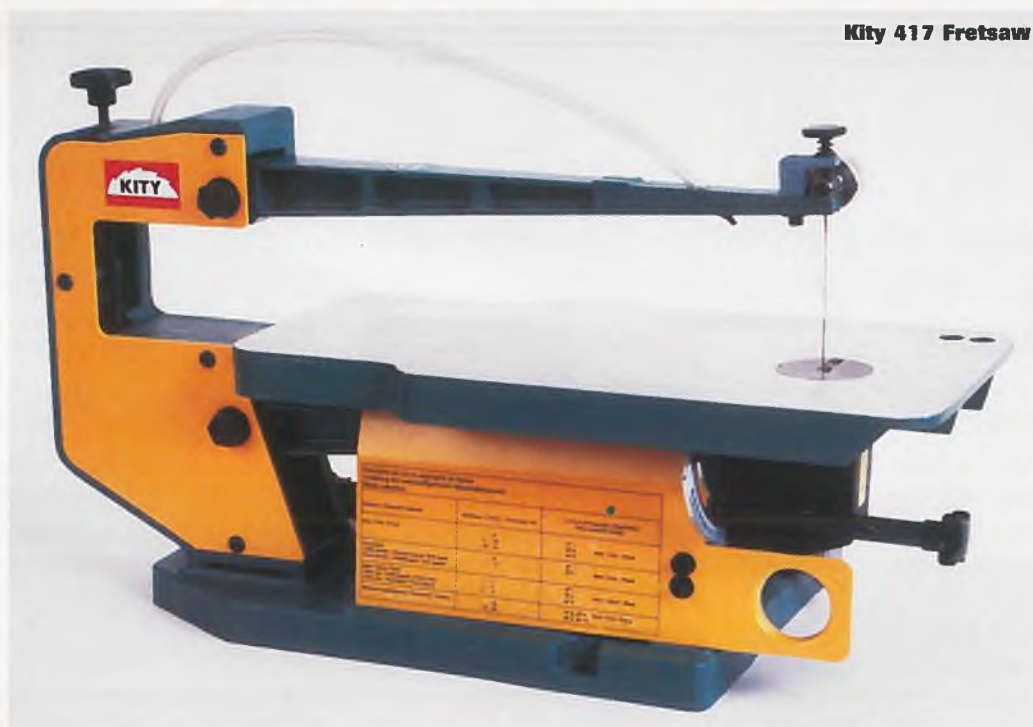
The new Tx with 6 functions, 4 model memories and 2 model types (aero and heli) offers many more features: user selectable PPM, "Z" type PCM or "S" type PCM modulation, electrical trims with positive centring, plug in NiCad transmitter battery, neck strap attachment, carrying handle and backrest, transmitter battery alarm, three character model name, programming via LCD screen to show the exact control response, auto repeat speed change on input keys, dual rates from 0 to 125% on aileron and elevator channels, selectable exponential control response, servo reverse on all channels to suit any installation, programmed sub trim for installations where the servos are inaccessible, trim offset memory so that trim levers can be returned to centre after trimming the model, servo travel separately adjustable each side of neutral from 0 to 150%, switch functions may be selected by the user, direct servo control, buddy box master facility.

Special features for aerobatic models are: aileron-rudder mixing couples aileron with rudder for accurate turns, elevator-flap mixing couples flaps with elevators for aerobatics, flapperon mixing enables ailerons to move together as flaps while retaining the aileron operation, differential aileron mixing enables descending aileron movement to be reduced to minimise the adverse yaw caused by aileron drag, flap-elevator mixing keeps the model in trim when flap is selected, V-tail mixing couples elevator with rudder for V-tail models, delta mixing couples elevator with aileron for delta models, three programmable free mixers for specialist mixing functions.

Special features for helicopter models are: throttle hold with its own pitch curve for auto rotations, throttle hold rudder offset for auto rotations, idle up facility for aerobatics, two throttle curves for hovering and aerobatics, three throttle curve points, three pitch curves, three



Kity 417 Fretsaw



pitch curve points, ATS revolution mix for torque compensation, ATS rotor direction selectable, one programmable free mix for specialist mixing.

JR Propo RC is distributed in the UK by MacGregor Industries Ltd., Canal Estate, Langley, Slough, SL3 6EQ. Telephone: (01753) 549111. Fax: (01753) 546983.

Kity Fretsaw

There are several small fretsaws available and useful for the smaller model making jobs. Low cost fretsaws aimed at the

model market are often not very sturdy. This 'Kity 417' by the Stayer Power Tools Group appears to be strongly built for rigidity and indeed comes with a two year warranty. The adjustable tilting table size is 355 x 180mm and a unique non-slip blade tightening system uses a 'clock screw' system. There are two blade speeds, a precision parallelogram action for 'on-the-spot' turns and the smoothest edges. An oscillating base and geometric design ensures blade tension for fast and precise cutting. It is fitted with a dust extraction

facility and a large range of blades is available suitable for most materials. It will cut softwood 50mm thick, 10mm alloys, 20mm plastics and ferrous metals 4/6mm.

Available from Kity stockists or contact: Stayer Power Tools Ltd. Unit 9, Guildford Industrial Estate, Deaconfield, Guildford, Surrey, GU2 5YT.

Micro Strip

Hand operated balsa strip cutters are not new but this balsa stripper allows precise adjustments to be made to the size of balsa or plastic card to be converted from sheet to strip. It is infinitely adjustable from almost zero to over 5/8" (16mm). The micrometer thread-control is graduated 0.005" and 0.001". It will utilise standard scalpel blades No. 10, 10a and 11. Left and right hand models are available for £34.95 (ask him for a metric version if you prefer) from: Martin C Roper, 1-3 The Cottages, Northwich Road, Colton, NR9 5BY. Tel: 01603 880695.

▼ The 'Micro Stripper'.



SkaT

Pylon race fanatics who keep their ears close to the ground may have already heard about SkaT. It has moved away from the popular stubby wing, short fuselage format to what is more like the layout for an aerobatic powered glider – high aspect ratio wings and a long slim body. After all this it weighs less too! I quote from the box lid. "The SkaT is a high performance pylon/sport racer. It is designed for maximum performance from a Speed 400 type motor. Very low weight and drag give the SkaT a decided advantage over the competition. The epoxy/glass/carbon fuselage is light yet tough. The wing is reinforced with uni-directional carbon and fibreglass for greater stiffness. Careful placement of all internal components allows for a small fuselage cross sectional area. The wing averages a very slippery .30 inches thick. A high aspect ratio makes for great turning ability at high speed and easy landings. Performance is outstanding yet it tracks well and is appropriate for intermediate flyers and above. Kit includes: Fibreglass/Epoxy/Carbon fuselage, Balsa/Carbon/Foam wings, Laser cut motor mount, Step-by-step Instructions. Wingspan: 28-32 in. Weight: 14 oz. Channels: Aileron, Elevator, Throttle. Battery: 7 cells 500AR or 600AE."

The moulded fuselage is provided but you build the wings. Kit contents are of super quality, watch out for a review of this model. Available from the manufacturer: Diversity Model Aircraft, 10223 Kaiser Place, San Diego CA 92126, USA. Telefax: (619) 693 8188, email: LetIFly@aol.com



▲ SkaT 400 pylon racer.

MacGregor/JR XP-642 set, comprising: NET-E136U Tx, R-600 6 function PPM Rx and NES-507 servos, plus NiCads, charger and switch harness for £219.





Big scale models



Vöster, the manufacturer of high quality kits with moulded fuselages and pre-finished veneered foam core wings ready for covering, has just extended its range with another half a dozen models by purchasing the production tools of another German quality manufacturer – most of these models are electric and two are scale!

The DC-3 was a wingspan of 2m (79") and recommended power is two geared Speed 600 motors and 12 cells. Fuselage and motor nacelles are GRP

moulded and the wing is obechi veneered.

Another popular twin is the Britten Norman Islander, also with a wingspan of 2m (79"). Recommended power is a pair of Speed 660 Turbo BB 12V motors with Kruse Intro Gear 2.4:1, 12 to 16 cells and 11 x 7 props. Typical weight is 3.9kg (8.6 lbs).

Available from Vöster Modellbau, Münchinger Str. 3, D-71254 Ditzingen, F R Germany. Tel: 07156 5652, fax: 07156 951666 or in the UK from The Electric Aeroplane Company. **EFI**

◀ **Vöster DC-3.**

New Speed Controllers

Benchmark Electronics Ltd, a new name to model electric flying is offering 'Microdrive' speed controllers for 400 and 600 size motors. There are two types of controller, a fully proportional controller and a switch with ramp start. Both versions are available in two power ratings, one for 400 motors rated at 10 amps continuous and one for 600 motors rated at 20 amps continuous. This makes four products in all. Each has a user selectable brake and each has user selectable BEC. All are suitable for use with 6 to 10 cells, weigh 20g (0.7oz) with leads and will accept for up to 30 seconds a peak current double that rated for continuous use. Product test soon. Types available and prices in the UK are:

- M10S. Ramp start switch, 10A. £32.
- M10P. Proportional, 10A. £36.
- M20S. Ramp start switch, 20A. £36.
- M20P. Proportional, 20A. £39.

The controllers are available from: Benchmark Electronics Limited, Low Dryburn Farm, North End, Durham, DH1 4NJ. Tel: 0191 384 64444. Fax: 07070 711131.



▲ **Microdrive M10P speed controller for 400 size motors.**

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Adaptors & Fittings for Speed 400	£6.00
for Super 400 + 410/12	£3.00
EJT Fan for 400 / 480's	£25.00
EJT Fan for 540's	£30.00
EJT Cobalt Fan	£35.00

Motors

W.E.P Turbo 10 +.....	£55.00
Fanfare 'Silver' 16T	£30.00
Fanfare 'Gold' 550 size, 22T	
BB with big brushes	£40.00
Speed 500 E Race	£16.00
Speed 600 PB	£10.00
Speed 600 7.2 BB SP	£18.00
Speed 600 12v Turbo	£20.00
Speed 600 8.4v Race	£18.00
Speed 650 9.6v BB Race.....	£35.00
Speed 700 / 7-14	£15.00-£45.00
Speed 400 4.8, 6, 7.2v	£5.50-£7.00
Power Plus 410/12	£12.00
Speed 480PB	£16.00 - BB £22.00
RE380 £4.50 - LRP Super 400	£43.00

MAX CIM BRUSHLESS MOTOR

Complete with Controller & 3:1 Super Box	£330.00
--	---------

Connectors - Cable - Fuses
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GEARBOXES

Master Aircrow 2.5, 3, 3.5:1	£15.00
Superbox	£38.00
MG 2BB CNC for 400's & 540's	£30.00
MG Twin 400 / 480 BB	£35.00
MG Twin 550	£48.00
Mini Olympus	£7.50
Olympus	£11.00

Motors & Gearboxes

Speed Gear 400 FG3	£18.00
Speed Gear 400 4:1	£35.00
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THERMIK 'V' F3J WING SPAN - 3.5 M SD 7037 V TAIL	£575.00	PARABOLA GLIDER SLOPE SOARER	£265.00
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BD EFL498

DERECK WOODWARD Over Here!

This is the SPORTS FLIERS' column. Dereck the Brit tell us what he is doing in the USA but he wants flying news from you - wherever you are in the world.



Every column should have a flying shot! 'Slow Fly' involves wheeled take - offs and this model will loop, so OH! covers it - this is Horst Fenchel's 'Stubenfliege' in action when Horst spent his summer holidays near Washington, DC. All carbon fibre superlight comes ready to roll (well, loop) in a polished wooden box. Just under 36" span, not many grams in weight, flies great. That red box under the wing TE is the entire control system - two servos and Rx by Becker - bar the miniscule speed controller behind the motor.



After last winter - so wet, cold and windy that locals thought I'd got the weather as a Christmas present from England - this year has been kind. January 31, we got a warm, calm day. I took my 'Pandora' and 'Wimpy' out, wrung 'Pandora' out, then flew 'Wimpy'. After a couple of average flights - around seven minutes and a taxi back from the strip - I loaded a fully charged 8-pack.

Off we went, played in the weeds, climbed, did the odd 'Figure 9' loop and some lazy rolls. Now - let's see how long we can fly, so make like a glider and fly in circles. After ten minutes the urge to loop won, then back to energy conservation. At around eleven minutes, I spiral down gently for the strip and the BEC says enough just before I flair for what is frankly an abysmal landing.

Check the watch - 11:57! A wide finals turn, an extra burst of power by recycling the BEC or even landing long and I would have flown twelve minutes. No gliding, definitely no thermalling, a draggy scale model on 1700s, a \$40.00 motor and gearbox. Few of the soarer guys topped that by floating around that day!

Sports Electrics

...is an attitude of mind - don't mind my attitude! Take my old

▲ **"Open wide" Mike Stewart checks out his 82" , 36 cell DynaFlyte sport-scale Spitfire at our 97 Spring Sizzle - now in May, to dodge the windy season. That is not the runway, that is a lot smoother and met with Mike's approval.**

'Pandora' - we start nearly every flight the same. Lift-off - and roll inverted. Push to a thirty degree inverted climb and get high enough to pull back through to level flight for some type of roll.

I carry her to the take off point, so I have that short spell when the battery is straight off

the charger and its voltage is a little higher than usual. I'd rather use that energy for a spectacular launch than a taxi-out. Okay, it's a tad 'extrovert' but I have practiced for years and follow the maxim of an RAF display pilot I flew with - fly the aircraft right to its limits - not one jot beyond. 'Pandora'

will half roll to inverted regardless of whether there is two or two hundred feet to the ground - on take off, she's climbing on full power which makes it easier, if anything.

For those mumbling about "smarty pants" - it took a while to learn, I bent a few on the way and my clubmates often

▼ **Another visitor, who's name escaped, prepares to lift off our shorter strip at the 97 Spring Sizzle at Rockville's Mt. Trashmore site. If you leave off the wheels, you miss out on the two most challenging events in RC - a good straight take-off and the three point landing.**



► OH!s "Coolest of 97" - Keith Shaw's Me 35. Modelled using what little is available on one of Willi Messerschmitt's one-off aerobatic aircraft from the 1930's, it has to be one of the best advertisements for putting in a little extra effort. Model spans 60", with a Maxcim brushless motor and gearbox on 20 x 2000mAh cells. From smooth take-off, through ten minute flights of solid turnaround style aerobatics - Keith flew a square eight control line fashion half way through his flights - to a delicate three pointer, this model is something to aim for. Incidentally - Keith never publishes his designs. Find some info and go for it!

hid when I was learning this one!

Electrics still fondly clings to the "handlaunch and no undercarriage" syndrome. Okay, the wheels are drag for much of a flight, but I'll keep them for the thrill of 'my' take-off, the ability to taxi off the runway and for the satisfaction of being able to practice repeat touch and goes to hone my landing skills. Hand launch is fine for really small electric sports models - though I know of a 40" P-51 with retracts - but that's it. Even my Longster Wimpy doesn't mind having a birdcage of a landing gear - see the above - plus a low wing model is much easier to take off than hand launch.

► Eric Leadley sells this plan for his sleek 'Electro 600'. 46" span all balsa aerobat could be a lively home for a seven cell pack and a ferrite 'can' motor (but would sparkle on eight, or scream on 10!)

D-BRIS

If you want them - you make them

'Pandora' isn't even that special over here. Ten cell and up models are getting common as folk catch on to the performance math we skimmed over last month. Pursuing the same performance I loved in glow power, the first thing to go was the battery. I had the urge to dodge the 'Seven Cell Trap' - and a pile of seven cell commercial packs.

Being of a determined nature, I determined that the shrink wrap came off easily - and that the welded straps came off nearly as easily! A pair of pliers to grasp the strap, twist and all four spot welds popped effortlessly off. I was going to put how many amps through those little spot welds?

Next - clean up the cells. The trusty Dremel and a gently applied drum sander on low RPM took off those sad spot welds and cleaned up the cells. I won't waste space with telling you how to proceed - there have been excellent articles on pack assembly techniques and widgets in past EFI issues and Ye Ed is not keen on repetition. Even if you are still playing safe, you can win some cheap performance on a cooking model by getting rid of those welded tabs.

Wasn't long before three packs that involved making a model to fit around them had become two nine packs (why not ten? - my

charger took an hour to charge nine!) that fitted into my model. Not much work and I was ready to get off the porch and play with the big dogs, as they say here. Well, I'd moved up from Yorkies to Labs - still a way from elbowing the Pit Bulls out of the way.

Meet our meeting

Our silent flight patch is an interesting place - it was once a superb miniature airfield for the noisy lot. They got the boot over noise complaints and 'Mt. Trashmore' languished for several years. Eventually, Roy Smith, local model shop owner, eased the way for the Capital Area Soaring Association (CASA) to fly electrics and gliders from it. After a lot of work by some stalwarts, it is a pretty good site.

CASA is, surprise, a soaring club, with a slim list of electric fliers though and, as Trashmore is not conducive to glider winches, we e-fliers have the place to ourselves without lines all over the shop. With a little prodding - I let Charlie French fly 'Pandora', for example - some of these are leaning to sports flying and doing interesting stuff as opposed to going round in circles.

A couple of years back, the idea of an electric Fun-Fly on the mountain took hold. There were two - one in the windy season, one in the hot spell of summer here. In 1997, some wag moved one from a weekend free of e-meets to atop the US electric flight Nats!

That's a little background - now good news for those within striking distance of Washington DC. The runways - one tarmac if the wind co-operates and a lot of grass for all other directions - allow about any electric

model to operate. Mike Stewart gave it the 'Whoppers League' seal of approval by flying his 82" span, 36 cell 'Spitfire' off it in 1997. So - for the lucky ones, the mountain can't come to you, so go to the mountain - Mt Trashmore. (For other US modellers who have a Mt Trashmore in their region - this one also has a columnist!)

For all you mid-Atlantic e-fliers, come on down - drop me a line or e-mail for the details. Maybe, just maybe, if this one succeeds, we can go out and find a site for a full weekend event - you folk in the area can help makes sports electrics work.

Low Voltage

It is just fine and dandy to stay in Herm Perez's "Seven Cell Trap" (though it is more fun to tag that eighth on the back of the pack!). The rider being, don't expect too much and you won't be disappointed. If you insist on making a 15 dollar/pound motor perform like a 100 note one, you still won't get the performance and you might briefly own the club's only electric with smoke!

Been there, done that. Let's look at the parameters for a decent low power model. Start with that ubiquitous seven cell pack and a 'can' motor. On a good day, it might just turn a generic 8 x 4 cheapo folder. Stick an 8 x 4 APC on the front and it might just start to smoulder.

As for gliders - it's still a big model for a little power. If smaller, it won't do the glider bit very well. If bigger, it won't get high enough to do the glider bit. Accept that you aren't going to set the world on fire, then build a lighter, smaller model and you'll be much happier. Models are a little sparse for the straight drive ferrites, though England has Howard Metcalfe's smart 'Crossbow' in kit form and Eric Leadley's 46" span 'Electro 600' as a plans build project. In the US, the Great Planes Electro-Streak has been around a long time, but can deliver reasonable performance on a ferrite can and seven cells (and goes like the proverbial lightly boiled feline on ten cells and an Astro 15!) For something a little cooler, Dennis Tapsfield's 'Lecky' (MW 2491 in the RCMW plans range is from a master of the

lightweight model, while Goldberg's 'Mirage 550' purports to be a trainer but is an ideal model for the experienced sports flier who wants a quick build that can whip around a field with surprising gusto. Mirage is a very pretty model too, for a three channel high winger. Both could suit the low time pilot, but offer good three channel performance for a limited layout in cash or time.

All the above will take the classic 540/600 'can' motor on seven cells and actually fly just like an aircraft should. Next time, we'll slap on a gearbox and really start to motor.

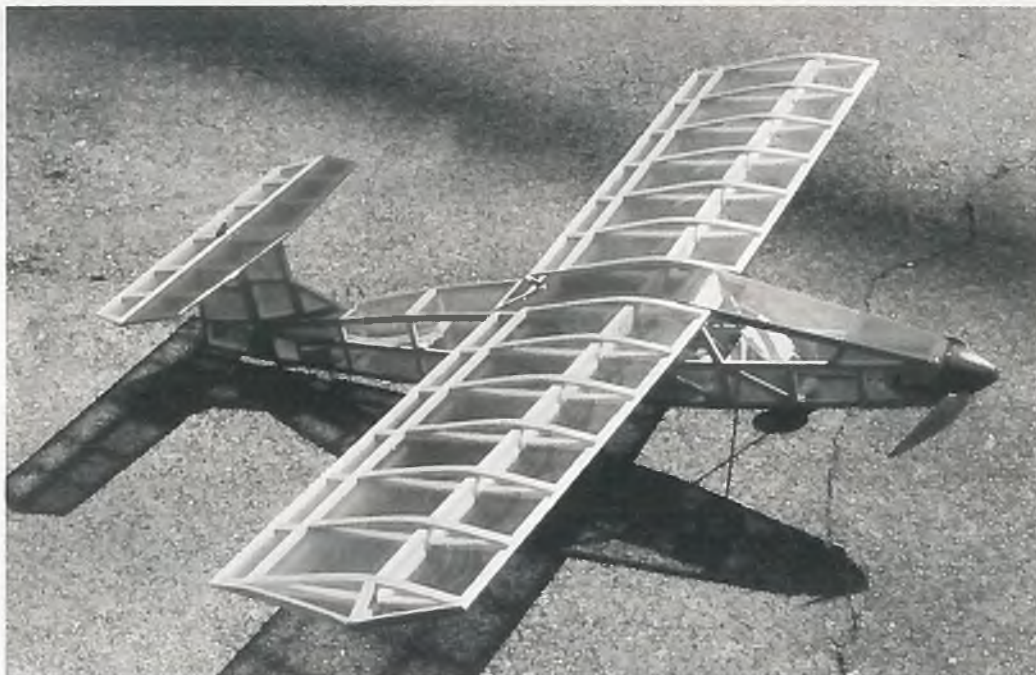
Stick with it

Let's not ignore Speed 400. Over here, a long e-debate ranged on just what you could call Speed 400. While Europe has no such hang-up, we couldn't use that for an official event as that would seem to have the AMA promoting a manufacturer. One wag suggested we call it 'Not Graupner' Speed 400, but the fires of battle still smoulder - perhaps common sense will sneak in if we ignore it?

Following hard on discovering a cheap fun idea came a rush of expensive moulded models. That's right - \$30.00 props, \$100.00 to \$200.00 moulded composite models, micro RC gear - all lashed around a \$10.00 motor. At least we now have Astro's stunning baby brushless 020 that makes those models come alive without smoking little can motors.

One who has matched the cheap and cheerful (Whatever) S400 motors with cheap and cheerful models is Tom Hunt of 'Model Air Tech', with his 'Stick Series'. Tom's way again was to build a model that matched the S400 motor in cost and spirit, and he succeeded way beyond the original idea too. The basis of these models was 1/8" x 1/4" (3 x 6mm) balsa strip - everywhere! I built Tom's 'Bare Bones' racer - he won the first US (Not Graupner) Speed 400 champs with one - from one sheet of 1/8" balsa that I turned into strip with a ruler and a modelling knife.

The range has such stars as 'Bare Bones' (racer), 'Lowwatt' (a high winger), 'DimWatt' (high wing, T tail), 'SoarWatt' (a soarer, "Watt" else?) and even 'Fan Task Stik' - a DF



▲ Dave Segal's rendition of Tom Hunt's DimWatt - 16.5 ounces of mini-fun with a 6V S400 motor on 7 x 600 KR cells and 6 x 3 folder. There are no formers in the framework - most of the structure is 1/8" x 1/4" balsa strip wood. These 'stick' frames from Tom seem to attract see-through covering jobs!

model that comes in under \$50.00 for the airframe and a Red Flame Blaster fan unit! Fuselages are just stripwood, with barely a former in the range let alone a model, as are the tailfeathers. Wings - well, they look like runaways from an indoor FF meet. Rib bottoms, LE's and TE's are flat 1/8" x 1/4" strips laid on the board, spars ditto, set on edge. Rib tops are bent pieces of 1/8" x 1/4" bent over the top.

Fit a 6V S400 and six or seven cells and they really scoot around the sky. Ideal little models for keeping in the car, while packs of 600AE cells make extra 'fuel tanks' easy on the pocket. They obviously go better with lighter RC gear, but can take mini servos and even normal receivers in the case of the larger fuselage models.

Flushed with success, the idea spread and Tom sells plans from S400 all the way to models in the 16 to 20 cell range. It's the little fellows that are hardest to resist though, and they are truly charming while delivering great performance per dollar/pound. While much of the US may know this, Tom sells his plans through 'Modelair-Tech', PO box 1467, Lake Grove NY 11755-0867 USA. He takes plastic these days, too, and the enet-ers may wish to drop by [HTTP://WWW.MODELAIRTECH.COM](http://WWW.MODELAIRTECH.COM) for a look at what Tom's up to.

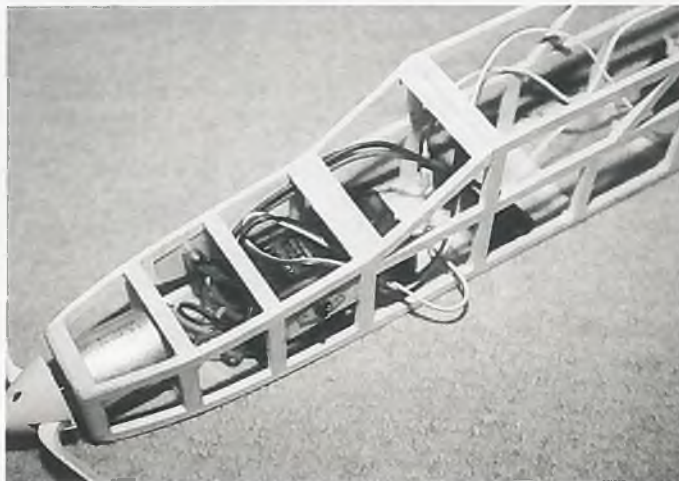
Winding down

- For month two. How's it going? So far it has been a lot of my ideas. What do YOU want in the sports electric game? One thing is certain - if I get your views, they will be in the majority. If not, you get mine! You've a choice of addresses - either via EFI at the Traplet Publications address, or mine at: 11159 Captains Walk Ct, North Potomac, MD 20878, USA. Feel free to drop by elec-

tronically at: WEEKENDPILOT@JUNO.COM - that's e-mail only, it cannot handle attached files or other clever stuff.

To get your pride and joy in here along with your ideas on sports e-flight, the magazine publishing lot need standard sized colour prints or slides. Send spare shots please - shots cannot be returned after publication. Let's be hearing from you sports fliers, only your models need to be quiet. **EFI**

▼ Francis Person's 'Lowwatt' from Tom Hunt's 'ModelAir-Tech' plans - just as he brought it to a club meeting last year! The only former in the model is the ply plate the S400 is screwed to. Model flies on six 600 or 1000AE cells - flies six minutes on the smaller cells. An agile model, she allowed Francis to charge up two or three packs at night, then go fly from a soccer pitch near his house before leaving for work.



Formula One

REVIEW BY: **KLAUS SCHARNHORST**

Early each year model fliers meet in Marburg to fly electric, or if it is foggy or snowing they keep warm and talk model flying. Several categories of model flying have been conceived at these meetings. The last one of substance was 'Formel 1' or Formula One to most of our readers. Since its creation this editor has prophesied that it will provide us with some good looking fast models that are easy to fly and probably aerobatic.



Compete?

Many model fliers do not like to compete. "Forget the competition, look at the model." - I tell them. I have spoken to pylon racers about this class: "Too big, not enough power, too slow." - they tell me. This sounds just right to me!

The models have to be 'so big', energy (battery pack size) is limited, they have to take off and land, they have to stay airborne for so many minutes and they have to look as if they could be real models - with model pilots.

Low cost motors will suffice. If you really want to compete you may need to spend

money on a good one. If you don't compete you have got a nice flyable model. Klaus Scharnhorst was at the centre of the conception of this class, issues a newsletter and has been kind enough to provide us with copies of the specification for the model and rules if you wish to race one. Check them out.

Design specifications for model aeroplanes of the Formula 1 Electric Pylon Racing Class.

1. Application of these standards

These design specifications apply exclusively to model aeroplanes that may participate in competitions run according to the rules of the Formula 1 Electric Pylon Racing Association. Compliance with the design specifications lies in the interest of the competitors, so that no participant is disadvantaged or favoured, when compared to the competitors, by non-compliance with the rules. Before every competition, the participating model aircraft is checked for obvious

◀ **Five models on the start line before a race.**



deviations from the design specifications. If such deviations are verified by measurement, the competitor may not, or only as a non-competing pilot, take part in the competition, unless the deviation can be corrected by the start of the first heat. The first three winning model aircraft of a competition are subjected to inspection after the last heat. If a deviation is found, the participant can be disqualified or points may be deducted from his score (see: Penalties for infringements of rules).

2. Technical specification of the model aircraft

The modal aircraft of the Formula 1 Electric Pylon Racing class should be based upon the models of the man-carrying "Goodyear Racer". In this case, it does not depend on whether the aircraft actually participated in such a race or only existed as a project, but rather upon whether it would have been able to participate had it been built in full size. Therefore, scale models are not described here. As a result, every designer has a great deal of freedom, which should result in a great variety in the form and appearance of the competing models. In order to ensure comparable performances, certain speed influencing limits are necessary within this framework.

2.1. Wing size

The wing size must be at least 25 sq.dm. The wing centre concealed by the fuselage is to be included in this measurement. This wing centre results from the extension of the leading and trailing edges of the wing to the median. Curvatures and wing/fuselage joins are not counted. If the wing has a leading edge drawn forward into the fuselage, the resulting enlargement of the wing area is counted; however, the initial prolongation of



▲ Yellow 6.

▼ Yellow 6.



the leading edge is decisive for the wing middle piece in this case. The same rule applies to a trailing edge moved to the back. The design of the of the wing tips is discretionary. If winglets are used, only their vertical projection is to be counted as part of the wing area. As the measurement of geometrically complex wing tips in their vertical projection is often difficult and inaccurate, it should be noted that the wing area is to be measured generously. Closer explanations are to be taken from the corresponding drawing.

With flying wing constructions, the wing

area must be enlarged by 20% to 30 sq.dm. The absence of a separate horizontal tail plane and the combined smaller resistance is thus compensated. The wing centre on tailless aeroplanes is to be defined as described above.

2.2. Fuselage

The form and length of the flight model fuselage can be freely chosen and depend on the model. One must ensure, if no real model is available, that the accommodation of a pilot, the engine and of the usual equipment of a full-sized racing aeroplane would be guaranteed. From this require-

▼ A winning model that managed to squeeze 13 Panasonic cells into the 700g limit.



▼ A flying wing that competed last year.



ment for a true-to-life seeming aircraft the need results for a clear cockpit canopy and the installation of a model pilot, or the bust thereof. If the cockpit canopy is designed to be a separate piece, a model head suffices, as no more is to be seen of the pilot in a full-sized aeroplane. The fuselage must show a sectional view at an upright interface in the area of the cockpit of at least 100 sq.cm. A divided stencil that lies closely on this field is to be made. With the aid of this stencil the fuselage sectional view allows itself to be calculated on a piece of graph paper. Curvatures in the wing/fuselage join are deducted from the sectional view. With purely elliptical fuselage sections, the measurements shown in the illustration result. Combinations of parts of an ellipse with other forms are entirely permissible as long as the 100 sq.cm are observed.

2.3. Undercarriage

The model aircraft of the Formula 1 Electric Pylon Racing class are to be equipped with undercarriages that will allow the aeroplane to take off from a closely mown grass runway. The placement of the undercarriage is discretionary. The main undercarriage unit is not to be retractable or discardable, although a retractable nose-wheel is allowed. The undercarriage is to be steerable over a radio-control channel. The size of the two main wheels should be at least 70 mm diameter and 22 mm width (manufacturer's specifications, nominal measures). Fairings for the two main wheels are required.

► **Klaus Scharnhorst's first Formula One design. Both his models are built up with balsa and blue foam.**

2.4 Drive

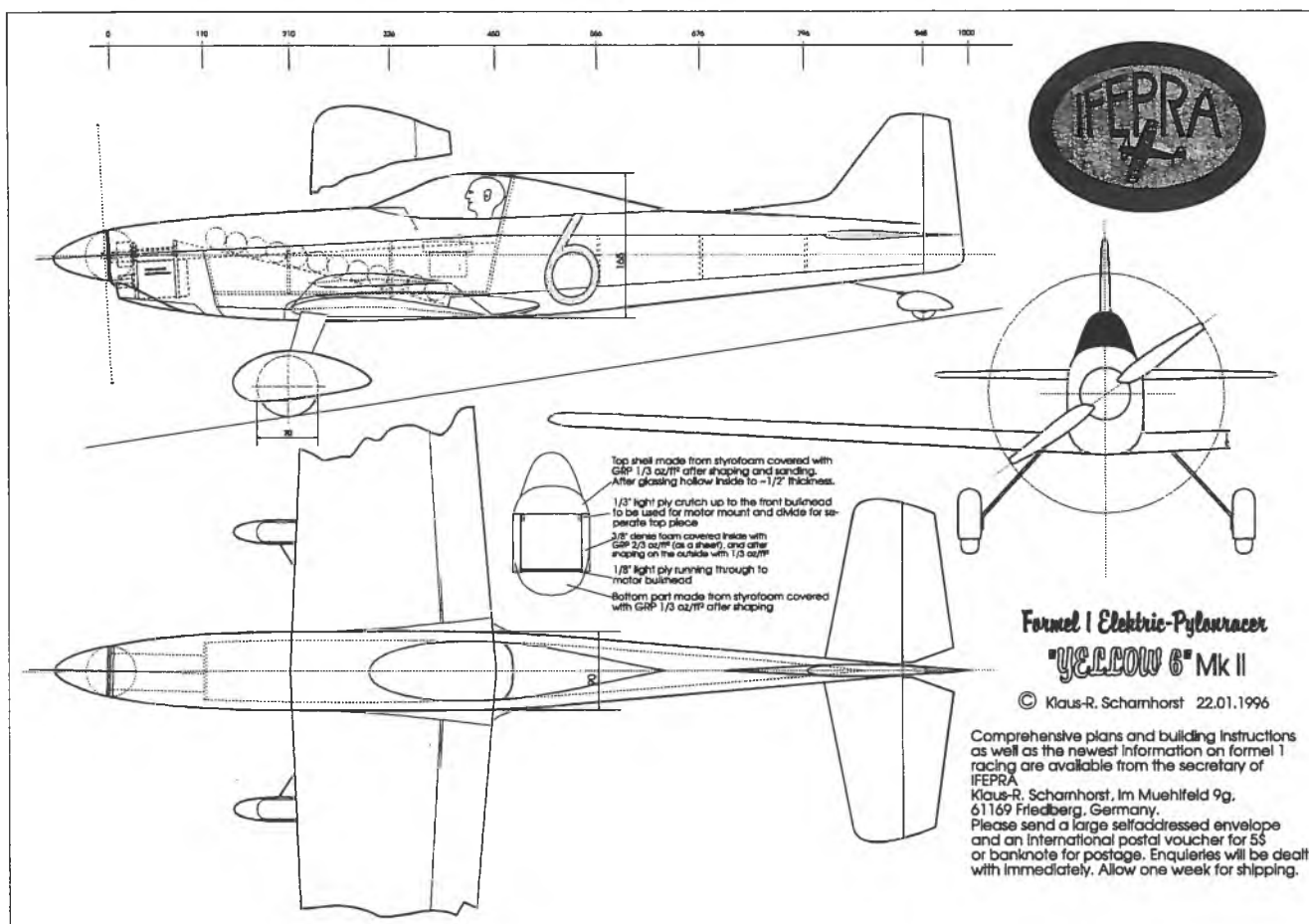
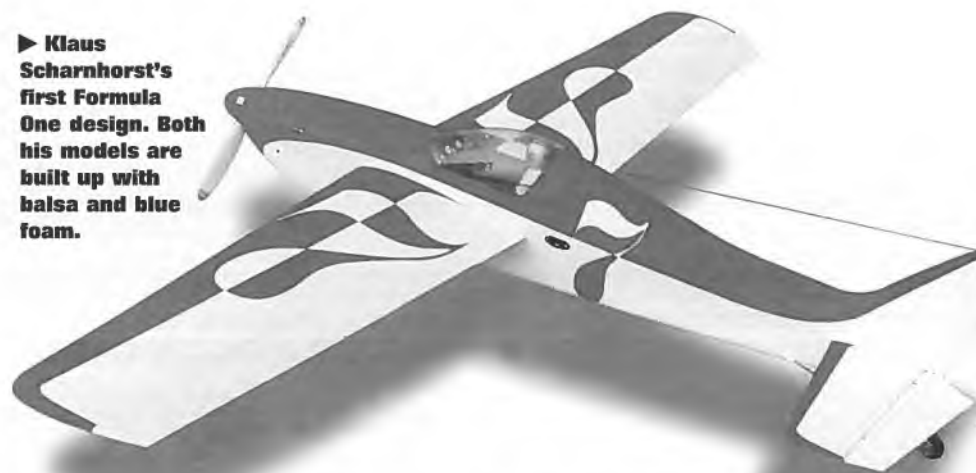
The model aircraft of the Formula 1 Electric Pylon Racing class are powered by electrical motors, supplied by rechargeable secondary cells. A free choice of the electrical motors is granted, likewise the use of Gears. The total battery weight must not exceed 700g, with cord and coupler. The motor or motors must be controlled during flight by a switch or speed controller. If three or more participants in a competition use ferrite motors, they can apply for separate evaluation.

2.5. Control

The model aircraft of the Formula 1 Electric Pylon Racing class must be con-

trolled on three axes i.e. control of ailerons, elevator and rudder.

Those are the 'rules'. Older readers will recall 'A' and 'B' class control line Team Racing many years ago with similar rules. They provided good competition sport for many years and dwindled when RC models swept the flying fields. Here we have the RC equivalent. You have already seen in earlier issues of this magazine about half a dozen model kits from manufacturers, intended to be suitable for Formula One or just sport flying. On these pages are photos and a drawing of scratch built models that have been used in the early competitions. With available kits and these (and more) enterprising designers we expect to see more models and more competitions this year. Will you have a go? **EFI**



▲ Drawing of Klaus Scharnhorst's second Formula One model, Yellow 6.

E-Scene

in the USA

WRITTEN BY: **JIM DAVEY**

Beginners – read this! Here are some wise words from a modeller who changed from IC to electric and who has a few “Dos” and “Don’ts” to pass on. Jim was editor of Model Helicopter World before he migrated.

Setting the scene

The following short article was inspired by the editor’s recurring theme: “Electric flight has come of age and is a practical alternative to gas power for the sports flier – no longer the stuff of experts and specialized competition classes.”

This story starts way back in “nineteen hundred and frozen to death” when my flying buddy, Graham Booker, and I would try just about anything in aviation.

The practicality of electric flight had just been demonstrated amid much ballyhoo so we just had to give it a try. The attempt was a collaboration. Graham built the complex (timer style) charger we planned to use and I built a high rate speed controller, complete with feedback stabilization – way ahead of its time, and taking no consideration for the like-ly (lack of) performance available.

The set-up consisted of an ‘05’ can motor (direct drive, of course) and eight AA cells in a modified Veron Impala. It flew – but only at full throttle, somewhat negating the effort associated with the speedo! Later the model “borrowed” a very much lighter and thinner wing from one of my light air slopers, and this did improve the performance from awful to merely mediocre. Needless to say, after a couple more false starts, interest waned rapidly and we went back to something more useful – in my case trying not to break rotor blades.

Time went by and a lot of water passed under the bridge. My next

significant electric experience was with a Kalt Whisper (helicopter) when I was editing Model Helicopter World. This model did not spend much time in my hands as the water passing under the bridge soon turned into the Atlantic Ocean! In New Jersey, a second Whisper got a lot of indoor use during the New Jersey winters and a seed was planted. That particular seed took a few years to germinate, and the fertilizer was EFI. I started reading the mag when I was handling Traplet subscriptions in the US and became more and more fascinated, particularly by the Speed 400 stuff which seemed to provide just the right level of performance/expense. Until then I had the opinion that electrics were a bit like climbing Mount Everest – you do it just to prove you can.

I was looking for a change of pace and the “no-clean-up, just charge and fly” aspect of electrics seemed a cool thing to do. A bunch of reading and scribbling on the back of old napkins came up with a project based on a Ridge Runt – a small slope soarer. As an inveterate kit basher, let’s just say that significant mods were incorporated! The result weighed 26 oz with 8 x 600AA or 800AE cells, three micro servos and a Speed 400 7.2V with 2.33 gearbox. Some very dud data (not from EFI) initially led me to attempt to fly with an 8 x 4.5 folder – which more or less worked.

Eventually I ended up with a 9 x 6.5 which really worked! The model gives 8 – 15 minutes of fun flight including slope soarer type aerobatics.



▲ Author’s much modified Ridge Runt provided an excellent introduction to modern ‘soft’ electric flight. Speed 400 7.2V, 2.33 gearbox, Aero-naut 9 x 6.5, 8 x 800AE & Jeti 10.

I was really pleased with this model until it was shot down by incompetent frequency control at a fly-in. However, the model had done the most important thing – I was hooked!

Just a few more watts

Just prior to completing the Ridge Runt I took the opportunity to drive over to the KRC meet in Pennsylvania (Late 1996) to see how it was really done. It was just as well that the model was already almost finished, as I was almost put off again. There were a lot of very impressive machines there, but my stop watch was indicating that the average flight was around four to five minutes for the non glider types – close to my definition of a waste of time. Now, please don’t throw rocks folks – if you are happy with a four minute flight, fine. I am not. Anyway, I took the opportunity to purchase an Easy Build kit of the Pilatus Porter, at the event, as the next project.

It was clear that a 400 would probably not be enough for the Porter, so more watts were sought. The Porter has a big fat body and a small wing so I traded some light contest balsa for that in the kit, replaced the slab tail surfaces with built up and added ailerons to the wing. In addition, I webbed the spars and constructed a more scale-like and damped undercarriage.

All-up, with the power combination described below, the model weighs around 36 oz. I’m going to dwell on the set-up a bit as the Porter calls up an ‘05’ and shows seven cells – probably 800ARs I guess. This is a pretty heavy and short duration set-up – technology has moved on.

I bought a Speed 480 Race only to discover that it was timed to run only one way, unsuitable for the gearboxes I had

▼ It’s so ugly it’s beautiful!
Pilatus Porter from Easy Build kit. Rewound AP29BB, 3.3:1 Model Air Tech belt drive, 10 x 6 Graupner, Tarling MicroStar 20 and 8 x 1400AE. Yellow pig on fuselage side is quoting “You can be a big pig too”.





also purchased – another point on the learning curve! The logical next step was an AP 29 BB which was fitted into a Master Airscrew gearbox using an adapter from New Creations. The adapter worked beautifully, however two snags appeared. First, the gearbox had eccentric gears and made more noise than a well silenced two stroke and second, the AP 29 threw a winding. Replace the AP 29 – throw another winding. Both windings failed at the point they are crimped to the commutator which tends to indicate to this old engineer that something is not right.

In some desperation I removed the armature from the Speed 480, dropped it into the AP 29 can and went flying – success! Now the model was actually flying reliably the noise of the gearbox started to drive me nuts. About the same time, Model Air Tech introduced their small belt drive for 400 class motors. With it I built up a combination of 480 Race and 3.3:1 reduction. This set-up worked really well and inspired me to rewind the dead AP 29 – I figured that the ball bearing can would give better life than the plain 480 on the belt drive.

This combination, driving a 10 x 6 folder assembled from Graupner blades on an Aero-naut hub, powered by 8 x 1400AE cells via a Gordon Tarling controller pulled around 14 amps static and would give me 8 to 10 minutes flight time with sensible throttle management. The way I operate is to set my flight timer to 8 minutes and then take off. I fly around shooting the odd touch and go or loop until the timer sounds and think about landing. This normally gives a 9.30 to 10.30 flight with a 'power on' landing and taxi in. A recharge returns around 1.2 amp hours to the battery, confirming that there is more to come if I want to push the batteries to the limit. I generally avoid taking any pack all the way done as battery life is adversely effected by deep discharges. I have found the 1400AEs to be a very good combination at these power levels. They offer a very high level of energy storage per unit weight and their higher internal resistance (compared to SCR types) is not a disadvantage at 14A and below. Since you have to operate at these (low) current levels to get worthwhile duration it all works out.

Generally I charge at 2 amps (1.5C), having allowed time to cool. After 20 minutes it is hard to detect if the cells are above ambient temperature, and at the end of the charge they are warm to the touch, as expected.

Astro's digital charger does a really good job. In hindsight, had it been available at the time, I would have gone for the Speed Gear 3.45:1 480 Race (in-line gearbox). This would probably match the model very well, and the slight change in gearing might make it suitable for a 10 x 6 Master Airscrew electric prop.

So, summarizing – I have achieved the first stage of what I set out to do. I have a sport scale model that can be flown every weekend with no special consideration. It will take off happily from hard ground and with care from grass.

Go west young man

The Pilatus was so promising that I decided to make it one of the models that I kept out of storage when I relocated to the coast (That's American for moved to California).

On arrival, I made some enquiries as to electric flyers and was pleased to find a country park site just 10 minutes from my apartment. The rules there are "no gas" so you find an eclectic combination of electrics. Naturally there are the usual self launching gliders, but the majority of the guys are flying regular sports type 'power' models.

A sample are captured in the accompanying photos, some of which were taken at the excellent Devil Mountain Electric Fly, where the 'San Antonio Boys' almost dominated the day, sweeping many of the prizes.

As might be expected in the US, many of the models are equipped with motors from the Astro line, but there is a smattering of ferrites too, including a couple of Speed 400s – much rarer in the US than in Europe, but growing fast. One flyer has one of the MaxCim brushless motors in combination with a gear reducer. This has proved reliable and does an impressive job of pulling a large biplane which was actually built for and flown with a large four stroke before conversion – no special weight saving here. Generally the models you see here are built from gas power kits, converted to electric with some weight saving.

If One is Good.....

I read somewhere that multi-engined models are rare in the US. Well that's changing too. At our site there has been a lone Partenavia, built from an Astro kit, that uses a pair of '035s' on direct drive and is fast and efficient.

▲ Ray Atkinson builds some superb scale ships. Here we see a Rearwin Speedster, Travel Air and Fairchild Ranger. Power is provide by Astro 035G, 035 'Texaco' and 05G respectively. These machines are exquisitely detailed with working sprung gear etc.

Recently we had three more twins on the field – two of them flying boats. The third model was a twin 400 P-38 which looked to fly well. One of the flying boats was a large "bitza" fielding an old glider wing strapped to an original hull. Power was provided by a pair of, what appear to be, buggy motors driving through Master Airscrew gearboxes. Power is best described as adequate and flight characteristics majestic – no camera that day.

I do, however, have photo's of my "Weed Whacker Too". This started out as an Ace Puddlemaster kit – I used the ribs and some of the bulkheads. Construction of the hull is lightened by selection of contest grade balsa and the wing is stiffened to enable the fit of ailerons and two Speed 400s driving through 2.33 gearboxes. The wing structure is now the familiar D box using spruce spars and contest grade sheet. I laid in two sub-spars at the motor positions using 1/4 x 1/8 balsa, just between the ribs each side of the motors. The nacelles are simple structures resembling the front of a small fuselage. After covering they were stuck onto the wing, in contact with the sub spars. The wings and tail are covered with Litespan and the fuselage with lightweight tissue and dope. Paint on the fuselage is PolyScale brushed on. Oh yes, there is a detachable sprung undercarriage for land use. The model weighs very close to 3 pounds, ready to fly, with a wing loading of about 17 oz/sq ft.

The plan was to try a combination of 7.2V motors on 10 x 1700AE cells. The numbers suggested that this set-up would give adequate power at full speed, and a long flight when cruising. When I completed the model I had only 6 volt motors to hand, so initial trials were conducted with these and an old 'Whisper' pack consisting of 8 x 1700 Panasonics. My first attempt at a fast taxi resulted in a solid 6 minute flight – I landed while I was sure I had a lot of battery left. Subsequent flights have been in the 9 minute region with this set-up, using 8 x 4 Slim Props.

I have just upgraded to the 7.2 volt motors and 10 x 1700AE cells. Power was marginally down on the Slim Props (static draw was

around 11 amps – total) but a change to 8 x 6 Tornado nylons has produced plenty of thrust and 10 minute plus flights. The next step is to build the wing floats and try it off water.

Parting thoughts

It's been an interesting experience getting into electrics after a very long time in almost all branches of this hobby – including long enough in the trade to be more than vaguely aware!

The vast majority of the folk I have met are very helpful indeed. Electric modelers are probably more technically oriented than most, with the possible exception of heli types, which suits me just fine.

Not all speed controllers are created equal. There seems to be a development in the industry to give 30 sec ratings. This might be fine for gliders where the controller is much used as a soft start and then for only short bursts with a rest in between, but beware if you plan more extended running. Not necessarily connected to this issue is a tendency for some designs to be incapable of extended part throttle running. If the FETs used are not correctly chosen and properly driven they

have a very hard time during the rapid on/off cycling required to control the motor speed, they overheat

and die. The guys I fly with have had this problem with at least two vendors' products. In brushed motor controllers, my experience has been limited to a Jeti 10, Tarling Micro-Star 20 and PicoMOS 33 – all these have given no problems.

Part of this problem is driven by the current craze to make the controller so small you can only find it by looking for the leads. Frankly, I would gladly trade a couple of grams in weight for the use of bigger FETs and some heat sinks.

The variation between props of nominally the same size is amazing, and the need to match the prop to the airframe is paramount. I recently tried replacing the Graupner grey blades on my Pilatus with the latest CAM blades of the same nominal diameter and pitch. Even after changing the gear ratio to

▲ Author's

'Weed Whacker Too' in almost finished state, prior to addition of decals and the correct motors and props. Object at the nose is not a flag pole but a Deans Mini-Whip antenna – very popular here. 'Flag' is small piece of tape to stop the antenna resonating at full RPM.

get the input power up to the old value the model couldn't get out of its own way. The CAM is a superb prop but is designed to absorb much more power than I have and at higher RPM – it's just the wrong prop for my low RPM set-up. This observation leads me to smile when I see complex predictions of model performance derived on a computer using generic prop data!

Finally, what is all this '05', '40 stuff? Tell me the current the motor can handle, its rating in watts and a maximum RPM etc., and I have some idea what is going on.

Like my fellow ex-pat Dereck Woodward over on the east coast, I don't miss gas models at all. I will be continuing to fly helis and can't wait to get my old Whisper out of storage and see what some new technology can do. **EFI**

▼ A closer shot of Ray Atkinson's Fairchild. Model to the left is a Sig Seniorita – a popular gas to electric conversion in the States.



▼ The San Antonio Boys' machines. The biplane is Dick Oglesbee's, originally had a 4 stroke but now has a MaxCim on 18 cells, weighs 9.25 lbs. Dave Stubbs built the Dynafite P-40 and Sportster Bipe, both with Astro 25s and 16 cells. Martin Robinson built the Stuardacher from a modified Ace kit for an Astro 40 and 21 cells. His P-51 is from a Dynafite kit and flies on an Astro 15 with 13 cells. All motors are geared.



New at Nürnberg



Simprop SE 200, 2020mm (80") span for direct drive 600 and 700 size motors and 7 to 10 cells. Moulded fuselage and moulded veneered foam wings with elliptical dihedral.

REVIEW BY: STEPHEN METTAM

There were obvious trends at this year's show. Developments in two areas are significant, small RC gear and Electric Ducted Fans – not the fan units but models for them.

You will learn more from the photos and their captions. We have grouped areas of interest but model types/brands/sizes are bound to overlap. Some products are available now, some are promised soon. Many of them you should not expect to see for months. This is a 'trade show' – entry is not easy for the general public – it is more for dealers to see what is coming and order stock that you may want. Some models here are really prototypes and may take months to tool for production. Ask your dealer to obtain what you would like to fly but be patient with him.

Small RC gear

As predicted a few years ago – small electronic components, micro microprocessors and surface mount technology are making available for us, very small RC gear – and this is spawning a new generation of small models suitable for indoor and very calm flying. The new generation has acquired the universally understood title "Slow Fly", which really does say it all.

There are 'still smaller' specialist pieces of equipment available from specialist manufacturers but there were several of the bigger established names at Nürnberg with small gear for us – at the right price. Graupner are not

▼ Simprop 'slow fly' package of 7g Indoor 2000 Rx, 1.5g RS 6-08 speed controller and Slow Drive 250 motor/gearbox combo.



▼ Multiplex small gear next to a 10 pfennig coin 21mm (13/16") in diameter. Last year's MS-X2 9g servos with a Pico 3/4 7g Rx and 4g Pico-Control 300 10/12.





▲ Graupner Pico MOS 7, you can gauge the size from the almost as big servo plug!



▲ Graupner JR R 200, 36 x 26 x 17mm and 16g.

ahead of the rest but are keeping-up with a 16g (0.56 oz) 2 function receiver for ground based vehicles that someone is sure to modify for 35MHz and aircraft use. The Graupner JR Sub-Micro servos C241 and C2041 weigh 9g (0.32 oz). Pico MOS 7 speed controller is OK for 7A continuous and 15A peak, 5 to 7 cells and recommended for 150mAh cells, it weighs just 1.5g (one twentieth of an ounce) presumably without cables. Not micro but small for what they do are Pico MOS 35 and Pico MOS 75 speed controllers at 25g and 65g. Graupner also offer new and smaller 'Gyro-System PIEZO 900' and 'PIEZO Mini-E' and 'PIEZO Mini-Duo' for those of you who fly that way.

Hitec keep coming out with smaller servos and in the catalog obtained at their stand is an HS-50 but it was not on display there. This 'Feather' servo weighs just 6.5g (0.23oz). Also new from Hitec are regular size servos and a not so small but dual conversion 'Micro 555', 5 function Rx. Hitec now offer two chargers with a capacity of up to 24 cells, the 'CG-330' and 'CG-335'.

Multiplex have gone even smaller too with a

Speedmodels slow fly power package.



▲ Webra Nano S6, six function lightweight Rx.

range of receivers that will interest weight conscious electric fliers. It is easier to list them, (see table).

The Pico 3/4 is titled 'Indoor' and range is claimed to be 300 metres but who can see a



▲ CETO Rx, servos and a 16g 50mAh Rx battery if you need it.

NEW • EFI



▲ The new 10mm thick servo for installation in wings and fins. The frame is built into the wing and actually strengthens it. The 'box' on the base permits egress of servo cable (this is just an empty case).

Multiplex Receivers

NAME	FUNCTIONS	WEIGHT
PICO 3/4	4	7g
PICO4/5	5	15g
MICRO 7	7	30g
MINI 9	9	30g

tiny model that far away? Compatible with this Rx is the Pico-Control 300 10/12 BEC speed controller for 5 to 12 cells that weighs 4g without cables and 8g with, rated for 8A. Also listed is a Pico 260, 3 – 7g for 6A and Pico 400, 16 – 36g for 20A.

Another Rx labelled 'Indoor' is the Simprop Indoor 2000', 4 functions and 7g – a quarter of an ounce, and suitable for indoor models is an 1.5g speed controller, the RS 6-08 to go with it. For larger models but smaller than last year's controllers are the RS 21-10 (11.5g), RS 35-16 AP (23g), RS 35-16 MC (23g), RS 55-14 MC (32g), RS 100-30 MC (35g). The first number is the continuous current rating, the second is the maximum number of cells and the suffix AP means Automatic Programming.

Speedmodels is a Swiss based distributor to the trade who will mail order abroad. They had a few lightweight models and displayed power and RC packages to suit. They had their own slow-fly package of motor/gearbox, prop, speed controller and 8 x 110mAh battery pack. They sell the CETO 7g Rx and 6.5g servos, all ideal for very small models.

The new Volz servo is not a micro but it is thinner than any other. You must have had problems installing aileron servos in a thin wing. Until now the thinnest servo with any acceptable power has been 11mm thick. This is because the smallest motor is 10mm in diameter and so is the final driven gear on the output shaft. This Volz is 10mm thick. The case actually has windows where the motor and gear normally get nearest to the outside. Holes for ingress of dirt? No, very thin hard aluminium labels cover the holes and resist pressure to force them in to interfere with operation, another Michel Volz first.

► Volz servo is only 10mm thick.



Beginners' models

Multiplex continue their very commendable 'Pico -line' campaign to entice the very young into the sport – but how young? Their new Permax 280 powered pusher with the motor mounted so that it must be absolutely impossible to bend a motor shaft is called 'Teddy' – with suitable decor. Start them young I say! Teddy has a wingspan of 1250mm (49") uses the smallest Multiplex RC gear, 6 x 270mAh cells for the motor and is moulded in a very resilient "Styroschaum" plastic foam. That name suggests a polystyrene/rubber blend but it feels like an expanded polyethylene or polypropylene – just about indestructible.

Another 'easy' model in the Multiplex Pico-line is the 'TwinStar' for two Permax 400 motors and 7 x 1700 cells. Wingspan is 1420mm (56") and weight 1450g (51oz) and it

▼ Multiplex all-moulded 'Teddy'.



▼ Kavan 'Wingo', 1100mm (43") span, weighs 550g (19oz), all moulded except for the boom and uses micro RC gear. 7 or 8 x 270 to 1100mAh cells provide the power. Floats, skis and a geared motor are options.



▼ Multiplex TwinStar.



▼ PB Modélisme of France have a range of sports models and trainers. This is 'Piaf' for IC or 400 size motors. Wingspan is 1m and this model is available built up with full instructions for assembly and finishing. A well established model but this manufacturer is new to Nürnberg. PB Modélisme, 112, rue du Mont d'Arène - BP 1435, 51066 Reims, Cedex, France.



comes with the option of ailerons, each operated by its own servo in the wing. This model is all polystyrene foam and needs no finishing other than decals so it will provide any pilot with a reasonably advanced model at minimum cost and build time. This will be good for aileron training student-pilots of any age.

Dymond have had a few models available for a few years but the only one that I have seen in the UK is the 'Easy' electric glider. Others are the 'T-Bird 90' a 90" (2250mm) electric glider with ailerons, 'Craze' and 'Flipper' electric gliders and a sport/trainer that with slightly different wing planform and different colour schemes is sold built and covered as a Piper Cub or Aeronca or Cessna 150 or Cessna 170 or Cessna Bird Dog or Piper L4 and with different decals even these become yet more versions.

▼ Dymond 'Cessna Bird Dog' is just one version of this model with a moulded fuselage and built up covered wings. For 400 power it is an excellent trainer or sports model. Dymond can also supply a lot of the equipment such as servos (9g upwards), speed controls, switches and chargers.



▼ Hirobo EP540 trainer, 1255mm (49") span 3 functions, ARTF, film covered wing, supplied with 540 motor.



▼ Kyosho 'Ferias' supplied built up and covered and with geared 400 motor. Wingspan is 1010mm (40") and weight 670g (24oz).



▼ Krick 'Habicht Jr.' an inexpensive built up lightweight trainer for 400 motors and 3 function control. Wingspan is 1340mm (53") and typical weight 700g (24oz).



▲ Ikarus Grade Eindecker.



▲ Herr Engineering Corporation of the USA have a long list of 18" to 30" (457 to 762mm) span scale models for rubber power, just ripe for conversion to micro electric. This is the F4U-1 Corsair, 30" span.

Slow Fly models

The Bleriot II, designed by Rainer Mugrauer and marketed by Ikarus has done much to promote the slow-fly scene. Now Ikarus have a Bleriot III and similarly equipped 'Rumpler Taube' and 'Grade Eindecker' with spans from 1100mm (43") to 1260mm (50"). These models are supplied with moulded wings and stick or (Taube) built up fuselages. The purchaser has little to assemble, small geared motors, 8g servos and 1.7g speed controllers can be supplied and with a 250 to 600mAh 6 cell pack you are airborne. Ikarus claim flying



▲ Simprop Taube.

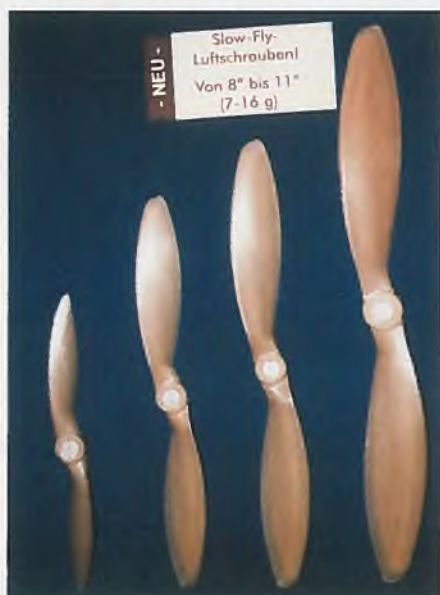
Speedmodels Albatros for C02 or micro electrics is supplied built up but not covered. Wingspan is 646mm (25.5").



weights of 155g and flight times of 20 minutes.

Simprop have a similar size 1200mm (47") span Taube and recommend their own 6:1 geared motor/gearbox. this model is built up and ready covered.

▼ APC lightweight props for slow fly models from 8" to 11" and 7 to 16g. These were on the Krick stand but many brands displayed them.



Graupner Comet.



Electric Jets

EDF is at last recognised by the major manufacturers and we now have in addition to all the drive units some models in which to use them.

Graupner introduced the 'Comet' twin for two of the Graupner fan units released last year and Speed 400 6V motors running on 10 1000SCR cells. Wingspan is 1360mm (54") and typical weight 1440g (51oz). Construction is a glass/epoxy fuselage and one piece unswept veneered foam wing. It does not try to be a scale model. Control is motors, aileron and elevator.

Aero-naut offer a scale DH Vampire with enlarged wing area, which is surprising. This model is for their own Turbo Fan 1000 and a hot motor like the HP 290-20-8 or Ultra 930-6 or Aveox 1409 2Y or Lehner 2730/6 or 1703/13. Wingspan is 1180mm (46") and typical weight with twelve 2000mAh cells is 2100g (74oz). Construction work for the pilot is minimised, the fuselage, booms and wing inners are a one piece epoxy/glass mould-



▲ Aero-naut DH Vampire.



▲ Vampire centre moulding.

▼ Kyosho T-33.





▲ Simprop Dornier 328 Jet.

ing and wing outers are balsa sheeted styrofoam.

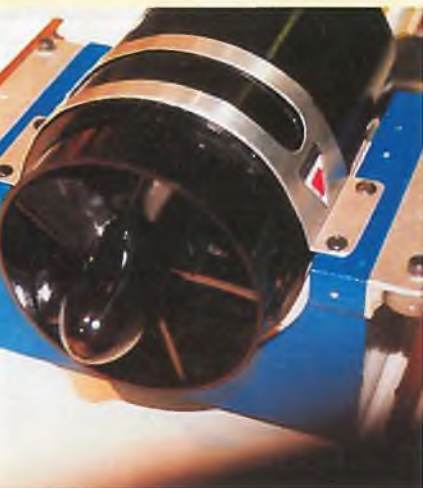
Simprop got their Dornier 328 Jet flying before the real one. Power is provided by two WeMoTec Mini Fan 480 units and 8 x 2000mAh cells. Wingspan is 1311mm (52") and typical weight 1650g (58oz). Fuselage is an epoxy/glass moulding and the wing the accurate Simprop system of press moulded veneer on foam. I want one!

Available about now is the Kyosho T-33 Thunderbird. The 1170mm (46") span wing is a superb smooth skinned foam moulding which contrasts with a more typical polystyrene foam fuselage. The model comes ARTF and no construction is necessary, just a little assembly. Discerning modellers will be able to improve performance by blending the intake ducts and relocating the aileron servo and power cables which are actually in this duct. I'm sure it will be a very popular model.

▼ Cutaway of the T-33.



▼ Kyosho fan unit on test rig. This is the same diameter as the Electro Jet Technologies 400 fan unit and the five blades have the same curious kink about one third out from the root and same spinner profile - great minds think alike!



Electric Gliders

These models still represent possibly the largest area of electric flying and some are good trainers so there continue to be many kits available. New models are available in all the established manufacturing and build techniques - built up 'stick and film', moulded reinforced plastics, veneered foam and moulded plastic foam.

Graupner's 'Cumulus 2000' has moved on a year and grown ailerons. 'Falke' has ailerons too but models like the 'Pedro' and all the other new electric gliders from Robbe and Simprop are very similar and with control on rudder/elevator/motor. It is difficult to be revolutionary with a formula that works!

▼ Hirobo G-22VM. One of four G-22 aircraft, with cruciform or V tail and glider or electric.



▼ Robbe Ranger, listed as "Powered glider for the beginner" despite its 2m (78") wingspan. All moulded foam and quick to assemble, this model uses a direct drive 500 motor and 7 cells. I'm sure its performance would be improved with a folding prop.



▼ Graupner 'Pedro' has a moulded fuselage, film covered open structure 2 piece wing already built and ready for a direct drive Speed 600 Eco motor and six cells. Wingspan is 1800mm (71").

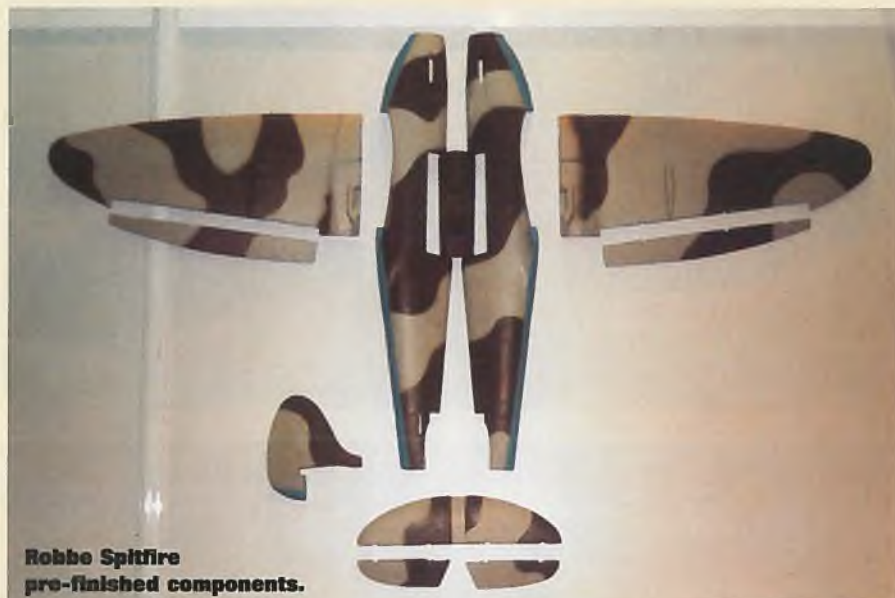


▲ Graupner 'Falke' for Speed Gear 2.8:1 500 or 600 units and 7 or 8 cells. Veneered foam wing is 1900mm (74") in span and includes ailerons. The fuselage is moulded.





▼ Simprop Ventura, 2650mm (104") wingspan, moulded fuselage, moulded veneered wings with ailerons. Recommended power is Power Speed 2000-7 with 3.25:1 gearbox and 8 x 2000mAh cells.



Robbe Spitfire pre-finished components.



Robbe 'Libra' labelled 'new' although it has been exhibited before. 1820mm (72") span and for direct drive 410 motor and 7 cells.



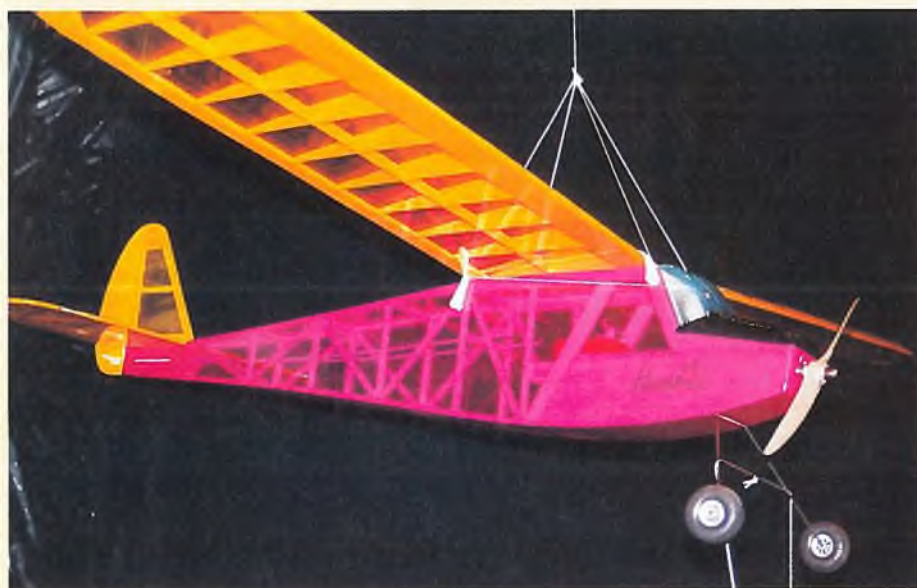
Aero-naut 'Diamond Aircraft DV 20 Katana'.



▶ Robbe Me 109.



▲ Aero-naut 'Diamond Aircraft Super Dimona TC-80'.



▲ Graupner 'Bölkow Junior' for Speed 4006V FG 1.85 and 8 x 500AR cells. Span is 1 metre (39").

◀ 'Hummel', an old timer by Multiplex for a geared 400 motor and 7 cells. Wingspan is 1380mm (54") and weight about 850g (30oz), it should cruise well.

▼ Graupner 'Augusta A 109 Power' with retracts for an Ultra 2000 size motor and lots of cells.





Sport and scale

'WW2 single engine Warbirds' is always a popular fun-fly/sport/aerobatic area and the same subjects always seem to take the top spots. Robbe have a 1025mm (40") span Me 109 and 1100mm (43") span Spitfire in moulded foam and available pre-finished with camouflage schemes if you are in a hurry to assemble. Recommended power is a 600/24 motor, 8 x 6 prop and 7 cells.

Aero-naut offer two new scale powered gliders with very similar moulded fuselages. The 'Diamond Aircraft DV 20 Katana' has a span of 1470mm (58") and the 'Diamond Aircraft Super Dimona TC-80' has a span of 2140mm (84"). Recommended power is the same for both, a multiplicity of Race 400 6V, 400 7.2V, 410/12 and 480 motors all with various gear ratios, props and 10 to 12 cells. Your possible choice is very broad.

▼ This small wing called 'Twist' for 400 motors was on the Speedmodels stand.



► Krick engine mount for 500/600 motors - then you fit a cow!l

Interesting bits

There were yet more additions to the already extensive ranges of Aeronaut and Graupner folding and fixed props. Of particular interest to users of smaller aircraft will be the Graupner folding CAM props 6 x 3 and 7.5 x 4. Both ranges have added some very large folders for big gliders.

Variable pitch props have come and gone. Kavan have a unit that can be adjusted to suit the blades used and the pitch changes desired. This is not cheap but may be the solution for an easy take off and a long cruise. Operation relies on a spring loaded return to max pitch which is inhibited by the centrifugal load of the blades so one part needs lubricating and two others definitely do not! Quick start-up selects fine pitch, at altitude and wishing to cruise the pilot gently reduces power so that the spring loaded return moves to max pitch, then he increases power gently. The centrifugal load of the blades prevents pitch change when power is on - that's the part you do not lubricate.

Do you have problems mounting your motor in a model intended for IC engines? A quick to assemble kit by Krick makes this easy. CNC cut ply parts glue together and bolt to a firewall. Even conversions to existing IC models do not involve glueing to fuel soaked wood. Advice is to use epoxy or PVA white glues for assembling the parts. Super glues are brittle and may not withstand the vibrations of out of balance props or harsh landings. Available in four sizes to suit motors from 500s to the largest.

Brushless motors have moved forward. Fierce competition for F5B motors has made things better for the rest of us. Brushed motors weighing over 500g are now equalled in power by ones weighing 200g (7oz). Controllers once bulky and heavy are

▼ Kavan variable pitch prop.



available as light as 20g. Slim surface mount FETS provide us with controllers as thin as 7mm. The cables are reduced too. The three power cables between motor and controller are still there but the five signal cables are not. These motors are described as 'sensorless' so the controller has to do even more thinking for itself - they are clever little packages. Look at the new range of Kontronik motors and a typical controller. Kontronik will continue supply of earlier type controllers for motors that still need the more involved sensors.

Graupner have added a small pylon race motor to their Ultra brushless range.

A new supplier of brushless motors for us is Ikarus. These are mostly for their own range of helicopters but can be used elsewhere. They vary from the X-250 size at 160g to the X-750 at 360g. These and the controllers are a step or two behind Kontronik and Aveox and Lehner and heavier but both motors and controllers are at much more reasonable prices. **EFI**

▼ Sensorless Kontroniks.



GLIDERS

DISTRIBUTION

NEW ITEMS



GRAUPNER 97 Catalogues from £2.99

PROGRAMMABLE SPEED CONTROLLERS

PICO MOS36 Bec. brake £56.95

PICO MOS56 Bec. brake £75.95

Power MOS48 Opto. brake £71.95

Power MOS85 Opto. brake £109.95

CAM PROPS

8.0 x 4.5 (3.2mm) £9.95

9.0 x 5.0 (3.2mm) £10.95

10.0 x 6.0 (5.0mm) £12.95

11.0 x 8.0 (3.2mm) £13.95

13.5 x 7.0 (5.0mm) £21.95

14.0 x 9.0 (5.0mm) £22.95

CAM BLADES

8.0 x 4.5 £5.95

9.0 x 5.0 £5.95

10.0 x 6.0 £5.95

11.0 x 8.0 £5.95

13.5 x 7.0 £6.95

14.0 x 9.0 £7.95

EPOXY CARBON CAM BLADES

12.0 x 7.0 £19.95

14.0 x 9.5 £20.95

15.0 x 8.0 £21.95

15.0 x 9.5 £21.95

Film roller cutter / trimmer £8.95

Fan System Speed 400 (slim) £44.95

Fan System Speed 400 (standard) £44.95

Speed 400 FG 1.85;1 6V £19.95

MC24 (40mem,1024,L screen) upgrade £919.95

Speed 500 ECO race 7.2V £15.95

Speed 600 ECO race 8.4V £20.95

Speed 480 BB race 7.2V £23.95

Speed Gear 480 3.45;1 7.2V £53.95

1.2V 1 cell 700 AR..... £4.95

1.2V 1 cell RC2000..... £6.75

Gliders Polo T-Shirts..... £16.95

Gliders Baseball Caps..... £5.95

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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
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With Brake ..	Y	6-10 18	£35.95
Soft Switch 40 BEC ..	Y	6-10 40	£34.95
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Mini/Sw40	N	6-12 40	£32.95
Mini/Sw40 W/BEC	Y	6-12 40	£37.95
RC Sw20	Y	6-7 20	£42.95



RC Sw25	Y	7-8 25	£48.95
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PicoMOS18	Y	6-8 18	£71.95
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PicoMOS56 Bec. brake			£75.95
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PowerMOS85 Opto. brake			£109.95
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PowerMOS80	N	7-30 56	£94.95
PowerMOS120	N	8-12 120	£154.95

ROBBE SWITCHES & CONTROLLERS

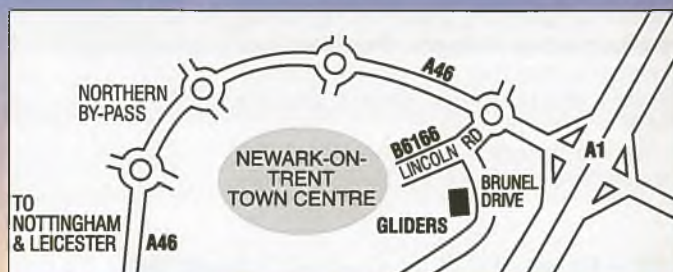
Model	BEC/PCO	Cells	Amps
RSC210	Y	6-8 10	£19.99
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RSC810 mP	N	6-8 12	£44.95
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RSC890 mP	N	7-30 90	£99.95

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MC-ULTRA DUO PROFII	£436.95
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Re-Heat, Re-Heat, Go!

WRITTEN BY: **CHRIS GOLDS**

Internal combustion engines have superchargers. Gas turbines have afterburners. Can we get more energy out of our nicads?

One morning recently, I was indulging in one of my great pleasures; I had a long 'phone call to Stephen Mettam in order to check some wiring circuits which I had devised using twin, yoked, speed controllers in order to spread the amperage load when running eight ducted fan motors, each at about 14 amps. He acknowledged that the circuit I had devised sounded sensible and I decided to go ahead and try it in order to run the maximum number of cells to my Speed 480 Race motors - eight cells per motor, giving thirty-two cells for the model, beyond the capability of an individual speed controller.

The conversation came round to the ever-present need to squeeze more power from electrical set-ups of liquid fuels. As Stephen went on about using better motors (where have I heard that before?) a tiny light blossomed in the back of what passes for my brain. It did not identify itself but presented me with the feeling of "I wonder if this would work?"

The power pack batteries which we use for electric flight are generally nickel cadmium or "nicads". Ian Peacock (I recommend his book 'An Introduction to Electric Flight') describes them as secondary batteries ie: capable of re-charging. Nicads give their energy by a chemical reaction between nickel hydroxide and a cadmium compound using potassium hydroxide as an electrolyte. Gosh! Ten months ago I didn't even know what electricity was! And now I am an itinerant Professor of Physics lecturing to a vast audience - well to you dear reader at least! The power of the cell to produce energy is largely dependent upon internal surface area: in other words a large internal area of chemical 'contact' gives of a large amount of energy.

The tiny thought was beginning to gel. The emphasis was on the word 'squeeze'. When

I flew the Lightning as an RAF fighter pilot I was conscious of the immense amount of thrust available when re-heat or after-burner was selected. We had more thrust than weight. (and this was over thirty-five years ago!) and in cold winter temperatures we did not need 'burner for take-off as there was plenty of thrust available with the throttles in "dry" power. If only I could devise an after-burner for my electric ducted fan models, all of which seem to struggle on take-off.

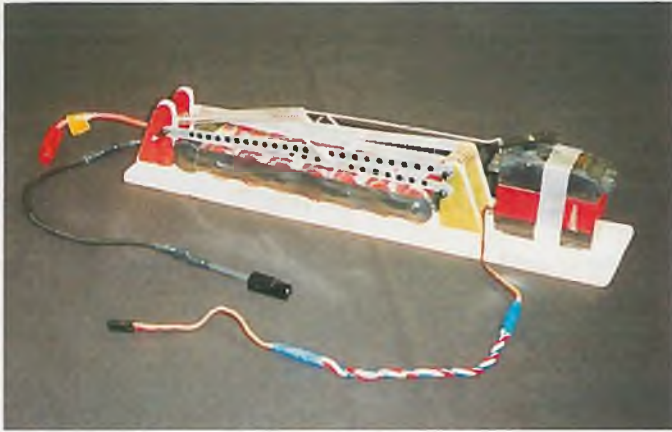
Then the thought simply burst upon me! SQUEEZE! Of course! If the nicads rely upon internal surface area for their reaction to produce energy, why not mechanically squeeze them to give more surface contact internally and thus more energy production - in our case more amps. OK! So you pay for it by reducing the overall capacity of the cells length of run time, but just think what a selective increase of perhaps 50 percent of your pack voltage would do for your ducted fan!

I suspect that prop flyers are not so embarrassed at take-off as we fan modellers are.

I could not wait to conduct some experiments to see whether the idea would work. I designed a sort of "press" driven by a servo (a large 1/4 scale Hitec) with a series of mechanical advantage levers very much like the increase in pressure if you catch your finger in the jamb of a closing door - even with very little pressure behind it, the door jamb will crush your digit. I set up a bench test structure whereby I could measure ducted fan thrust, amps taken by the motor and fan RPM. None of this was difficult to make

and set up but the system for squeezing the whole pack was not easy to achieve. I ended up with a sort of scissor arrangement which allowed equal pressure upon each cell to avoid putting





the pack into discharge imbalance. On the first test the ammeter went off the clock (a 40 amp meter) and this with only one speed 480 Race motor! RPM up by 25 percent and thrust up by 20 percent (with a not very efficient method of recording) so I thought that my dream had almost come true.

Future refinements of the system should reveal about a 40 percent increase in short run performance but pressure of existing work will not allow me to achieve this increase for several months. If you have any results from a similar system of power boosting, please write to me but make sure that your letter reaches me before the first day of April 1998!

Have fun. **EFI**



Chris Golds
1997

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SPITFIRE

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Plan Price code: E

CORSAIR

Ref: MW2455 Span 760mm, weight 580g, motor speed 400/7.2V (direct drive) and 7/8 cells, radio 2/3 func-

tion. Another superb plan by Heino Dittmar, the Corsair is incredibly agile on 600AA cells giving a high £'s to fun ratio.

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Ref: MW 2499 Scale 1:5 - Span 2.8 metres - Weight 2270 gms Unique true scale model for flat field and slope soaring. A good model for the intermediate to advanced builder, only requires 3 channel radio.

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Ref: MW 2458 Designed by Neil

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Ref: MW 2529 A WW2 fighter that did not enter service, designed by Rob Bulk for two functions plus motor control. For two 400 motors and 7 cells.

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Ref: MW 2511 Designed by Paul Rossiter. A clean and very aerobatic model that is tempting many away from i.c.

Plan Price Code: L

plan price coding

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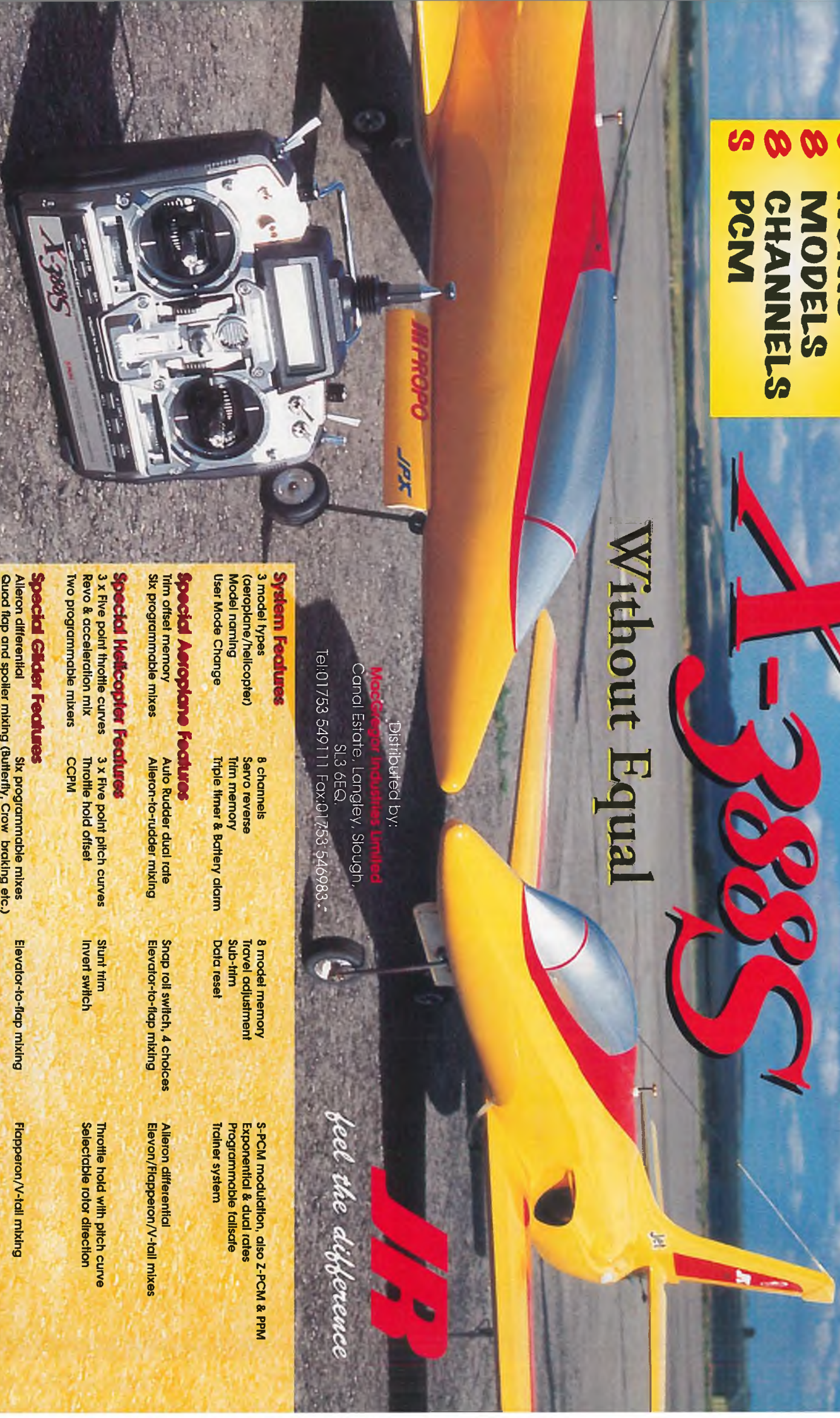
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Cover Story

X-Models

Little St

REVIEW BY: **STEPHEN METTAM**

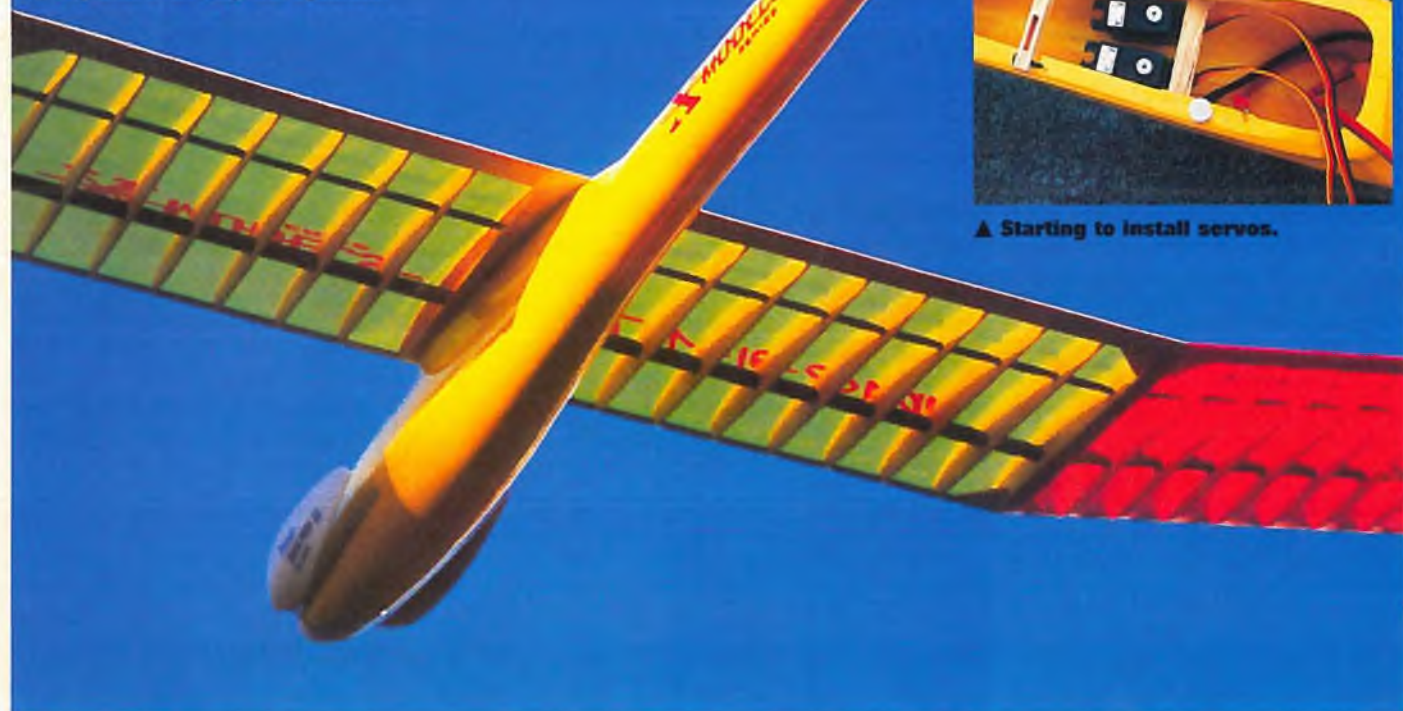
The complete model with battery installed and ready for flight needs to be lifted to be believed – it is so light. Wingspan is 1620mm (64”) and it is for geared 400 size motors.



▲ Ply insert to stop the spinner.



▲ Starting to install servos.





◀ Servos and Rx in place.

imum torque of the motor lower in the RPM range. So, for any given motor/battery combination you can drive a larger prop and so, if you wish to use this larger prop, the motor will operate more efficiently. (Flux rings do not always increase efficiency but it does this time!) The motor fitted easily and the prop spinner butted up to the thin fuselage shell projecting about 1.5mm in front of the bulkhead. If I pushed firmly the spinner just sprung inside this shell. I like a spinner to be a close fit to a fuselage so that in one of my too-heavy landings the spinner prevents the shaft from bending. I have therefore fitted a ply disc in front of the bulkhead, flush with the back of the spinner. That was all the building I did!

Wings

These panels could be framed and hung on the wall – they are beautiful! The leading edges, mainspars and a not-full-span rear spar are all carbon tubes (carbon fibre and epoxy resin). The trailing edge and ribs are balsa. The centre rib bays are sheeted with balsa too. The only 'work' is to perforate the covering film over the screw holes. I used the nose of a heat sealing iron to 'countersink' the holes in the top surface and bond the film to suit the M4 nylon countersunk screws used for retaining the wing. Another carbon tube is already bonded in one mainspar and slips into the other as a wing joiner, so you always have a two piece wing.

Tail

I used clear waterproof tape to hinge the control surfaces to the tail panels. I have used this system for 14 years now and it is one of the few parts that does not break when my models crash. Control horns are screwed to the ruddervators. I slipped the carbon pushrods into the fuselage from the rear. I just did not believe that there would be no interference between tail tubes and pushrods, they are such a close fit. One rod just touched so I inserted a washer as a spacer. You may just see this in one photo. It is still a remarkably precise bit of manufacturing. I have not bonded the tail panels to the joiners, if the ball end joints are sprung off, the tail parts can be removed to save space in storage or transit. The whole model could fit back into its original box.

▼ Pushrod fit is so tidy. Do you see the extra washer?



▲ Tail surface tubes.

wood blocks and in place. Two servo rails are bonded to the fuselage sides and the front crosspiece for mounting the servos is already installed. The front and the rear crosspieces have a slot routed in them so the servo mounting lugs fit into these, saving the weight of screws. Servo lugs are slotted into the front one and the rear one is moved forward to capture the rear servo lugs. The rear one is retained by two woodscrews into the side rails. I cut and filed small slots to engage webs on the servo lugs but you don't have to.

I had decided to use this model for 'Electrosport 400' contests as well as sport flying so I was committed to a Speed 400 motor. This competition specifies "400 motors and no more than 7 cells", also "maximum of 2 minutes motor run within a 10 minute slot, target flight time is 10 minutes". Therefore to get the optimum climb rate I decided to use 7 x Sanyo N-500AR cells, the Graupner Speed Gear 4:1, 6V motor/gearbox and a Graupner Gear Prop 12 x 10 (a folder). This is a big prop for the 6V motor and if climbing steeply can burn a lot of amps. More than 9A is a lot for a Speed 400. For this reason I fitted a flux ring to the motor.

Flux ring? It is a band of steel that slips round the motor. Discerning users of larger motors sometimes cut the band (tube) into four curved plates and use only two, to save weight. The job the flux ring does is to bridge the gap between the two magnets (so two quarters will do the same job). This alters the flux density of the magnet and moves the max-

tar

What is there?

You open a big white cardboard box and inside is a completely built model. It is not assembled and each major component like the fuselage and each wing panel is in its own clear polythene bag. The pair of tail halves and their ruddervators, are all in another bag. A small bag contains a handful of small parts like control horns, plastic and metal screws, nuts, clevises, piano wire joiners for the tail and a short strip of wood for mounting the servos. In the bottom of the box were carbon pushrods with threaded steel rods installed, decals on clear self adhesive film and instruction sheets. Mine were in German but if you purchase in the UK from ModellHaus, English ones are supplied and I am sure you could get these or other languages supplied on request.

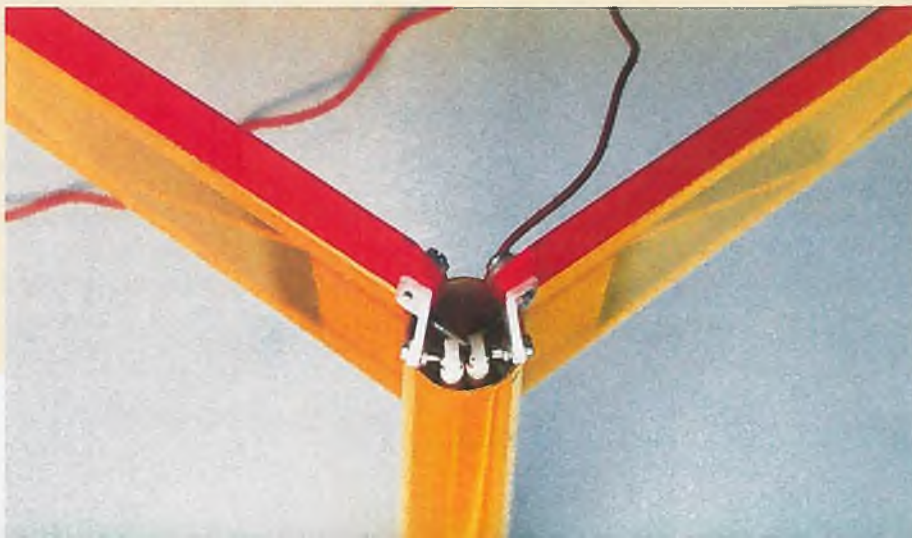
Building?

Some of the little assembly you do need to do, does involve the use of an adhesive but everything you could possibly do wrong or not align correctly, has already been done for you.

Fuselage

The fuselage is a high gloss epoxy/glass moulding with aluminium tubes installed in the tail, offset to accept right and left hand tail halves. The front bulkhead for mounting the motor/gearbox is already installed with a centre hole for the motor shaft and two pairs of holes to accept whichever unit you fit. Wing retaining captive nuts are already in small

▼ Control horns cut down to the last hole.





▲ Tail surfaces can be unplugged anytime.



▲ Cut the several size decals and fit them where you wish.

Weight

I weighed components on the kitchen scales as I unpacked them.

WING:	160g	5½oz
FUSELAGE:	105g	3½oz
TAIL:	15g	½oz
PUSHRODS:	20g	¾oz
TOTAL:	310g	10¼oz

Equipment installed was:

2 x HS 80MG servos
Kontronik Easy 1000 speed controller
7 x Sanyo N-500AR cells
Webra S5 Receiver

The complete model with battery installed and ready for flight needs to be lifted to be believed – it is so light. Kitchen scales again showed 665g or 1 lb 7.5 oz.

Smaller lighter servos could have been used, these are very robust mini servos. The Kontronik Easy 1000 speed controller is good for 18A continuous use, 35A peak for up to 15 seconds and 6 to 10 cells, so it may be possible to find a lighter one. The Webra S5 Rx weighs 21g. It is still a very light model, its net wing area of 28.3 sq.dm gives a wing loading of 23g/sq.dm (7.7oz/sq.ft). Regular Kontronik controllers are programmed before use and can be re-programmed if desired at any time. This is not at all complex but the 'Easy' SC range is just that, already pre-programmed (and you cannot change it) to what most of us want and it has a brake, excellent for electric gliders, you just plug in and go. All the Easy range have BEC so the model is live as soon as you plug in the power pack, unless you plug in an on/off switch harness between SC and Rx.

Flying is believing

I was surprised and it must be due mostly to the weight. The climb rate for a 400 is excellent. You cannot do much on 70 watts but 'Little Star' does a lot. It will climb at about 45 degrees but it is hanging on the prop. The best rate of climb is I think achieved at about 30 degrees.



I waited almost 3 months for a day that was not too windy or too cold. Every day that it was suitable for flying I was miles from home. At last, late in one cool day in February, the wind dropped at the same time as the sun. I dashed out with Little Star, a battery pack that had been charged a few days previously (there wasn't time to recharge) and a Simprop Star 12 Tx.

The sky was very clear and the transparent yellow wing centre panel almost vanishes at about 500 feet altitude but the red outers are very visible. The low sun glinted on the fuselage too, the whole model sparkled.

You will need to use a Tx with 'Delta' or 'V-tail' mixer, or you could fit an electronic or mechanical mixer in the model but the first option is very much the easiest. I had flown two V tail gliders without ailerons years ago and was well aware that a lot more rudder movement was needed than elevator. I had adjusted this at the Tx before flying and must have got it about right because it turns easily. I may still reduce elevator output a little but not until I have 'fine tuned' the balance point. At present it balances at the wing screws, just behind the mainspar. I may be over-using my glider experience here and flying with it too far back. I like a glider that is sensitive to wind movement but the more sensitive the less stable. If you get a Little Star, play safe and balance at the mainspar.

The first flight involved checking where the stall occurred and how easily it could move from a banked turn in one direction to the

▲ The power combination used.

other and what was the optimum angle of climb. All this must have wasted a lot of height but it flew for 14 minutes. That is the energy set-up that I will use for 'Electrosport 400'.

X-Models recommend and sell several motor/gearbox combinations and the one used here is the softest option. With a hotter 400 size motor like a 410 or 450 Turbo or 480 or LRP or Astro 020 brushless or Plettenberg HP-200-20-12, the climb would be VERY impressive. The combination used here but with a 10 x 8 or 11 x 8 prop would give longer flight times. My 1700AE pack would give more than 3 times the motor time and the model would still weigh only 840g. I think I see some hour long flights for summer evenings this year.

Conclusions

If you do not have time to build, this is money well spent. If you are not a superb builder, you will not be able to build a better finished model. You could buy this and pre-wired equipment and be flying it within an hour. I think you will have difficulty in finding a model that flies better.

Control is very easy, it might suit a beginner. Availability: X-Models, 310, rue de Luxembourg, L-4222 Esch/Alzette, Luxembourg. Ask for Manuel Gentilotti who has several languages. In the UK this model is available from ModellHaus, price £125. Tel/fax: 0161 439 9083. **EFI**



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The Light Fantastic

CHRIS GOLDS

The first of a regular column about Electric Ducted Fan RC model aeroplanes, without the heavy theory of fan units and their electrics.

Meet your new columnist

What about me? Almost twenty years as a fighter pilot in the Royal Air Force, with a good bit of operational helicopter flying whilst I was a Staff Officer and a life-long lust for model aeroplanes, beginning circa 1940. Since retiring from the RAF because of diabetes in 1971 I have made my living by painting

pictures - mostly of aeroplanes - as an aviation artist. But model aircraft kept coming back despite periods of doing other things like full-size flying and yachting.

In about 1979 my sailing boat (a 26 foot cruising catamaran) was sold and aircraft modelling came back to stay.

▼ **An assortment of some of my Cox TD 020 ICDF mini models.**



▼ **Mini Victor for 4 x Cox TD 020.**



► **The author with his Twin Cox TD 020 Arado 234 - fine flyer and fully aerobic.**

In 1983 a friend gave me the centre disc (which he had turned) and blade material to make my first ducted fan. On the front end of a Super Tigre 0.45x it flew my very first ducted fan model - a sort of He162 of course! I was fan-hooked and although I have built a lot of prop driven models since then, most of my output has been of the "suck and blow" variety. Singles, twins, fours and even eight fan monsters have all appeared from my drawing board and they got bigger and bigger - just like Topsy - until the largest weighed in at 77 pounds *without* fuel (just over one gallon!).

One of my birthday presents at my 60th in September 1996 was a cardboard box containing everything I needed to get airborne by electric power. Two 400 motors, two GASKIN fans, a speed switch and eight 800 cells plus the necessary electric spaghetti was enough to get me up into EDF by the October of that year. Another captivation of the heart - they do say that old mens' passions go deepest - and one which is likely to stay for good.

Electric Jets!

Electric Ducted Fan (EDF) flying has much to recommend it, being clean and relatively quiet; I fear for the future of ICDF as it has grown into quite a noisy beast evidenced by mandatory noise testing at most IC fan meetings nowa-

days - at least no one has suggested that for EDF - yet.

The cleanness is a blessing in many ways; my model flying clothes don't smell of carbonized castor oil, there is no tedious rag-on-a-stick cleaning of the model's ducts once it is



► Front end artwork on profile English Electric Lightning for two WeMoTec Mini Fan 480 units. Very draggy until it gets going.



▲ My first B-52 with 8 x Cox TD 020 - it had to be heard to be believed! A good stable flyer.

▼ Miglet! Single Cox TD 020, long duct and a very marginal performance.

back in the workshop, with no puddles of blackened oil forming under stored models and if - heaven forbid - we have a slight contre-temps with Sir Isaac Newton and his wretched laws of gravity, repairs are so much easier to effect where the wood is *not* soaked in fuel and oil.



Energy

On the debit side we definitely do *not* get as much energy release from the fuel we carry. A direct comparison is worthwhile here. During my ICDF days I experimented successfully with *small* home-made fans some two and a quarter inches (57mm) in diameter driven by the beautiful - if noisy - Cox TD 020 engines. I built the same range as for the large motor fans and indeed some of my 'babies' were built as scaled-down test models prior to building their big brothers (HP Victor and Boeing B-52 especially). I now have EDF units which could just be squeezed into the Cox engine airframes but with the power packs fitted, the wing loading would rise to a figure that I would not contemplate for hand-launch or light bungee launch. For this type of take-off I consider 20 ounces per square foot to be the maximum for a hand launch (I used to throw the javelin at school but not anymore!) and about 30 ounces per square foot for

bungee launch. Either that or a very long piece of tarmac and an undercarriage or dolly for take-off. I have a vivid memory burned into my brain of taking-off when leading a pair of fully tanked (1,050 gallons - 4 tons of fuel) Hunters out of Nairobi international airport at the end of ten days of exhilarating low level formation aerobatic displays. The runway at Nairobi was 13,500 feet long - about 2 and 1/4 miles - and we used almost all of it to get off. Heavily loaded and at an airfield height of over 5,600 feet with *very* thin air compared to sea level we struggled away until, with our wheels tucked up, we could reach our climbing speed of about 370 knots and climb up and go 'home' to our base in Aden. And that was entirely due to weight - take the drop-tanks off and you



▲ My electric B-52 with 8 x WeMoTec Mini Fan 480 units - power to spare but I have not tried to loop it!



▲ **My 4 x Speed 480 Concorde is heavier than I wanted and needs more power for the climb.**

could leap into the air in about twenty seconds instead of some fifty seconds for the take-off described.

Weight

So, weight is our 'enemy' and we have to make strenuous efforts to 'build it out'. John Swain (of Fanfare) put it exactly in one of his articles in a past issue of EFI

"Why does the last ounce (of building) always weigh eight ounces?" In my big ICDF B-52 (8 x OS46 VDF) the main gear trucks alone weighed about seven pounds and even at 77 pounds plus, she simply leaped into the air. With my electric B-52, of about 2/3rds the size of the big one, I struggled for some weeks to achieve better than a slow taxi, then better than a slow Kamikaze circuit of the airfield, until with changed fans

▲ **First single fan profile experiment is aerobatic but mildly so.**

and motors and lots more cells (please see EFI May/June 97 and July/Aug 97 for the full saga) I achieved a model with adequate thrust - enough to allow me to throttle back for the cruise. Take-off roll time is

now down to just 4 seconds and the model is very stable and a delight to fly. It has gone to a new home to make space for my latest eight motor project, a model of the Northrop YB49. The 142" span B52 weighed 15 pounds 8 ounces



✦ My YB-49 for 8 x WellTec Mini Fan 480 units at ONLY 14 pounds 5 ounces (6.3kg) and 13 oz/sq.ft (40 g/sq.dm) has lots of spare performance. It uses drag rudders in concert with elevons.



ting drag rudders) let alone being over weight for that critical first take-off. However with a wing loading of only 13 oz per square foot as my best insurance, I opened up the throttles and she literally jumped into the air and flew a very successful first flight.

Research

So for weight read 'wing-loading' and try to achieve the lowest figure practical for your model. Of course there are limits but if you double the size of your projected model the weight will rise but *not* double the original. So quadruple the model's size and vastly reduce the projected wing loading - goody goody! EXCEPT of

course your fans/motors will probably be unable to propel the model against all that form drag. So I think that the way to go with getting new designs into the air is to do it step by step. For me it all starts with balsa chuck gliders about a quarter or a third of the projected model's size and keeping strictly to span/chord proportions, sweep angles etc., etc., so that the transfer of the gliders' eventual C of G found by experiment can be accurately made to the full size model.

This has worked very well for three seemingly difficult models: B-52, B-2, and YB-49.

Each glider version has been

► **Concorde climbs away - gently!**



but the 147" span YB49 weighs in at 18 pounds 5 ounces due to having to carry 2 and 1/4 pounds of church roof up front to get the C of G into the correct position. I really was worried that such a heavy electric model would have troubles enough from the flight controls system (electrons and coupled split-



► **YB-49 landing with flaps but without No. 4 fin which was knocked off on take-off. It made no difference to the handling!**

► **The monster cruises overhead - note the trough mountings for the WalloTecs - seems to work well.**

extensively 'chucked' and the C of G positions have shown where it should be on the 'big' model with the proviso that I move the latter's C of G ahead by 2% as I would rather be slightly nose heavy than tail heavy on that very first flight. Each of these models has been spot on from the start despite the fact that the B-2 did not last very long - for reasons other than C of G.

Next

I am still pressing on with 'proper' flying wing models and I am in the middle of drawing up a HORTEN IX (GO 229) for EFI to produce as a magazine plan. BUT, it has got to fly without false fins and to do so will have to employ working drag rudders of the type that rise/lower from the wing-tip top and bottom surfaces. Certainly my YB-49 is easy and pleasant to fly using working DRs but that one has

► **My flying chum Ron Lutton holds my twin Cox TB 020 mini JamoOn - quite a handful!**



▲ My first EDF model with twin Gaskin fans and 400 motors. The bug got me!



▲ Vulcan profile for 4 x Wemotec 480s in build.

the advantage of 4 fins in the scale positions. I will keep you informed on this project.

Necessarily, this first edition of my column is about fan models on my own doorstep; in future I want to include YOUR EDF models and you can send photos, descriptions and stories

to me at the address shown at the end. Remember, our sort of mag NEEDS material from its readers like an EDF model needs around 100 watts per pound (my own estimate not an official one) to fly well.

So, scrape the dried cyano

► Columnist Chris with finished Vulcan at 5 pounds 6 ounces (2440g).

from your fingers and send me your photos. PLEASE!

That's it for this time: meditate upon the following Roman inscription I discovered on a tomb in a castle during my holiday in Verona, Italy:

"HOMO AQUILIUS PER VOLTAM EST, MENINGI WATTO NEEDUM".

Safe and happy EDF.

Chris Golds, Hideaway, Lower Loxhore, BARNSTAPLE, N.Devon, EX31 4SX. Tel: 01271 850456. Same for fax, but by pre-arrangement only.

PS: If you are into EDF please drop the Editor a line in reply to his 'footnote' on page 5 of EFI Nov/Dec 97. Thanks.

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By Paul Tupker with technical assistance from Dick and Bert van der Vecht.

REVIEW BY: PAUL TUPKER

Some people may have noticed, at the 1997 'Jet Masters' at Wroughton, the sprightly performance of the Robbe Gnats flown by the Dutch van der Vecht brothers. Here is how to improve the performance of your Gnat.

If you are one of the more or less disappointed owners of this cute looking electric fan jet, you may not believe that you too can make this Gnat into a great flying model. This will not necessarily cost you loads of money. This is how we did it.

If you want to give your model the same treatment, in part or in full, please first read all this article, before starting. Of course, you do not need to make all of the modifications that we did, but I can assure you, that each mod you make will contribute to a better performance of your model. This model will give you a nice entry into the world of model jet flying, at a cost to you that is only a fraction of the cost of miniature ICDF or gas turbine powered models. Even the sound replicates at a reduced scale, that of the real thing.

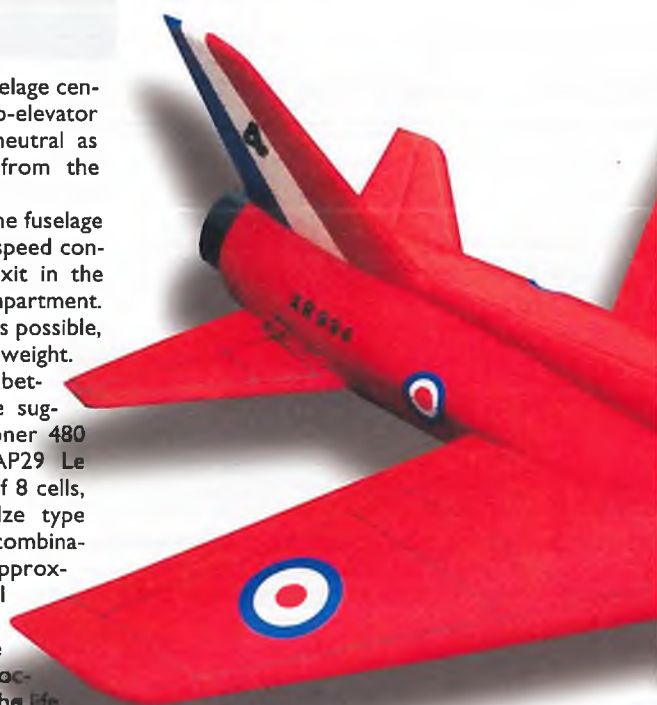
To start: we prefer - as the safest way of launching - to use an elastic bungee about 15 meters long with a diameter of 6 to 8mm, pegged at one end in the short grass at your flying site. The hook on the model should be located about 170mm in front of

the centre of gravity, on the fuselage centreline. For the launch, some up-elevator should be used - going to neutral as soon as the model is free from the bungee.

Make a good cooling hole in the fuselage nose for the battery pack and speed controller and a larger cooling exit in the bottom rear of the radio compartment. Try to keep the model as light as possible, at least under 900 grams flying weight.

A good, cheap motor, giving a better performance than the one suggested by Robbe is the Graupner 480 BB or the similar Kyosho AP29 Le Mans. We use a battery pack of 8 cells, Sanyo N-800AR and a Schülze type D21-25 Bes controller. This combination gives a flight duration of approximately 4 minutes if you use full power for the entire flight, or of course, longer if you use your controller for reduced velocity/power. This also lengthens the life of your motor; this model has very good slow flight characteristics.

If you have enough money to spend and want more speed, power and duration and an almost maintenance free motor, we suggest the Lehner brushless motor, type 1126-15 turn, with a Lehner controller, type 1830 BEC. This combination was installed in the model as flown at Wroughton. For more information, contact: Lehner, Nottingerweg 40, 85521 Riemerling, F R Germany, tel/fax 089/6019922. We think that the new Astro brushless, type 802F, 6 turn, with con-



troller type 800 with BEC should also be suitable.

A good intermediate priced solution is the Plettenberg HP 200-20-6 motor. The motor can be built into any '400 type' fan unit. Use 8 Sanyo N-800AR cells (15A for 3.5 minutes full speed) or, for more performance, 9 cells (17A for 3 minutes full speed). The motor can be ordered from: Hobby Modellbau - Bergemann, Plettenberg Elektromotoren, Rostockerstr. 30, 34225 Brunatal, F R Germany - or The Electric Aeroplane Company. Use a controller that will handle at least 20 amps. Schülze has new 'slim' controllers with BEC which weigh only 4 grams.

To avoid radio interference, it is very important to locate correctly the electrics and radio components. On the plan supplied with the kit, the receiver is situated too close to the battery and controller. We have seen several Gnats plagued by inter-

▼ One uncovered servo and aileron pushrod.



our Gnat



ference problems, after which, when adjusted according to our suggestions, the problems vanished.

Keep the leads between battery pack, controller and motor as short as possible and well away from the receiver and the antenna. We replaced the receiver antenna with a 0.5 mm piano wire of the same length. Install the receiver in the most forward position of the fuselage, lead the antenna in front of the cockpit hatch, vertically upwards through the fuselage. Attach the rear of it with tape to the vertical fin, keeping a smooth radius from the exit hole. A PCM transmitter/receiver combination will, in our opinion, also suppress interference problems.

In the rear of the radio compartment goes the battery pack. We install it so that by shifting it the centre of gravity may be adjusted but be sure that this cannot happen in flight. We locate the speed controller in the fuselage dorsal. We choose, for convenience, to keep the rear fuselage with elevators permanently glued to the model. In the bottom of the fuselage, between wing and elevators, we made an access hatch for the propulsion unit. If you opt for this

mix facilities. We choose control horns at servos and control surfaces so that we got half the deflections as suggested by Robbe in their instructions, and minus 20% exponential on each control position. Try this, our models fly perfectly with this set-up. Our Gnats fly loops and axial rolls, as long as these are entered with enough airspeed.

A further improvement we found is to reduce the area of the exit duct at the fuselage rear. This can be done simply by inserting a paper or plastic coffee cup (McDonald's) in the fuselage rear. Trim the open cup end to the duct diameter, and the smaller diameter to 50 mm. We cover the servo installations on both fuselage sides with low-temperature or self-adhesive film before finishing, with a slot for the pushrod to the aileron. This improves smoothness and enhances the appearance. Our favourite finishing method is as follows. First, a coat of a lightweight filler (e.g. Model Magic) thinned with water-based children's paint of the preferred colour, is applied. After drying, this is lightly sanded and a coat of unmixed water based paint is applied over the first coat. Use, wherever possible, a paint roller. We hope that, when you make use of some, or all the recommendations given here, you will be happy with the improved performance of your Gnat - ours fly great.

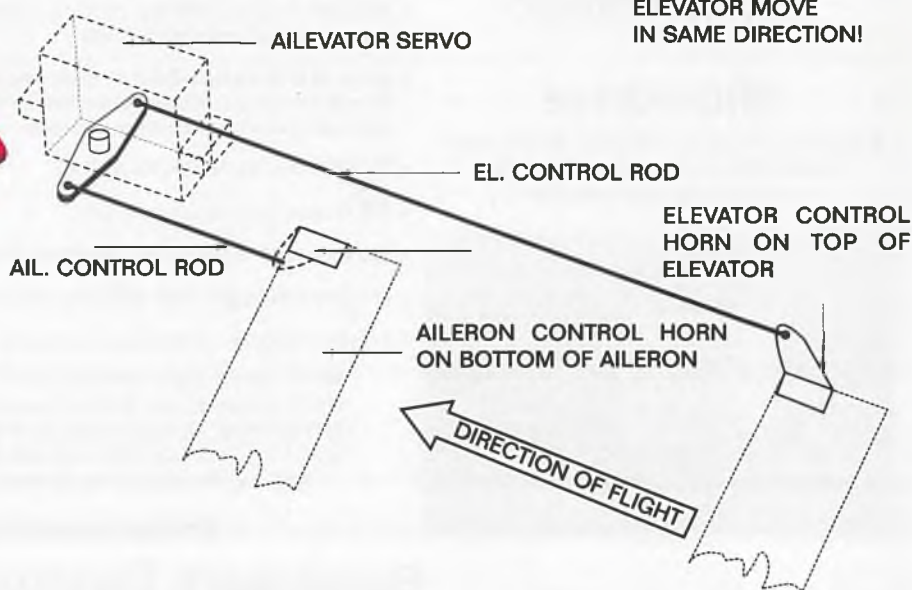
Have fun with your Gnat. **EFI**

▲ You can just see the elevator pushrod and control horn.



▲ Locate battery as far back as possible.

NOTE: AILERON AND ELEVATOR MOVE IN SAME DIRECTION!



Schematic view of steering system.

L.H. CONTROLS SHOWN -
R.H. CONTROLS AS MIRROR IMAGE

modification, be sure that the installation of this hatch is very secure, and does not come off in flight.

Keep the ducting channels as clean and smooth as possible; this greatly improves the efficiency of your fan installation. For this reason, we also revised the control set-up for ailerons and elevators. With our control system, no rods are in the ducts obstructing the air flow. The photos on these pages show you how. We use 2 mini servos (Hitec HS80 or equivalent will do). On the left and right sides of the fuselage, the servos are installed in the sockets. Each servo is coupled to the elevator and the aileron on that side of the model in such a way that, when the aileron on that side goes up, the elevator on that side also goes up and when the aileron goes down, the elevator on that side goes down. This requires a transmitter with elevon or delta

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MotoCalc 2

REVIEW BY: **DICK WHITEHEAD**

Do you have trouble deciding which motor to purchase for your new model, or what prop to use - and how many cells? This inexpensive computer software can save its cost the first time you use it.

Is it simple to use and will it help me - that's all I want to know?

As someone who regards computers as a tool rather than something to play with, I have this hatred of over complication. Modern advanced computer programmes are all complex - however, they can be 'just complicated' or the programmer can use his skills to hide the complication and make it easy to use - MotoCalc 2 definitely falls into this latter category.

What is MotoCalc 2?

Given a simple description of the basic components MotoCalc predicts the performance of any electric flight drive system. Add a few basic details of the model, and it will also give you an analysis of the likely 'in flight' performance.

It makes no pretence to be a 'model design' programme, but sticks to the idea that you have a model in mind and want to know how best to power it.

Getting Started

It's as simple as putting the disc in the computer and typing A:SETUP.EXE. After that the programme takes over and loads itself. There is no documentation - all the instructions are in the on screen help system once the programme has loaded. It worked first time when I tried it - what else can I say!

Once started, read the 'help pages'. I can recommend them as a good read even if you don't need help, there are so many useful hints, tips, and other bits of information. If they were published as a book you would pay good money just for this.

In use

MotoCalc starts with a basic screen (Figure 1) which is divided into 6 areas. Each area is used to describe one component of your model, ie: motor, battery, drive system, speed control, and airframe.

One area is a bit different and is called 'Filter'. This is used to enter any particular requirements you have such as a maximum current you do not want to exceed, or a minimum motor run time.

There are only two menus offered on the main screen, 'File' and 'Help'. File gives the usual options to save the details you have entered with an identifying name, and to open up and view any previously saved details. The 'Help' menu is where you go to learn how to use MotoCalc, or to solve any problems you have when using it. As well as the useful hints and tips I mentioned earlier there are also contacts for further information.

I have one very simple model, a slightly modified Goldberg Electra, which I have been flying for many years with a variety of prop and gearbox combinations. After all this time I know how it flies and what works and what doesn't. It is ideal basis on which to check out how good a computer programme really is.

If you wish you can just type data into the various areas of the basic screen, but it

makes more sense to use the help the system provides. Just click on the open button in an area and you will be presented with a list of information to pick from. For example the battery section contains the entire Sanyo catalogue ranging from the 225AE to the 5000MAX, complete with all the details you need - just pick the one you want. Similarly the motor section lists the Astro, Aveox, Graupner (including Ultra), Hectoplett, Keller, Kyosho, and Robbe ranges plus many others.

It is always possible that the particular motor you want is not listed, and that was true in my case. The motor was so old that my version is no longer in the Kyosho catalogue. That is not a problem with MotoCalc. The motor area has the ability to accept either a set of measurements taken yourself using voltmeter, ammeter, and rev-counter, or you can enter details from the manufacturer catalogue (you know - those figures on the box that you never understood before). Full instructions are provided in the help pages on how to do either, including taking the measurements. Luckily over the years I have taken note of the right sort of measurements, and MotoCalc calculated the performance of my motor for me.

Getting the answers

The information you see in Figure 1 is the data I entered for my Electra using suggestions for typical model types provided by the 'help' pages. At the bottom of the screen is a large 'Compute' button.

▼ Figure 1 - Main screen.

The screenshot shows the MotoCalc 2 main screen with the following sections:

- Motor:** Kyosho 360 PT, Constant: 3552 RPM/V, Idle Current: 21 A, Resistance: 0.0747 Ω, Weight: 8 oz. Buttons: Test..., Cal..., Open..., Save.
- Battery:** Type: Sanyo 1800SCR, Capacity: 1800 mAh, Resistance: 0.004 Ω, Weight: 21 oz, No. Cells: 7 to 7. Buttons: Open..., Save.
- Filter:** Fields for Current, Loss, Effic., Thrust, Speed, P/Ratio, Time. Buttons: Use, Clear, Open..., Save.
- Drive System:** Description: Electra drive, Gear Ratio: 3 to 12 by 1 in, Propeller Diam: 8 to 12 by 1 in, Propeller Pitch: 4 to 6 by 1 in, Motors (Series): 1. Buttons: Open..., Save.
- Speed Control:** Name: On/Off Switch, Resistance: 0.003 Ω, Max Current: 50 A, Weight: 1.5 oz. Buttons: Open..., Save.
- Airframe:** Name: Electra, Wing Area: 690 sq.in, Empty Weight: 28 oz, CD: 0.05, CL: 0.5. Buttons: Open..., Save.

At the bottom, there is a large 'Compute...' button, and 'Close' and 'Help' buttons on the right.

Pressing this causes MotoCalc to calculate results based on the data you have entered. This calculated 'static' data, see Figure 2, shows the estimated performance with a range of props. The information is also colour coded to tell you when the prop is stalled so you know which combinations to avoid.

At the bottom of this list is a series of buttons which give the usual options to print or save the list plus the option to display the information as a graph or look at a separate list of 'in flight' information. The graph in figure 3 shows the overall effect of all this information and indicates a maximum efficiency at about 15 amps and a prop speed of 9000 RPM. That may sound a rather high RPM, but read on!

If you now select one of the lines from the list e.g. for the 9 x 5 prop, and hit the 'In Flight' button, MotoCalc will list the predicted in-flight performance for the selected prop - see Figure 4. Again this list is colour coded on screen to show where the model is below stall speed or above maximum speed so you can see the effects of your choices at a glance. The information can also be seen as a graph - Figure 5.

The graphs are very flexible as you can choose what information to display on any of the three axes. For each axis of either graph you make your choice, as shown in Figure 5, from a drop down menu of all the columns of information in the lists e.g. in the 'static analysis' graph (Figure 3). I have chosen to display 'efficiency' and 'prop RPM' against a base of 'current'. In the 'in flight' graph (Figure 5) I have picked 'prop RPM' and 'efficiency' against a base of 'airspeed'.

Conclusion

What does all this tell you? Well it confirmed what I already knew about this particular plane and drive combination. The gear ratio was too low to use the larger more efficient props that the model needed. My next move was to try entering higher gear ratios. Again MotoCalc confirmed that the combination I eventually settled on worked better. I found out the hard way by trial and error i.e. by buying new gearboxes and props. MotoCalc would have told me what to do without that expense.

MotoCalc 2 is simple and effective to use. Be careful how many options you give it to work on at once or you could be confused by the amount of data it throws at you. But be sensible, take it one step at a time, and it definitely gives useful and accurate results. As a bonus, and despite my opening paragraph, I found I actually had a lot of fun playing with MotoCalc.

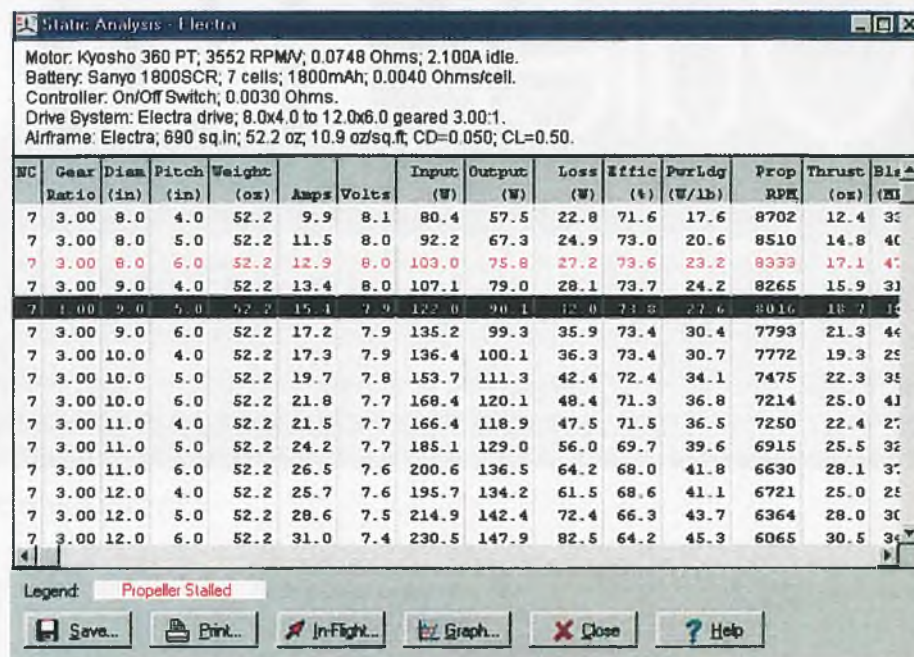
One last thought

If you put in lots of options for gear ratios, props, and numbers of cells, it will produce some amazingly complex looking graphs. Print one off in full colour and take it to the flying field. When you wave it about in front of your mates - you cannot fail to impress them with your expertise!

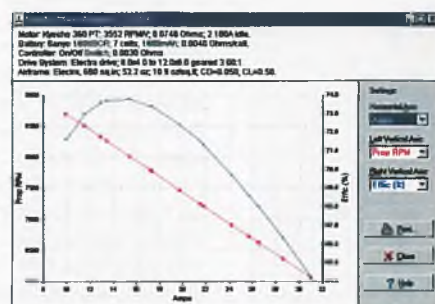
Hot news!

MotoCalc 3 is available now with even more

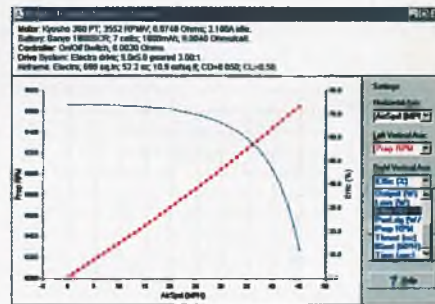
motor choices and available in Europe and UK for £21.00 from Gordon Tarling, 87 Cowley Mill Road, Uxbridge, Middx, UK-UB8 2QD. [EFI](http://www.efi.co.uk)



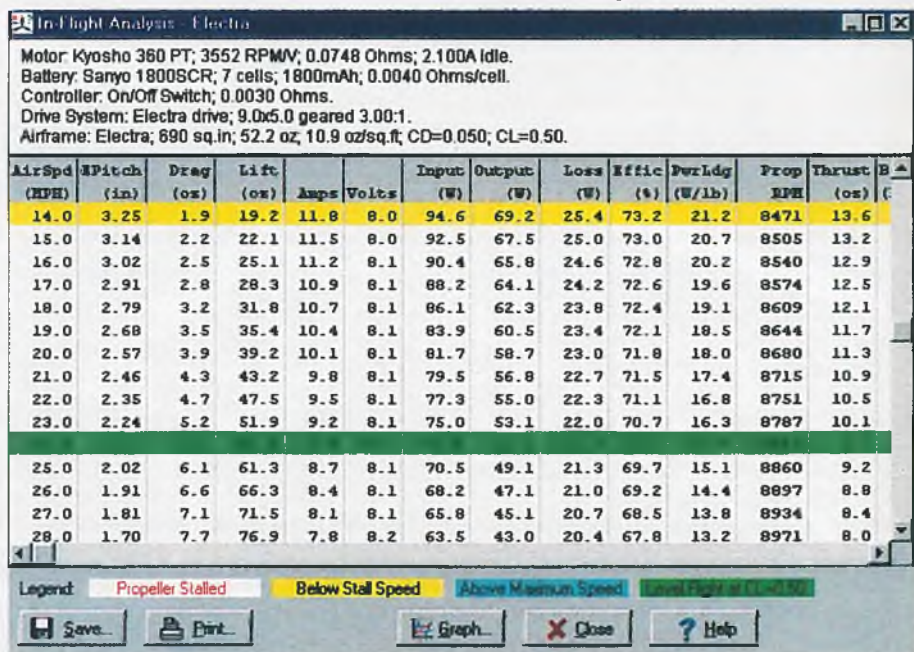
▲ Figure 2 - 'Static analysis' data list with 9 x 5 prop selected ready to calculate 'In-flight' data.



▲ Figure 3 - Graphical display of data in 'Static analysis' list.



▲ Figure 5 - List of 'In-flight' data based on one line selected from the 'Static analysis'.



▲ Figure 4 - List of 'In-flight' data based on one line selected from the 'Static analysis'.

Quiet Rotors

MIKE GOULETTE

I have covered the full spectrum of model electric helicopter sizes over the last few editions of Quiet Rotors. This time I will do the same again, with further news of Alexander Van Der Rostyn's micro helicopter developments at one extreme, to the large 30 cell Vario 'Silence' at the other. Along the way, I will also cover some interesting Autogyro experiments.



▲ OS.15 powered sport autogyro in slow flyby flight.

Olympia antics

As I have said before in this column, we seem to be very conservative in the UK in our approach to electric helicopters, they have not really caught on in a big way as they have started to do in the rest of Europe. Part of the reason for this may be the emphasis put on the 3D style of helicopter flying both at demonstrations and at club level. If it does not do Mach 2 and flip itself inside out, it does not appear to be interesting and electric helicopters do not generally have the excess of power needed for this type of flying. It was very gratifying, therefore to see the Ripmax team displaying a pair of scale bodied Kyosho EP SRs with great panache at the

International Modellers Show at Olympia in London in January. Both models, one of which had a Jet Ranger body shell and the other an MD/Hughes 500 shell, gave an excellent scale display and achieved impressively long flight times. Interestingly, one of the pilots was Paul Heckles who had been doing forward and backwards four point rolls and other impossible manoeuvres with an IC powered helicopter not long before! The EP Jet Ranger is currently being sold in the UK as a budget package deal and is worth checking out if you fancy a 7-8 cell scale model.

Silence is golden (well, yellow, white and mauve actually!)

One of the big electric helicopter models that is well established in Europe but has not really caught on over here is the Vario Silence. This is a full .60 size model with a 1500mm rotor and a flying weight of around 5 kilos with 30 sub C cells. They also do a cut down trainer version for 24 cells called the Falco. The Silence and the Falco are based on the Vario Sky Fox mechanics and the latest versions have glass/epoxy sideframes to reduce weight and a flybarless head with special matching moulded blades to reduce drag.

◀ A 'barebones' photograph showing the lightweight structure of the G-Too. Just visible is the synchro gearbox below the main rotors.





▲ Jerry Holcomb's original G-Too electric synchro-gyro.

I acquired a second hand Silence last year. The one I have is a fairly early version, actually the first to be imported into the UK, and it has the Sky Fox moulded plastic frames and the conventional Sky Fox rotor head with a flybar, paddles and wooden blades. Like all Vario machines it is superbly engineered and manufactured with a partly enclosed main gearbox and strong yet light construction. The plastic parts are moulded in white and the metal parts are mauve anodised. Together with the yellow canopy this gives the model a refreshingly different look from the usual Japanese "any colour you want as long as it's black" machines. The 30 sub-C nicads are split in to two packs each of 15 cells and these slide into holders on either side of the chassis.

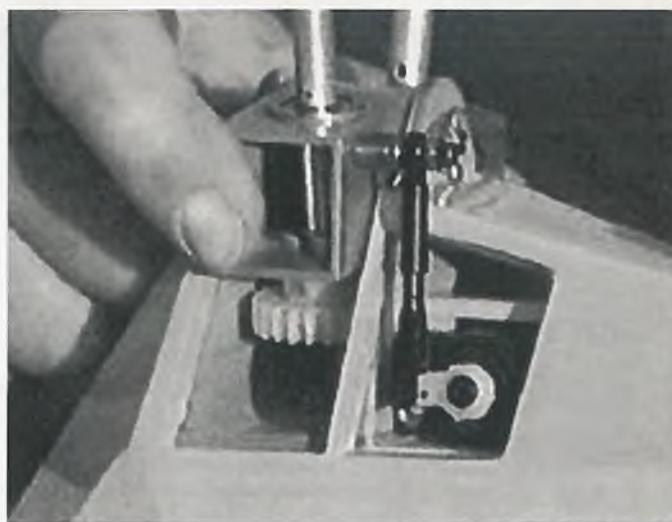
The control set up is for CCPM only and can be arranged for either 90 degree mixing (two servos for roll and one fore & aft) or 120 degree mixing with three servos equally spaced around the swash-plate. The model as received was set up for 90 degree and I left it like that as I can set up my Futaba FF7 to support this (using the 90 degree program mix plus a free mixer) but it does not have the dedicated mixing facility needed for 120 degree CCPM. The 90 degree CCPM set up does not give complete support to the swash-plate but seems to work OK in practice. Flying has been frustratingly limited to date. My original plan was to fit one of the new Kontronic long case brushless motors designed for the German LOGO 30 cell helicopter. Unfortunately,

although these have been advertised on their Web site since mid '97, they do not yet seem to be in production. In order to do some flying while I waited, I acquired a second hand Ultra 1800 and did some hovering in the garden. The counter-clockwise blade rotation took a bit of getting used to, the model leans the wrong way at take off! Once I got used to this, however, it was fine and hovers in a stable manner at a moderate head speed. Unfortunately, on the fourth flight the motor decided to discard an armature segment which generated lots of sparks and a definite and sudden loss of power. The post mortem showed no obvious cause for the failure but death was confirmed! I now have an Aveox 1415, custom wound to give about 500 RPM/volt, on order which should do the job OK. I will report again when the model is flying properly.

Goofy Gyros

Jerry Holcomb is an American master modeller who has been involved in most aspects of the hobby over the years. He was one of the pioneering US helicopter fliers, starting in 1972 and in more recent times he has been flying electric helicopters and water-planes as well as wet powered models. Jerry is also one of the American band of Gyronuts who have been experimenting with and developing practical model autogyros. You can check out their activities on their Internet Web site at: <http://ourworld.compuserve.com/homepages>.

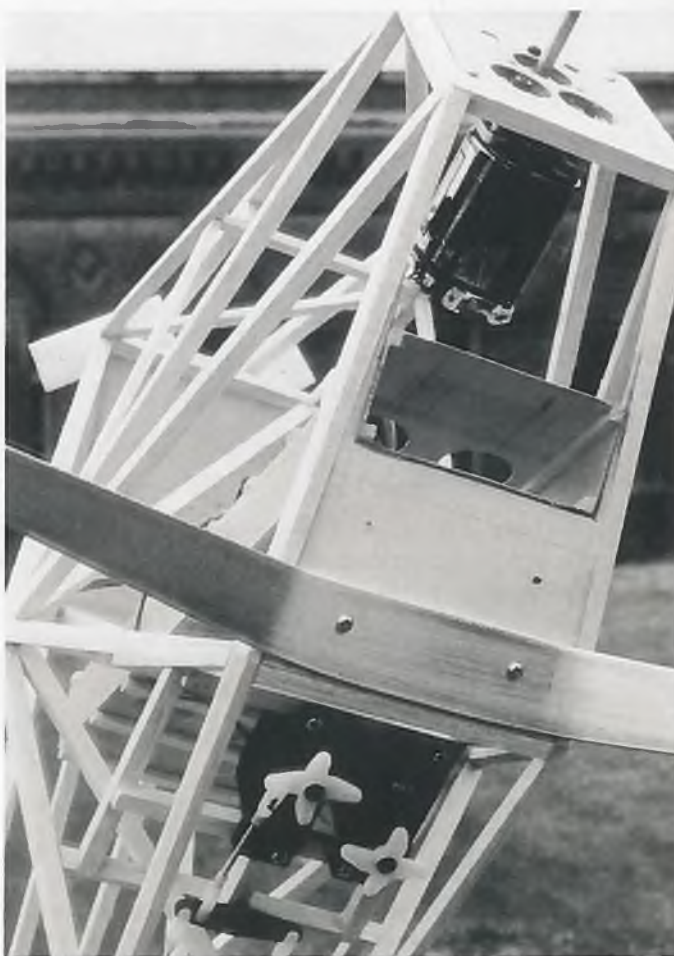
One of his autogyros is the



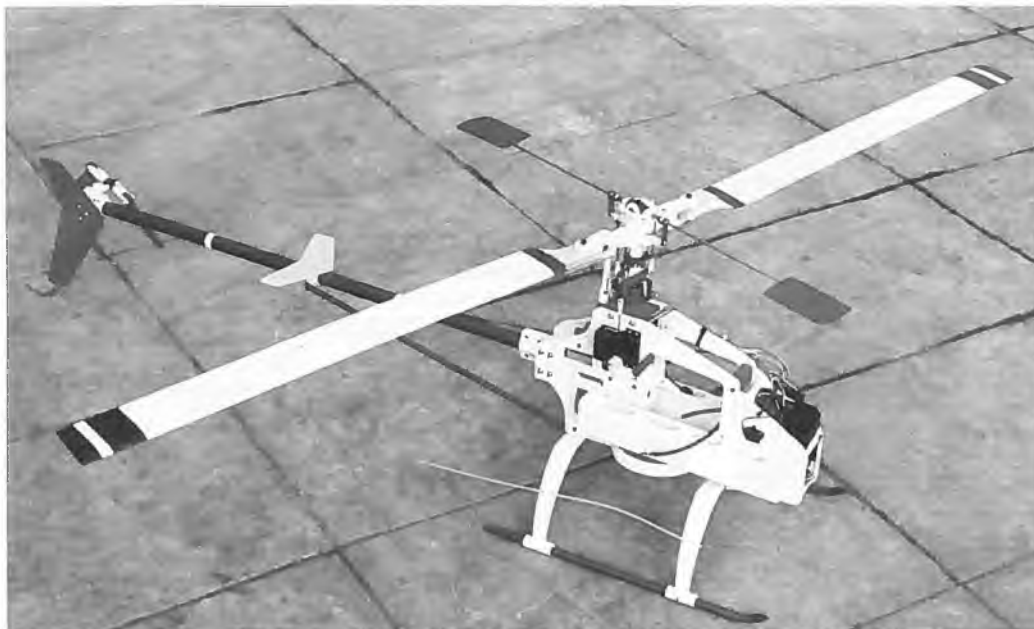
▲ The rotor head in place and connected to the roll servo.

'Goofy', an IC powered gyro which is conventional in the sense that it has a single rotor with direct control of the rotor head for pitch and roll. Shown in the photos is the G-Too, which is an electric gyrocopter built and flown by Jerry. He used the Model Electronics Corporation (MEC) 'Turbo Ten

Plus' motor and the MEC 6:1 gearbox turning a Master Airscrew 12 x 6 wooden electric prop to power the model. The speed controller is an MX-80 and the ten Sanyo 1700s are held in MEC 'Solderless Power Tube' battery pack. This pack is cleverly contained in an inclined battery box for quick



▲ A close-up view of the underside of the G-Too showing the rudder and elevator standard size servo installation and the motor/gearbox mounted to the 'firewall'. The inclined 'easy-in-easy-out' battery box access opening is just ahead of the landing gear.



▲ The Vario Silence without its body and motor.



▲ The Vario Silence ready to go.

battery change and easy ejection of the battery pack in case of a hard landing! The system draws around 25 amps static.

Construction of the very lightweight G-Too airframe is strictly conventional but the really unconventional part is that this is a 'synchro gyro' with a pair of contra-rotating overlapping blades. Self destruction is averted by synchronising the rotors by a pair of intermeshing gears. The twin rotor shafts are splayed apart to allow the rotor hubs to miss each other. This type of rotor system is used in a number of full-size helicopters but it is pretty rare in the model world. Control of the model is via rudder, elevator and a servo is also used for lateral tilt of the

rotor system to give roll control. Hopefully, the accompanying photos will make this clear. Jerry says that maintaining orientation of the model is difficult since there is not much horizontal structure to see, and the intermeshing rotors are very distracting in flight. The model has since been outfitted with broad stripes of red and white on the main rotor blades with black 'windows' added to the fuselage and these really help in determining which way it is going.

Unfortunately, G-Too was only marginally powered with the MEC system and although sev-

eral successful flights were made Jerry has now converted it to glow power (shame) with an OS .32 up front on a slightly longer nose. He says that it is definitely not underpowered now with most flights using no more than half throttle at any time.

Jerry is actively working on a new electric autogyro and he will let me have details when he gets it running to his satisfaction. He is planning to offer drawings and at least a rotor-hub kit for this design early this year and these may be followed by a construction article later. As soon as I have any information on the new design I will feature it here.

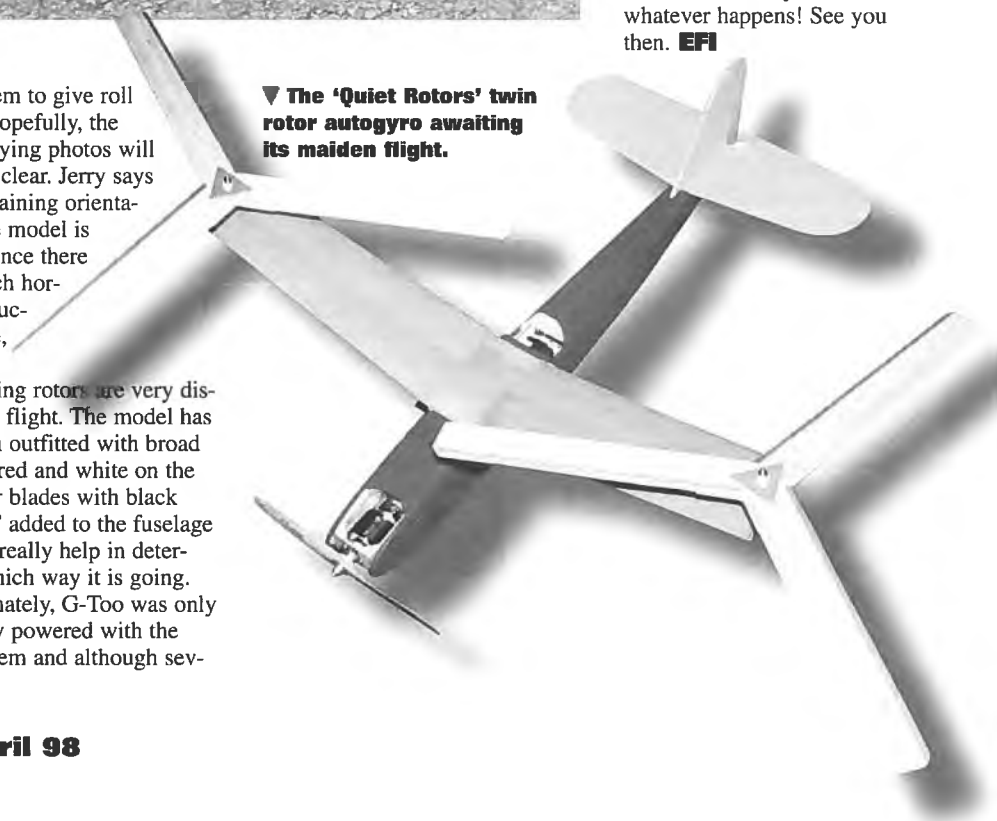
More Pixels

Following the feature on Pixel in the last Quiet Rotors, I had an email from Alexander Van Rostyne to say that he is working on a new model. This one will be nearer to normal size with a 50 cm rotor, using a Graupner 300 can motor and some of the new 9 gram servos that are everywhere these days, but it will still be 2.5 times lighter than anything else around. Alexander is hoping to get longer flight times and full aerobatic capability. Perhaps we can persuade him to do a construction article too. I certainly want one.

The Wrap Up

The much heralded Quiet Rotors twin rotor gyrocopter is complete but not yet flown. Pictures and story next time, whatever happens! See you then. **EFI**

▼ The 'Quiet Rotors' twin rotor autogyro awaiting its maiden flight.



Diary Dates

If you wish your events to be included sent details to the editorial office by post, fax: 01684 594586 or E Mail: 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.

March 29

BEFA AGM at Royal Spa Centre, Leamington Spa, Warwickshire. Market opens 10am, AGM 1.30pm.

April 1-5

Intermodellbau 98, Dortmund, Germany. All types of models, exhibition and market.

April 5

BMFA F5B League, Owthorpe, Notts. Contact Mike Proctor, 01904 489386.

April 12

Electrosport and AULD 400 (plus Open Thermal). Plotcock Farm, Stair, Scotland. Contact: John Walker 01292 560341.

April 12-13

The Great DB Sport and Scale Easter Fly-in. Old Warden, Bedfordshire. Bring a DB model and fly, or just watch, swapmeet, concours.

April 18-19

Havant Lions Models and Hobbies Show. Warblington School, Havant, Hants. Contact: Malcolm Wilson, 01705 250604.

April 19

Ascot Model Show. Silver Ring Ascot Racecourse, all model types plus model airshow.

26 April

Glenrothes Fly-in. Electrosport, AULD 400 and Electrobatics. Glenrothes Club canteen open, please leave your sandwiches at home! Contact: Colin Sparrow, 01505 850242, email: csparrow@clara.net

May 3

BMFA F5B League, Owthorpe, Notts. Contact Mike Proctor, 01904 489386.

May 10

Vintage and Scale Fly-in. Raydon Airfield, Ipswich. BBQ & raffle, clubhouse & toilets. Contact Gary Western, 01473 729279 or 01473 652462.

May 21-24

Pfaffikon, Switzerland.

May 23-24

Mettenheim Electric Meet. For information contact: Franz Stockinger, Tel: 08677 2198, Germany.

May 24

Blackpool & Fylde RCMS, All Electric Fly-in. Fun and competition flying for all types of model. Proof of insurance required. Contact: P. Leech, 8 Hacklands

Avenue, Lea, Preston, PR2 1XY. Tel: 01722 731614 or Stan Craythorne on 01254 248299.

May 30-31

Pannonia Cup, Oberpullendorf, Austria.

May 31

Cumnock Electric Fly-in. Contact: Keith Reid, 01290 550055.

May 31

Diamond Jubilee Cabbage Patch Nats. Including CL electric Aerobatics and Speed. Contact: Brian Lever, 3 The Park, Peakirk, Peterborough, PE6 7NG.

June 6-7

ADS Fly-in. Electrosport (plus Open and 100" Thermal). Contact Norrie Kerr, 01224 734652.

June 7

BMFA F5B League, Oakington, Cambs. Contact Mike Proctor, 01904 489386.

June 7

BMFA Southern Area Electric Fly-in, access off A272 Winchester to Petersfield road. Scale, Vintage and AULD. Contact: Andy Palmer, 47 Lovage Way, Hordean, Hants, PO8 0JG, tel: 01705 591228, or Eddie Clowes, 2 Chalmers Way, Hamble, Hants, SO31 4LR, tel: 01703 452931.

June 7

Isle of Axholme MFC Fixed Wing Fly for Fun Day. Epworth Agricultural Showground, North Lincs, 7 miles from junction 2 of the M180 (A161). Proof of insurance required. associated trade welcome. Contact: Steve Fields 01427 873346.

June 13-14

River Valley Flyers Electric only Fun Fly, Wis. Rapids, WI, USA.

June 20

Aberdeen Aeromodellers Longest Day Fly-in. Various fun competitions from 5pm. Contact: Les Adams on 01224 734652 or email: lesadam@aol.com

June 26-28

MARCEE 98. The Great Minnesota Area Electric Fly. Contact: Stevepauley@worldnet.att.net

June 27-28

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

June 28

Chester MFC All Electric Day, Roodee Racecourse, Chester. open Duration, Vintage, Scale and

Aerobatic competitions. Enter on the day. Extended sports flying. Vendors pre-booking only. Contact: C R Filtess, 26 Raymond Street, Chester. Tel: 01244 378476.

June 28

Mossmorran Electrosport and AULD 400 (plus Open Thermal). Contact: Colin Sparrow, 01505 850242, email: csparrow@clara.net

June 28

Electric Fly-in. Raydon Airfield, Ipswich. BBQ & raffle, clubhouse & toilets. Contact Gary Western, 01473 729279 or 01473 652462.

July 3-5

Popular Flying Association, International Air Rally & Exhibition, Cranfield Airfield Beds. Contact: PFA at Shoreham Airport, Sussex, BN43 5FF. Tel: 01273-461616 or fax: 01273-463390.

July 5

Cumbria Fly-in. AULD 400 and fun events. Contact Dougie Eustace on email: 106006.220@compuserve.com

July 5

Malvern Soaring Association. Open, 100S and Classic glider competitions plus Electrosport 7 cell, at Fish Meadow, Upton-upon-Severn, Worcs. Contact: Nick Neve, Eynhallow, The Purlieu, Upper Colwall, Malvern, Worcs, WR14 4DJ. Tel: 01684 561160. Pre-entry by June 29, 2 frequencies, £3 per event, include SAE if confirmation and map is required.

July 11-12

Wings and Wheels Model Spectacular. North Weald Airfield. Market and airshow. Contact: Designation Limited, P O Box 102, Malvern, Worcestershire, WR14 1XJ. Telefax: 01684 562038, mobile: 0836 297168.

July 12

BMFA F5B League, Oakington, Cambs. Contact Mike Proctor, 01904 489386.

July 25 & 26

INTER-EX 1998. Oistrach, (near Bodensee) Germany.

July 31-Aug 2

Electric Flight Festival, Neuhausen, Germany.

August 1-2

Scottish Soaring Nationals. Electrosport and 30 Minute Electric (plus Thermal soaring events). Contact: John Walker 01292

560341 or Colin Sparrow, 01505 850242, email: csparrow@clara.net

August 2-9

F5B World Championships, Neuhausen, Germany.

August 2-4

USA AMA Nats.

August 8-9

Fort Wayne Electric Fly, Texas, USA. Contact: Pat Mattes, Yoder, IN, USA. email: Pat-Ingrid-Mattes@Juno.com

August 15-16

Family and Model Craft Show at Plumpton Racecourse, 4 miles from Lewes, Sussex. All Enquiries to: Dave Bishop of DB Sound, 17 The Square, Tatsfield, Kent, TN16 2AS. Tel 01959 577550. Mobile: 0850 752061.

August 16

Greenacres MAC Electric Fun-Fly 98. Walsall Airport, Off Bosty Lane, Walsall, West Midlands. Signposted from Junction 9 M6. Entry £2 per Tx. Food and refreshments on site. Trade stands welcome. Contact: (01922) 404658 or 448873.

August 22-23

Haverfordwest Model Club's annual show, Scolton Manor. Contact: Adam Pollard, 6 Castle High, Haverfordwest. Pems. SA61 2SP. Tel: 01437 762633.

August 22-23

2nd Annual MARCEE/St Paul RC E-Fun Fly, USA. Contact: Stevepauley@worldnet.att.net

August 29-31

BMFA Nationals, venue still undecided, UK.

September 6

Montrose Electric Fly-in. Fun events. Contact: Ian Guthrie, 01674 672268 (business hours).

September 15

SAM Champs at the AMA National site in Muncie, Indiana, USA.

September 19-20

KRC, Queen City Airport, Allentown, PA, USA.

September 20

BMFA F5B League, Owthorpe, Notts. Contact Mike Proctor, 01904 489386.

September 20

Linithgow. Electrosport (plus Open Thermal). Contact: Colin Sparrow, 01505 850242, email: csparrow@clara.net

September 20

Battle of Britain Fly-in. Bring your WW2 aircraft. BBQ & raffle, clubhouse & toilets. Contact Gary Western,

September 25 to 27

Lleyn Model Aero Club 'Bring and Fly' all flying model types. Contact: Frank Pilling, Crud y Gwnt, Abersoch, Pwllheli, LL53 7HR. Tel: 01758 712673.

October 4

Mossmorran Electrosport (plus F3J Thermal). Contact: Colin Sparrow, 01505 850242, email: csparrow@clara.net

October 11

BMFA F5B League, Owthorpe, Notts. Contact Mike Proctor, 01904 489386.

Quiet Scale

MARTIN IRVINE

I am a firm proponent of converting successful models. It's great to design a completely original model and have it fly well but it can be a bit of a dice throw, especially if the model is unusual or your flying skills are not what they could be. Going with a proven design is one way to be more sure of what you are getting.



Bellanca update

Before I get into this month's column - here is some much deeper information on Eben Oldmixon's beautiful 1922 Bellanca CF, in this column several months ago and correct because details are from Eben! These details were developed with the help of "Aero*Comp" computer programme. It has a 68" wingspan, 680 sq.in and a RTF weight of 56 oz. He is using an Astro 035 geared 3.6:1, with 8 cells and is drawing 26 amps with an 11 x 10 prop. He reported that the actual flight characteristics match

the predicted ones pretty well.

As the pitch speed is calculated as 54 MPH and the max airspeed is calculated as 35 MPH, based on airframe drag, I would guess that a lower pitch prop would better match the pitch speed to the airframe airspeed. This would lower the current. Right now he has about 210 watts to power a 3.5 lb. model, or 60 watts/lb. For this style of model, this seems more than enough, so that a few less amps wouldn't hurt. In fact I would bet that an 11 x 6 or 7 would work fine or maybe a 12 x 6. The cautious approach would be an 11 x 9,

then 11 x 8, and so on. If you are going to get the most from electrics, you should have a selection of props for experimentation. Try to think of it as an investment rather than an expense!

Kit and plan conversions

Electric conversions of gas kits remains a favourite topic. The Dynaflyte series are a good bet as they are reasonably light. Several of these have been in this column. Unfortunately, they are the

exception rather than the rule. Generally we will have more luck with plans.

Going with a proven design is one way to be more sure of what you are getting.

A popular sport plane is the 60" Cloud Dancer by Fred Reese. Built from the Ace kit and powered by 16 or 18 cells, they work well. Built from scratch, they can be made a half pound, or more, lighter, and that translates into more performance. The SIG 4 STAR 40 is a similar model with similar possibilities.

Of course this is a scale column so where am I going with

all this? Well, 25 years ago(!), Radio Control Modeler magazine published a sport biplane by Don Dewey and Lee Renaud, called the Acro Star, designed for 40 to 60 size engines with a 50.6" (1285mm) span and 5.7 sq.ft (53 sq.dm). Shortly after this, Airtronics produced a kit. The flying characteristics were terrific. Keith Shaw reports that it was better than the Andrews Aeromaster, which I have always regarded as benchmark design. If it's that good, then it's very good!

A little more than a year later, Robert Munn published a set of simple modifications to turn it into a semi-scale Hawker Fury. The magazine photos focused on the back end more than the nose of the airplane, but the results looked good.

I got the Acro Star plans with a view to building it just as a sport biplane. I like biplanes and it would be nice to have one that didn't require the fuss and bother of a scale plane. I was thinking of using 18 cells and an Aveox 1412/2Y with the Astro 3.69:1 gearbox. Once I had the plans, I compared them with a set of 100% scale, 50" (1270mm) span Fury plans I had drawn to about the same size years ago. Wow, this is starting to look as though a sport scale version of the Acro Star/Fury would be a possibility. Certainly more scale than Robert Munn's version, and more scale than a lot of stand-off scale models. All this and an everyday flier too!

Over the next few columns, I will be going through the design of the model as it is it is drawn and built. I hope that by doing this some readers will be encouraged to try their own design and modifications of proven fliers into good electric models. In the end, assuming it is a success, I will do a construction article and plan. If it is not a success... well, sometimes our mistakes are as informative as our successes!

Hawker Fury/Sport Fury - drawings

First thing to do was to gather all the information on the Fury I had. I have three sets of drawings, ranging from very good to superb. Those in the centre of the photo are from the December 1959

Aeromodeller. These are excellent and were the basis for my own scale drawings. The best set I have is by Peter Westburg. These are incredibly detailed and large - 1/10 scale. All internal structure is shown and there are lots of cross sections. The third set is from Scale Aviation Modeller International Vol 3 issue 8, August(?) 1997. These are pretty good but don't have cross sections and I am not completely happy with some of the nose contours.

Who cares about accuracy for sport scale? You should. The nose contours won't have anything to do with making the model fly better or worse so why not make them accurate? If I have to make compromises I prefer to make them intentionally, not find out after it's all finished.

One of the export versions of the Fury was built with a single strut landing gear, called the Dowty landing gear, with an internal springing mechanism, similar to the legs on the Gloster Gladiator. This style eliminates the need for the rear strut that makes wing removal such a nuisance. A nice simple dural gear is a good approximation for a sport scale model.

Given that the Westburg drawings do not include the Spanish Furies, and the Scale Aviation Modeller versions don't have cross sections, the old Aeromodeller set get the nod.

Colour schemes

The photo shows some of the colour schemes published. The SAMI article includes 16 profiles with scrap top views as well as internal construction drawings and cockpit details. The large colour 3-views are from "Classics of the Air" by Marshall Cavendish Books (also Pilot Press). The single page set of 4 profiles is from "Military Aircraft Markings & Profiles" by Barry Wheeler, Hamlyn 1990. The smaller page is from the Profile Publications which, unusually, doesn't even mention the Spanish aircraft. I have decided to build a Spanish Fury so the choices were limited to those few.

Sport Fury - fuselage

Once the drawings of the



Spanish Fury were enlarged to size they were compared to the original Acro Star plan. Robert Munn had described tilting the centre section struts forward 1" (25mm). This is less than we need for scale, but he was trying to use the kit strut fittings. We need to move the top wing about 2 3/8" (60mm) forward to be closer to scale. This lines the wings up pretty close to scale stagger. This also moves the CG forward about 1 3/16" (30mm), increasing the tail moment and shortening the nose as compared to the Acro Star. The longer nose of the Spanish version lines up nearly perfectly with the Acro Star prop thrust washer (see drawing). It does have a lower thrust line than the Acro Star, but this also is only 1" and with the scale length longer landing gear of the Fury, there is still room for 20" (508mm) props(!). Of course the profile of the fuselage is a little different from the Acro Star but not much.

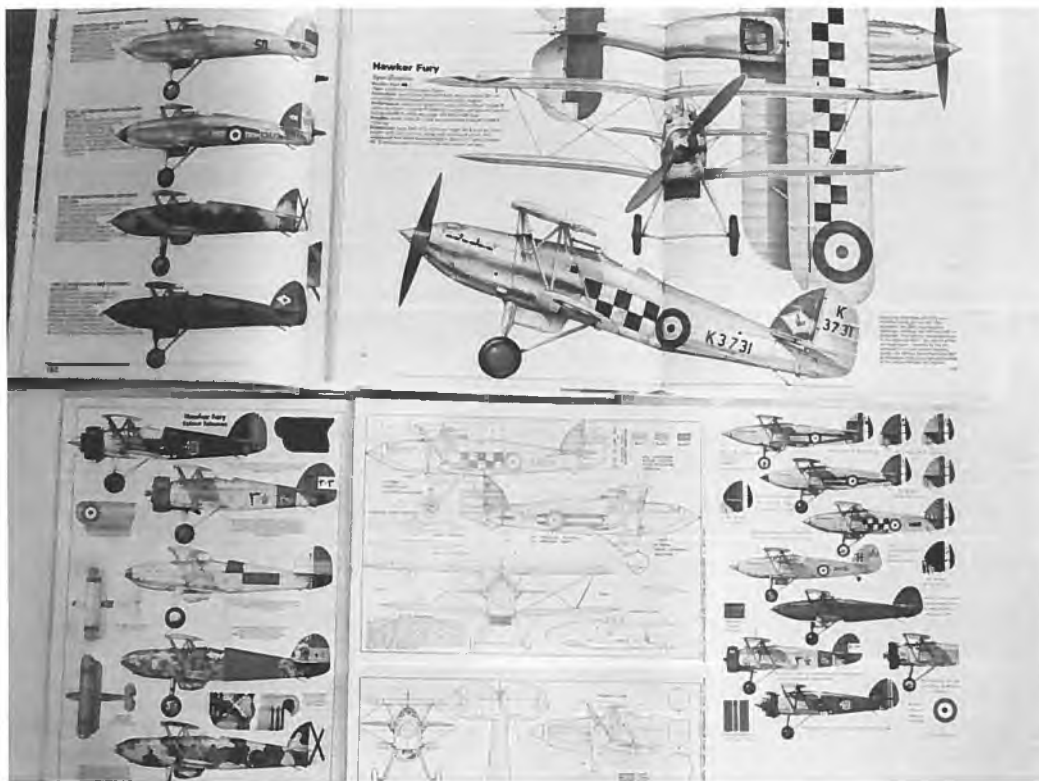
The scale spinner is pretty much 2 3/4" (70mm) - as compared to the 3" (76mm) on a standard Fury. To make one is not too difficult as it is a straight taper, but a commercial one could do the job if we weren't fussy about the shape. (Sport scale - remember?)

So far, the front end of the

Acro Star is fairly close to what we need. The rear half is rather different. First it has an extra 2 3/4" (70mm) between the cockpit and the rudder post. The fuselage also needs to be deepened. This works out fairly well as it gives us a little extra area back aft to compensate for the smaller fin and rudder of the Fury. With the longer tail moment the tail volume is increased a bit making what we've got a little more effective. This vertical area is lower than the original tail but that helps with the lower motor thrust line.

The landing gear is somewhat longer at 1 7/8" (48mm) plus the larger wheel for a 2 1/2" (64mm) total, than the original Acro Star. A plus of the Spanish version is that the axle is further forward than if we were doing a standard Fury. This compensates somewhat for the CG moving forward, and lessens, (not eliminates!), the tendency to tip over on its nose. True scale track should be 11 3/8" (289mm), about 1 3/4" (44mm) less than the Acro Star.

The shape of the legs as viewed from the front is curved outward where they meet the wheels. This would be difficult to do in a scale model but this is a weekend



scale plane so a regular Dural landing gear will do fine. SIG make a series of Dural blanks that will do the job nicely.

There are some lighter composite versions available but I have no experience with these.

OK, this is a place for a difficult decision. Are we going to go with the scale length and position for the undercarriage? Let's consider what we end up if we go scale.

The original ground angle on the Acro Star is 10 degrees. With the longer landing gear it is 13 degrees even with a long tail skid. Three extra degrees doesn't sound like much but it is 30%. The angle between my estimates of the vertical CG and the wheel's contact point with the ground goes from the Acro Star's 19 degrees to 10 degrees with the new gear (see drawing). This is OK with a well groomed grass field, but don't try to fly out of a hayfield or you'll end up on your nose!

What happens if we split the difference? Say we lengthen the gear 1" (25mm) and move the axle forward 3/8" (9.5mm). This increases the vertical CG/ground angle to 13 degrees from the "scale" 10 degrees. Not a lot perhaps but I will feel better about it. I will bolt on the Dural gear so that if the position causes problems, I can salvage things with a new setup.

The width of the fuselage is much wider on a scale Fury. The Acro Star plan has a fuse-

lage width of 3 13/16" (97mm) and this is constant, (ie parallel sides), from the nose to the cockpit whereupon it tapers straight to the rudder post. The Fury has a maximum width of 5" (127mm) and it has a smooth curve from the forward fuselage to the leading edge of the stabilizer. The new fuselage will be widened to 4 5/16" (110mm) to ensure room for 4 cells across as well as fairing strips down both sides.

Wings

The airfoil used on the Acro Star is an unknown semi-symmetrical section of about 17% thickness. I am loathe to mess around with this as it is a major determinant of the flight characteristics. It will be interesting to try to evaluate the effect/cost/value of the thick and draggy section on the flying qualities once the model is finished.

The wing is a classic D-tube structure with cap strips and a sheet trailing edge. Ailerons are on the bottom wing only.

The forward spars are 1/4 in (6mm) square spruce and the rear is 3/32" x 1/4" (2 x 6mm) spruce. I believe in strong spars but I will probably drop the forward ones to 3/16 in (5mm) square (saves about 1.7 oz or 48g) and leave the rear ones as is. These will be fully webbed, the lightest strength you will ever add to an airframe.

The sheeting on the entire wing is 3/32" (2.4mm) - overkill for us. I will redraw everything to go to 1/16" (1.6mm) sheet. Wing tips have to be changed to Fury shapes and the lower wing shortened a bit as per the original. I am still working out the cabane and strut mounting arrangements as I want it to remain easy to build and easy to use every weekend.

Another decision is whether to move the ailerons to the top wing. The bottom ones are larger than the scale size on the top wing but the original's are large enough to be quite adequate, (approx. 75% of the Acro Star's). With the dihedral and the usual vertical weight distribution, the rolls should be more axial with them on the lower wing. Any pattern designers like to contribute to the discussion? Anyway, this is of little concern to a weekend flier. It certainly more convenient to have them on the bottom but the look of the top ailerons look better to me so that's where they'll go.

The Acro Star is set up with the stab and lower wing at zero degrees incidence and the top wing at 1 degree positive. This is not the most efficient aerodynamically but it ensures that the top wing will stall first, creating a nose heavy airplane. This drops the nose and gets the wing flying again.

Along with the incidences noted there are 2 degrees of down thrust. If we take out the

down thrust and add it to the wing incidence, we have a better shaped nose and a more scale looking wing angle. The effective downthrust is again 2 degrees.

(The SE5a is a classic case where the 5 degrees of wing incidence is vital to maintain the correct appearance. With 5 degrees unobtrusively added to the stabilizer, we get 5 degrees effective downthrust and the characteristic nose down attitude of the SE.)

Stabilizer

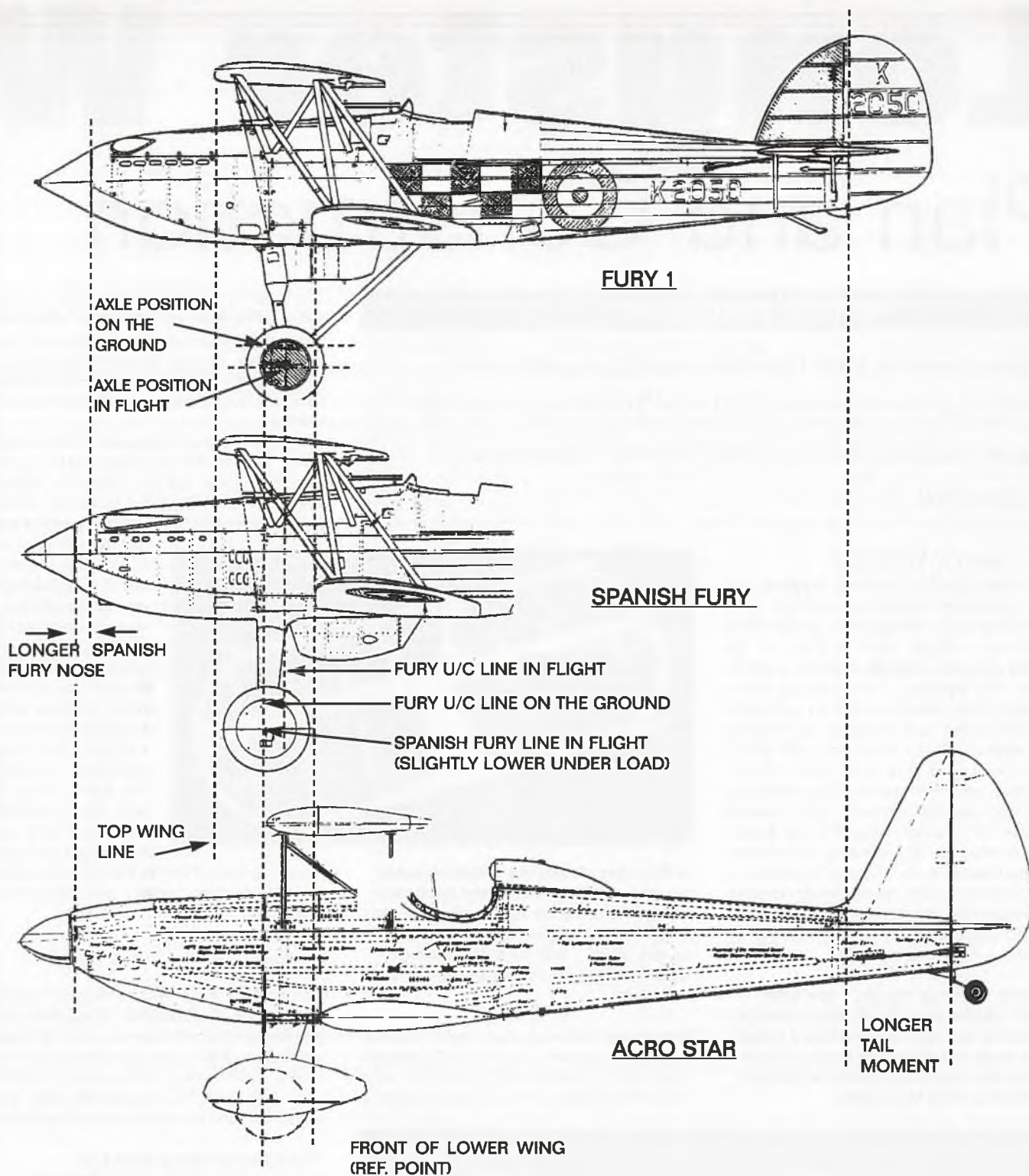
The stab on the Acro Star is quite large - approx 145 sq. in. A scale Fury stab would be about 90 sq.in. As a large tail is often a contributing factor in an easy flier, I don't want to go full scale. I've decided to use a 120 sq.in. This will be made a little more effective by the increased tail moment caused by the CG moving forward. It is small enough to not look out of place with the rest of the model. Compared to the scale Fury with 3/4 of the area and 2 3/4" (70mm) less tail moment, the Sport Fury will be much softer longitudinally.

Equipment planning

I want to be able to get at the battery packs in this model so as to be able to put in repeated flights if I wish. This necessitates access either through the lower wing cut-out or a hatch somewhere in the fuselage. Given that the lower wing will have interplane struts attached, I prefer a hatch.

Top hatches are convenient. You can change cells without picking the plane up. Unfortunately, with the considerable stagger, there isn't much room between the motor area and the upper wing. For this reason, I will probably put a hatch in the lower cowl. This makes having the batteries low in the fuselage fairly easy, which in turn will help with the vertical CG mentioned earlier. Remember that we don't want the batteries so low as to induce a pendulum effect when rolling or inverted.

I will try to mount the gearbox with the motor "high" so that the speed controller can also be mounted high right behind the motor and out of the way of any "rapidly decelerating" battery pack. In a crash, the battery pack can nail



equipment no matter where you put it but, on average I believe that high mounted equipment is safer. The majority of crashes are right way up and nose down and this is another reason for the lower hatch position - an battery pack escape route in case of a crash.

The battery pack will need to be made removable yet secure. The basic mounting will be spruce rails glued to the interior sides and I suspect the

pack(s) will be taped to plywood plates and mounted with one or two nylon bolts.

Compromises

There are three main compromises we have made compared to true scale. One is the lengthened tail moment. To correct this take out 2 3/4" (70mm) between the cockpit and the leading edge of the stab. The second compromise is in the landing gear length and posi-

tion. Lengthen 1" (25mm) and move the axle back 3/8" (9.5mm) to get back to scale. The third is the enlargement of the stab by 33% to approx. 120 sq.in. To correct this, shrink the drawing by 25% to 90 sq.in.

There are a few other things that won't be spot on but these three are by far the most important. These three also contribute a lot to making the model an easy flier and an everyday flier. I don't think

that they are going to be very obvious to anyone but a real Fury fan and this way you get a great flying and looking model.

As always, I am happy to hear from readers about their own experiences and any problems they may have dealt with.

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

Longster Wi

Plan and Construction

REVIEW BY: **DERECK WOODWARD**

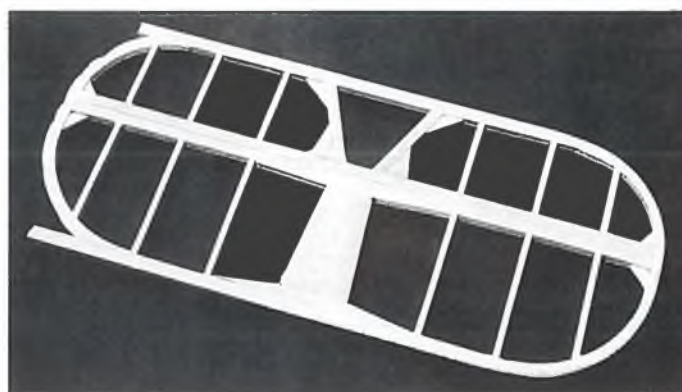
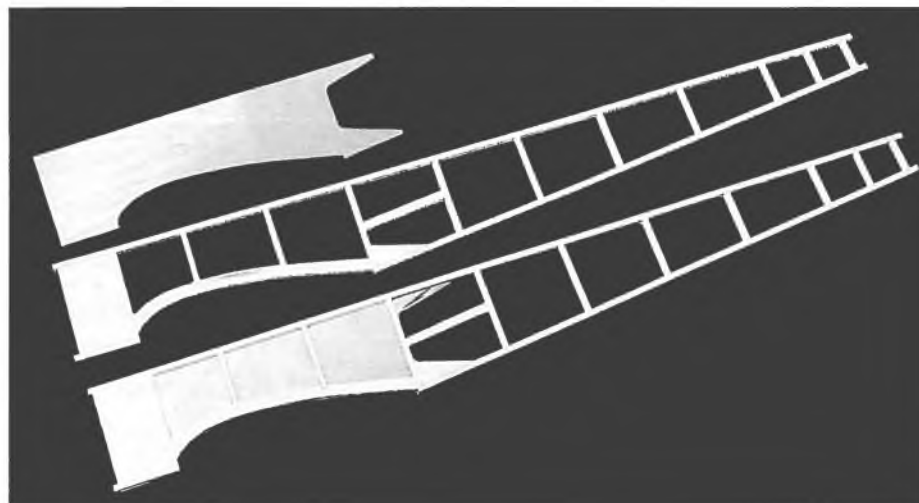
This could be your first scale model, or just a fun machine for an experienced flier. If you have not built many models, there are full "how to" instructions right here.

So - who's Wimpy?

In 1930s Oregon, Les Long designed and built lightweight single seat aircraft as a hobby. I've been reading of his aircraft for a while now, though there is little on his designs in some respects, there is much in others. For example, I don't have a documented colour scheme, but I do have construction notes and drawings for building two others! 'Wimpy' was a one - off, with a flat twin engine Les built from Harley Davidson cylinders and his own crankcase. The low wing was unusual - Les favoured shoulder or parasol wings for the better view downward - but the long tail moment and high aspect ratio wing are his style.

By tradition, scale model design involves documentation, researching the cockpit seat wicker pattern, rivets in the cowl, oil streaks - all good stuff. Phil Kent, Mick

▼ **Basic fuselage frames - one with 1/64" ply doubler fitted. The rearmost upright is set in 1/4" to allow a balsa filler to be fitted for the lower rudder hinge. It's about the minimum amount of wood to hold the shape.**



▲ **This shot shows the tailplane made up. One end is trimmed and sanded to shape, the other is as it comes off the board. The elevator TE has been fitted as one piece - will be cut out when shaped. What do you mean, which end is which?**

Reeves can do it that way. I saw a 'Wimpy' in another size and used my CAD program to produce a loading around model for calm days. When happy with the size, I added a

light structure. A \$40.00 Graupner motor and gearbox have a home unlike other low cell count models, mostly soarers and vintage models. Neither fly well at low level in a breeze, but 'Wimpy' with her three axis control is quite happy in a little wind or turbulence.'

'Wimpy' has been modelled in sizes from indoor scale to 90" for larger electrics, and the "best guess" colour scheme is yellow with black trim. She's fun to fly, has more performance than the real one would have

and always attracts favourable comments. The fuselage may look familiar to vintage modellers, the wing is light, yet practical, the tailfeathers have laminated outlines with minimal structure. Following the three principles of electric flight - build it light, don't make it heavy and take out any weight you can

- she's a practical sports flier that can stand the odd imperfect arrival we all make occasionally.

Flying

If you don't fancy this, building one would be a waste. A Graupner Speed 600, 3:1 gearbox and 8 cells turn a 10 x 6 prop, trimmed to 9.5" to cut current to my controller's 20A rating. Full power is around 170 watts, near the classic 50 watts per pound for safe, non-aerobatic performance.

▼ **Laminating forms from 1/4" corrugated card, glue-proofed with packing tape. The larger is for a wing tip, has an outline held on with rubber bands. Smaller is for the tailplane tips, one outline already to be trimmed to fit.**



mpy

► Colour scheme and pattern seems to be how the full size was finished. Simple and attractive - that's close enough for me! TowerKote film is a little translucent but, as we won't be going to Top Gun, I don't find myself minding too much.

power. Her ailerons will roll on bank smartly though a full roll is slow, though axial. The elevator is positive in pitch, the rudder has little yaw/roll coupling. The stall is hard to provoke, there is no wing drop and height loss is minimal. As balanced, she will not spin or snap roll.

If you fly her really slow, you may have to help her turn with some rudder and extra power - she'll fly safely at speeds where control gets woolly. For a loop, a long gentle dive, apply the power as she's going upwards. Over the top and reduce power to just spin the prop. Not very round but if

▼ Front end fuselage detail with the motor mounted on a "Sonic Tronics" mount - very light and adaptable. The battery tray replaces the strength lost by having a lift off top deck for nicad replacement. Here, the cowl is well on its way.

As she only needs that for take off and the odd daring stunt, flights last around eight minutes from the 'old' 1700 mAh cells. She also flew on seven cells at some 150 watts for a slower though safe climb - with the lighter pack, she had lost two ounces.

She can handle shorter grass, but on tarmac she'll unstick in around thirty feet, climb smartly and enter a cruise on lower

▼ Wing centre with the servo nestled in a custom wood mount. Servo barely protrudes from tray. Full depth mainspar is assembled with ply doublers, slots in from bottom of ribs so is not visible under the covering at least on top of the wing. Only the centre section of the wing is sheeted, works fine on a low stress airframe like this.

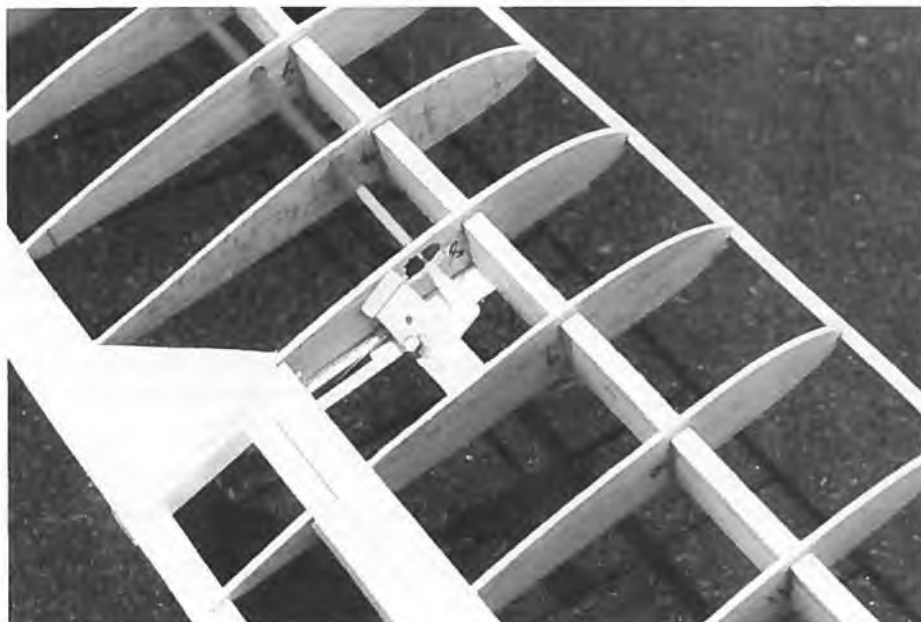


▲ The rudder and elevator servos are fitted aft of the wing aperture - the servo mount is built in with the basic sides. Gussets stiffen up the extra holes around the wing aperture.

you could loop a 30HP aircraft, it would look like that. She will roll without losing height - well, once and even manage a stall turn, with a short vertical leg. She has flown inverted with little height loss - the far corners of the envelope are well checked.

Typically, I enjoy having a clear field to play "in the weeds". Slow and low passes. Fly-pasts with the wing down to show her topsides, then bank away from the runway and pulling up into a lazy chandelle to come back the other way. Landings are great fun, gliding down the downwind leg and into a long, curving turn on finals. For landing, juggle a little up trim against power and either touch on the mains, or hold off for a three pointer. Like many scale models she has a fair amount of drag, especially if you let the speed fall, so watch for excessive





▲ More wing detail and the aileron bellcrank detail. I used a 'Goldenrod' snake to connect the bellcranks, but 1/16" wire could be used with supports. 3/16" dowel LE is tough, easy to install and ready shaped.

► The wing bolted in - I used small metal bolts and rely on the wood around their T nuts to give way if I insist on having a crash. The main UC legs are soldered together in place, the cross wires and wooden fairings can be added off the model.

sink sneaking up on you. The landing gear is very stiff, so I usually take off from our tar-mac and alight on the grass.

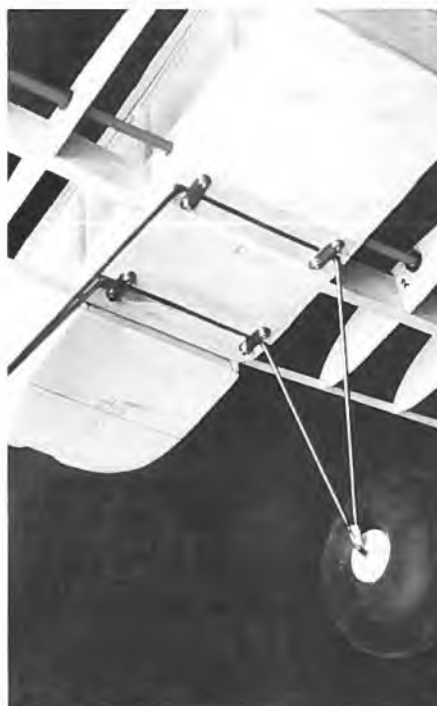
On smooth grass, she will taxi around under power. This always amuses 'wet' fliers and electric soarer pilots alike, as if an electric shouldn't be able to get around on its own wheels and power. Well worth landing early to keep a little power in hand for!

As reports on smaller electric models always mention thermal ability - to the best of my knowledge, she will not thermal! 'Wimpy' is never flown all that high, she's ideal for loafing around but if an urge strikes, I can do the odd basic manoeuvre. For complicated ones, I fly my 320 watt firebreather and do the job properly. Interested? Good.

Don't procrastinate - Laminate!

You can do other parts while the tail outlines and wing tips dry. This is "add lightness" where needed - if you make the tail from hard sheet, on your head be it. Laminating forms for all are drawn on the plan and can be anything that's 1/4" thick - I used corrugated card and sealed the edges with plastic parcel tape.

Out with the light balsa and strip! Now put your clothes back on and cut out strips of 1/4" by 1/16" (6 x 1.5mm). Soak in warm



water for an hour and make up a 50% mixture of white PVA glue and water. Out of the tub with them, dry off the surface water, spread glue on mating faces and join the strips. Push them together - rolling with a dowel or rolling pin works - to ensure they are fully glued, then add the next strip. When you have four in a pile with glue running everywhere, wipe off the excess and proceed.

Hold them on the former at the centre - rubber bands or masking tape work fine - and work them down around the former, lashing down as you go. The aim is to have them all together and held down onto the former right around the shape. Toss somewhere warm, make up the next one and carry on until you have two wingtips, two tailplane tips and one fin/rudder outline.

For the tail surfaces, pin down the dry laminates, add the main long members and cross pieces. When dry, lift off the board, round off the appropriate edges, bevel the fin and

tailplane LE's for control throw clearance and put a little 1/64" (0.4mm) ply where the control horns go. You're done.

A long skinny body

I don't like removing the wing to swap packs, especially with an aileron model. So, the fuselage top between cowl and rear deck comes off instead, so you fit the wing and make the aileron servo connection for a session - and leave it. To swap packs, undo two screws and remove the top. To ensure fuselage rigidity, the battery tray holds the fuselage sides just above the wing, and a few gussets ensure that stress points are minimised.

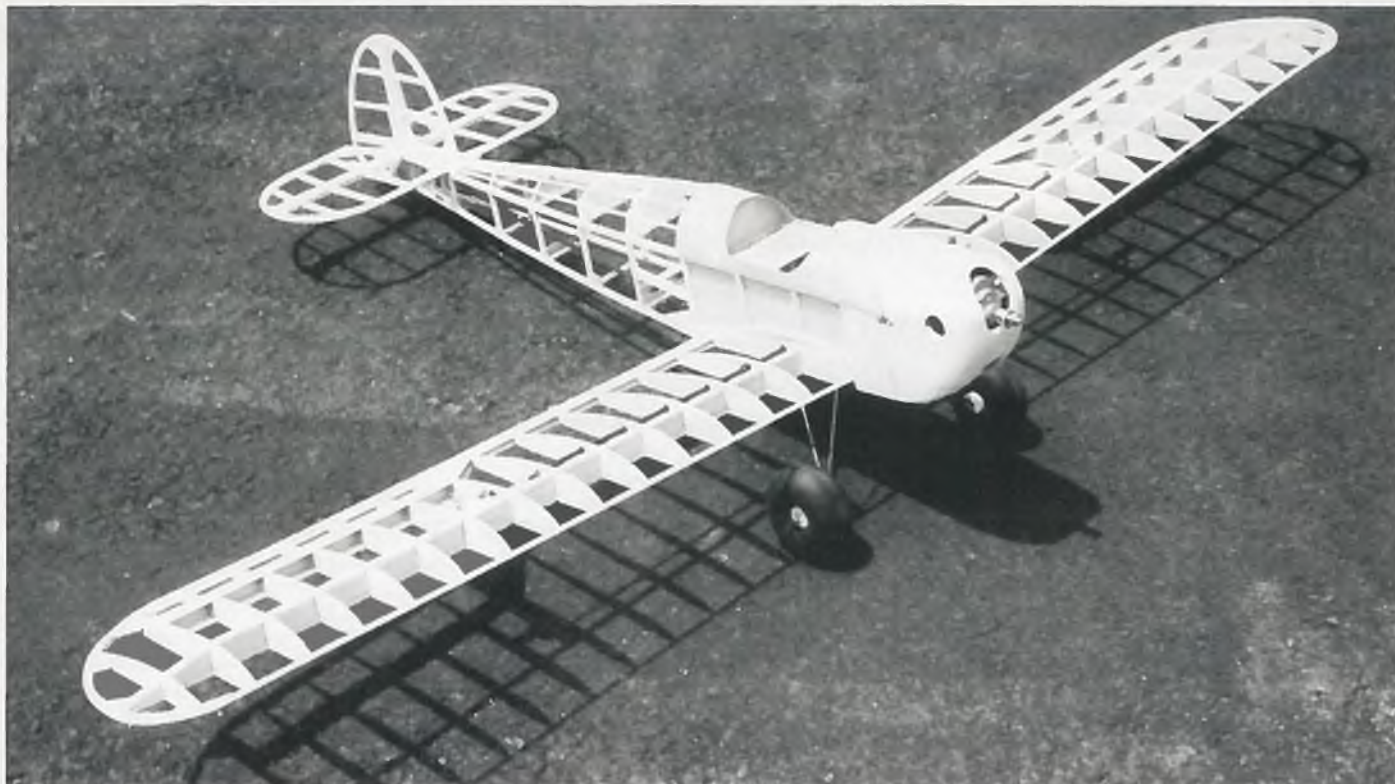
The longerons are from 3/16" (5mm) square spruce, the uprights and cross members from light 3/16" balsa. Make the second atop the first and avoid gluing the two together - the first is easier than the second! Note that the stern upright is 1/4" short of the end. When you join the sides, trimmed to a sternpost thickness of 1/4", fill this with a scrap of 1/4" sheet to allow the lower hinge to pass through wood rather than a glue line.

Sides are joined by the "firewall" (electron shield? Sounds like Star Trek!) and F4. Because of the holes in these, use 1/8" birch ply, not liteply. As there are many motor mounts around, you may have to modify the cutouts in F1 to suit your favourite. I used a "Sonic Tronics" mount as I had one handy! The battery tray is hard 1/16" (1.5mm) balsa with its grain across the fuselage, or use 1/16" ply if nervous. The slight angle to the tray and the large hole in F1 should allow the nicad to leave in a hurry without taking half the fuselage along. The nicad is held down by Velcro™ - I put a strip of hooks on the battery and three strips of loops across the platform.

To fit the rear deck, fit the formers without the scallops, then the 1/16" x 3/16 (1.5 x 5mm) spruce stringers - they are light and

▼ After adding the UC cross brace wires, the wooden fairings are made and fitted. 3/32" square balsa and 1/64" ply make up the distinctive shape, covered in black film on the prototype. On the full sized, the flying wires ran from the rear edge of the fairings to the wing spars just inboard of the ailerons. As rigging wires cause drag and the model's wings are fully cantilever, I left the wires off.





▲ I always take a shot of the wood-work! Lots of holes trimmed with a minimum of wood, this lightweight frame is covered in lightweight film to make low power electric scale an easy reality. You'll see the Graupner 3:1 gearbox in the cowl and the holes for the dummy cylinders.

resist handling well. Next, undercut the formers as shown on the plan. When covered, the stringers will show, not the formers - details like this shout "scale" for little effort and no weight.

Now the top hatch. Make up a 1/8" x 1/4" (3 x 6mm) balsa framework to sit atop the fuselage, then fit the hatch formers. A full length top stringer will stabilise them while you glue on the 1/64" ply deck. 1/64" ply is great for this kind of application as it is light, stands being bent easily and will take rough handling that would crack balsa. It is simply secured by two small screws into the top longeron.

To fix the ply, I coat the frame with white glue, place the ply and push into position. This puts glue on the ply - now separate the two, check that the mating areas are fully coated with glue and leave to set. When dry, heat up an iron and position the ply on the framework. Now 'iron' the ply onto the frame from the top longeron down - the heat melts the glue and seals the ply down. A great technique, you might want to practice on scrap first.

The cowl is last and is another place for the individualist. I pondered over fibreglass, brown paper and white glue over foam - then used balsa in the old fashioned way. A cowl is a great way to empty out my scrap wood box - make up a large box on the nose, carve and sand away any wood that doesn't seem to belong and there you are! It is secured onto FI with four brass straps and

small woodscrews top/bottom and sides. Naturally, your motor must protrude through the front with a little clearance and there is a cooling aperture in the bottom of mine.

The dummy cylinders are the legendary Veron plastic ones and look enough like a flat twin for me, though maybe a tad large. I'm sure that dummy jugs could be sourced from Williams Bros, or made up from card and balsa - they don't get an oil bath every time the prop spins, so can be as light and detailed as you like. As homebuilts are traditionally fitted with all manner of engines, so can your model. If you want to pretend your Wimpy had an inline four or apple cheek cowl - fine and your photo will go in my scrapbook with pride!

The wing

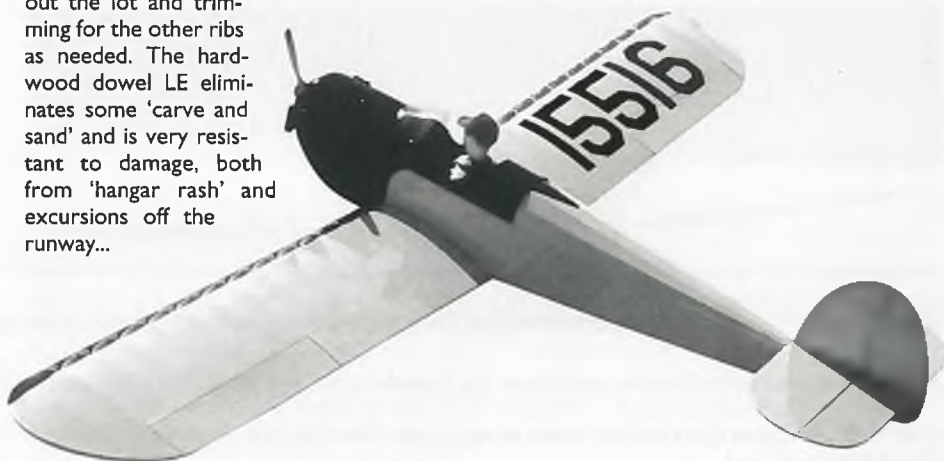
Homestretch! You made the tips a while back, so make up the mainspar - take care over the centre joint, it is the heart of the model. With the constant chord, save time by cutting a ply rib template to R3, cutting out the lot and trimming for the other ribs as needed. The hardwood dowel LE eliminates some 'carve and sand' and is very resistant to damage, both from 'hangar rash' and excursions off the runway...

For a round dowel, you need a round hole. I use a length of 3/16" (5mm) OD steel tube with one end sharpened on the inside; the other end is liberally taped over. This will make a clean hole in ply or balsa - and a clean hole in your hand, hence the liberal use of tape. The first hole you cut will take a while - it's in the ply template. Now cut a round hole in your balsa, leave the cutter in place, position the ply template against it and cut out the rest of the rib. Repeat as necessary.

Where do you find 3/16" OD steel tube? Well, sooner or later we'll bend a regular Tx aerial beyond repair...

The wing section aft of the spar is flat bottomed, so one can build one panel over the plan, then the other, finally putting the centre section between them. The rest of the wing is details - the tips do not sit flat on the

▼ Out on the strip and ready to roll. High aspect ratio wing means a long span. 59" gives plenty of presence for a small model. Long rear moment gives steady, docile handling - now do you see why the tail is built so light?





▲ For this one, she wore some 2 3/4" Trexler wheels - rather large, but they treat long grass with disdain. She later acquired some light foam 2 1/2" ones. Dummy 'jugs' were made by 'Veron' for their Hawker 'Tomtit' biplane, but were available again the last time I was in England - a tad big but better (and nearly as easy) as forgetting about a dummy engine. Pilot and ballcap are from Britain's own 'Pete's Pilots' again, very light and they really look the part.



▲ A gentle model to fly and, hopefully, no one will mistake her for a 'Cub'! You get a practical scale model for nice calm days and a distinctive and lively model in one package. Suspect the full sized 'Wimpy' was not aerobatic on its 30HP flat twin, but mine will loop, roll and stand for some lively low level antics on a mere eight cells at 20 amps flat out.



▲ Not the runway! The white line is actually on a local basketball court, but with the prop gently idling, she looks about ready to go follow that white line to the skies.



▲ UC has a reasonable track, and those big Trexlers - all of 2 3/4" - are fine on rougher grass. Even the prop - a Master Airscrew wooden electric 10 x 6 trimmed to 9 1/2" to match the current rating of the Viper Micro Demon controller - looks about the right size.

board, they rise slightly from the TE to the LE, for one. The aileron bellcranks sit on ply plates, a wire pushrod or nylon snake crosses the wing between them and a FMA Direct S200 'mini' sits in a wooden box in the centre section to drive them. Looking at the cost and weight of sub-micro servos suggests that, in future, I shall put one in each wing and lead wires up the wing, rather than juggle with pushrods.

The built up ailerons are top hinged with clear adhesive tape; this works great on an oil free electric, is light and seals the hinge gap. If you prefer to hinge with covering film, that's fine and equally light. Regular hinges could be used but you'd have to add extra wood to hold them - the weight just crept up a tad.

I dislike big nylon bolts, which don't break in crashes anyway, so used 4-40 metal bolts and T nuts - around 6BA or 3mm in Euro-speak. If she hits between "scraped paint" and "re-kit", I bet the wood T-nut brackets will break out with minimal damage. Fill the void between the TE strips with scrap balsa, with a little 1/64" ply to prevent the bolts distorting the TE. The bolts are perpendicular to the wing lower surface; the T nuts are installed to suit and balsa fairs the nut mounts to the wing upper surface.

You'll notice that I only sheeted the wing centre section, whereas convention would have sheeted the wing root bays. Saved weight and time and the wing is fine - I won! This is not an aerobatic ride, the stresses are low and plenty of aircraft have got by without that sheet - most old timer models for starters.

Getting it together

I'll fit the RC gear as soon as possible, so I can get the gear working with minimal structure in the way. Electrics are fun, you can run the motor without the covering and in the house - try that with a glow motor! Snakes were used for the tail controls, but a closed loop control on the rudder would have saved weight and looked better than a yellow plastic pushrod.

For radio, I used Futaba micros on rudder and elevator, with a FMA Direct S200 mini for aileron. The servos went aft of the wing to free up the overwing bay. The receiver is a Hitec 535, servo taped onto the fuselage side. Wondering where the aerial is? Easy - it's a short Deans whip, mounted internally and horizontally. That may cause a few gasps in the US, but I'm happy with the range available. For a regular aerial, I suggest a tube from drinking straws running from radio bay to the back. I

soldered the controller wires onto the motor - one less plug and socket to carry.

The second premise of successful electric flight is "Don't make it heavy?", so I used "Towerkote" for mine. "Towerkote" has two enormous advantages - it is light and cheap. Other ideas are 1.5 mil clear Mylar or "Micafilm" with a sprayed finish. Such a lightweight aircraft might have flown in plain doped fabric - cream Litespan does this well for low weight. My black on yellow is very "interpretive", so if you want to colour yours like the one in your dreams - go ahead! She'd look good with scalloped LE's for example.

The UC is a typical period birdcage, used to anchor the flying wires. Rigging wires eat power, and I don't plan on competition flying, so I left them all off. Solder the front and rear 3/32" (2.5mm) wire UC legs together in place on the model - check axle alignment against the wing LE. Cross bracing is 1/16" (1.5mm) wire soldered to the main legs. Those fairings, typical of the era, have sides of 1/64" ply with a frame of 3/32" square balsa. Mine are held together and onto the wire with a slower setting CA glue. For wheels, light is good, size can be adjusted for your site. Mine used 2 3/4" (70mm) Trexler wheels initially, then I went to smaller light foam wheels.

No open cockpit model can go out in public without a pilot. Mine is 1/6th scale from "Pete's Pilots" of England, complete with latex ballcap, so my pilot flies in America's tradi-

one last check of systems with a charged pack and go fly. Really fly - taxi out to the strip, perform a smooth and gentle take-off like any other scale model, spend four or five minutes enjoying flying her while exploring her handling. Time your first flight to land with plenty of life in the battery, then around the pattern, down the slope and flair into a three pointer. Let her roll to a stop, power up and taxi off the runway, just like real aircraft do. All this on a power pack once the province of models that all too often have to be hand launched, can barely fly and end flights by flopping down in the grass.

Hangar flying

The last day of January 98 was warm and calm. I had flown 'Wimpy' several times that day on a Leisure gearbox of 3.6:1,

▼ **Without one, a scale model looks pretty silly! Transatlantic effort produced this American looking pilot from England - I sent a copy of the cockpit area to Pete Richards at 'Pete's Pilots' (45 Lichfield Rd, Stafford ST17 4LL). Pete supplied this delightful fellow - pardon his not removing his hat, it is actually glued on to withstand flight stresses.**

when I took off with a fresh pack of 1700s, I always set a countdown timer for six minutes with her. We played around, shot a few "rollers", did some loops, the odd roll. At six minutes I wondered just how long would she fly for, so I started to be economical with the power. Still, I would make the odd low pass, check the top end of the power, even tossed in a loop around nine minutes.

At eleven minutes, we started a slow descent - I prefer to land under power at my discretion. Another circuit was easy - and at last I called "Finals to land". Rolling into a last 180 to full stop, the BEC said "enough" but, on short finals, the controller's reset capability allowed me to open up and flair to land. When she rolled out just short of the strip centre, I looked at my watch and could have kicked myself.

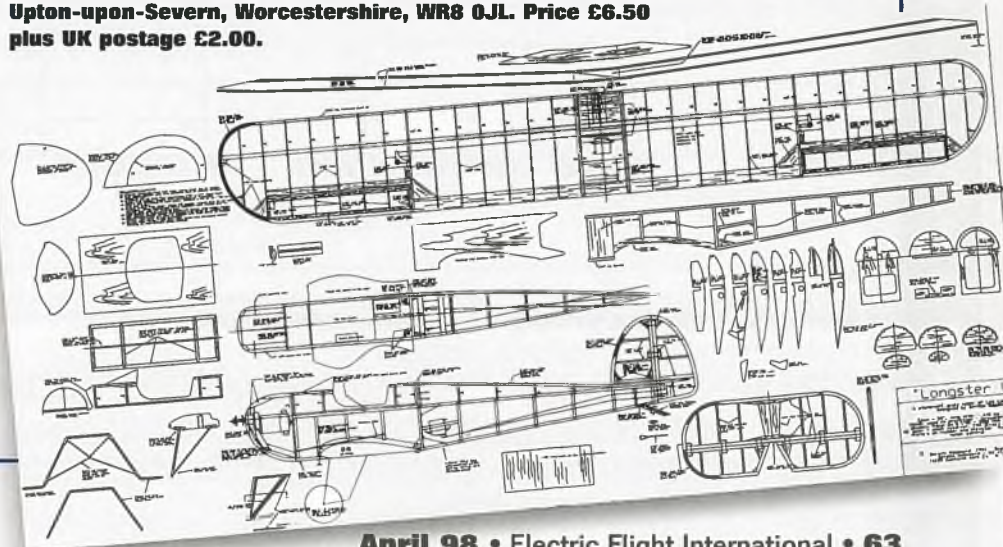
If I had opened that last turn, tapped what juice was left in the battery and landed long, she'd have flown for twelve minutes Still, with a \$40.00 motor and gearbox on but eight cells, in a scale model with a bulky fuselage, birdcage undercarriage, open cockpit, pilot figure and the dummy cylinders - eleven minutes and 57 seconds, with witnesses, is pretty good.

What are you sitting around reading magazines for? **EFI**



MW2656 - LONGSTER WIMPY

Copies of this plan No. MW 2656 for this 59" (1.5m) span model are available from Electric Flight International (Plans Service), Traplet House, Severn Drive, Upton-upon-Severn, Worcestershire, WR8 0JL. Price £6.50 plus UK postage £2.00.



tional headdress (glued on against the slipstream!). "Pete's Pilots" are a boon to models like 'Wimpy' with vast choice, real character and light weight. The scarf, over-length to better flap in the breeze as tradition demands - is a piece of old ribbon while the instrument panel came out of a deceased 'Speedy Bee'.

Now you can check out the systems - with an electric you can do a motor running range check in the street outside your house and the neighbours will be fascinated by what you're doing, not incensed by the noise. Take one more long, hard look at control throws and CG in the calm of the shop and top up all your 'fuel tanks' in anticipation of a great day's flying.

All that's left is to head off to your patch,

▲ **'Wimpy' clatters by on the awesome power of eight cells - we later figured that she cruises "straight and level" on around 90 watts. This was the test flight, by the way - nowadays I seldom fly that high. Must have been 50' (15m) up.**

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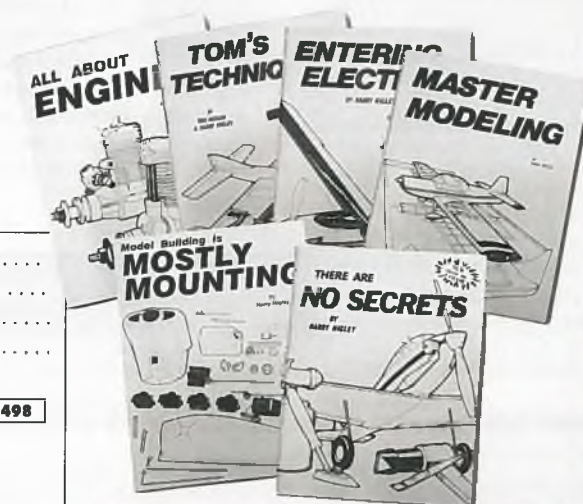
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