

SUPERB CHRISTMAS SAVINGS INSIDE

Electric Flight

INTERNATIONAL

DECEMBER 1998

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REVIEWS**

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DIY Fan Design

**REPORTS ON THE WORLD'S
BIGGEST ELECTRIC MEETS**

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Electric Flight

INTERNATIONAL

DECEMBER 1998 • ISSUE NO. 30

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Editorial

It's Christmas, it's our Birthday and my amnesia is cured!

4 years!

The last issue of the year always reminds me that it is EFI's birthday. The first issue was November/December 1994. We have gone monthly since then so technically October is the end of our year. Birthdays are on the 'date of birth', so that's November - but it could be December too! That fits in with the last issue of each year being birthday time. I find it easier to remember - that way. This issue is the start of our fifth year. I have 'rabbited on' on several occasions about how the electric scene is developing - and changing too. It will continue to do so I am sure. It is the changing scene that makes this seat so interesting. I could do with more time to design, build and fly my own models but I couldn't bear to be far away from knowing what the rest of you are doing.

This Issue

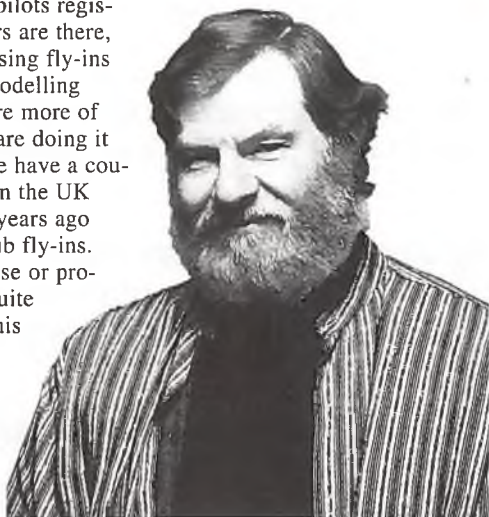
Every issue shows what some of you are doing. I am so aware from the reports that I get every year from fly-ins that contributors visit and I am also aware from what I see at the many that I visit - I am so aware that the fly-ins are getting busier. More pilots register, more spectators are there, more traders are using fly-ins as places to sell modelling goods. Not only are more of you doing it, you are doing it so much better. We have a couple of big fly-ins in the UK each year - a few years ago these were just club fly-ins. Now BEFA organise or promote or sponsor quite major events. In this issue we have reports from probably the two biggest electric fly-ins in the world - KRC (USA) and

Aspach (Germany). These two were on opposite sides of the world - on the same weekend! The models there are incredible, large, small, some complex and some so simple.

This variety is admirable. Most specialist groups get a bit blinkered - only helicopter, only pylon race, only aerobatic, only... so many more. Electrics is still very broad; at electric fly-ins we see so many different types. We still mix, we still take an interest in other types of models (provided they are electric!) That last remark is not quite true. I am very pleased to see that pilots from other (non electric) areas are coming in and showing a spread of interest in all of our varied groups.

Content

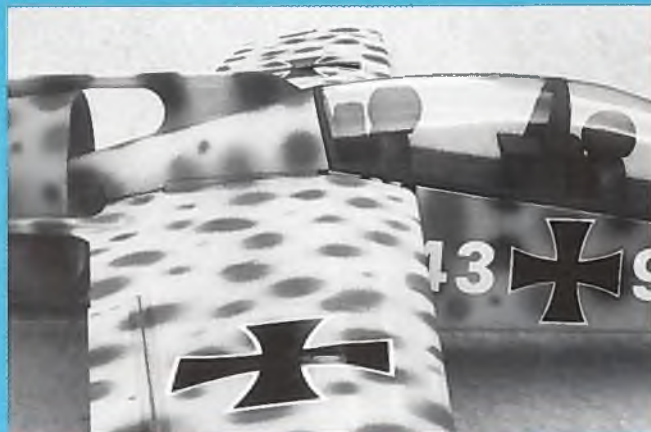
It's Christmas and things get a bit busy at this time of year and the order of things gets adjusted too. A few days before I wrote this editorial I had to decide on which pages to hold until the January issue. Reason? One of the 'extras' at Christmas is a few more pages of advertising so I had to decide what you were going to be without. You will already have noticed that this editorial



Fantrainer 400

The Free Plan for this model was in the October issue of EFI and there were hints about the availability of plastic mouldings for the canopy and fan shroud but no prices were quoted. This was because your editor, keen to keep stable the wooden vacuum forming tools he had machined and cut, had placed them in a box and put them away "somewhere safe" where the relative humidity and temperature would not be too variable. Yes folks, you have guessed - I could not remember where. I usually find these things I have stored "somewhere safe" when I move house. I stored them three and a half years ago and it took me more than a month of careful searching to find them.

They are now with the moulder and by the time you read this they will be available for your models. The canopy will be moulded in clear acetate and the fan shroud in ABS. If you need them please ring +44 (0)1684 589505 and ask for Customer Care. Request "a canopy for plan number MW 2700" or "a fan shroud (two parts) for plan number MW 2700" - or both. I cannot tell you the prices now but Customer Care will be able to by the time you ring. Sorry for the delay.



▲ Fantrainer 400, plan number MW 2700, fan shroud (two parts) and canopy.

is only one page, so after saying "Merry Christmas" there is not much space for my usual monthly message. I have squeezed a few articles to make room for others but I still had too much.

At Christmas/New Year time we usually spend more on ourselves than at any other time (ask any retailer). We spend more on others too. There is nothing more worth spending money on than model goods so I have 'held over' two small 'Guidance' articles in favour of a kit review. Also held over is the whole scale content from KRC - for another kit review.

You tell me you like to know what you are buying at this time of year. Most of you readers are in the northern hemisphere so you will be building not flying; so more guidance on your use of speed controllers and wiring multi engine models (both of which we started in the last issue) can wait until the days are beginning to lengthen.

We are running out of space, so Christmas Greetings to all our readers and Best Wishes for a happy building season - I hope to see many of you out there flying in a month or two.

EFI

Diary Dates

Plan ahead, next year is not far away. If you already know your event dates for next year, let us know. If you wish your events to be included send 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 in the UK.

December 27

Roy's Last Mega Swapmeet.
This is the last one, unless you want one in the next year! At: Lancaster House, Bentinck Street, Farnworth, Bolton (opposite Apollo Motors) tel: 01204 792921. All modelling goods, over 100 stalls with all your favourite dealers, phone to pre-book stalls. Stalls pre-booked £10, on the day £12, two tables £16 pre-booked. Doors open 10.00am. Entry £3, OAPs £2, under 12s £1.50, refreshments available, come to buy, swap or sell, have a ball on the day after Boxing Day.

1999

January 8 to 10

Sinsheim Show, at Sinsheim on the A6 between Heidelberg and Heilbronn, Germany. All model types, exhibitors, traders, indoor flying.

February 12 to 14

MID-WINTER ELECTRICS sponsored by The Silent Electric Flyers of San Diego. This event will be similar to our first - and rather wet - winter fly of this year. There will be symposiums, pylon races, AULD, fight demonstration, a tour of the San Diego Aerospace Museum with a Saturday dinner and a guest speaker. In spite of the El Nino rains, our first Midwinter Electrics was

exciting and was well accepted with participants from as far away as Iowa, Washington, Texas, and New Mexico. The second Midwinter Electrics can expect much better weather with much flying and fun.

Contact: Charlie White, 4420 Ladera St., San Diego, CA 92107-4232, USA.

Tel: (619) 223 8903, email: charliew@adnc.com.

February 14

BEFA Indoor meeting at Parklands Leisure Centre, Oadby, Leicester

March 14

BEFA AGM at Royal Spa Centre, Leamington Spa.

April 21-25

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

August 14/15

Inter-Ex 14, Nederweert, Netherlands.

2001

June

Second World Air Games. All types of flying including some model categories (no electrics last time). Further information on the website:

<http://www.fai.org/wag>

ELECTRIC FLIGHT

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'Sports Electric' Helpline - Phone/Fax: (01227) 771331.



- MAIL ORDER - SPORTS ELECTRIC FLIGHT FANS AND GEARBOXES

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MG Twin 550	£48.00
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TAB CNC 2.1 & 3.45:1 for 480's	£40
Mini Olympus	£7.50
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Motors & Gearboxes

Speed 400 FG3	£18.00
Speed Gear 400 4:1	£39.00
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	11x7/11x9	£3.75
	12x8/12x10	£4.00
	13x8/13x10	£4.25
Plastic Folders	8x4	£3.80
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Pulse/Peak Detect 4-8 Cells	£23.00	
Speed Ex Digital		
as above with Discharge	£50.00	

Current Affairs

More new products to add to your shopping list.



Dallaire Sportster

This is the latest kit by the 'Spirit of Yesteryear' Model Aircraft Company in Canada. They 'revive' old model designs, re-issue kits for radio control and a lot of them are for electrics.

The original was a 1937 free flight model and I'm not sure what size that one was but this one has a wing span of 52" (1320mm) and 341 sq.in (22sq.dm) of wing area. Whatever the original size, the wood strip sizes must have been scaled down: there is a lot of very slim balsa strip in this kit. All the original formers and ribs that would have been a laborious careful cutting job are lazer cut for you; you should be just able to see some of the fine cutting in the photo of the box contents.

The model is intended for Texaco 1/2A competition with a small IC motor or for sport electric with a Speed 400. This model will build up so light

▲ Part of the kit box label of the Dallaire Sportster for 400 motors.

weight that you may possibly have the option of direct drive or gearbox.

Expect a review soon, as soon as the box was open the editor grabbed it and vanished. (He is old enough to remember when all model aircraft were built this way so as soon as he had recognised the high standard of wood selection and quality of cutting, he was off to the workshop to commence construction.)

There is a mail order service but it may be worth checking if there are any importers or dealers in your area, phone/fax +1 (705) 737 0532, Monday to Friday 1000 to 1800 hrs, Saturday 1000 to 1600 hrs and phone +1 (705) 726 6208 after hours. (Remember to first work out the time difference!) Address is: Spirit of Yesteryear Model Aircraft Company, 40 Holgate Street, Barrie, Ontario, Canada, L4N 2T7.



▲ Dallaire kit box contents.

Videos

You may wish to be sociable at Christmas time (instead of spending all your time building models). You might just want to sit down with the others and watch a video. You may even wish to give someone else a video, knowing you can borrow it when you wish to see it.

There is a long list of Traplet videos - check the list in this issue - but these are all models. If you wish to see some Big Stuff, try the 'DD Video' range of videos. One has just been added to the range that makes interesting viewing and whether your model flying interests are in scale models of the very latest or of historic aircraft, you will view some exciting subjects and flying in:

'British Airshows 98, The Best of British Airshow Action'. This contains footage from the spectacular RAF 80th Anniversary celebrations at Fairford and shows at:



▲ DD Video.

Farnborough, Mildenhall, Flying Legends Duxford, Middle Wallop, Yeovilton, The PFA Rally, Kemble, North Weald, The Schneider Trophy, Shuttleworth and the King's Cup. Running time 125 minutes. See the 'DD Videos' advertisement in this issue.

Another video house has a whole 88 minutes of one of the shows mentioned above, you miss nothing! It is: 'The Royal International Air Tattoo 1998' from Onyx Productions. Filmed at Fairford in July 1998, the airshow celebrates not only the RAF 80th Anniversary but also salutes the 50th Anniversary of the Berlin Airlift including the Lockheed Constellation, the South African Airways DC-4 Skymaster and supporting DC-3 (C-47) Dakotas. Other highlights include 'Skywatch 98' - offering a fascinating insight into the world of surveillance and reconnaissance.

This video also contains a few aviation 'firsts' from Fairford, notably the Red Arrows flying with the Eurofighter, a debut display from a new a Polish Air Force aerobatic team, 21 Tucanos flying a figure '80' formation. Vintage and modern aircraft perform stacked flypasts and traditional missing man salutes. Contact - telephone: +44 (0)1285 713456, or fax: +44 (0)1285 713999, email: rafbfe@rafbfe.telme.com Internet web Address: <http://www.rafbfe.co.uk>



▲ Onyx Productions.

Astro Gearboxes

Astro Flight have now released the 035 and 05 motors with an 'inline' gearbox. (This is an epicyclic or 'planetary' gearbox, very efficient and puts no side load on the motor shaft.) It has a 4.4:1 ratio, adds only 25mm to the length, output shaft 4mm. Available in the UK from sole official importer: West London Models, tel: 0181-897-2326. Price, 035 FAI, 5 turn: £169.95, 05 FAI 5 turn: £179.95

► **Astro 035 and 05 with new 'inline' gearbox.**



Flying Clocks

One of these will make a good Christmas gift to anyone who is at all 'Aviation Inclined'. Clock watching by keen aviators is now made even more appealing with the introduction of the new 'squadron' of clocks from Clivedon Collection.

Boring old desk clocks are bound for the bin now that these novel time pieces are available. These delightful novelty clocks are made by British craftsmen from English Pewter, each one being hand cast and carefully finished to ensure every one is a miniature work of art.

The monoplane clock is based on the famous US monoplane racer, the Gee Bee, whilst the biplane is a concept design. With wing spans of 125mm and

105mm respectively, each is fitted with a quality clock movement and can be supplied in antique pewter or gold plated finish.

Both clocks are available from specialist aviation outlets or direct from the manufacturer, Clivedon Collection - priced at £26 each plus £4 delivery within UK.

Clivedon Collection can be contacted on, tel: 01749 850728, fax: 01749 850729

Email: sales@clivedon.co.uk



▲ **Highlight Unlimited in glider and electric form.**

40A ESC

Benchmark Electronics 'Microdrive' Electronic Speed Controllers have been on these pages before. They are now offering us a bigger one. In fact it is not physically much bigger than the smaller Microdrives but it is for use with bigger motors.

The Microdrive is available as a ramp start switch (M40S) and fully proportional controller (M40P). Both versions have a 40A continuous current rating and can take 50A for 30 seconds and are suitable for use with 6 to 10 cells and weight with leads is 35g.

The new units use the control system proven on the existing Microdrive range and so have the same advanced features such as auto set-up, LED status indication and spurious signal protection.



Clivedon Collection Clocks.

The units use the most advanced Mosfets available to give the controller a resistance of only two thousandths of one ohm when switched on. This gives very high efficiency and cool operation without the need for heatsinks.

The M40P costs £55, The M40S costs £49. Both are covered by the Benchmark full refund guarantee. Available from Benchmark Electronics Limited, Low Dryburn Farm, North End, Durham, DH1 4NJ. Tel: 0191 3846444, fax: 07070 711131. **EFI**

► **Microdrive M40P.**

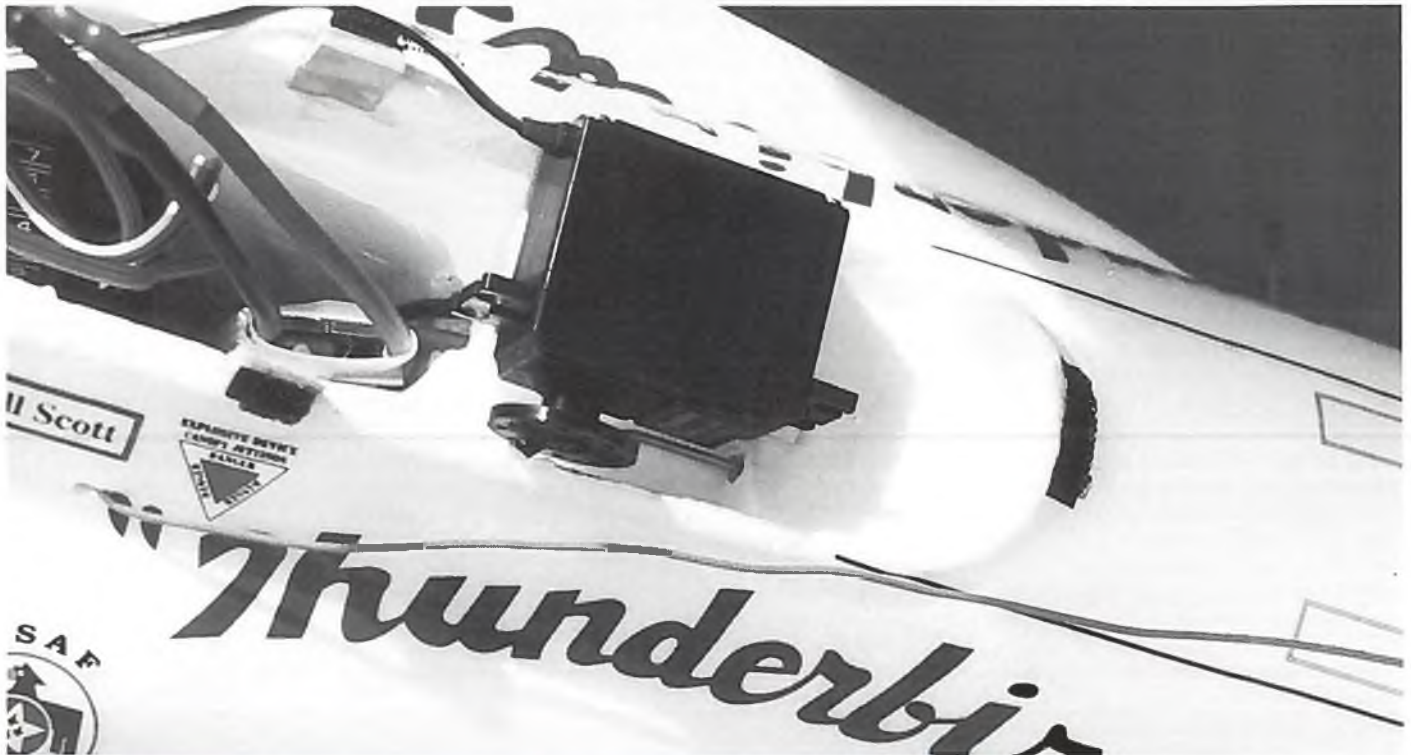


Highlight

Two new electric gliders have been announced by West London Models, the 'Highlight' and 'Highlight Unlimited'. Both come with glass reinforced epoxy fuselages and a carbon D boxed wing that is ready-covered in Profilm. They are for 400 size motors, direct or geared.

'Highlight' has a one piece wing with a span of 1480mm and costs £95. 'Highlight Unlimited' (see photo) has a two piece wing with a span of 1795mm and costs £125. Available in the UK from sole official importer: West London Models, tel: 0181-897-2326.

A Hotter T-33



REVIEW BY: **IAN JACKSON**

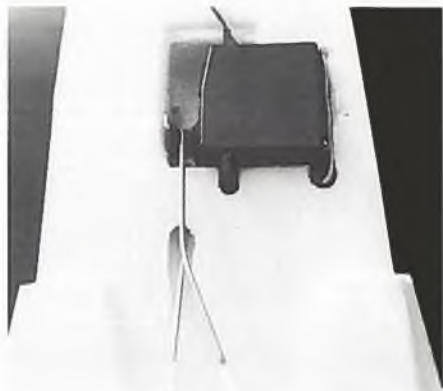
It's a great way into Electric Jets - but experienced pilots are wanting a model with a bit more poke.

Here's how to do it without spending money.

How it all started

I've been flying oil burners for many years now, in most disciplines, but my favourite has always been Ducted Fan.

When it became clear that our local field could no longer support my chosen aircraft because the runway is breaking up, I started to look around for an alternative. It didn't take me long to figure out that the EDF



▲ Cut a cavity to accommodate the servo, route the cable round the servo.

route was ideal, being hand launched and recovered on grass.

My first EDF model was the Robbe Gnat - it was also a total disaster. I followed the mods in EFI to the letter but due to uneven washout caused during covering (my fault) and the lack of ailerons (it used tailerons), the thing rolled into the ground on launch (Gnat builders be warned, watch wing warping during covering). Work is now under way on a set of mods, which will include ailerons but keep the duct clear; I'll keep you posted on the outcome.

This left me with a dilemma - what to build now?

The brief was simple, I wanted an aircraft which could be built and flown with normal controls without resorting to exotic motors etc, and as it happened, the Kyosho T-33 looked like a good candidate, the only problem being that various sources reckoned that it was underpowered. A light came on when a small piece in a show report by your editor said that "the cables etc., in the duct couldn't be helping the airflow, but no doubt someone would come up with an alternative way of doing things". If that wasn't a challenge, nothing was, and so a kit was duly pur-

▲ Canopy off to show elevator servo installation, note also motor cable entry.

target to shoot at - both the servos must be standard size.

After some thought I realised it could be done - this is how.

The Wing

The modification to the wing is to essentially open up the servo mounting space and then lay the servo on its side. All that is then required is to re-route the controls to the aileron horns.

Start by following the kit instructions to fit the wing fixing plates to the fuselage lower moulding - don't join the fuz halves yet and do make sure the wing is square by measuring from the tip aileron line each side to the tailpipe. Mount the wing to the fuselage as it will be when finished, and mark around the hole in the fuselage where the wing mates from inside the fuz. This is the limit of the aileron servo hole that you are about to cut. **DO NOT CUT YET.** Remove wing from fuz.

Draw a line from the port aileron torque rod forward to where the servo will sit, and place the servo on the wing so that it covers the hole already there and the output disc (yes a disc - the same diameter as the servo width) lines up with the line on the wing.

Draw around the servo and cut the skin and foam away right down to the lower skin.

The best way to do this is to melt it away with the tip of a soldering iron as this leaves nice radiused corners which reduces the chance of a stress fracture later. Be very

careful not to go through the lower skin and make certain you don't breathe the fumes! Check that the servo goes all the way to the bottom of the hole and then remove it.

Again using the soldering iron, melt a hole on a line from where the lower hole on the servo disc will be, to the port aileron torque rod. Cover the side of the servo that will be in the hole with masking tape and remove the output disc after first centering the servo. Fit the aileron pushrod for the port side to the output disc and put them in the wing where they will be when finished. Put a blob of epoxy on the servo (actually on the tape) and fit the servo into the wing, fitting the disc and its screw to the servo as you go. This is quite fiddly but not too bad if you 'dry run' it first.

When this is set, fit the torque rod horns and link up both ailerons, bending the starboard pushrod to fit as needed. For neatness, push the servo cable down between the wing and servo so that it exits as close to the hole in the fuz where it will eventually go.

That's it, wing finished as per my aircraft - you could cover the servo hole with film if you like or even plank the fuselage gap, but I didn't and it doesn't seem to do any harm.

The Fuselage

The modifications to the fuselage are almost all done to the top half - soldering irons at the ready!

Temporarily fit the fan shroud into the fuselage and mark a line from the front of the shroud to the apex of the duct join just behind the cockpit. Remove the fan and using the iron, carefully melt a shallow channel (4mm MAX) wide enough to take the motor power wiring, all the way from the apex of the duct to a point on an extension of your drawn line, about 25mm behind the shroud rear edge.

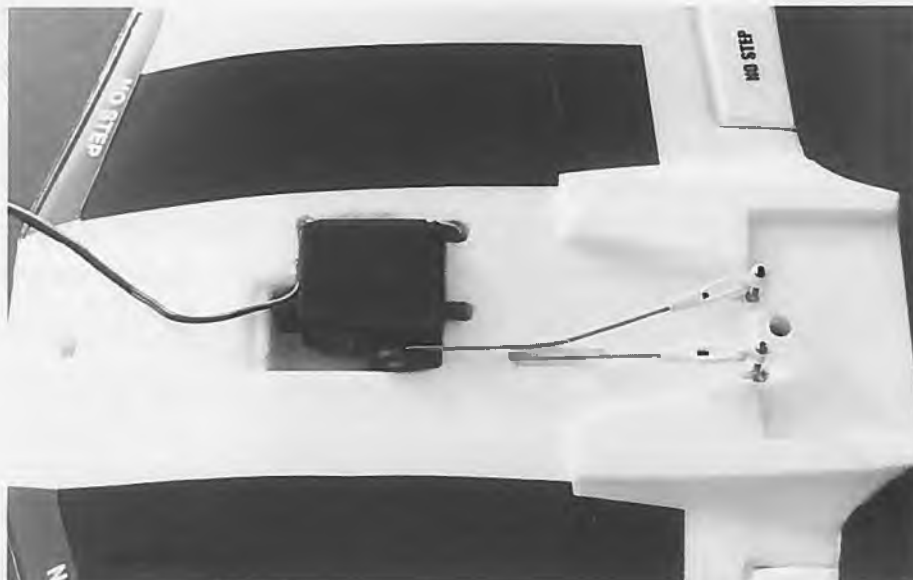
Carefully remove a section of the shroud locating ring so that there is an unobstructed channel all the way from the cockpit (melt a hole through to the cockpit as well) to behind the shroud when the shroud is in place.

Now fit the elevator servo as per the instructions, if you use standard servos, you will need to enlarge the mounting point (there is room for a 148) and after fitting the pushrod (more judicious bending) cover the channel. I used masking tape.

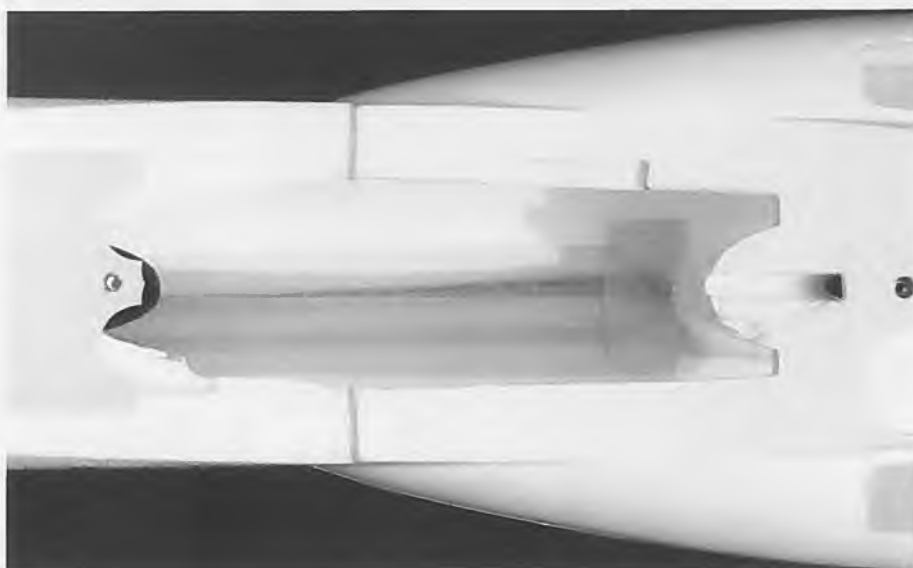
Assemble the fan as per instructions and fit to the TOP half of the fuz using the method given, DO NOT fit it in the bottom half as in the instructions. Run the cables into the channel and on into the cockpit and again cover the channel with tape.

Now for the only mod to the bottom half, a small rebate needs to be cut to clear the aileron servo where it protrudes above the top surface of the wing. Before joining the fuselage halves, if you're going to plank the wing gap in the bottom half, now is the time, taking care not to put anything where it could foul the aileron torque rods.

There is no need to add a taper tube to the exhaust, Kyosho would appear to have done their homework here and the standard fuz tapers cleanly to 61mm already. Continue assembly as per the book.



▲ Fit the pushrods to the output disc and to the aileron horns.



▲ Fuselage underside showing tape over channels and servo rebate.

The End Result

I power mine with an 8 x 2000mAh pack and this gives a static thrust of just over 500g - quite an improvement over the 400g I have seen quoted (about 25% more) and it shows! I haven't altered the intake geometry at all, no rounding or anything, I reckon that as Kyosho had done their homework getting the exhaust right, they must have done the intakes the way they are for a reason.

Launching is easy, it doesn't need a good heave as I was led to believe, but goes off happily with a gentle shove. Full throttle results in a very sprightly performance - so much so that I fly at half throttle most of the time! Aerobatics are good with loops and rolls for most of the flight, the only limitation being that you should be into wind for any that you do after the first 2 minutes. Control response is fairly crisp, with a good roll rate and decent pitch control. I've yet to run out of control authority at all when landing.

Throws are 8mm each way on elevator, 7mm on aileron.

ENJOY! Now, where are the remains of that Gnat? **EFI**



▲ Nice clean intake duct; what is still there is out of the airflow.

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EFSQF

Diversity Model Aircraft

Skat

REVIEW BY: MIKE DODDS

A small light model for Speed 400 Pylon Racing or Fast Fun Flying, for seven cells and aileron, elevator and motor control.

- Speed control with BEC (I used a Jeti 10 mounted on the back of the motor).
- 2 micro servos (I used HS60s, HS80s should fit but there's not a lot of room).
- A micro receiver (I used the new Jeti 4 Channel receiver, available from FVK Models).
- A 7-cell battery (either 500ARs or 600AEs).
- Some covering material for the wing and tailplane (I used a combination of Profilm and Solarspan, both a bit on the heavy side, but as you use so little I suspect it makes little difference).

Fuselage and Tailplane

First the front of the fuselage is trimmed and an access hole cut in the wing seat area.

Two ply nut plates are fitted in the opening. To fit the motor mount you'll need the motor and spinner. Fit the motor to the

mount. Carefully trim the mount so that it first in the fuselage about 1/16 to 1/8th in. back from the front of the fuselage. Use the spinner to ensure that the mount is positioned correctly and then tack the mounting place with CA. Remove the motor and then using epoxy and microballoons make a fillet around the front edge of the mount.

Two holes are drilled in the fin, one for the elevator pushrod outer and the other for an antenna leadout. The pushrod outer is cyano'd in place at the leadout.

At this point the fuselage and canopy can be painted (the canopy can be trimmed to shape after it is painted).

Before the fuselage can be completed you need to make the wing and tailplane. Decide for yourself what shape you want to give the tips of the wing and tailplane. Cut and sand the tailplane to shape. Drill holes in the tailplane and then drill and tap the fin to accept the two nylon bolts (I didn't have taps for the 4-40 bolts provided so I used M2.5 steel bolts instead).

Cut free the elevator and sand a bevel on its

Wow!

Diversity Model Aircraft's Skat is a high performance Speed 400 pylon or sport racer. Its high aspect ratio wing gives it great turning ability at high speed. It flies like it's on rails and is easy to fly. Launching is a bit of an art. You will definitely find it easier to have someone launch the Skat for you. Having said that I'm now quite confident launching my Skat for myself.

Bits

The kit is typical of many from the US, you have to apply the skins to the foam wing yourself. Other than that there is very little building involved. The fuselage is epoxy glassfibre with some carbon stiffening. It is provided unfinished, and in my case had quite a large number of pin-holes. In addition to the foam cores and fuselage the kit contains glass and carbon cloth and 1/32nd balsa to skin the wings, a nice laser-cut motor mount, balsa for the tailplane and associated hardware. A comprehensive instruction booklet is included. This booklet is excellent, well illustrated and easy to follow. To complete the kit you'll need:

- Graupner CAM 5 x 5 props (they break easily, get at least two).
- Graupner Precision Spinner
- Speed 400 6V motor

Specifications:

SPAN:	28-32in (711-813mm)
AREA:	91-104 square inches (5.9-6.7 sq.dm)
LENGHT:	22 in (559mm)
WEIGHT:	14 oz (397g)
AIRFOIL:	MH30
BATTERY:	7 x 500AR or 600AE cells
MOTOR:	Speed 400 6V

EFI • KIT REVIEW

leading edge. Cover the tailplane with a heat shrink covering (use the covering for the hinge or use Diamond tape. After covering cut a slot for the 1/16 ply control horn and cyano it in place.

Wing

The instructions give some alternative methods of skinning the wing. You can use epoxy, contact adhesive or even foam safe cyano. The instruction booklet is very clear and shows a method using large amounts of weights. However, my friend Neil Gillies has a vacuum pump and so with his offer of help, I decided that we would vacuum bag the skins to the cores. Vacuum bagging sounded difficult and complicated to me, but with Neil doing the work it was quite easy! The photos tell the story. First the cores are sanded very lightly to remove the 'fluff'. Next the skins are trimmed to slightly over final size. Two oversize pieces of polythene are cut to size and waxed with a beeswax furniture polish. A bag is made by folding heavy-duty polythene sheet along one side and then sealing around two of the three open sides with double-sided tape. A layer of kitchen towel is placed in the bottom of the tube to allow the vacuum to equalise. Follow the build sequence in the photos 'Step 1 to Step 8'.

Step 1. This shows the skins in their beds with carbon fibre stiffening and glass fibre centre reinforcement in position. The cores, at the front, are very thin indeed.



Step 2. The second picture shows Neil spreading a thin layer of laminating epoxy, using an old phone card to remove as much as possible.



Step 3. Neil then carefully positions the skins on the cores and carefully ensures that everything is straight.

Step 4. The sandwich is ready to put in the bag.



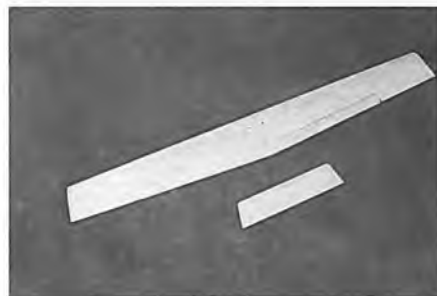
Step 5. Neil checks again that that everything is straight before sealing the bag.



Step 6. The granite block holds the sandwich in place as the vacuum is drawn. After checking and fixing any leaks the bag is left to allow the epoxy to set. Neil has a vacuum pump with a switch that ensures the pump only runs when necessary to maintain the vacuum. It is possible to modify a fish tank pump to draw a useful vacuum, and the pump can run continuously for the 24 hours. After 24 hours the wing is taken from the bag.



Step 7. The leading and trailing edges are trimmed accurately and the 1/16 x 1/8 balsa leading edge is glued on and then sanded to section. Now comes a major decision. What wing span to choose for your Skat. For pylon racing it is recommended that you cut the span down to 28". I decided to start with the full 32" span on the principle that I could always reduce it later. Cut the wing to length and glue



on the quarter inch square balsa tips and sand to shape.

Cut out the ailerons and bevel their front lower edges. Sand a half round channel in both the wing and the ailerons. Epoxy a torque tube into the channel on each aileron. You can now cover the wing and ailerons, but do not attach the ailerons yet.

Using the provided template, drill two holes in the top surface of the wing. Fill the holes with epoxy and microballoons. Once set, use the template again to accurately counterbore and drill holes for the wing mounting bolts. I again substituted the US size bolts with M3 nylon bolts. Using tape, attach the wing to the fuselage. After ensuring everything is aligned correctly, drill through the ply plates in the fuselage using an undersize drill so the holes can be tapped to suit the bolts. After tapping, reinforce the threads with thin cyano.

Step 8. The instructions show two ways of fitting the aileron servo. I chose the second method, which involves cutting a notch in the trailing edge of the wing and gluing the servo in place in the notch. For both methods two holes are cut in the top surface of the wing and the torque rods are pushed through the holes to exit in the aileron area. When fitting the control rods to the torque rod ends ensure that the canopy will fit. Once everything is working properly epoxy the torque rods into the torque tubes in the ailerons and hinge the ailerons to the wing using Diamond tape.

The rest of the installation depends very much on the type of servos and receiver you use. I attached the elevator servo and the receiver to the fuselage sides with servo tape in behind the wing mounting area. The battery is attached to the bottom of the fuselage with Velcro.

I did have a problem ballancing the Skat. The CG range is given as 11/16 (17.5mm) plus or minus 1/16 (1.6mm) aft of the leading edge. The CG on my Skat ended up



1/16 too far forward. The aileron servo stops me from being able to move the battery further back. So far I have been flying the Skat with this forward CG, it seems fine to me.

When setting up the Skat, follow the recommended control throws closely. They are more than adequate, even with the forward CG.

Flying

Once again Neil Gillies readily accepted the challenge of the first test flights, to allow me to take photographs. On a breezy afternoon the launch was uneventful, the Skat dipping slightly from a good heave and then climbing away rapidly. After a few seconds familiarisation Neil was soon flying circuits as low and slow as possible, to give me a chance to get photos. I tried! In the two flights I ran through a roll of film. It's a small model and they are too small for publication.

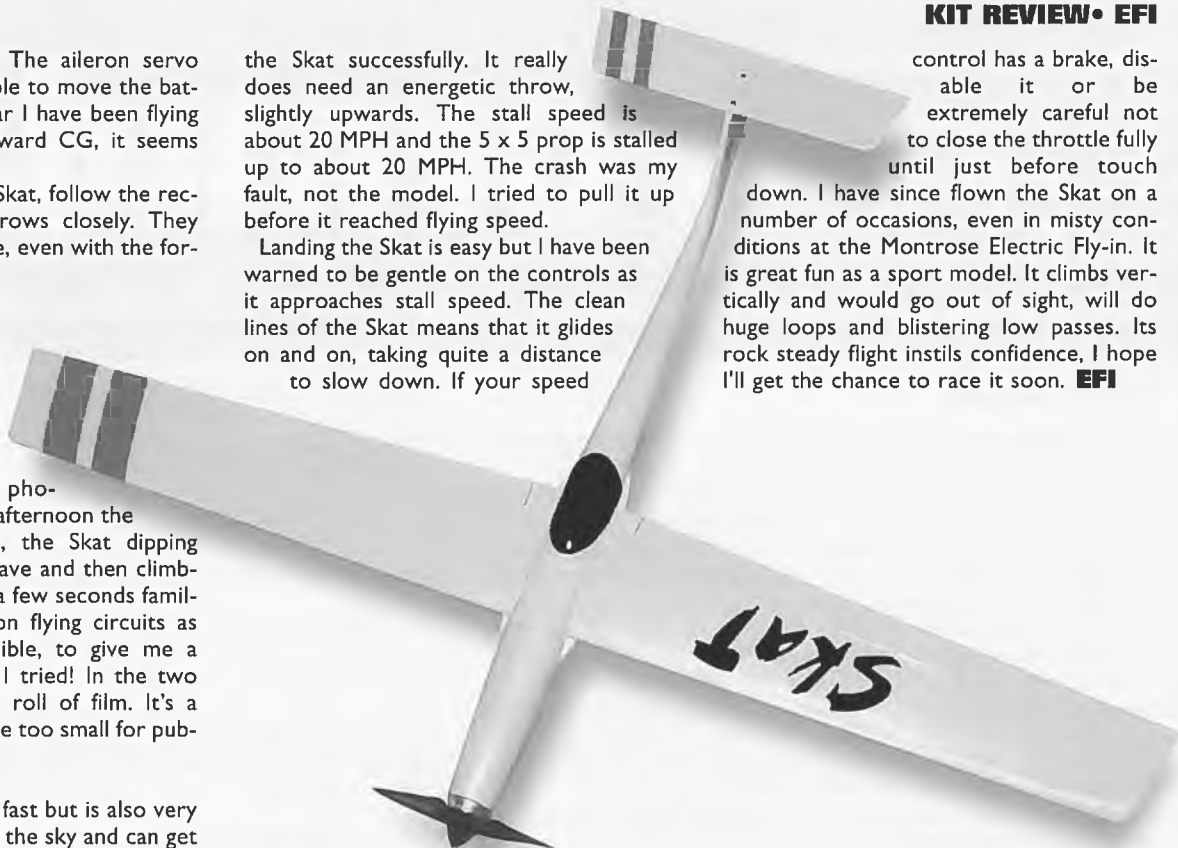
The Skat is very, very fast but is also very well behaved. It eats up the sky and can get very small extremely quickly. The Dunfermline Model Aircraft Club electric fly-in was the day after the first test flights. Neil and I were the organisers and we were at the site an hour or so before the official start time. We decided that I would fly the Skat for the first time before anyone else arrived. This time it was flat calm. A combination of my lack of experience with this type of model and perhaps an insufficiently vicious throw lead to the Skat failing to reach flying speed and hitting the ground quite hard. The wing was creased, a prop broken and some minor damage done to the wing seat area of the fuselage. A few days later repairs were complete and I flew

the Skat successfully. It really does need an energetic throw, slightly upwards. The stall speed is about 20 MPH and the 5 x 5 prop is stalled up to about 20 MPH. The crash was my fault, not the model. I tried to pull it up before it reached flying speed.

Landing the Skat is easy but I have been warned to be gentle on the controls as it approaches stall speed. The clean lines of the Skat means that it glides on and on, taking quite a distance to slow down. If your speed

control has a brake, disable it or be extremely careful not to close the throttle fully until just before touch

down. I have since flown the Skat on a number of occasions, even in misty conditions at the Montrose Electric Fly-in. It is great fun as a sport model. It climbs vertically and would go out of sight, will do huge loops and blistering low passes. Its rock steady flight instils confidence, I hope I'll get the chance to race it soon. **EFI**



MANFRED MALTEN Fans^{with}Formulae

Part 5: Basic theory and practical tools for the Design and Construction of Electric Ducted Fan Units.

Efflux Velocity

On with the theory. In July 98 we started to set the Scope Of Work (SOW) by fixing not only the required thrust but also the efflux velocity for our own-design fan. This may have surprised some, because, at least in the not too distant past, most often only 'thrust' was mentioned in the advertisements, implying that the more thrust an impeller has to offer, the better it is. This limited view however is only partially correct. Having enough efflux velocity is much more important for performance than having an enormous (static!) thrust. Anybody shaking his head? Please read on:

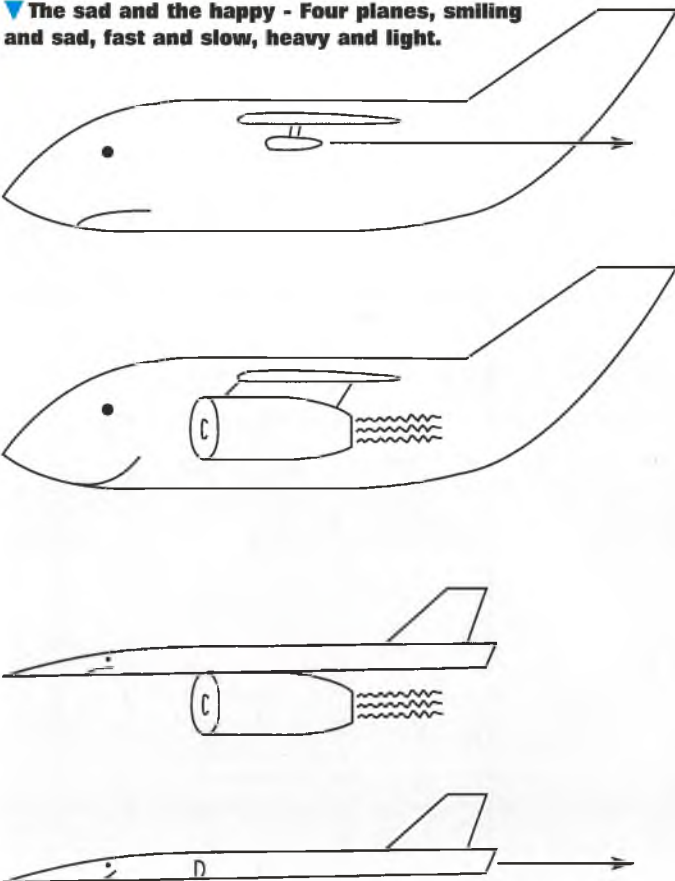
For widening the base - the March 98 article dealt with 60mm and 80mm fans for 6V Speed 400 motors - and before working out the significance of efflux velocity, let's calculate it for an imaginary sample impeller which your dealer may have on the shelf. Let's say it is described to offer modest (but honest) 5.5 N of thrust. Previously you were stuck with this figure, but now you take out vernier calipers, measure the diameters of its centre body (40 mm) and shroud (90 mm), and calculate away.

Analysis of the formulae previously provided shows that thrust depends on the annular cross section (A_o) between centerbody and shroud, because this governs the mass of air which can pass through the system at a given speed. If therefore we know thrust T and this area A_o , we can calculate the corresponding efflux velocity c_4 .

$$(13) A_o = \pi * (r_s^2 - r_b^2);$$

wherein r_s and r_b are the radii of shroud and body respectively in meters [m] please.

▼ The sad and the happy - Four planes, smiling and sad, fast and slow, heavy and light.



Starting with (1A), an expression for efflux velocity c_4 evolves from the following chain of substitutions and conversions:

$$T = \dot{m} * c_4; \rightarrow c_4 = T / \dot{m};$$

$$\dot{m} = \dot{V} * \rho \text{ (EQ 4)}; \rightarrow c_4 = T / (\dot{V} * \rho);$$

$$\dot{V} = A_o * c_4; \rightarrow c_4 = T / (A_o * c_4 * \rho); \rightarrow$$

$$(14) c_4^2 = T / (A_o * \rho); \rightarrow$$

$$(15) c_4 = \text{SQR}(T / (A_o * \rho));$$

Done in two steps as above, the calculation of efflux velocity is easy and does not take more than a few minutes. The two steps bundled into one would read

$$(16) c_4 = \text{SQR}(T / (\rho * \pi * (r_s^2 - r_b^2)));$$

or, condensing ρ and π into a single factor

$$c_4 = \text{SQR}(T / (3.77 * (r_s^2 - r_b^2)));$$

which looks frightening at first, but if fed into a programmable pocket calculator or a computer produces results at a snap. Without any frills for printing on paper, a program listing would look like this ('turbo' programs would not even need numbered lines):

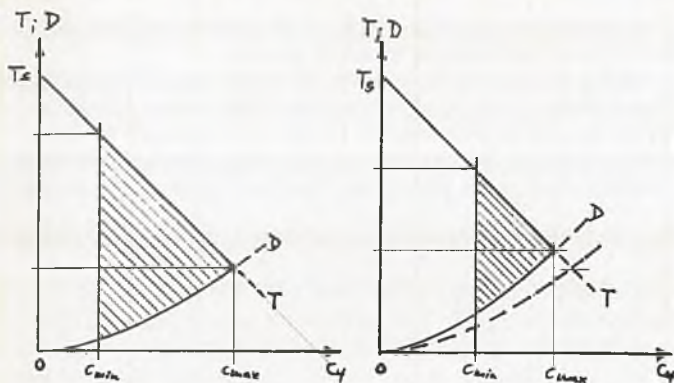
```
10 Pi = 3.1415      '[-]; declares pi
20 rho = 1.2         '[kg/m^3]; declares air density
30 Input "T [N], rs [m], rb [m]" ; T, rs, rb 'your data input
40 c4 = SQR(T/(rho*pi*(rs^2-rb^2)))
50 Print "c4 [m/s] = "; c4
```

The screen would immediately display " c_4 [m/s] = 29.96" (plus a rat's tail of digits) if you entered the sequence 5.5, 0.045, 0.02 for our 90 mm sample impeller.

Bearing in mind that all calculated results represent the maximum a ducted fan unit could do under ideal circumstances, we can interpret the result as follows: A certain combination of motor cum EDF unit which delivers 5.5 N of thrust and measures 90/40 mm in diameters, reaches a maximum efflux velocity of 30 m/s.

Likewise these formulae can be used to verify efflux velocities and thrust figures stated in ads for coherency, and finally, seeing is believing, you can augment your own thrust measurements by calculating the corresponding efflux velocity. An advantage not to be overlooked. Accuracy of the results is determined by you and your measuring equipment and not by some higher interest like sales figures.

The other day in another model magazine I read a preview concerning a new electric impeller, its status given as "under development". Fan diameter was quoted to be 110 mm, and according to the author/reporter the unit will "easily" obtain an efflux velocity of 95 m/s. Thrust for a change was not mentioned in this case, but this can be calculated now, can't it? Take a 55 mm motor centerbody for your calculations. And don't hold your breath for this impeller to appear on the market - with above performance that is. Just one example to show that doing some numbers prior to opening the wallet can be worthwhile.



▲ **Figure 1: Light versus Heavy**

The above diagrams show the relationship of thrust, drag and speed for two aircraft which are identical except for weight. 'Aircraft No 2' needs more lift, hence a higher ground (launch) speed for take off but in turn its top speed is less than that of 'Aircraft No 1' because it has to fly at a higher angle of attack to produce that lift, and therefore has increased drag. The net result is a considerably smaller thrust/speed range for manoeuvring (shaded area).

The Cardinal Question: What do we need c_4 for?

With the above preparation behind us we can work out the significance of efflux velocity, and for this again we go back to the principal equation:

$$(1A) T = \dot{m} \cdot c_4;$$

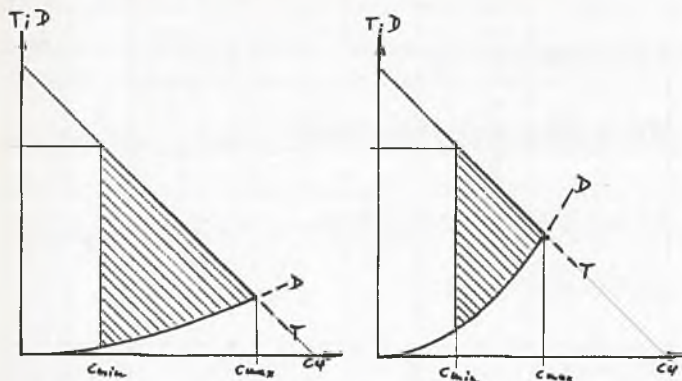
Looked at it mathematically, thrust is the product of massflow times exit velocity, and can be obtained in a multitude of ways by corresponding variation of the two factors \dot{m} and c_4 .

In theory massflow could be made very large and efflux velocity very small for the same thrust. Had we decided for instance to have our fan produce 3.5 N not at 40 m/s but at only 25 m/s (a very bad decision as we will see), then at first glance we would still have 3.5 N of thrust at our disposal. But look what would have happened to the diameter: Instead of 60mm it would need to be 85mm in order to pass the same volume of air! To begin with, we may not be able to install such a large system in our model, also our motor may not be suitable for turning a rotor this large.

This is however only half of the story. Equation (1A), which we so extensively used already, has its limitations because it applies to a special case only. In this abbreviated form it is valid only as long as

▼ **Figure 2: Sleek versus Draggy**

Two aircraft are identical except for their drag, the draggy one suffers similar results as the heavy one in figure 1: Its manoeuvring zone is smaller because the faster rising drag limits its top speed. It is better off than the heavy one however when it comes to landing speed, because needing less lift it will touch down at a lower speed and therefore risk less damage if the arrival turns out a bit sudden.



the system remains stationary, i.e. for calculating STATIC thrust. To see what happens to DYNAMIC thrust, i.e. during take-off and in flight, the formula has to be amended to include the forward speed c_0 [m/s] of the aircraft, whereafter it reads:

(1B) $T = \dot{m} \cdot (c_4 - c_0)$; thrust equals massflow times the difference between efflux and airplane velocity.

This equation now can be used to describe how our EDF system behaves in different states of operation: During static thrust measurements, or when the fans are run up to full power with the aircraft stopped in 'Number One Position' on the runway, maximum thrust is available because $c_0 = 0$. As soon as the plane begins its take-off run however, thrust starts to decrease! That's right, it gets lower immediately!

In other words: As soon as our airplane budges, we don't know its actual 'dynamic' thrust anymore, only the 'static' one it had a moment ago! The knowledge of static thrust by itself therefore does NOT allow us to predict whether a plane will fly or not, although unwittingly it is (mis)used and quoted for that purpose all the time!

This is where the mistakes are made. The figure for static thrust measured or read somewhere is registered and tucked away in the pilot's memory, and subsequently treated like it was a constant throughout the flight from take-off to touch-down. The big surprise then comes at the flying field, when 'inexplicably' the plane refuses to take off or settles back to earth after a hand launch in spite of all its mammoth measured thrust. Chucking it harder or using a bungee will make no difference other than moving the point of impact a bit farther out.

Unfortunately per 'feeling' the remedy seems to be 'more thrust', and if it works, that settles it. Well, maybe it does, but for a different reason than assumed, as we will see in short order.

Let's see what happens to dynamic thrust. While it commences to diminish during take-off, drag, which was non-existent a second ago, starts to rise. These two opposing forces, thrust and drag, finally reach equilibrium, at which time the plane is no longer able to accelerate, i.e. the residual thrust is just sufficient to balance the airplane's drag. This also terminates the plane's ability to climb, it has reached its ceiling altitude.

Two things are very important to realize:

- The THEORETICAL maximum speed our (any) plane can reach in level flight is equal to the efflux velocity of its engines; it can never fly faster than this, not even theoretically, because if a state of $c_0 = c_4$ were reached, thrust would become $T = 0$, and with zero thrustforce no further acceleration is possible!

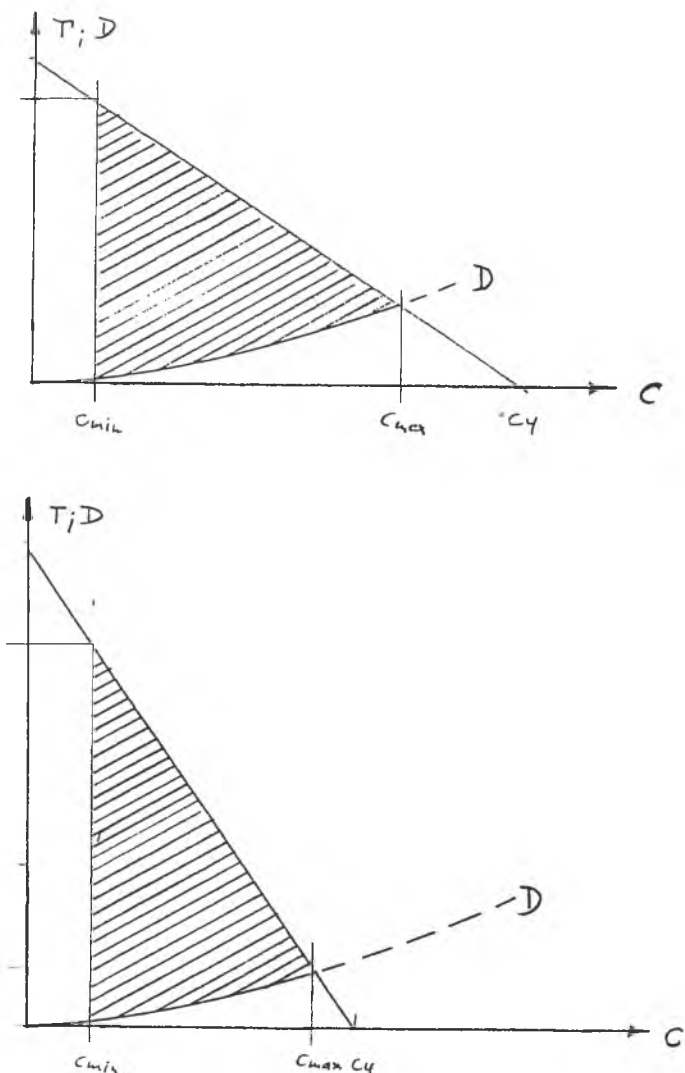
- In real life maximum airspeed is considerably less than efflux velocity because of drag. The difference depends on how clean the plane is aerodynamically speaking. Little information (wishful thinking aside) is available on actual speeds of EDF models but for lack of something better we may borrow from propeller experience and assume a range from 60 to 75 % for a rule of thumb, i.e. a 2/3 relationship between speed in level flight and efflux velocity.

The influence of drag and of efflux velocity compared to thrust can be read from the two diagrams in Figure 1.

Thrust T (and acceleration a with it) decreases steadily as speed rises. As seen above, thrust without the influence of drag would become $T = 0$ the moment flying speed reached a value of $c_0 = c_4$. Drag however rises proportionally to the square of forward speed until $T = D$. This is where all acceleration ends, the resulting c_0 is the maximum level speed our airplane can attain. The drag curve may be a flat parabola for an aerodynamically 'clean' aircraft, allowing a higher top speed, or a narrow, steep one for a larger, draggy plane, resulting in a greater portion of dynamic thrust being consumed to maintain the $T = D$ balance. It is therefore of prime importance not only to provide a sufficiently high efflux velocity to begin with, but also to minimize drag. Racks, bombs, missiles or what have you may enhance the looks of a model, but these decorations not only increase drag but also the mass to be accelerated and lifted.

The problems encountered with some models during take-off are due primarily to insufficient efflux velocity, causing the airplane to approach maximum horizontal speed while still on the runway. If in this state the plane is yanked off with elevator or bumped into the air by a wheel hitting a pebble, the speed difference $c_4 - c_0$ may already be too small to overcome the sudden rise of drag, the plane gets "behind the power curve" and crashes.

If the pilot manages to keep it airborne, the equilibrium between



▲ Figure 3: Speed versus thrust

Two identical aircraft are investing the same amount of energy in their propulsion but with different emphasis on thrust and speed, the one having a higher efflux velocity will have a higher top speed, the one having more thrust may be easier to launch but will have a limited speed range. The art of living is to find the right compromise!

drag and thrust is precarious and ceiling altitude uncomfortably close to terra firma. All it takes to run out of lift and altitude at the same time is some additional drag from control surface deflection, for instance to make a flat turn before the model disappears over the horizon.

Sounds familiar? You may have wondered how little was said about thrust in this scenario, whereas descriptions of similar near - or actual disasters continue to be blamed for it - or a lack thereof. The opposite might be closer to the truth: For the invested electric energy it may have had too much static thrust at the expense of efflux velocity!

Again, Sir Isaac Newton's fundamental equation will clarify this:
 $F = m \cdot a$; [N] = [kg] * [m/s²];

Force equals mass times acceleration. This means that whenever a force F is present, the mass m it acts upon will be accelerated, independent of how large or small the force happens to be (or the mass for that matter). Applied to our take-off problem and forgetting about friction and drag for the moment, this means, that our airplane will accelerate with any thrust. The amount of thrust determines how fast it will ACCELERATE, but not, how fast it will FLY!

Let me repeat this: Maximum speed is not related to static thrust.

To forestall the argument that nevertheless there seem to be cases where 'more thrust' cured a marginal take-off and made the models flyable, I invite you to re-examine the description of said cases in the light of what is written above, and then maybe come to a different

conclusion. Scrutiny of the measures taken will invariably reveal, that c4 was instrumental to the improvement:

- Where the original fan units, i.e. the diameters, were retained and higher thrust was obtained by simply increasing motor voltage (= RPM), this required more air per second to pass through the same outlet, and this is only possible via an increase of efflux velocity c4.

- Where more thrust was obtained by switching to other, obviously smaller fans, c4 had to increase twofold, first to let the same mass of air pass through a smaller opening than before, and then once more to let pass even more air for increased thrust.

The essence of all this is, that while more thrust was indeed installed and then given sole credit for the improvement, the real remedy was the (incognito) increase of efflux velocity.

The conclusion to be drawn from this: Had enough efflux velocity been installed (i.e. designed into the fan unit) to begin with, the increase in thrust might have been unnecessary. Also, this higher efflux velocity could have been effected at the same input power (and battery weight) by simply selecting a smaller diameter fan unit. It is therefore not always the larger fan which is more suitable, in fact 'input for input' it rarely ever is!

Having sufficiently knocked thrust, and before you run off to put plugs in the nozzles of your planes to increase c4, let me hasten to state that of course a good amount of static thrust is also important to have, together with enough efflux velocity. Thrust makes the difference between limping down the runway or being off in a flash. Thrust determines - no, not speed - sorry - but how long it takes to get up to it, and whether the runway is long enough for that. This will be seen in the diagrams in Figures 1, 2 & 3.

▼ Belts and Braces

Reference and Comparison Table for Formulae. Listed by the numbers they were assigned in the March 1998 issue of EFI.

{1} $F = m \cdot a$;	$F = m \cdot a$;	[N];
{2} $a = (v_2 - v_1)/t$;	$a = \frac{v_2 - v_1}{t}$;	$\left[\frac{kg}{s}\right]$;
{3} $F = m \cdot (v_2 - v_1)/t$;	$F = m \cdot \frac{v_2 - v_1}{t}$;	[N];
{4} $m/t = m \cdot \dot{t}$;	$\frac{m}{t} = \dot{m}$;	$\left[\frac{kg}{s}\right]$;
{5} $a \cdot t = c_e$;	$at = c_e$;	$\left[\frac{m}{s}\right]$;
{6} $T = m \cdot \dot{t} \cdot (c_e - c_f)$;	$T = \dot{m} \cdot (c_e - c_f)$;	[N];
{7} $m = v \cdot \rho$;	$m = v \cdot \rho$;	[kg];
{8} $m \cdot \dot{t} = \dot{V} \cdot \rho$;	$\dot{m} = \dot{V} \cdot \rho$;	$\left[\frac{kg}{s}\right]$;
{9} $\dot{V} = V/t$;	$\dot{V} = \frac{V}{t}$;	$\left[\frac{m^3}{s}\right]$;
{10} $A_o = \pi/4 \cdot (d_s^2 - d_b^2)$;	$A_o = \frac{\pi}{4} \cdot (d_s^2 - d_b^2)$;	[m ²];
{11} $c_e^2 = T/(A_o \cdot \rho)$;	$c_e^2 = \frac{T}{A_o \cdot \rho}$;	$\left[\frac{m^2}{s^2}\right]$;
{12} $c_e = \sqrt{T/(A_o \cdot \rho)}$;	$c_e = \sqrt{\frac{T}{A_o \cdot \rho}}$;	$\left[\frac{m}{s}\right]$;
{13} $c_e = \sqrt{T/(\rho \cdot \pi/4 \cdot (d_s^2 - d_b^2))}$;	$c_e = \sqrt{\frac{T}{\rho \cdot \frac{\pi}{4} \cdot (d_s^2 - d_b^2)}}$;	
{14} $c_e = \sqrt{T/(0.9424 \cdot (d_s^2 - d_b^2))}$;	$c_e = \sqrt{\frac{T}{0.9424 \cdot (d_s^2 - d_b^2)}}$;	
{15} $F = m \cdot a$;	-----> {1}	
{16} $a = F/m$;	$a = \frac{F}{m}$;	$\left[\frac{m}{s^2}\right]$;

Summing up

Some airplanes just run out of runway! Given a few more kilometres for slow acceleration and a hawk eyed pilot to keep them in sight they would make it!

Too much thrust at the expense of c_4 leads to take-off problems due to insufficient top speed. Too much emphasis on c_4 to the detriment of T also would lead to take-off problems due to insufficient acceleration. An airplane needs a fan unit with a well balanced couple of both thrust and efflux velocity for acceptable performance both on the ground and in the air.

More information

If the real c_4 is less than 30 m/s then life promises to be short and miserable, especially with draggy airplanes, and no bungee in the world will cure this!

A reminder

All our calculations reflect ideal conditions, which do not exist in real life. Actual results therefore will inevitably be not quite as good as we calculated. That's why, as a first attempt we did shoot for 40 m/s with our own design fan unit. This may turn out to be a bit ambitious but in any case even after losses it would leave us with a good sized margin for a dynamic flight.

If we had the means to do it, would we further increase efflux

velocity? This depends. For a given thrust too high an efflux velocity is no good either, it results in low external efficiency and therefore is a waste of electric power. With the limited amount of energy at our disposal, economical use of battery capacity is the main incentive for not getting carried away. Power is not for free, more of it means more current being drawn, which results in higher thermal losses both in battery and motor. Motor life aside, more current also means less flying time, which may be alright if we design an EDF system primarily for a spectacular two minutes display of hot performance during a meeting or airshow, but may not be so welcome for week-end flying. In this light we may have to take another look at our chosen 40 m/s later on.

Parting thought

Having seen my BASIC formulae fare in print and realizing how even correct ones may be hard to read for those who are not familiar with computers, I am about to absorb another type text processor which allows to display them in the customary way - provided the scanner can cope with multi-line formulae.

Looking at (13) in both versions, I am not all too sure which one to put my bets on.

Having sufficiently confused you with theory I leave you until next time, when we will tackle the calculation of the input power required to achieve our design goals of thrust and speed - and - space allowing, also get our hands on some wood again to make another practical tool for building an EDF unit. **EFI**

Fly Indoors!



polystyrene wallpaper lining material available in thin sheets. 3mm Zepron was the most common thickness used at Sinsheim.

Dave Ridgeway has constructed the entire model from expanded polystyrene sheet. He reports it as "very quick to build" and "the performance is all one could wish for - slow and realistic". **EFI**

Specifications:

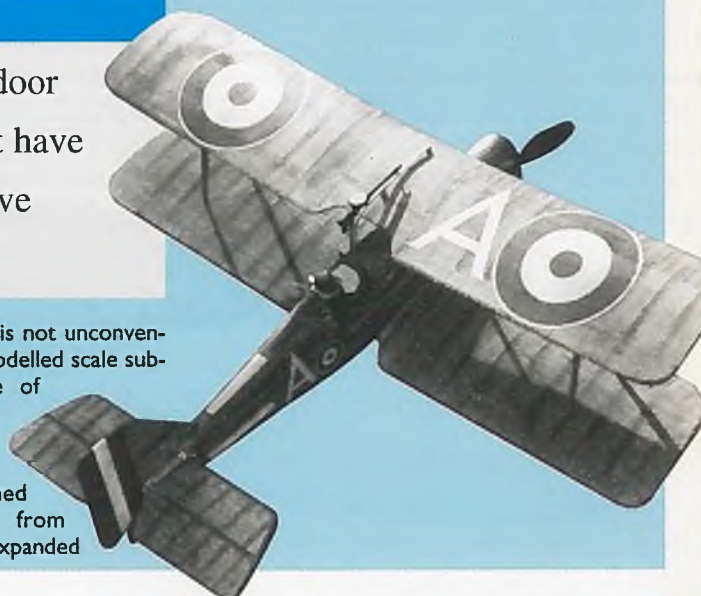
WING SPAN	26" (660mm)
WEIGHT	4 oz (100g)
MOTOR	WES 5-2.4
RECEIVER	Ceto
SERVO	2 x HS 50
ESC	Proflight

WRITTEN BY: **DAVE RIDGEWAY**

It is that time of year. This is the time to fly indoor models, for several months many of us will not have the opportunity to fly anything else. This is Dave Ridgeway's latest.

This guy does not only fly indoor models. He has designed and developed several models for conventional electric flying. In fact, before his recent conversion to 'electrics only' he designed and even kitted many IC powered models - often unconventional.

The subject on this page is not unconventional - it is a very often modelled scale subject - but Dave's choice of materials is not so common. The editor's report of the Sinsheim Show (EFI, May 1998 issue) contained several models built from 'Zepron', a self skinned expanded



DERECK WOODWARD Over Here!

Electrics is fun! Look at this month's selection of sports models and see how other electric fliers D-I-Y design their own models.

KRC 98 is now history - the reports will appear soon, but trends show that 'Over Here!' was there first. We saw less of the 'cookie cutter' low power soarers; most folk used the grass to launch smaller scale and sports models, while many sports aerobatics flew up a storm all weekend. Yours truly was right in there, with my 20 cell MaxCim brushless Sig Four Star Forty, eight cell 'Wimpy', ten cell 'Pandora' - and the 'Pat Mattes Models' 'Blue Foamie' (everyone has to get serious sometime!).

The exhilarating high cell count models are catching, as folk realise that electric models can perform as well as their oily counterparts, but they are still the tip of an awesome iceberg. From tiny models of heavy metal fighters, flying with the authority of their prototypes, through every size of sports and scale model, the future is here - quietly!

Working Indoors

We left off last month with a 48" x 9" wing on a big sheet of paper - better draw something to sit on it. I'll follow the philosophy of Chuck Cunningham

from Texas and make the fuselage length 70% of the span. Believing in simplicity, Chuck measures from the back of the spinner to the rudder hinge - I know that works, so that will be 34" for my new model.

The wing chord takes up 9" of that, with just over half of it from the TE to the rudder hinge - say 18" or 19" - and we're left with 8" or 9" ahead of the wing for the nose. Bet you thought model design was complicated? Well, it can be, but there's many good models designed as I've described. Remember - we are out to please ourselves, not make millions or appease law-makers and nosepokers. The fuselage shape can be defined by laying the big bits around a line with the above drawn on it, with vertical offsets derived by "If it looks right, it'll fly right".

For example, an upright glow engine is less trouble, but turns a fairly small prop - a partially cowled upright engine with a low thrust line works well for sports models. My 'Amelia' (low wing sports) and 'Amy' (low wing tailless aerobatic) looked like that. As I'll be using 10" or 11" props, and electric motors run fine in any attitude, I'll use a cowl shape borrowed from inverted in-line engines in the full sized world. Another

advantage is having the ESC out of the escape path of the nicad pack, if you are prone to pessimism. Look at the early DH Moth biplanes compared to the Tiger Moth, for well-known examples.

Both low and high power versions will use the same primary fuselage box with spruce longerons and balsa uprights. You'll have to wait for the sketches to see what the secondary framework will do to create both a low power, mildly aerobatic cruising model with an open cockpit and an aerobatic version with low-drag canopy and other trimmings.

So, there's the two big bits - next month, we'll add the tailplane and fin while sorting out the sort of controls that will keep even me happy.

Of course -

There's always 'Design by Copier'! It's Ron Fikes, one of e-flight's prolific builders, and his approach to having something different to fly. This is

easy - take a 16" span 'Bostonian' class rubber model plan, toss it on a copier, select '200%' and push the button.

Bostonians come in many shapes - there's even one that looks remarkably duck-like - but all are 16" span, so twice that gives a handy 32". The body comes out real fat - the rules stipulate the fuselage must enclose a hypothetical block under the wing and comes out too wide for comfort, so Ron made his 2" wide. The rudder and elevator are eyeballed for size and are all that is needed for control.

Power is the ubiquitous Speed 400 6V on seven 500AR cells. Seems like the US has overcome its phobia about using "Speed 400" to describe this class, despite it being Graupner's name for these little can motors. Yes, just like Europe has always done. There is hope! With micro servos and a Jeti 10B ESC/BEC, this little fellow flies at around 16 ounces in very spirited fashion.

As indeed it should! The Phil

▼ **My favourite! Dan Chies' 34" Fw190 "Dora" is cool beyond its 34" span. A light balsa frame is covered in tissue with white glue, and painted with artists' acrylic. Dan reckons the hard part is the spinner - it's tough to make it run true. S400 scale is catching on fast in the US, with this being the standard to aim for.**



'Large Scale' from Ron Fikes - twice life size! 'Silver Schtick' is a 16" span Bostonian class rubber model, whose ancestry is obvious. Ron blew the 'Bosty' class plan up 200%, slung in a S400 and seven cells, with rudder and elevator controls, and a neat see-through finish. Beckons if he can do it, anyone can. Love it, want one for next year.



▲ A glider for all seasons! George Stringwell sets off to do battle with this neat line in model cum support kit all terrain vehicles. There's all sorts in this stack - from award winning e-floaters to his neat little mini aerobats.

Kraft 'Ugly Stik' inspired John Oldenkamp's 1992 Bostonian 'Silver Shtick'. Ron's structure owes more to the rubber powered version than overbuilt RC 'Stiks', with 1/8" square Basswood spars and 1/16" ribs, and a fuselage mostly from 1/8" balsa strip, but the concept went from RC to FF and has now gone back to RC.

Plans? Well, the reason that Ron turns them out so fast is that he doesn't bother with plans at all! He also reckons

that a 'large scale' Bostonian is so easy, if you want one that bad, you should be able to do it yourself easily. He's got a point - so somewhere in the 'To Do - Real Soon' pile is a real monster. I took a recent 'Bosty' plan and did a 250% number on it for my MAT S400 belt drive unit - a whole 40" span. Once the BDF has had its annual Autumn/Fall clearout, I intend to whip one of these up for myself - maybe that plan will make it to print!

"I did it my way"

Must be the theme tune of the 'own design' modeller. The US looks funny at folk who 'OD' - political correctness fogs common sense, even in aeromodelling! But some of us cannot build the same models as others, and Brits who have been around know that only one person can claim a design as OD'.

'Over Here', the argument tends to "Does 'scratch built' mean a model from a plan?" - with overtones of "You built it - don't you know where to buy them from?" Well, George Stringwell really does it 'his way'. Many of you in England will have heard of George's 'Sundancer' soarers - having trailed these low tech, high craftsmanship models in comps. Well, here's George's other side - his sports models!

Yes, the soaring master can make the air tremble over the strip a little! George sells direct to the discerning plans builder through 'Sunfly Models' at 17 Hepley Rd, Poynton, Nr. Stockport, Cheshire SK12 1RP (England, for you lot 'over here'!). His soarers have been covered in all the right places - here are his other designs to stimulate the little gray cells, as the short Belgian detective would say.

'Stinger E' is remarkable - while it travels like it looks, the

power isn't even a 400! A geared Speed 300 motor on five cells hurls all of 18.5 ounces (525g) around. Not just a pretty face, the elevators and flaps are coupled in CL fashion for square corners, and the rudder works too. For a change, there are also options for a straight drive S400 on seven cells with a radial cowl.

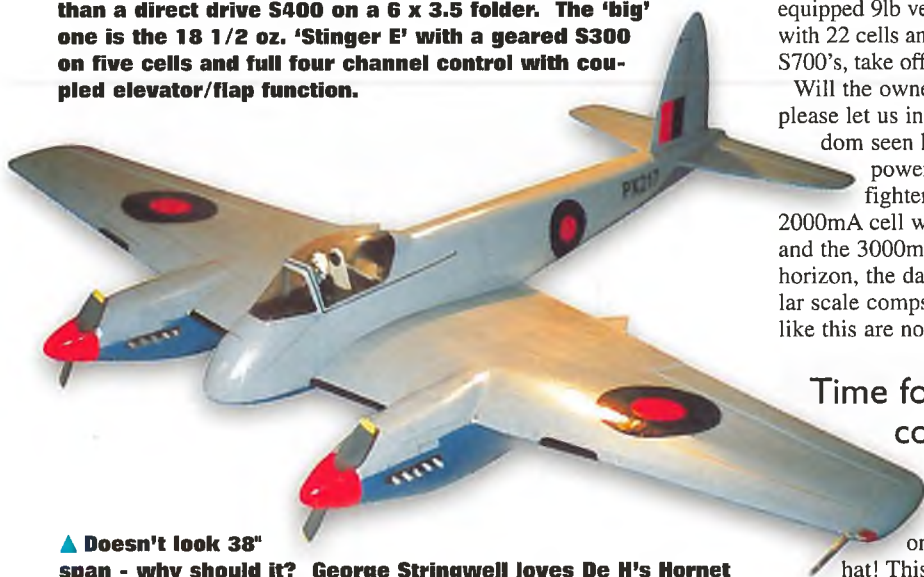
A little more 'basic', the aptly named 'Square Dancer' is for six cells and a 6V S400 - the one shown flies at 15 1/2 oz (440g). The weights are achieved in the old style - well thought out structures that some might think have lots of little bits of wood in them. George sent me a small print of his 'Sundancer' plans and the structure looks superbly thought out - light, stiff and no more complex than I'd use myself. The plans are very well drawn too.

George uses a fascinating covering technique, which he has fully documented in the past. The model is covered in document laminating film - applied like a regular covering film, but is lighter. He then uses clear dope to apply coloured tissue panels, followed by another coat or two of dope.

At the pinnacle of George's plans - and a big surprise - his 'DH Hornet'. This is George's current version - the F1 - of this superb fighter twin. Power for this 38" (965mm) span beauty



▲ The dark side calls - renowned glider guider George Stringwell does occasionally succumb to tearing up the sky! The V tail low wing number is 'Square Dancer' at 34" span, 16 oz, with 7 cells and a 6V S400. You don't get any quieter than a direct drive S400 on a 6 x 3.5 folder. The 'big' one is the 18 1/2 oz. 'Stinger E' with a geared S300 on five cells and full four channel control with coupled elevator/flap function.



▲ Doesn't look 38" span - why should it? George Stringwell loves De H's Hornet fighter and his S400 version looks the part. If George ever goes for the bigger version with retracts and some heavy metal fighter power, the scale world will never look at electric power in quite the same light again. With seven 1250 cells, this little fellow easily handles 34 ounces and is fully sheeted - love it, George.

is but two S400 7.2V motors and seven 1250mAh cells driving Cox 5.5 x 4" props. She's bungee launched - well covered by Chris Golds, and as applicable to models of real aircraft as for jets.

The structure is fully sheeted, with accurate outlines. The wing section is a Selig 3021 for good handling and speed and the only real modifications to the fuselage and nacelle shapes were those needed to blend into the airfoil. George is selling the plans for this one, and is working on the NF21 long nosed version. Seems there is also a larger Hornet flying in England right now - George reports seeing this retract equipped 9lb version at Chester, with 22 cells and direct drive S700's, take off from grass.

Will the owner of that beast please let us in on what is a seldom seen level of electric powered heavy metal fighter? With the 2000mA cell well established and the 3000mA cell on the horizon, the days of flying regular scale comps with models like this are not far off.

Time for a collection?

No, you don't have to run - no one is passing the hat! This month's fleet

comes from Dan Chies up in Vancouver, British Columbia, Canada - a country that is a surprising hotbed of e-flight activity. Firstly, a 'work in progress' as posed by 13 year Michael Chies (who is being brought up properly with full immersion in aeromodelling). Dan's 1/12th scale Me 262 was intended for DF but Dan realised that the jet pods on this sleek shape would be way out of scale, so he flies this one as a catapult glider instead.

Structurally, the Me 262 is fascinating. The main material is blue foam skinned with lightweight brown paper and white glue. The fuselage is made around a balsa keel, the next one will be balsa - Dan reckons there is a surplus 3 oz in there.

What is a glider doing here? Well, the guy who writes this thinks the Me262 is one of the coolest shapes that ever flew! Anyway, having admitted that the nacelles would be cartoons with 480 fans, Dan is going to fit a pair of prop driving S400 6V's and 8 x 800AR cells to take the weight up to around 31 ounces - when he stops having fun catapulting his creation around the sky, that is.

Another of Dan's creations is the Fw190 D. The 34", 1/12th scale airframe weighs but 6 1/2 oz. There's a lot of contest grade 1/16" sheet balsa in the

▼ Dan Chies achieved the finish on his Me262 by skinning blue foam with silkspan tissue and white glue, then painting with artists' acrylics. Due to lack of oil spraying all over the place, no proofing or sealing is needed - electrics win again! The canopy used to be a 'pop' bottle.





▲ Meet Michael Chies - on his 13th birthday, dad Dan let him pose this neat 43" span Me262. Intended to fly with a pair of S400's with tractor props in the front of the nacelles, Dan currently enjoys shooting her off as a glider for short, fun-packed aerobatic flights. Says he'll fit the motors later!

airframe, the whole model being sheet covered. Finish again is silkspan tissue with white glue, then Dan's favourite finish of 'Liquitex' acrylic artist's colour paint - another case for sniffing around non-modelling sources.

That 34" span packs 195 square inches with a S3021 airfoil. A 6V S400 turns a 6.5 x 4.5 prop on 8 x 600AE cells. Dan mentioned that the home-made - and big - spinner is tricky to make run true. These little scale models can really perform, and are becoming really popular in the US. Agreeing with Ron, Dan reckons that if you can contemplate something on these lines, take your three-view off to the copyshop, blow it up and go for it!

▼ Early press release! 'Over Here' really has built a big one - this is 60" 'Four Star 40' with its MaxCim brushless motor and 20 cells. Minimally altered Sig kit is a delight to fly - on her third flight, in front of the KRC audience, I flew my signature take off - airborne into a half roll to inverted. She's got some more decoration on now - more to come.

Initial assessment of performance - WOW!



Short Circuits

There's this idea floating around about trying out electrics with decent power. Basically, it involves those two seven cell packs I bet you've acquired to fly your 'snoarer' on, and using them to feed a geared Graupner S700 motor with maybe a 12" prop. This lot is fitted into a handy '40' sized oilybird, preferably of the lighter sort, to provide a cheaper way into electric sports than going full house 'Buy-buys'. Another economy measure is to buy another cheap seven cell charger to charge each 7-pack separately.

The purists may howl, but it is feasible and I'm on trail of the guy who came up with the idea. I talked to John Swain of 'Fanfare' while Sue and I were

over in England and he is introducing a new gearbox for the S700 motor. This could well be in their ads by now, so a decent sports electric is getting closer. All that's needed now is a 14 cell capable speed controller that won't cripple the piggy bank and we're off.

One thing that puts me off direct drive is that motors have bendable prop shafts. This means either using a folder - expensive, not as efficient as a rigid prop and unhappy in high G aerobatics - or risk writing off the motor by bending the shaft on landing. Aside from Tom Cimato's replaceable propshaft on his new 'MegaMax' 30-cell brushless - a propshaft saver is a good idea.

'New Creations' sold one comprised of a composite frame supporting a ballraced 1/4" propshaft set-screwed onto the motor shaft. This also gave a decent prop-nut to attach regular props with. One sold in England was a two part affair, one on the motor, the other on the prop and the two held together with rubber bands to allow a prop to be pushed aside if it caught the ground. Seemed a good idea, especially for S400 motors, which have notoriously weak shafts. Is that type still around anywhere?

Direct drive can be handy for higher speed models and might yet make a serious comeback if the technology Tom Cimato is experimenting with trickles down to smaller motors. Tom's latest will turn over 20" of prop on 30 to 36 cells at 4,000 - 5,000 RPM. While hardly mass market at that level, it is a great concept. No gearbox losses, lower noise - and even the prop noise is low at those revs, while 'awesome' is a word that springs to mind when describing the power to pull a quarter scale Fokker DVIII vertical for a long way!

I'm home...

The Four Star 40 flew once before Sue and I set off for three weeks in England. On the Friday pre-KRC, I reminded myself of her abilities with a check flight. On KRC Saturday, I eased her onto the strip, swung into wind and let those 600-odd watts loose. Off the deck, lazy-roll to inverted and push to vertical. The 'Four Star 40' went where pointed and we were soon flying knife edge, long four point rolls and sequences of inside/outside loops without batting an aerodynamic eyelid.

The 'Four Star 40' has to be the best fun I've had in a field with a bunch of other guys in ages. Even the display pilots at KRC remarked on how forcefully it flew - this model is everything an electric sportster should be. I've learned enough throttle management to be airborne six minutes with power left - making it last is one of the great challenges of e-flight, while two vertical rolls at around five minutes shows how the MaxCim brushless puts out the power.

Guess what - it won't thermal! Now I can build my Kavan 'Wingo' and settle down to a winter of having a model for all reasons - from my 'Kolibri' Slow-fly all the way to the Four Star 40.

I'm off - snail mail to 11159 Captains Walk Court, North Potomac, MD 20878 or Traplet Towers, please. Drop by on 'weekendpilot@juno.com' for an e-natter, but that won't take attachments. Please - well composed glossy paper shots of what you're up to this winter, or you get my stuff! Back next month, folks, in the meantime - if you're landing with a cool pack, you aren't trying. **EFI**

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Gold Plated 4mm (Shorties)

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30mm x 2.13mm

30mm x 3.2mm

40mm x 3.2mm/4mm/5mm

45mm x 5mm

GIGANT PROP 4 x 2, 3 Blade

CAM PROP 4.7 x 4.7 / 5 x 5 / 5.5 x 5.5 /

6 x 5.5 / 6.5 x 6.5 / 7 x 7

(6mm or 8mm bore)

Slim Prop 8 x 4

9 x 5 (speed 400)

ROBBE Turbo Spinner

CAM PROPS

6.0 x 3.0 (2.3mm)

7.0 x 4.0 (3.2mm)

8.0 x 4.5 (3.2mm)

9.0 x 5.0 (3.2mm)

10.0 x 6.0 (5.0mm)

11.0 x 8.0 (3.2mm)

13.5 x 7.0 (5.0mm)

14.0 x 9.0 (5.0mm)

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6 x 6	£8.95	£11.95
7 x 3	£9.95	£3.45
8 x 4.5	£9.95	£11.95
8 x 6	£10.95	£11.95
9 x 5	£11.95	£11.95
9 x 7	£11.45	£4.45
10 x 6	£11.95	£4.45
11 x 7	£13.95	£4.45
12 x 10	£11.95	£4.95
12.5 x 6 x 5	£14.45	£4.95
12.5 x 6.5 x 5	£14.45	£4.95
13.5 x 7 x 5	£14.45	£5.95
14 x 8 x 5	£14.45	£6.95
3.2/4/5mm collets for above props		£2.49
spinners for above		£2.95
216 Prop Set 2.B 15 x 8		£20.95
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9.0 x 5.0	£5.95 £7.95
9.0 x 6.5	£5.95 £8.95
9.5 x 5.0	£5.95 £9.95
10.0 x 7.0	£6.95 £9.95
10.5 x 6.0	£6.95 £9.95

11.0 x 6.5	£7.95	£9.95
11.5 x 7.0	£7.95	£9.95
12.0 x 7.0	£7.95	£9.95
12.5 x 6.5	£8.95	£10.95
12.5 x 10.0	£8.95	£11.95
13.0 x 6.5	£8.95	£11.95
13.5 x 7.0	£8.95	£11.95
14.0 x 7.0	£9.95	£12.95
14.0 x 8.5	£9.95	£13.95
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Model	BEC/PCO	Cells	Amps
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With Brake ..	Y	6-10	18
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With Brake ..	Y	6-10	40
Mini/Sw40	N	6-12	40
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PicoMOS36 Bec. brake				£56.95



PicoMOS56 Bec. brake				£75.95
PowerMOS48 Opto. brake				£71.95
PowerMOS85 Opto. brake				£109.95
Race 80 (FAI Pylon) ..	Y	6-8	80	£92.95
PowerMOS80	N	7-30	56	£94.95
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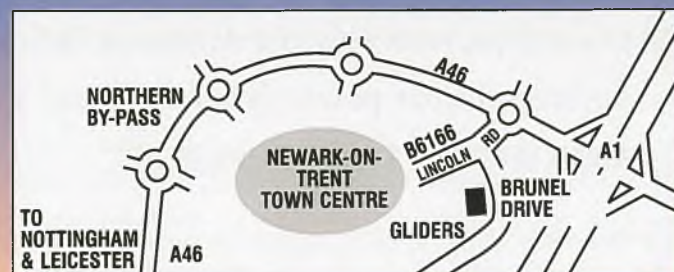
Model	BEC/PCO	Cells	Amps
RSC210	Y	6-8	10
RSC750	N	6-20	50
RSC810 mP	N	6-8	12
RSC835 mP	Y	6-12	35
RSC860 mP	N	7-30	60
RSC890 mP	N	7-30	90

CHARGERS

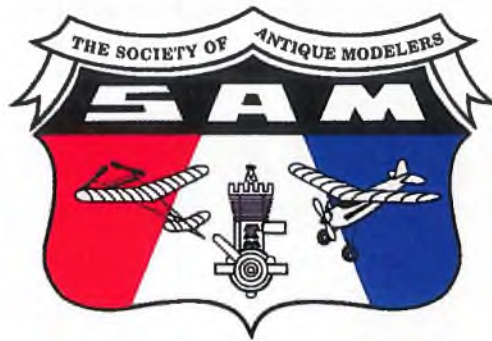
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SAM



Champs 98



▲ On the left, Owen Morris with Stahl Gypsy, winner SOS. Kirby Hinson on the right was second with a Judge Wakefield.

REPORT BY: JAY BURKART

The best of the Old Timers in the USA meet every year to compete with very old design models and the very latest in electric power systems. "Good vintage models never die, they just get borrowed".

Location

The 1998 SAM Championship was held September 14 through 18 at the wide-open spaces of the Academy of Model Aeronautics National Flying site at Muncie, Indiana, USA.

Conditions

In keeping with the character of my previous accounts of the Champs we were again plagued. Previous years have brought, rattlesnakes, fire ants, rain and mud. Not to be

outdone, this year brought the remnants of Hurricane Frances, which gave us gray cloudy skies and very breezy conditions. The first two days the wind never quit and at times approached 25mph, making flying a real challenge, only on the last day did we see the Sun and good thermalling conditions.

The Event

On to the events, technical developments and models of interest for us Vintage E modelers.

This year the Spirit of SAM (SOS) event brought some innovations in battery and motor combinations. The first two places were won by teams of modelers, Owen Morris and Kirby Hinson finishing first and second respectively. The models were an Earl Stahl Gypsy for Owen and a Judge 1936 Wakefield for Kirby, both typical Wakefield designs but the approach they used was to look at the batteries in a new way. They looked for the most capacity as related to weight keeping within the 4.1oz total battery pack limit. They found that four of the Sanyo 1500mah cells gave them the most power to weight rather than the more often used six Sanyo 600mah cells. They then went on to find a motor and gear-train combination that could fly their SOS planes. This turned out to be the Graupner Speed 300 with a EMPS gear mechanism with a 4.8:1 ratio, turning the Gypsy's, Peck 9 inch rubber model prop and on the Judge a Graupner 11 x 8 CAM prop.

Also these two former NASA engineers mounted the radio and servos and radio battery all the way in the back of the model and the motor battery in the front as you see in the pictures.

To win the event in the fly-off, Owen ran his motor continuously for nearly 20 minutes, flying against a fifteen MPH headwind. With this performance he outlasted the other four competitors and he still had some battery capacity left on landing.

The LMR (Limited Motor Run) event was also part of the venue for Monday, Aveox motors are now showing up in the SAM events and as in many competitions this year, they are living up to their winning reputation. Mike McIntyre flying his Lanzo Racer won the event using an Aveox 1114/4Y motor with a Hobby Lobby 2:1 gearbox that he adapted to the motor and used an AeroNaut 13 x 7 prop.

The SAM event calls for a much longer motor run time of 90 seconds, so the Aveox of choice is different from other LMR type events. This is a necessity since the required 800mah cells cannot supply the high amperage for a long duration. Competition in this event was very close with five flyers all making maxes on one of their two flights and coming very close to max on the second.

The Texaco event was held on Friday, the only day of the event with sun most of the day allowing for good thermalling. Steve Moskal flying his Cabin Playboy won with a time of one hour and fifteen minutes. This same model won the LMR event in Colorado Springs in 1995, so good vintage models never die, they just get borrowed. It



▲ Stahl Gypsy with rear mounted radio gear and single elevator.



▲ Stahl Gypsy Speed 300 motor and EMPS gear detail, Peck 9" rubber power non-folding prop.



▲ Motor detail on Kirby Hinson's Judge Wakefield, good detail with transparent covering.

is interesting to note that this 'Borrow Special' model was comprised of borrowed batteries, borrowed motor and gearbox and even a prop he borrowed from me. When I went to photograph the model and its proud pilot the model was stripped and he had to borrow many items back to pose for the photo. The motor and gearbox were typical of former winners of the Texaco event and used a Graupner Speed 400,



▲ Ray Bourke's handsome Miss Canada, Ray hand carved the 17 x 10 prop, beautiful work.



▲ Battery detail of 4 x 1500 pack in Judge Wakefield



▲ Servo and receiver detail in Judge Wakefield. Note broken rudder piece from mishap on ROG.



▲ Jack Hiner's SOS Comet Clipper Jr. very good penetration in windy weather, great model for event.



▲ Motor mount detail on Miss Canada, ingenious but simple rubber bands.



▲ Mike McIntyre and LMR winning Lanzo Racer with Aveox power.



▲ Aveox Motor and Hobby Lobby 2:1 gearbox detail of Lanzo Racer. Note cast aluminum motor mount and strap, also wrap-around cowling.

Simprop 5.9:1 gearbox pulling a 16.5 x 15 AeroNaut prop.

Next years SAM Champs will be held in the beginning of October in Muskogee, Ok.

So for you Vintage modelers we'll look to see you there but be prepared to see what kind of plague Mother Nature will present. Maybe 'Rattlers' again!

Jay Burkart

jayflyer@iglou.com **EFI**



▲ Jay Burkart's Aveox powered Stardust Special for LMR, great flyer just need to practice.



▲ Mike Muskal's 'Borrowed Special' Cabin Playboy winner of Texaco event. Note wrong prop on model, I didn't lend my prop back to him!



▲ Speed 400 mounting on Playboy, simple and practical for multipurpose flying.



▲ Jack Miners Baby Playboy for Texaco event, a seldom seen model that flew very well.



► Glen Poole's Twin Cyclone for Texaco event, twin rudders controlled by crossing flex cables in stab flew very well, placed third in Texaco.

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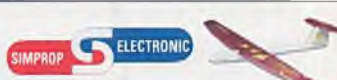
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Sport Scale



PLAN & CONSTRUCTION BY: **MARTIN IRVINE**

A 52" (1320mm) span aerobatic semi scale biplane for a middle sized geared motor and about 20 Sub-C cells.

This model was originally conceived as a everyday sport flier that was reasonably scale but without the usual handling quirks associated with most scale models. Or, looking at it from the opposite direction, a scale plane that flies like a sport model.

The plan is a drastic modification of an old RCM plan called the 'Acro Star'. The gestation was outlined in 'Quiet Scale' in the April issue of EFI, and much of the design rationale was covered in the May and June columns as building progressed. This article will concentrate on the 'what' and 'how' rather than the 'why' of the construction.

The original intent of making a limited number of changes to a successful sport model to make it a scale model has been exceeded a bit. This model has the same airfoil and wing area, but everything else is different!

The wing span is 52" (1320mm), wing area is 800 sq.in (52sq.dm) and weight with 20 x 1400SCRs is 7 lb (3.2kg) on the nose. I used a MaxCim MaxNeo 13Y motor with an Astro 3.69:1 gearbox and a 13 x 8 Master Airscrew electric prop.



▲ Cabane struts are 3/32" wire with basswood sheathing. The clips are 0.030" (0.75mm) brass strip.

Sizes

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

1/64"	0.4mm
1/32"	0.8mm
1/16"	1.6mm
3/32"	2.4mm
1/8"	3.2mm
3/16"	4.8mm
1/4"	6.4mm
5/16"	7.9mm
3/8"	9.5mm



▲ Tail struts are attached with small screws into small ply cross pieces under the covering. The non scale tailwheel makes ground handling much easier.



▲ Interplane strut fittings are made from servo pushrod fittings. The set screw is loosened, not removed for disassembly. The aileron horn looks small but the hinge line is on the top surface of the wing meaning that the effective horn length is about twice as much.



▲ Radio area above the lower wing. The radio switch is operated through the cockpit. The large red rectangle is an RCD foam pad around the receiver.



▲ The lower hatch has a small dowel at the front and a ForeMost hatch hold down at the rear. The MaxCim speed controller is velcroed to a platform above the battery pack. The battery is attached to a ply plate which sits on the two 3/16" basswood strips on either side of the fuselage. The rear end is held up place with small blocks while the front end is held in with two nylon bolts. The spinner is an 1/8" ply disk with a 1/8" ring turned on a lathe.



▲ The battery plate is 1/8" ply with the 1/4" nylon bolts clamping them in place.



▲ The battery plate in place. Nylon bolts hold it in place. The cross piece is to hold the motor connectors out of the way.

Wings

Both wings are conventional D-tube construction. The spars are all spruce, the rear ones being flush with the outer surface of the wing. This gets them as far away from each other as possible. If you prefer to recess them so that the 1/16" balsa sheeting covers them, cut the rear spar notches 1/16" deeper.

All ribs are basically the same and can be cut from light, 'C' grain sheet and notched as appropriate for dihedral bracing and cabane mounting blocks.

Upper Wing

Lay down the 3/16" sq. and 3/32" x 1/4" spruce lower spar caps with 1/16" shims under the front and 5/16" shims under the rear ones. These will lift the ribs clear of the building board so that the wing can be built straight. Glue the spar doublers in the centre and then add ribs and the top spar cap, (with its doubler glued on), but don't glue the pieces yet. Check the trailing edge points for straightness and add the 1/8" sheet false leading edge. Now glue things solid.

Fit the 1/8" sheet aileron spar facing and

the 1/8" sheet tip bracing, but don't add the laminated tip strips yet.

Plane or sand the false leading edge to match the rib contour. This will help give a very straight and strong leading edge sheeting joint. Add the top 1/16" leading and trailing edge sheeting and the centre section sheet.

Now flip the wing over and sand a bevel on the trailing edge for the lower surface sheeting. Shim the wing straight, upside down, on the board. The exact shims are not important as long as the wing is straight.

Add the 1/4" spruce centre section spar to the lower surface. This will tie the front of the rear cabane mounting blocks to the wing structure. Add the cabane mounting blocks and the aileron pushrod. The cabane mounting blocks should be drilled for either 4-40 blind nuts or threaded inserts. I like the threaded inserts as the thread is longer and the insert provides a hard surround to the bolt hole.

I like to install the aileron servo at this point as the wing is still wide open if anything needs adjustment. The bellcranks are bolted to 1/16" ply plates with 1/8" sq. reinforcement at the ends where they meet the ribs.

Install 1/8" webbing with the grain vertical and between the spars. This is an important step to creating a strong wing with little weight increase. At the interplane strut mounting point on the rear spar, make sure the webbing is flush with the forward edge as this is part of what ties the mount to the spar. For now, leave the webbing off the forward spar where the cabane mount is glued, until after the mount is fitted.

Now you can add the lower surface sheeting, including the sections at the tip. Take the wing off the board, sand the leading edge sheeting square and flush with the false leading edge and add the 1/8" sheet leading edge.

Add the rest of the tip sheeting, sand the tips flush and glue the three layers of 1/16" x 1/4" to form the tip which will show under the covering. Sand the leading edge to the section shown on the plan and continue around the tips.

Add the rib cap strips to both sides and do a preliminary sanding.

The ailerons are a simple all sheet construction with the leading edge bevel planed and sanded in after completion.

The interplane strut mounts are built as sub-assemblies. I would suggest you build the eight fittings and mounting 'pockets' at the same time. The pictures and drawings on the plan describe them and they are easy to make. The 'pockets' are epoxied to the forward faces of the spars, and small slots for the brass fittings are made. The fittings will not be added until covering is complete.

Lower Wing

This is very similar construction to the top wing except that there are no ailerons but there is dihedral. The last rib is propped up 3/4" (19mm) on each side.

The hold down bolt hole needs bracing so that the tightened bolt doesn't crush the wing. I like end grain balsa for this as the wood fibres are oriented to resist the crushing forces the best. Don't drill the hole yet



▲ Finished spinner held on with 4 short screws. Slot the holes so that tracking adjustments can be made.



▲ Spinner construction. The plug is on the left, a trimmed blank is on the right and the finished version is in the middle.

but wait until the fuselage is finished and the wing is ready to be mounted.

The dihedral braces are 1/16" plywood added after the wing panels are completed to the point of sheeting the bottom. I find that if I use a NEW #11 blade for this, it is pretty easy. If you have gone overboard with glue at the rib/spar joint, you may need a razor saw. I like to glue dihedral braces with epoxy but you must have a good joint. Epoxy is heavy.

Fit the wing dowels but don't glue them yet. It is much easier to cover the wing if you don't have to work around them.

Fuselage

The basic fuselage uses 3/16" sides. This means 3/16" balsa from the nose to the rear of the wing and 3/16" sq. spruce longerons aft

of there. Verticals are 3/16" sq. balsa and all diagonals are 1/8" x 3/16" balsa.

I like to build the second side directly over the first side with small squares of wax paper at all glue joints to prevent sticking. Sand flat and flush with a large sanding block.

Add the ply doublers. The plan calls for 1/32" ply but I used 1/64" and it is holding up fine. It ties all the balsa parts together, reinforces the forward fuselage and provides some 'armoring' of the inside surfaces as this model was designed for replaceable battery packs and bare balsa gets beaten up over time.

Once the basic sides are completed, use the cabane mounts, landing gear mounts and wing bolt plate to make the basic 'box'. The cabane mounts are notched into the sides and are braced with 3/32" ply. The landing gear mount and the bolt plate fit in notches so that they are flush with the outer sides.

Join the rear fuselage and add the cross pieces. Now glue on the 1/8" side fairings and sand to section, tapering the upper and lower edges to the basic sides. See the front view section. Add the rear fairing stringers.

Now it's time to tackle the nose. The two side pieces are flush with the upper edge of the sides and are tapered back, (see the top view). Sand the pieces flush top and bottom and if you have one, use a disk sander to sand the front face square. Tack glue the top block in place and sand front face to match the sides. Cut a nose ring of 1/16" ply but don't glue it on yet.

The next step is the motor mount. I was

using an Astro 'Superbox' which has threaded mounting holes. It was a fairly easy job to cut an over-wide mounting bulkhead and trim the sides until the spinner backplate is 1/32" ahead of the nose ring. Glue the mount in place and brace with triangular stock.

The lower hatch block is in two pieces. Cut from the same piece of balsa and glue the front piece firmly in place. Then tack glue the rear half in place. Check the fit of the nose ring and epoxy to the sides and bottom only. It will be glued firmly to the top block later.

Carve, plane and sand the nose close to the final contours. Pop the top block off and hollow to about 1/4" to 3/8" thick. Keep a little meat around the motor bulkhead so that it can be glued in place, including the nose ring.

Now sand to final contours checking the plans frequently. Brace the corners inside the nose with triangular stock as necessary. Pop the rear section off. I used a small dowel in the front and a 'ForeMost' hatch mount in the rear. This is a great little item that has no loose parts to lose.

Now add the turtle deck formers, from F1 to F11. Note the centre stringer which gives the sheet edge something to be glued to. The forward section is sheeted from the nose to the cockpit. The fuselage sides are straight so that this sheeting is a simple curve.

The rear stringers are evenly arranged over the rear turtle deck. Their forward ends are notched 1/16" so that they slip fit under the sheeting at the rear of the cockpit. Only notches at the ends are marked. It has been my experience that notching on the plane rather than before assembly, results in straighter stringers. Wavy stringers really show up so it is worth taking some time on this.

The cylinder bank fairings are carved balsa and added after covering.

Add the tailskid/wheel and the strut mounting points with 1/16" ply. Sheet the lower surface of the rear fuselage. This is a little more resistant to damage than a more scale stringered surface.

The stab is set at 2.5 degrees, which, with the wing incidences indicated, results in an effective couple of degrees down thrust in the motor. Add the blocks shown and sand to a faired section. Use scrap 1/4" sheet to maintain spacing.

Fit the wing with the wing dowel plate in the front and the wing bolt mount in the rear. Dry fit the plate checking several times for squareness from front and top. Glue and brace as shown on the plan. Drill and tap the rear bolt plate trying to keep the drill square to the bottom surface. This makes sure that the bolt head will sit flat on the bottom surface. A 1/32" ply washer can be added after covering to protect the surface and spread the stresses.

Cut and bend up the landing gear struts and bolt to the landing gear plate with 6-32 bolts and blind nuts. Sheet the small section behind this and the fuselage is finished.

Tail

The tail is from strip stock and straightforward. The leading edge of the fin is shown laminated which is a strong and rather ele-



▲ Vacu-formed radiator with plastic grill from model railroad supplies. The small dot in front of the undercarriage is the ForeMost hatch latch. The landing gear is bolted on. It is sheathed with balsa and painted.



▲ Painting supplies.

The LustreKote is a colour match to the MonoKote. The small bottles are Floquil Railroad colours that stick very well to MonoKote. The can of Testors satin spray is sufficient to do the whole plane. The Floquil thinner in the rear is required for Floquil paint. The lacquer thinner is used to correct painting mistakes.

gant construction. Try at least this bit and I think you will agree. I've drawn the rest of the tail using strip stock. The secret with using strip stock is to remember that it gains its strength from lots of long joints so don't try to do curves with too few pieces.

The spruce strips in the stab help spread out the stress riser that occurs at the fuselage join line. The tail struts mount into 1/8" ply pieces glued flush with the stab lower surface.

The tail struts are spruce strips with small brass tabs glued into slots in each end. Mount everything while the epoxy is still wet so that the tabs can 'float' and not twist the stab.

Struts

The cabane struts are 'N' sections. The verticals are all the same length. They slide into the brass tubing in the cabane mounts and can be withdrawn for covering and finishing. The top clips are from brass strip as outlined on the plan. Bend these up, drill and

temporarily mount the wing. Note that the rear clip has the vertical and the end of the diagonal to fit. A way of determining the exact length of the diagonal is shown on page 15 of EFI May 98.

Remove the wing and solder the clips in place as close as you can. Next put the wing on with one inch dia 1/32" ply washers between the clip and the wing. Tighten while applying a soldering iron. The solder will flow allowing the clip to sit flush with the surface - a perfect fit.

The socket head screws are not soldered and can be easily withdrawn.

The struts are sheathed with basswood. I got mine from a local lumber and do-it-yourself store. Make a 'U' shape with the 3/32" sq. as the bottom and the 1/32" sheet as the two sides. This can be slipped onto the wire and the other 3/32" sq. will finish the strut blank. Sand to an oval section and finish. I used a little SIG EpoxoLite to fair the ends neatly.

The interplane struts are spruce strips with 1/16" wire inserts to fit into the strut fittings. Sand to an oval section. Note the ends are bound with thread and smeared with epoxy.

The landing gear is sheathed with 3/8" balsa, grain running across the strut. These are attached with contact cement which will stick well to the materials and flex as well under landing conditions. The balsa is tapered as it goes down to the wheel (see the front view section) and to a streamlined section. It is covered with epoxy and sanded smooth for painting. I think that covering the struts with film will result in a very wrinkled undercarriage after a few landings. The wheels are Williams Bros. Golden Age wheels.

Spinner

The spinner construction will require a lathe. I have come to the conclusion that anything that is whirling around at 7,000 RPM needs to be lathe precise.

The back plate is made from 1/8" ply with another 1/8" ply ring around the edge. This is turned on a lathe with a taper to fit the spinner. The edge is 1/4" thick now so that mounting screws, which will attach the spinner to the back plate, will seat square to the spinner surface. You will need to notch the ring so that the prop will sit flat against the backplate.

The male mold for the vacu-formed spinner was turned from maple and mounted on a balsa base. A spinner was formed from .040 (1 mm) plastic. The base acts as a 'square' reference for trimming.

Attach the spinner with 4 small screws. Use a small needle file to slot the holes to centre the spinner. The tip of the spinner shouldn't wobble more than a couple of mm. With such light material, you don't need a very precise alignment but as with everything, the closer, the better.

Another method is to make a spinner out of fibre glass as laid out in the second EFI article I did on the PZL 1/11, Jan/Feb. 1995. This is heavier and time consuming, but more durable.

Covering

I dislike silver finishes so choosing a colour scheme for the Fury took a while. I ended up with one of the aircraft flown briefly by the Republicans in the Spanish civil war. Other alternatives would have been an all yellow scheme use by the RAF for trainers or a camouflaged version from the time of the Munich Crisis.

I covered the entire model with MonoKote, 'Blue Mist' on the bottom, 'Tan' on top and scraps for markings. The squiggles are airbrushed after the markings are complete.

First clean the whole model with a good wipe of acetone. This will remove greasy fingerprints and dirt. Next spray the green and light tan squiggles. I used Floquil 'Rail Road' colours, a finely pigmented lacquer based paint you will find in the rail road section of the hobby shop. I think that any good quality enamel would also work but please test before you use!

Struts, blisters, radiator and spinner are first sprayed with MonoKote 'LustreKote', a paint that closely matches the film. The squiggles are done as the rest of the model.

Note that I haven't mentioned masking.



▲ The markings were applied and then the colours were sprayed on. At this point the markings have 'overspray' from the airbrush



▲ Using a rag dampened with lacquer thinner, the overspray on the markings was removed. The sooner this is done after the paint is touch dry, the easier it will be.



At this point the markings have 'overspray' from the airbrush. Using a rag wetted with acetone or lacquer thinner, carefully wipe the edge of the markings, removing this overspray. This works surprisingly well, as you can see from the photos.

If you screw something up, as I did, a rag soaked in lacquer thinner will remove all the paint and you can start again. This is the most appealing part for me. It's a variation on the old saying: "If you can't make it perfect, make it adjustable". This is an adjustable method of painting.

When you are happy with the results, a coat of Testors 'DullCote' will even up the paint finish. I used a satin version as I find the flat too flat.

Equipment

Power is a MaxCim MaxNEO 13Y brushless motor with matching controller with an

Astro 3.69:1 gearbox mounted by MaxCim. The power is 20 cells, either 1400SCRs or 1700SCRCs and the prop is a Master Airscrew 13 x 8. This is a good prop for under 6000 RPM but is a power hog at higher revs. It is similar to aircraft with undercambered wings. The wing will allow a maximum speed that is difficult to exceed. There is a regular size receiver and battery pack and mini servos (FMA 200s). Total weight is right on 7 pounds, which is: 112 oz (3175g), for a wing loading of 20 oz/sq.ft (61g/sq.dm).

Control throws

Elevator: 3/4" (19mm) up and down measured at maximum chord.

Rudder: 1 1/2" (38mm) each way measured at maximum chord.

Ailerons: 3/8" (9.5mm) up and down (low rate) - 1/2" (12.7mm) up and down (high rate).

I mention the two aileron rates because



while I like the smoothness of the low rate, others prefer the response of the higher rate. At 'low rate' an aileron roll will take about 2 seconds, at 'high rate' it is closer to 1 second.

Flying

This model flies like a sport plane.

Take-off requires full up elevator until the plane is moving whereupon elevator is released until flying speed is achieved. Then a little elevator and you're flying. The take-off run requires a bit of rudder to keep it straight but not much. It tracks quite well. If you forget the initial elevator, the plane will nose over and crack the spinner. Fortunately you can straighten it out a bit and continue. The light weight and the gearbox allow you to get away with a less than perfect spinner.

With the listed power system, I usually take off at about 2/3 throttle and in about 50 feet. Other than for vertical manoeuvres, you can fly very comfortably at half throttle and throttle will keep it in the air. I was very pleased to get over 8 minutes with the 1400s in spite of the drag of the thick wings and all the struts and radiator.

This plane will turn quite respectably with no rudder input, something that surprised me as most biplanes seem to need the rudder. It will make me lazy!

If you try to stall the plane, it gently drops the left wing panel, loses a few feet and starts flying again.

I am a sport flier so I can address mostly the simpler manoeuvres. Loops are entered from level flight and can be quite large with the power system used. Pull the throttle back on the backside of the loop to slow things down a bit. It gives the illusion of a larger loop.

Rolls are a little barreled, at least at the rate I have the ailerons set, about 2 seconds each, so a little elevator when upside down helps.

Stall turns, spins, Cuban 8s are all straightforward. It will also fly knife edge quite nicely with a better set of thumbs at the sticks.

I land a little hotter than many people so the landing gear has been tested for robustness and is holding up well. I find that my usual landing technique (deadstick) is not the best for this model. With the drag, it is best to come in with a bit of power as this helps maintain control authority. If you find that you have to land and have nothing left, put the nose down and try to come in with a bit of speed. It will bleed off quickly enough.

Martin Irvine, 1331 Rockwood Dr., Kingston, Ont, Canada, K7P 2M8

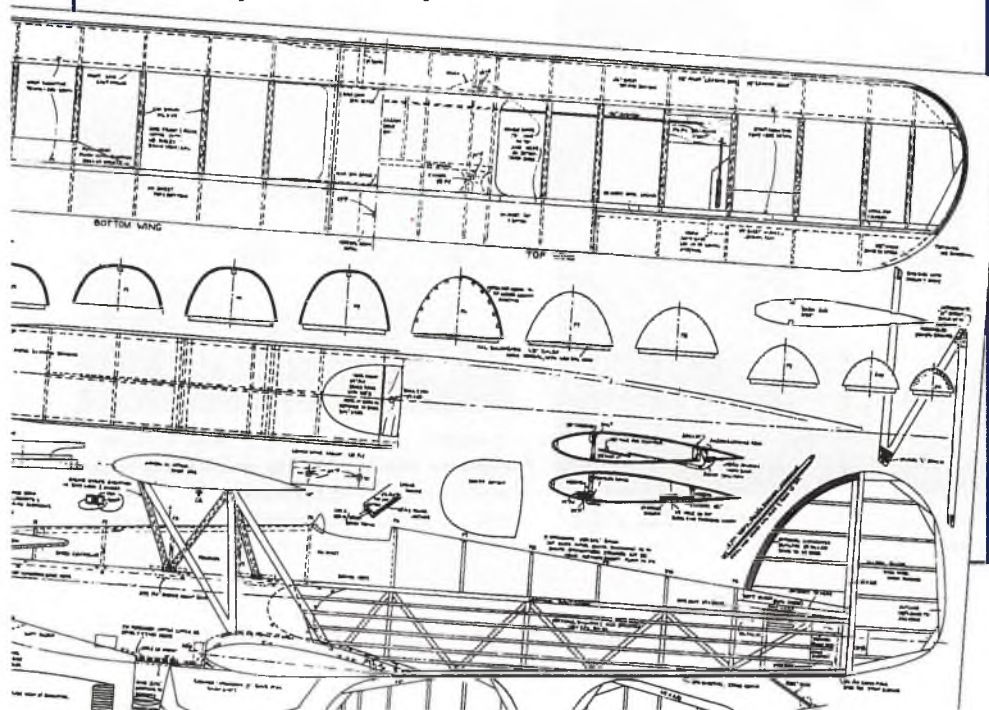
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EFI

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Cover Story

Aspach 98

Cover Model

This month's cover shot is an L-39 Albatross (see 'Current Affairs' in the October 1998 issue of EFI). It is an all moulded kit manufactured by G&S Modellbau of Bayern. This one is for an Ultra 930/6 motor, Aeronaut Turbofan 1000 and 16 to 18 RC-2000 cells. It weighs 3.2kg and has a wing span of 1270mm (other size wings available). The price is 599 DM unpainted but it can be supplied painted as on the cover. This example for electrics is close to scale; there is a lower cost PSS version less close to scale with a stretched rear fuselage and extended wings.

Suitable power trains for the electric L-39 are listed as: Aeronaut Turbofan 1000 or WeMoTec Eco-Fan Pro with Speed 700BB or Ultra 930/6 motor and 16 cells - or WeMoTek RK 530-E with Ultra 1300/9 motor and 20 cells.



REPORT BY: **ROB HEMMINGS**

PHOTOS BY: **FRANZ STOCKINGER**

Ideally situated just outside Stuttgart, Germany, Aspach attracts the top electric fliers from most parts of mainland Europe



▲ **Monster Hercules met its end at Aspach 98; stronger wing spar next time chaps!**

This Year

Almost all of the models at Aspach are scale types and variety is guaranteed.

Last year's star was without doubt Swiss modeller Hans Bühr's Antonov 225 'Mriya' (see EFI, Nov/Dec 1997). At 3540mm (139") span the Mriya is a big model but it would have been dwarfed by this year's 'spectacular'. Jörg Golombek's 6m (20') span Hercules amazed everyone when it was bungeed off the tarmac (it had no undercarriage!). Sadly the wing failed half way through its first display, producing the most spectacular crash. Interestingly my video tape shows the bro-

ken port wing folding down, under the aeroplane - theories please.

Fashions always appear first at Aspach and one trend definitely on the increase is the large WW2 warbird. Most of these use large Ultra motors and Giezendanner electric retracts. typical is Christian meindle's powerful Me 109G, this year flying formation aerobatics with Christian Hoffmann and his well known Me 309. Heinz-Gerd (Harry)

▼ **Impressive Dewoitine D250 by Jens Dormann shows off its Ultra 2000/5 motor in the static park.**



▼ Two Robbe Sport 650/8 motors power this DC-3 from the 'Fibre Classics' kit. 1/9th scale, 3.22m span, 14.3kg and 48 x Sanyo 2000 cells. Melf Heikomast flew this model beautifully.



► Another DC-3 but at the other end of the scale. 1.52m span and 2 x Speed 400 with 6 x 3 three blade props.

Kottmann had less luck and lost his Ultra 2000/5 powered Yak 9 on take-off (before Franz could photograph it). Harry made amends later though with his clever little Do 335 Pfeil.

Jets are on the increase too, almost 30 % of the models registered were EDF and some amazing progress is being made. Many fliers are fitting retracts to their jets and several examples of the new Robart 'Micro' units were spotted (EFI Sept/Oct 97). Christian Hoffmann deserves a mention here too, his Me 262 manages to combine both of the aforementioned classes and although it appeared last year, it is now completely debugged and flies beautifully.

Once again I thoroughly enjoyed Aspach and I hope you enjoy Franz's photographs. Stuttgart is only one hour and twenty minutes away from Heathrow by 737. Join us there in 1999.

Model Specifications

As many models as possible have been listed here. I know you find this data valuable. When you are designing your own new model or just re-equipping an existing one, it is always good to know how some one else has done it. **EFI**



▼ At quarter scale this Himmelhaus (Pou du Ciel) still only spans 1.5m. This model by Melf Heikomast weighs 3.1kg and is powered by a Speed 700 BBT 9.6V with Power Gear 2:1 gears and 14 x 6 prop. 12 x 1700mAh cells. Rear wing only moves for pitch control.



◀ Engine trouble (shed a fan blade) grounded Christian Hoffmann's Me 262 last year. This year it flew the way Christian's models usually do and it even taxied back through the grass.

▼ Pretty little PZL P8/11 by Rik Verbiest from Belgium.



▲ Heinz-Geld (Harry) Kottmann and his Do 335 Pfeil (Arrow).

◀ Curtis Hawk (1.92m span) by Michael Schlotter on finals.





▲ Franz Schmid always something spectacular. This year a 2.88m span Stuka amazed us. Franz flew the model very realistically, with some incredible power dives. Sadly the Stuka was badly damaged when an elderly spectator fell on the model in the pits.



▲ Dirk's Tigershark flew well but the Robart mini retracts gave trouble and I only saw the model fly from a bungee launch.



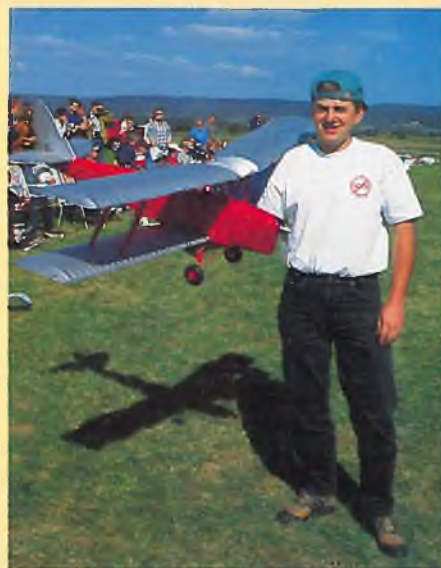
▲ This Cosmic wind by Paul Junker sparkled. 1.93m span and 24 cells.



▲ This Keith Rider R3 survived an emergency landing when the cowl shifted forward into the prop during Heino Dittmar's display.



▲ Ingenious retract mechanism uses micro servos modified into tiny winches, first breaking the over centre links and then hauling the wheels up.



▲ Your photographer Franz Stockinger doing his bit for British exports with this Tiger Moth from the DB Models kit.



▲ Bill's Airbus A319, 1.3m span with 69mm fans.



▲ You may remember Peter Köhler's diminutive (but very scale) Hawker Hunter from last year. Peter now has a plan available for the Hunter. This year he flew this Lockheed Galaxy of foam and paper construction, with operating cargo doors.

MODEL	SPAN (M)	WEIGHT (KG)	MOTOR	GEARBOX (OR FAN)	PROP	ENERGY	PILOT
A6M5 Mitsubishi Zero	1.00	1.50	Speed 500	Comp?	10 x 7	8 x 1700	Rudi Hunpert
A7 Corsair II	0.90	1.50	HP290/20/7	RK 709	76mm	10 x 1100	Ulf Herder
Airbus A319	1.30	2.00	2 x Speed 480 Race		69mm	10 x 1000	Bill Kleinbrahm
Arado 234 Blitz	1.49	1.78	2 x Speed 480 Race	Mini Fan	69mm	8 x 1700	Christian Kothe
Astro Viking	1.50	1.20	Speed 600 7.2V	3:1	13x5	8x1700	Mario Schauerermann
BD 5	1.20	0.70	HP 200/20/6	Schwerdtfeger	66mm	10 x 700	S Glöckner
Bell 222 h	1.50	5.20	Ultra 2000/7 heli			30 x 2000	Roland Guse
Bobby/Slowfly	1.00	0.27	Speed 280	6:1	?	7 x 270	Rainer Bingel
Bristol Fighter F2B	1.00	0.28	Speed 280	5:1 OD	Rubber	6 x 250	Rik Verbiest
Bristol MIC	2.24	4.50	Aveox 1406/2Y	4.05:1 OD	21 x 0	24 x 1700	Ludwig Retzbach
Bucker Jungmann	1.85	6.00	Aveox 1412/4	6:1	20 x 2	36 x 2000	Klaus-Dieter Sohn
Bucker Student	2.60	6.70	Aveox 1412/3	6.25:1	18 x 0	36 x 2000	Klaus-Dieter Sohn
Canadair CL 215	1.60	2.20	2 x Speed 400 6V	2.33:1	8 x 4	10 x 1800	Bernhard Holzemann
CAP 231 EX	1.60	2.20	Ke 240/6	Kruse 2500 Synchro	20 x 0	52 x 1700	Paul Junker
Challenger 601 RJ	1.40	3.50	2 x Speed 600 12V	90mm OD		16 x 1700	Arno Donath
Champion FI	1.19	2.05	HP 300/20/A3		9.5 x 8	13 x 700	Ulf Herder
Christen Husky	2.12	5.30	Newtor brushless		16 x 8	24 x 1900	Philip Gardemin
Comic Kunstflugm	0.80	0.72	Speed 400 7.2V	2.33:1	9 x 6	10 x 500	Jochen Ihmeis
Cosmic Wind 'Ballerina'	1.93	4.93	Lehner 1740/14	6:1 Super Chief	17 x 10	24 x 1700	Paul Junker
Curtiss P-6E Hawk	1.92	6.20	Ultra 2000/7	2.4:1 Kruse Synchro	18 x 12	30 x 2000	Michael Schlotter
D H 82 Tiger Moth	1.50	2.90	Webra 15/10	2.5:1 Power Gear	13 x 8	12x1700	Franz Stockinger
D H. Tiger Moth	0.84	0.76	Speed 400 6V	2.3:1	8.5 x 6	8 x 1100	Uwe Bremer
D H Vampire	1.20	2.20	Lehner 1730/15	Aeronaut	90mm	15 x 1800	Marius Niewind
D H Varnpire	1.10	1.60	2 x Speed 480 Race	5 Blades contra	65mm	10 x 1900	Heino Dittmar
D H. Vampire	1.20	2.00	HP220/20	Aeronaut	90mm	15 x 1700	Jorg Rehm
D H. Vampire		2.30	Lehner 2730	Aeronaut	90mm	14 x 1700	Ludwig Retzbach
D H Venom	1.82	5.00	HP355/37/5E		120mm	30 x 2000	Ueli Amacker
DC-3 SwissAir	1.52	1.254	2 x Speed 400 7.2V	direct	6 x 3 blade	8 x 1400	Christian Ramoser
Dewoitine 520	2.00	6.00	Ultra 2000/5	2.4:1 Kruse Synchro	18 x 12	24 x 1700	Jens Dormann
DO 335 Pfeil	1.00	1.30	2 x Speed 400	5 x 5	8 x 1700	8 x 1700	Heinz-Gerd Kottmann
Do 435	0.86	0.62	2 x Sped 280	6 x 4	6 x 500	6 x 500	Thomas Schmid
Dornier Do X	2.00	5.10	12 x Speed 400 7.2V		6 x 4 & 6 x 3	24 x 20	Mario Schauerermann
Douglas DC 3s		3.22	14.28 2 x Sports 650/8		13 x 7	2 x 24 x 2000	Melf-Heiko Mast
Douglas Skyray	0.54	0.50	Speed 400 6V		56mm	10 x 500	Ralf Küper
ED 2	0.99	1.80	KBM 39-14		8 x 7	10 x 2000	Martin Dimster
Extra 300	1.42	4.00	HP 355/25/5E	2:1	14 x 7	20 x 2000	Uwe Bremer
F 104 Starfighter	0.88	2.30	Aveox 1409/2Y	Donath Fan	90mm	14 x 1700	Ralph Kayser
F 104 Starfighter	0.80	2.50	Ultra 930/6	DS 51	90mm	16 x 2000	Christoph Meindl
F 16 Falcon	0.85	1.90	Aveox 1409/2Y	D Schübler	90mm	14 x 2000	Ludwig Retzbach
F 16 Falcon	0.80	1.83	Aveox 1409/2Y	Schwerdtfeger	90mm	12 x 2000	Horst Kühn
F 20 Tigershark	0.95	2.50	Ultra 930/6	Donath	90mm	15 x 1700	Dirk Juras
F 86 Sabre	0.85	0.78	HP 200/20/6	Schwerdtfeger Speed 480	66mm	10 x 700	Siegfried Glöckner
F 86 Sabre	1.07	2.98	Aveox 1409 2Y	Donath Fan	90mm	14 x 1700	Ralph Kayser
F 86 Sabre	1.18	1.90	Ultra 930/6	Aeronaut	90mm	12 x 2000	Siegfried Glöckner
F4 Phantom	0.78	1.78	Aveox 1409/2Y	Turbo Fan	90mm	10 x 1700	Dirk Juras
F4U-4 Corsair	0.76	0.22	Ikarus Slow Fly		18 x 7	8 x 0.11	Matthias Sebold
F7F Tigercat	1.0	1.3	2 x Speed 480 Race		6 x 4 Grp	7 x 1700	Christian Eisenmann
F7F Tigercat	1.30	2.20	2 x Speed 600 8.4V	2.5:1 Power Gear	8 x 6 CAM	2 x 14 x 1700	
F8F-1 Bearcat	0.72	1.00	Speed 500 Comp		7 x 4	7 x 1000	Ralk Beck
F9F-8 Cougar	1.60	4.80	HP 355/37/5E	OD 6 blade	120mm	30 x 2000	Ueli Amacker
Fieseler Storch	2.84	6.00	Ultra 1600/8	2.3:1	18 x 6	24 x 1700	Georg Höfelschweiger
Flying Leopard	1.23	0.94	Sped 480		6 x 4	6 x 1400	Hans Dieter Levin
Focke Wulf 190	2.10	5.77	Robbe Pro 744/8 sydney	2:1 Kruse, Synchro	18 x 10	30 x 2000	Ralf Binder
Fokker Dr.I	2.20	4.80	Ultra 2000/7	2.8:1 LMO	20 x 10	30 x 1700	Franz Schmid
Fournier RF 4	1.50	0.67	Speed 400 6V	2.33:1 Aeronaut	9.95 x 5	8 x 600	Christian Kothe
Funny	0.70	0.585	Speed 4000	1.5:1	8 x 4	8 x 700	Holger Peters
Gabelweihe	2.33	1.70	Speed 600 8.4V	4:1 Reisenauer	14 x 9.5	9 x 1700	Helmut Ziegler
Go One F5B	1.60	2.00	HP 370/30/A2		14 x 13	27 x 1000	Guntmar Rüb
Hasslicher (Ugly)	1.40	1.80	Ultra 930/7		9 x 6	10 x 2000	Puppenthal Franz Josef
Hawker Hunter Mk 58	0.64	0.75	Speed 400 6V	Rojet	70mm	11 x 500	Peter Kohler
He 162 Salamander	1.29	2.70	Ultra 930/7	WeMoTec Eco Fan Pro	90mm	16 x 1700	Johann Wagner
Hercules C-130	6.00	19.80	4 x Marx GT 300/10	?	20 x 10	96 x 1900	Jörg Golombek
Horten	1.60	1.65	4 x Speed 400 7.2V		4.7 x 4.7	8 x 2000	Paul Meider
Horten V	1.30	0.95	2 x Speed 400 7.2V		5 x 5	8 x 1000	Dirk Wouters
In Tension	1.99	5.10	Lehner 1940/14	6:1	17 x 12	32 x 2000	Michael Ramel
Jak 9	1.97	6.50	Ultra 2000/5	OD	20 x 14	30 x 1700	Heinz-Gerd Kottmann
Jonny	1.00	2.50	Mega Mini 7	2.5:1	12 x 8	8 x 2000	Peter Domeyer
Ju 288	1.18	1.30	2 x Speed 400 7.2V		5 x 5	8 x 1700	Günther Pohn
Ju 87	2.88	8.00	2 x Ultra 1600/6	Twin Gear OD	2 x 20 x 2000		Franz Schmid
Jupiter E	1.57	3.01	Ultra 1300/12	Planeta	12 x 8	14 x 1700	
Keith-Rider R3	1.60	4.20	Ultra 1600/5	2.4:1 OD	13 x 8	22 x 2000	Heino Dittmar
Klemm L 25	1.18	1.80	Graupner 540 VZ	?	11 x 7	8 x 1700	Peter Radtke
Klemm L 26	2.11	3.55	2 x LRP Zenith 550	2.0:1 Kruse Synchro 800	12 x 8	14 x 2000	Philip Gardemin
L 39 Albatross	1.30	3.20	Ultra 930/6	Aeronaut Turbo Fan		18 x 2000	Stefan Streng
Lazy Bee	1.00	0.64	Speed 400	2.07:1 Aeronaut	8.5 x 5	8 x 500	Dieter Wadle
Lazy Bee	1.80	3.14	HP 270/50	?	12 x 6	20 x 1700	Holger Peters
Little Midget	0.72	0.43	Speed 400 6V		4.7 x 4.7	8 x 800	Michael Schlotter
Lockheed C5A Galaxy	1.88	3.22	4 x Speed 480	Rojet	70mm	2 x 8 x 1700	Peter Kohler
Lockheed Orion	2.00	5.80	Ultra 1800/5	3:1 Eigenbau	17 x 8	28 x 1700	Sukowski

MODEL	SPAN (M)	WEIGHT (KG)	MOTOR	GEARBOX (OR FAN)	PROP	ENERGY	PILOT
Lockheed P3 Orion	1.45	2.00	4 x Speed 400 7.2V		6 x 4	8 x 200	Hubert Schulz
Me 109 G	2.0	6.0	Ultra 3500/8	2.2:1 Zimmerman	24 x 16	34 x 1700	Christian Meindl
Me 163 B	0.74	0.46	Speed 400 6V		4.7 x 4.7	8 x 600	Sebastian Schulz
Me 262	2.00	5.20	2 x Ultra 930/6	D Schübeler	90mm	2 x 15 x 1700	Christian Hoffmann
Me 309	0.85	0.76	Speed 480		6 x 5.5	7 x 1000	Christian Eisenmann
Me PI 106	1.45	3.25	Ultra 1600/5	RK 740	106mm	16 x 2000	Dirk Juras
MiG	1.00	2.00	Lehner 2735n6	Aeronaut	90mm	14 x 2000	Dirk Wouters
MiG 15 bis	1.00	1.80	HP 220/20A3S P6	PS 51 Fan 3 ph		15 x 1700	Daniel Schübeler
Mignet HM 293	1.51	3.12	Speed 700 9.6V BB Turbo	2:1 Power Gear	14 x 6	12 x 1700	Melf-Heiko Mast
Minifly	1.35	2.00	Ultra 930/7		9 x 7	10 x 1700	Frank Scholz
P-80 Shooting Star	1.15	1.40	2 x Speed 480	Twin Fan 480	65mm	10 x 1900	Ralf Dvorak
Pampa	0.80	0.74	Speed 400 6V	Schwerdfeger	65mm	10 x 600	Hubert Schulz
Partenavia P68 C Victor	1.30	1.35	2 x Speed 480 Race		6 x 4	7 x 2000	Heinz Schär
PBY 6A Catalina	1.38	1.66	2 x Speed 400 7.2V		6 x 4	8 x 1800	Arthur Schönknecht
Pilatus Turbo Porter	2.60	6.90	HP 355/30/6	3.7:1 Planetary	20 x 10	30 x 1700	Eberhard Schaal
Pou du Ciel Himmelslaus	0.70	0.42	Speed 400 7.2V		6 x 4	8 x 300	Jochen Ihmels
PZL P8/II	0.90	0.40	Speed 280	3:1	9 x 5	7 x 500	Rik Verbiest
Quickie	1.80	5.50	Ultra 1600/8	2:1	13 x 9	28 x 1700	Michael Sukowski
Red Arrows	1.40	1.16	2 x Speed 400 6V		5 x 4.3	7 x 1000	Paul Meider
Red Tarossa	1.32	2.15	HP 290/40/8 T		9 x 8.5	12 x 1700	Ralph Müller
SF 28	3.08	4.80	Robbe 330/6	2:1 Kruse	12 x 8	14 x 1700	Peter Domeyer
Shooting Star	1.20	1.20	Kyosho AP 29 L	Kyosho		8 x 1700	Sebastian Lochinger
Speedy Bee	1.00	0.86	Speed 480	3.45:1 Graupner	9.5 x 7	8 x 1400	Armin Kasten
Spitfire	1.37	4.10	Ultra 1300/8	2:1 Kruse Intro	13 x 8	20 x 2000	Eberhard Schaal
Spitfire Mk I	0.80	0.64	Speed 400 7.2V	2.64:1 Aeronaut	9 x 7	10 x 500	Bernd Rittinghaus
Stubenfliege Doppeldecker	0.83	0.17	1717-12	Braun Getriebe	10 x 6	10 x 50	Stefan Dolch
Su 27	0.60	0.50	Speed 400 6V		5 x 4.3	9 x 500	Rik Verbiest
Su 35	1.16	2.57	2 x Speed 600 BB 12V	OD	90mm	20 x 3000	Roland Guse
Turmalin LXE	1.99	3.30	Sports 430	5.3:1 OD		20 x 1400	Fred Ludwig
Wuppi 400 Fun Model	0.75	0.52	Speed 400 7.2V		Günther prop	8 x 700	Günther Pohn



▲ Lockheed Orion by Hubert Schulz. Foam and paper construction.

▼ Who says the Germans don't have a sense of humour? Bill Kleinbrahm's T shirt says it all!



▲ Harry's ingenious solution to an unusual problem. The under fin on his Do 335 retracts just before landing!

▲ Veli Amacker displayed this F9F-8 Cougar, HP 355/37/5E powered.



▲ Dirk Juras bravely flew this Me P1106. He reports that this model is very unstable, particularly in pitch. Would the full size have flown better?



▼ Galaxy.



▲ Ralph Dvorak who impressed everyone at Middle Wallop in June with his P-80 Shooting Star, note the relaxed approach!



X-Models Thermik Star



Thermik Star is - as its name suggests - from the same constellation as 'Little Star', reviewed in the April 1998 issue of EFI. Construction is similar (this one is without the Little Star's carbon wing spars) and because of the coincidence of identical colour covering film and the same colour fuselage mouldings in both models supplied for review, the appearance is very similar. But the similarity ends there, Thermik Star is a very different beast.

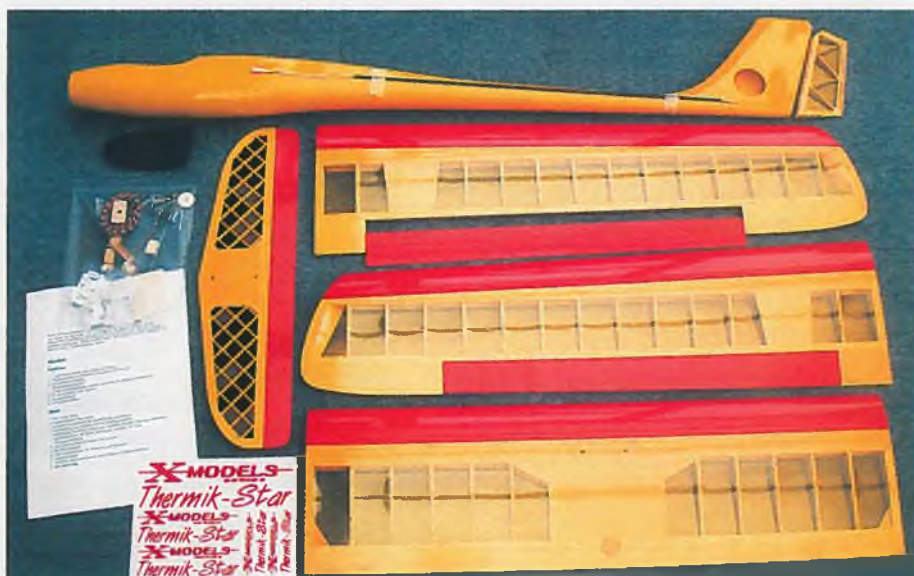
It IS another electric glider and the tip dihedral wing emphasizes the family similarity to the Little Star but THIS glider has ailerons.

"So what is so unusual about a glider with ailerons?" I expect some of you will be asking. You are quite right, nearly all the scale models of gliders use ailerons and almost all of the gliders that are not basic trainers or soft flat-field soarers also use ailerons. The same may be said of electric glider equivalents.

Primary directional control of any model is either by the use of a rudder and wings with dihedral OR with ailerons. Thermik Star has tip dihedral wings AND ailerons AND a rudder if you wish to use it. You could be forgiven for thinking that you might be able to fly it on either and I was not at all sure so I

KIT REVIEW BY: STEPHEN METTAM

The easy way into thermal soaring. Everything has been done for you - well almost everything.



▲ As it unpacks - all the construction work has been done for you and the standard of covering is superlative.



▲ Graupner Speed 600 Race 8.4V and Reisenauer 'Micro' 4:1 gearbox.



▲ All the parts you need for assembly - you provide adhesives, solder and a little time.

fitted servos for ailerons and rudder and plugged each into separate Rx functions. You can wire it up so that you fly CAR (Coupled Aileron Rudder) from one control function but I have mixers on my Tx so I am able to fly separate or coupled.

You may be thinking I am starting at the wrong end of a kit review. Thermik Star is a duration type electric glider and although most models in this category do not use ailerons, I wanted to emphasize at this stage that Thermik Star **MUST** use ailerons.

The Model

Anyone opening this model box has to be impressed. The self-coloured moulded glass reinforced epoxy fuselage is quite beautiful and with a very high standard gloss finish. The mould join line is apparent but there is not even any flash to clean off. A ply disc in the nose is already drilled to locate the motor front bearing and accept motor retaining screws. Rails are installed for a rudder and elevator servo tray and two wing retaining captive nuts are installed for the screws near the mainspar (there is another). An alternate elevator servo location is in the fin so there is a hole here for access. The fin/rudder stern post is bonded in and so are two captive nuts for the tailplane.

The moulded forward 'canopy' hatch is retained by a length of piano wire bonded to the centre underside of the hatch by a blob of epoxy resin - a very simple and effective system.

Tailplane and rudder are built up and the elevator is light sheet balsa; all are covered in transparent 'Oralight' film.

The wing is supplied in three panels, each of



▲ Elevator servo and link. The ball ended rudder horn was the only deviation from supplied fittings.

balsa D-box construction and open behind the main spar. The wing outers have inset ailerons (supplied but not fitted) and an aperture big enough to accept standard servos but you will need to use minis or micros if you wish to keep them within the thickness of the wing.

There are sealed bags too containing all the components you need for assembly, clevises, control horns, wing servo mounting blocks, wing joiners, servo extension cable, etc.

Assembly

With a ready built model RC installation seems a big task! Not much to do but two parts took a very long time. Almost all you need to do is to install the RC gear. When you construct a complete model, some RC installation is taken care of as you build and the rest is a minor task at the end.

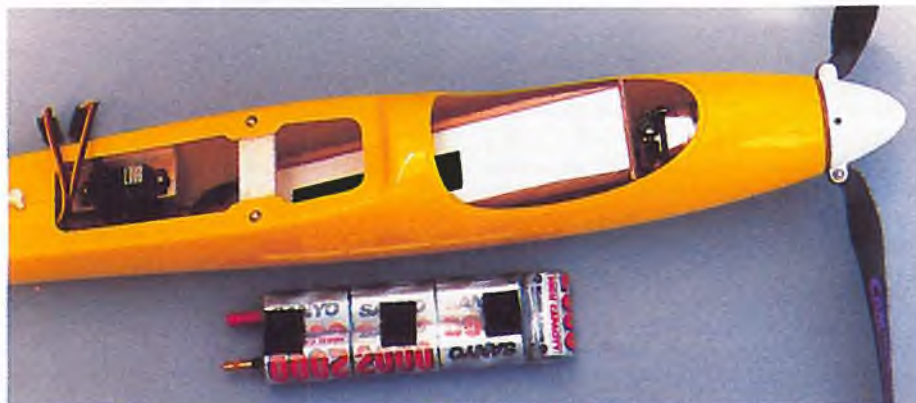
The motor/gearbox assembly fits and is retained by two screws. I had decided to fly 'Open Electroslot' with this model as well as fly it for fun. Electroslot is now dominated by expensive brushless motors but I wished to do it at reasonable cost so I selected the very modestly priced Graupner Speed 600 Race 8.4V motor (kindly supplied by 'Gliders' of Newark) and fitted a Reisenauer 'Micro' 4:1 gearbox. This is actually a Maxon

gearbox with an adaptor flange made by Andreas Reisenauer, he machines literally hundreds of flanges for different motor gearbox combinations (for a few gearboxes and lots of motors).

X-Models offer for this model a very similar article in their range of recommended motor/gearboxes so if you want to duplicate the review model, obtain the parts separately or ask X-Models (ModellHaus in the UK).

It is not essential but as I was using a lightweight thin walled HM spinner I fitted an auxiliary ply plate in front of the one provided in the model (as I did in the Little Star). This protects the back edge of a light spinner in one of my 'precision' landings!

With the wing attached by two nylon screws near the mainspar, it is necessary to use the hole already in the wing trailing edge and drill through the fuselage. A 'T' nut captive nut is inserted into a ply plate and 5 minute epoxy bonded into the fuselage. I fitted the wing whilst the epoxy was going off and tightened the screw to ensure that all would match up later. I cut from paper/foam/paper laminated board a ramp on which to locate the seven Sub-C cell battery. This ramp has a leg at the front to lift it above the motor if the battery should wish to eject swiftly. The battery is located with



▲ You see here the battery ramp and Velcro fasteners, cut servo tray and HM lightweight spinner.



▲ Servos with and without covers.

Velcro so this permits adjustment for CG 'tuning'.

Ailerons, rudder and elevator I tape hinged (my preferred method) and screwed on the supplied control horns - then the time consuming fiddly tasks started.

First, I needed to extend the servo cables. The servos are conveniently near the root of the tip panel for the servo lead to project through the root rib. An extension cable is needed to run from the wing centre hole to the tip of the centre panel. The hole in this tip rib is oval and big enough to accommodate the servo extension socket. Holes in ribs are not big enough for a socket or plug to pass through so I used the cable supplied and lengthened a short extension cable and in the process fed it through the wing. Small job but it took as long as building the rest of the model!

Second - the second long job was fitting the RC bits in the model. Machined blocks are supplied for retaining servos in the wings but I preferred to apply tape to the servos then bond these direct to the inside surface of the top sheet of the servo bay. I attached the elevator servo in the fin in a similar manner - the supplied links were made up and fitted - all very easy and very quick. The rudder servo is installed in the supplied tray and on the already bonded-in rails. Problem: in competition, even Electroslot (whenever a lot of other transmitters are nearby) I like to use Dual Conversion receivers. These are big, the protection circuitry alone is far bigger than a conventional Rx. Fitting any of my 'fun' receivers was easy but not the Dual Conversion ones. Eventually I cut away the half of the servo tray not occupied so that I can push one of these big receivers past the servo. There is lots of room forward but I wanted the Rx at the back and the servo rails were already there. Think about this, measure up before you install the servo tray, you may wish to move it well forward in that bay under the wing.

Did I call it a big task? Unreasonable of me perhaps but it took longer than building the model!

Real Assembly

Real? Yes the putting it together on the field. Wing outers are plugged onto removable short steel bars and the wing then locates on and aligns very accurately on permanent pins near leading and trailing edges.

The tailplane is secured with two M4 nylon screws and the wing with three.

Flying

'Day One' was typical of my flying days in 1998 but I did not wish to wait. I waited for it to cease raining and it was windy and turbulent. I was kept busy constantly correcting it in the bumpy air but its first flight was 33 minutes with a 7 x Sanyo N-1700mAh pack. The second flight with 7 x RC-2000 cells was 40 minutes. I was trying to stay up as long as possible but I also explored the performance envelope on both flights. I had originally adjusted control surface throw as I thought fit, was not happy and before the second flight I adjusted to the throws recommended in the instructions (If it does not work, follow the instructions!) With 12mm up and 4mm down for ailerons and 6mm each way for elevator it was much better. No throw is recommended for rudder, I use about 25mm each way and with the servo arrangement I have, this cannot be increased.

The model was flown with rudder and aileron coupled and uncoupled and there is surprisingly little response difference without rudder.

If your Tx gives you the option of 'crow' or 'butterfly' braking (same thing - both ailerons lift together) use it. The model can be flown (or programmed) with the stick back so that the inboard panels are part stalled but outers still fly and ailerons are still working and still offering control. The model slows and descends and here I think the rudder is beneficial. Crow is recommended as 40mm up.

Modifications

The speed controller is safely located below the ramp. So far the battery has not made a quick exit but it is installed with connectors at the rear so it will disconnect as it exits. Early tests were with a speed controller and Rx battery but now a Graupner 'Soft Switch 40 BEC/Brake' part no: 2874.5 is used to reduce weight. This was also supplied by 'Gliders' of Newark. A powered glider is one type of model where a 'soft start' switch is still beneficial. You are 'on' or 'off' and need the soft start to make life easy for the gearbox and folding prop. It takes about one second of very crunchy sounding gear meshing as it opens up.

Direction changing has a certain oscillation caused probably by the weight of steel wing joiners and servos outboard in an otherwise lightweight wing. I removed the joiners and replaced them with carbon rods. I purchased 1/4" rod and turned it down until it was a tight



▲ Aileron servo plugs into socket which rests in the wing centre's last rib bay.



▲ Cockpit hatch and piano wire clip.

fit - about 6.15mm. The weight reduction is an advantage, turns and correcting them is a smoother operation.

This is a 'pilot's model', you need to fly it all the time. Keeping it in thermal lift demands constant attention. I have now increased the movement of the ailerons to 15mm up and 6mm down. If you really wish to it will fly some aerobatics, it loops very easily and will make an untidy not very axial roll but it is a glider and is best flown as one.

The prop blades fitted to the review model are Graupner 14 x 9.5 part no: 1336.36.24. If you wish to go for a slightly softer option, more motor time and possibly a longer flying model, you may prefer to fit Graupner motor/gearbox combinations: Speed Gear 2.8:1 500 Race 7.2V, part no: 1716 or Speed Gear 2.8:1 600 Race 8.V, part no: 1717. A suitable prop would be smaller than those listed above, check the motor/gearbox inpack literature.

X-Models own recommended power train is EXO GEAR 42 4.4:1 (gearbox) with mounting flange for Speed 500 Race 7.2V motor, 12.5 x 10 Aeronaut carbon folding blades, 47mm aluminium middle-piece with 44mm diameter lightweight spinner, 7 x Sub C cells and Kontronik BEC 40-6-12 speed controller. **EFI**

Specifications:

WINGSPAN	2180mm (86")
LENGTH	1200mm (47")
WEIGHT	1530g (54oz)
MOTOR	Graupner Speed 600 Race 8.4V
GEARBOX	Reisenauer Micro 4:1
PROP BLADES	Graupner 14 x 9.5 on 47mm CRS
CONTROL	Rudder, elevator, aileron (crow brakes) and motor
RC GEAR	Simprom Dual Conversion Rx, 3 x Union 12G and one Jamara Micro No 1
SERVOS	Graupner 'Soft Switch 40 BEC/Brake.'
ENERGY	7 x Sanyo RC-2000

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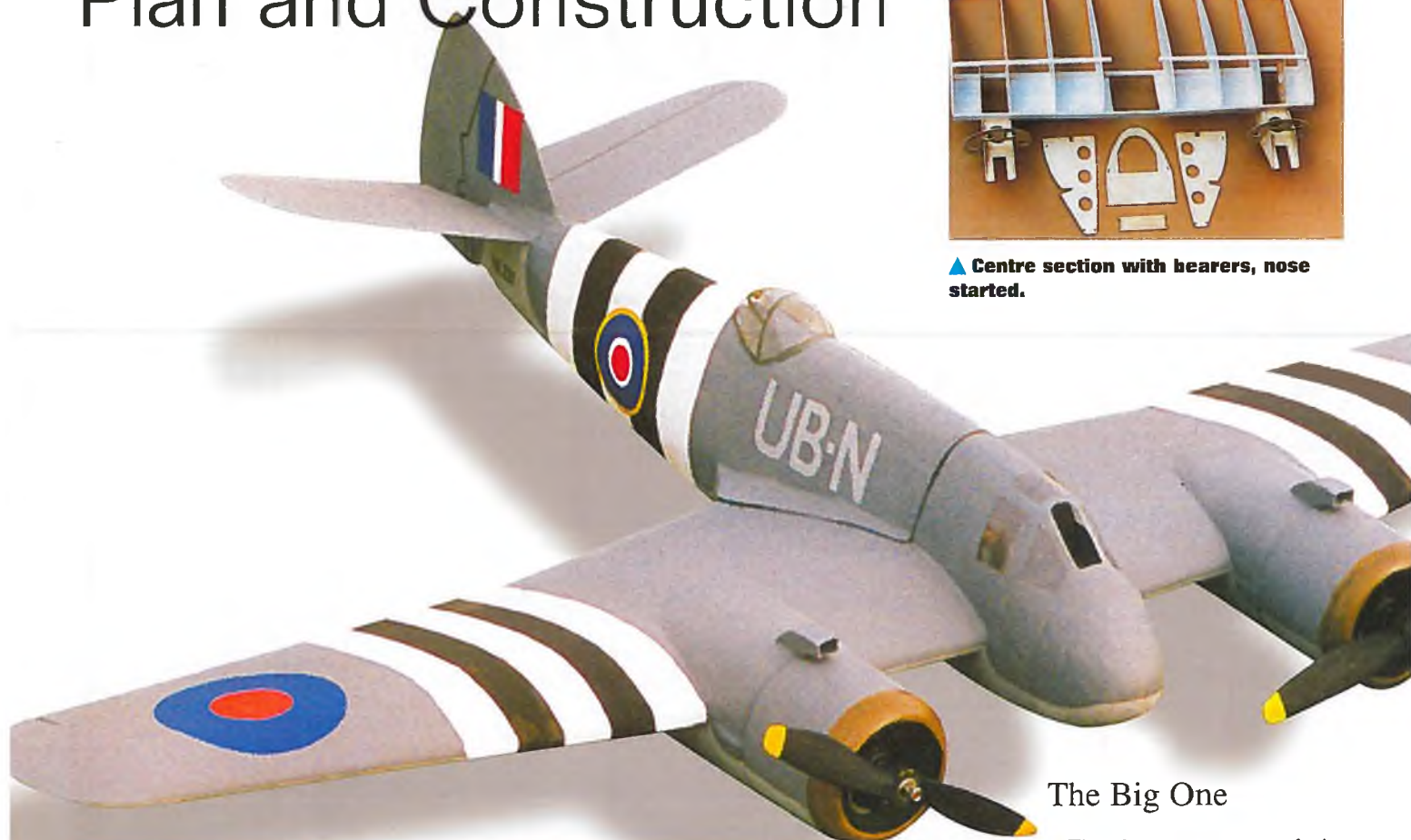
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EFIXMAS98

Bristol Beaufighter

Plan and Construction



▲ Centre section with bearers, nose started.

The Big One

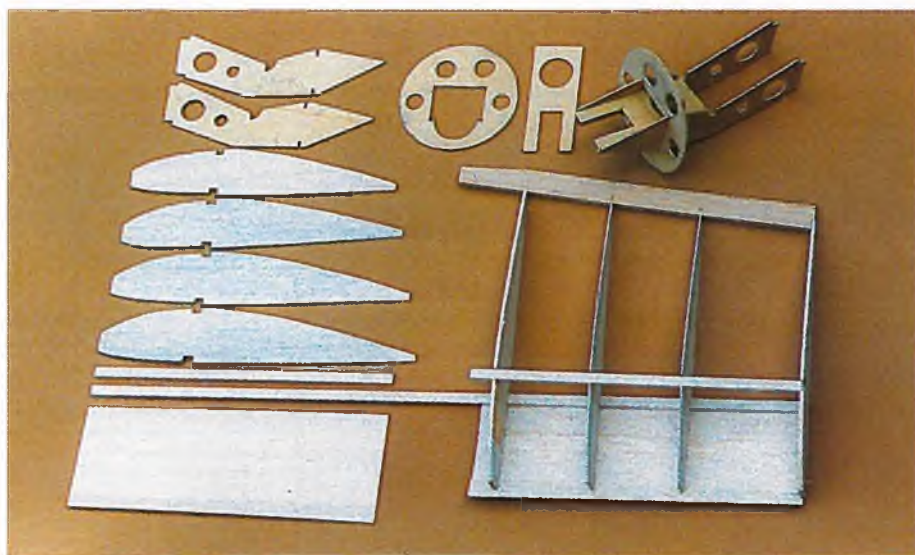
The first prototype of the Beaufighter flew on 17th of July 1939. The first main production model was the Mk IF and these were delivered to Tangmere in August 1940 and made their first sorties with the Fighter Interception Unit early the next month. Although the Blenheim IF was actually the first night fighter to carry the secret AI radar, it was not fast enough to be effective and the Beaufighter with its greater performance was able to make an impact on the German night raids in the winter of 1940/41.

The Beaufighter was also entering service as a long range fighter in the Western Desert. Malta was to receive Beaufighters in May 1941 and Mk ICs also began to replace the Coastal Command Blenheim IVFs in March 1941. In all, 914 of these IF and IC aircraft were produced. Then followed 450 Mk IIFs with Merlin XX engines. This was the first version to have the 12 degree dihedral tailplane to rectify a problem with longitudinal stability. The tendency for Beaufighters to swing on take-off gave rise to the additional dorsal fairing which became standard on later Mk Xs. Improvements to the AI radar led to the thimble nose first tested on a Mk IX late in 1941.

In 1942, with the Mk VIF with Fighter Command and VIC with Coastal Command,

REVIEW BY: ROBIN FOWLER

A 48" (1220mm) span model for two geared 400 motors, seven cells, aileron, elevator and motor control.



▲ Start here, kit of parts cut out for wing centre section and engine bearers.

ghter

the power reverted to the Hercules radials and no more Merlins were used to the end of production. The Mk VIs had the Hercules Mk VI or XVI engines which gave an additional 225 HP over the Hercules III (of 1,425 HP) and in all 1,832 were built.

In Coastal Command the Beaufighter's versatility was increased by the introduction of a torpedo carrying version referred to as the 'Torbeau' and a rocket firing version of the Mk VIC (sometimes called the 'Flakbeau').

In 1943 the Beaufighter Mk X of which 2,205 were produced, was introduced to the Coastal

Command only, as in the RAF the Beaufighter had largely been replaced by the Mosquito in the night fighter role. Now sporting the new ASV radar in the thimble nose, the Mk X had the 1,770 HP Hercules XVIII increasing its potency in the anti shipping role.

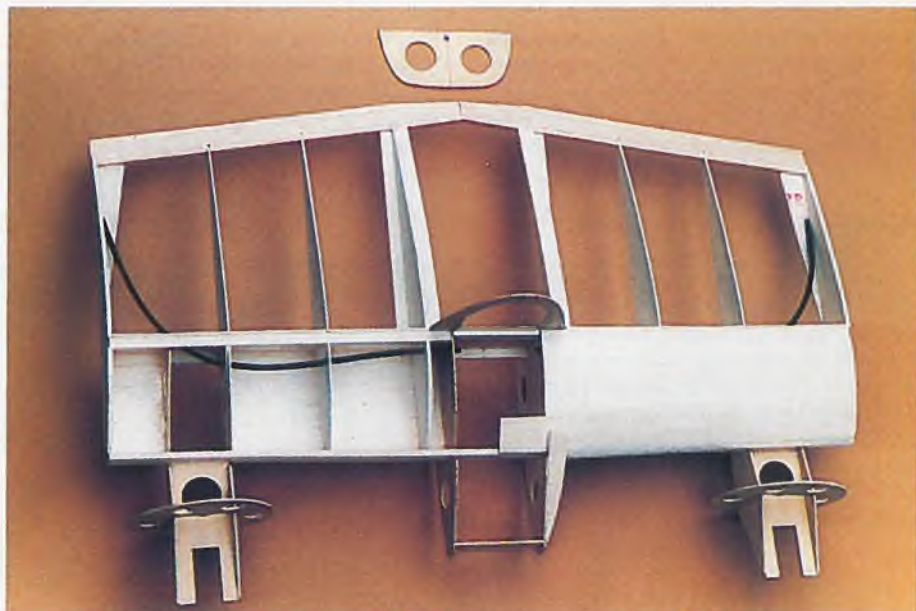
After the war Beaufighters were still serving in the far east with No. 45 squadron until February 1950, when the Brigand arrived. As with many types some lingered on as target tugs and the last active service flight of a Beaufighter was made by a Mk.TT10 on May 12th 1960.

Why model a Beaufighter?

Simple - I love it! It's such a purposeful and distinctive aircraft, and having looked at many illustrations I thought it would be great to see a Coastal Command example complete with invasion day stripes in the sky. Having got a couple of twin electric powered aircraft under my belt, the Fairey Hendon at 50" span, and the Armstrong-Whitworth Whitley at 48", I decided to go for this new model also at 48" span using the identical power unit. This was two MFA Mini Olympus gearboxes with 400 motors fed in parallel from a pack of seven 800 AR cells. My only concern was whether the drag of a fuselage about three times the cross sectional area of both of the previous twins might prove too much for the power source. There were also two radial engines instead of in-line to add to the possible problem.

Drawing time

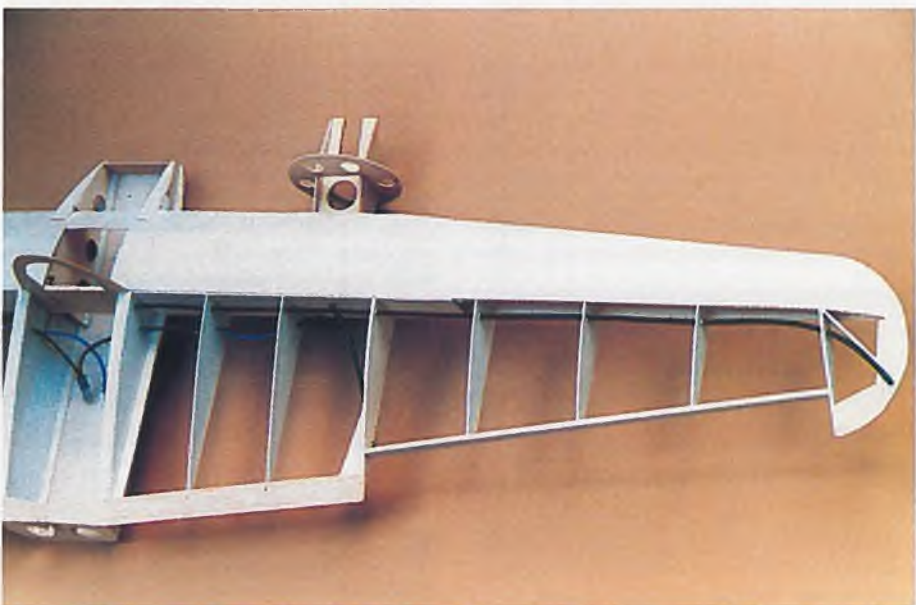
Once more to the drawing board dear friends, once more! Standard wing - nothing unusual here. The front is a D box and open structure behind. The question of how to absorb the shocks of belly landings which would be met by the engine fairings, with the battery pack in the fuselage half way between them had to be met. Should I use real wheels in the semi-retracted position as for the full size, with some springing intro-



▲ Control snakes in, top sheeting in progress.



▲ Basic centre section complete.



▲ ...add outer wing panels.

duced to take the shock? Or perhaps, if I was going to carry the extra weight, should I go the whole hog and go for retracting undercarriage? The weight penalty was too much - I decided to try a vac formed moulding. I had to go for lightness and a moulding was not only lighter but quicker. With the larger cross sectional area and smaller wing area, I reckoned this was more important.

I designed the tail section to be removable from the wing which would have the front lower fuselage and cockpit area back to the main wing spar permanently fixed so that it could carry all the equipment except the elevator servo. Assembly times on the field are so short. The joint is made as a halved joint with a permanent dowel pin at the wing trailing edge and wire loops and removable wire pin at main spar.

The nose section of the fuselage I designed as a rather ambitious one piece moulding. I was hoping that I could make it all in clear PET and simply mask out the clear glazed sections for painting, but if it proved impossible by pop bottle, then I would have to resort to the vac rig or do the cockpit itself as a separate insert. In any event the front screen would be left open as an intake for battery cooling air which would be channelled round below the wing and let out by a hole in the rearward section of the navigator's turret, with a little extra help from a hole where the tail wheel ought to go.

So build it

The foundation is laid so to speak with the construction of the wing centre section onto which the motor bearers and the lower front fuselage section can then be built, see the build photos. There is nothing at all remarkable or difficult in these stages, you don't even have to remember to install wiring for the electric motors early as these can be added by simply rotating a small drill bit between the fingers to make holes in the ribs through which the wires can be inserted just before covering. The only thing that has to be installed early (before the top sheeting is added) is the aileron bowden cable outers.

The fuselage sides are cut out of 1.5mm soft balsa sheet and the side formers which will give the sheet sides their vertical curve

are glued on, having first marked their position. The sides are first connected to each other using the ply facings at the front end and then stage by stage adding the remaining spacers to complete the formers progressively towards the tail. This is where problems can be encountered as the sides, stiffened by their curvature across the grain

complain about being forced to take on a curve lengthways as well. I used a little steam from the kettle to lower its resistance, but was left, when it had all dried, with some rather obvious bulges between formers. The addition of longerons sorted most of these

the sheet sides so as to spread the load to top and bottom of the fuselage, I drilled the ply facing plate F3A and extended these into slots to take the loops which would extend from the rear of the front fuselage section. The ply former F3 at spar position was then drilled with two small holes in line with top and bottom of these slots through which the wire ends could pass. A single bend in thin wire makes the loop, the ends of which will pass through these holes. The loops are taped into the rear fuselage with the pin in final position and the ends inserted through F3. The four wire ends can now be turned out at right angles and a sandwich of hard balsa cut to fit and hold them fully encased in wood glue. Pull the loops fully to the front and make contact with the pin before fixing them and the fuselage sections will be positively located without slop. It's a bit of a fiddle but a simple and cheap design with nothing to buy but piano wire.

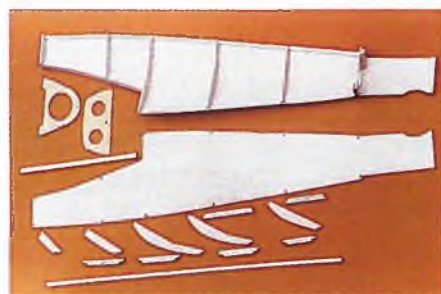
Before covering I made sure all the wires etc., were in place. The aerial was routed through the starboard wing, I didn't want to have to thread it down the rear fuselage every time I assembled the model.

The airframe has cost £5 so far, what do I cover it with? I rejected doped tissue because of openwork wings, so it was Solarfilm or Solartex. I had in my box a pack of clear yellow Solarfilm but it was all going to be painted over anyway (somebody told me Solarfilm would take paint - wrong!). I used what I had to hand, a right patchwork it looked, it took exactly the one pack. That's another £3.65 gone! Total weight now 11.5 ounces. The airframe ought end up under a pound, now to the mouldings...

Mouldings...

I was soon carving a sizeable lump of softwood to the shape required for the nose so that I could mould pop bottles over it. The cockpit and upper fuselage part was no problem but the nose was a mess. I cut it off and decided to add that bit later. Tops and bottoms of the engine nacelles were no problem. The navigator's cupola took a one litre bottle.

I always enjoy the advancement of an aircraft's shape as each part gets glued on and give it another appraising by viewing it from several angles. The original air scoops above the nacelles were formed from some scrap 3/32" sheet, with the underside being made from a flap formed by cutting the plastic on three sides to make a hole to take the scoop and bending the flap forward. The first com-



▲ On to the detachable rear section, sides first.



▲ Tailplane and wire elevator links.



▲ Rear section basic assembly complete.

ponent was a former at the rear by which the nacelle would be screwed to the airframe and rolled a strip of 1/32" ply round it. When this was dry I glued 1/4" wide strips of spare veneer round the inside at the front to form the rough curve required. I sanded the cowl-ing front to shape and used a little filler to get over the major imperfections, then gave it a coat of dope.

I completed the installation of radio and did a quick weight check. With nose, batteries and painting still to add it was under two pounds. A test or two revealed the awful fact that none of the normal paints would resist abrasion and stay on the Solarfilm. Cellulose, acrylic and enamel all rubbed off. Now what? I hadn't the heart to rip all the covering off so I just painted the model anyway in the knowl-edge that in all probability I would have to touch it up after every flying session.

The power train at this stage was a pair of MFA Mini Olympus gearboxes with Rocket 400 7.2 volt motors and Graupner 8 x 8 props and my seven cell 800AR battery pack feeding through a flight switch.

The first of the 'phew'

The first flight of a new model is always a bit fraught for the pilot. While the model was in its semi painted state a calm day dawned. I installed radio gear and gave it a final weight check before making off to the field.

This was it! Switch on, check all works as it should, face into wind, motors on ... and fling! The wind was picking up by this time and the Beaufighter climbed away gently with only a little elevator trim adjustment required. At an all up weight of two pounds ten ounces it flew much as one would expect - gently. It responded to aileron positively and I switched the rates in at about fifty per-cent to give a less twitchy turn. It rolled at quite a scale rate at this, but I always seem to give my models too much down while inverted (especially when new!). A loop from a shallow dive gave no problems although it looked a bit on the mean side. The air was getting a bit lumpy to judge how the model behaved and I stooged it about to get used to turns until I suddenly realised the motors had cut. There had been no attitude change at all. I just noticed that the props were stationary as it flew overhead. I turned into wind at thirty feet and turned another 360° as this particular field has a

pond which I was too close to. The model landed at a ground speed of about ten miles an hour in the long grass. Phew! I switched off and walking back to the car, I wondered... It could have done with more speed, but my main problem was the covering. Something would have to be done, even if it meant stripping it back down to the wood!

Adjustments

The second flight I timed. The BEC cut the power at three and a half minutes. I had been using a flight switch and I wondered what would happen if I changed to 6V motors and used a six cell 2 Ah pack? I knew that I would need more current than the 7.2s. At a guess it would give me about six minutes in the air compared to the 800 ARs - if it didn't upset the wing loading! Well, actually it did seem to upset the wing loading and although the motor run was around ten minutes, the flight, which took only half this time before I decided that discretion really was the better part of valour and put her into the long grass, was fraught with the most weird control effects. At least I could deduce from the increased motor run that the model as originally configured required larger cells.

I moved the battery pack and radio gear forward as far as they would go, then gave it another flight. Ah! The wing loading was the same as on the last flight, but the Beaufighter performed better all round. The flight was eleven and a half minutes this time and although some of the strange effects were still noticeable, they were much reduced. The worst was a tendency to bank unbidden and to roll slowly into the bank once entered, requiring a little opposite aileron to hold it.

Several flights later, having changed the flight switch for an M'Tronics HF250 speed controller but otherwise using the identical set-up, I was happy. With the amount of elevator I was unable to produce a stall in level flight. With motors off the nose dropped

slightly and no amount of up elevator could produce any misbehaving. Landings were effected with quite a lot of back stick. Flights were now in the order of twelve minutes flat out all the time with enough speed from a shallow dive to execute some nice rolls without having to use so much aileron that adverse yaw resulted while inverted. The only oddity remaining was a slight lack of fin area (which was a problem the full size had - hence the 12 degree tailplane dihedral on later marks), but I wanted to stay strictly scale so decided to put up with it. At least I knew I could return to a smaller battery pack and improve the handling if I wanted, but now that other adjustments have been made the effect seems to have disappeared.

A word about speed controllers on a six cell pack: the controllers tend to cut off early because they protect the voltage needed for the radio receiver. This is to protect your radio receiver's supply, and is quite right too. The M'tronics I now use for this model does not actually shut off the motor supply but reduces the power available to the motors so that they continue to run but at reduced revs. So when you notice that the model is starting to sag, you enter the landing circuit.

The Highs...

I was really starting to enjoy flying the Beaufighter now and flew her at one club meeting held on the field. I made a fairly sedate flight of it with a few low level rolls thrown in, but mostly scale like circuits, and was caught by surprise on landing by a generous round of applause. Well, it's nice isn't it? A little encouragement goes a long way, and it seems from comments I've had that the little Beaufighter is well admired by quite a few.

...and Lows

With the July '97 Electric Flight weekend at Old Warden looming I stripped the tail section and refinished with tissue and dope, learning along the way that the thinned PVA I had used to sur-face the foam top and underside was not impervious to



▲ Bracing across to true up the section, now we can add foam top and bottom. Bracing across to true up the section, now we can add foam top and bottom.



▲ Model covered and awaiting mouldings.



▲ Pop bottle nacelle parts added with clear glue on top of covering film.

Specifications:

SPAN	48" (1220mm)
LENGTH	32" (813mm)
WEIGHT	2 lbs 13 oz (1276g)
WING	
LOADING	20 oz/sq.ft (61g/sq.dm)
MOTOR	2 x Speed 400 6V current 10A
GEARBOXES	MFA Mini Olympus
ENERGY	6 x 1000mAh
PROPS	Kavan 9 x 6 (modified to 8" pitch)
SPEED	
CONTROLLERS	M'Tronics HF250
CONTROL	
THROWS	elevator +/- 4mm aileron + 8, - 6mm (for scale flying)

dope! At a vital moment a prop nut came loose and vanished into the Shuttleworth grass leaving the just-thrown Beaufighter with half power and an immediate landing.

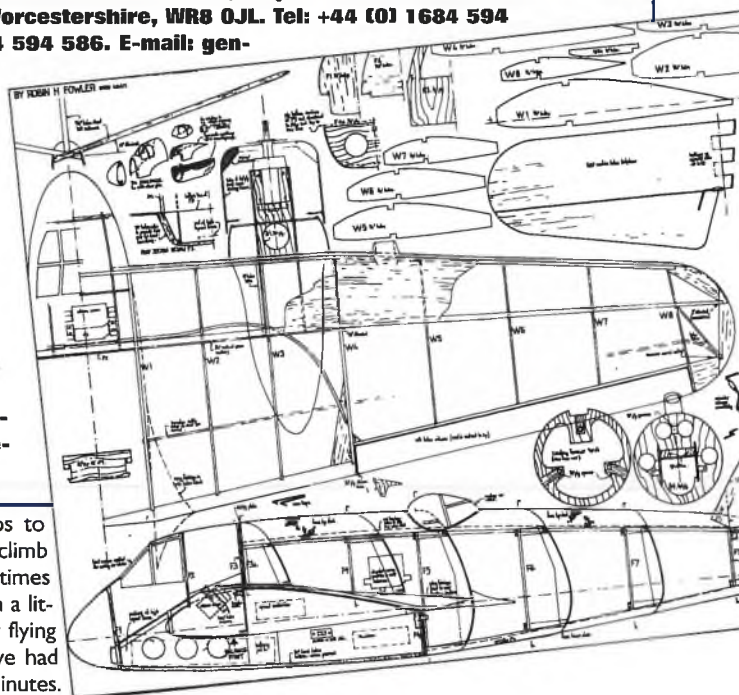
The last ditch...

I made one more alteration to great benefit. I ditched the Graupner 8 x 8 props which were designed for glow motors and heavy and fitted a pair of Kavan 9 x 6s on which I increased the pitch. How? - put the hub in the vice and grip the blade with a mole grip or similar with a towel cushion. Play the heat gun

MW2716 - BRISTOL BEAUFIGHTER

Copies of plan number MW2716 'Bristol Beaufighter' are available from Electric Flight International (Plans Service), Traplet House, Severn Drive, Upton-upon-Severn, Worcestershire, WR8 0JL. Tel: +44 (0) 1684 594 505. Fax: +44 (0) 1684 594 586. E-mail: general@traplet.co.uk

The plan is price code K which at the time of going to press was £9.00/\$15.00 plus post and packing of £3.00 for UK orders, £5.00 for Europe & Worldwide orders or shipping and handling charges of \$8.50 for USA orders. For more information on Traplet Publications plans service see our advertisement in this issue.



between and ease the grips to the desired amount. The climb out was improved but flight times did not reduce. In fact, with a little use of the slope by our flying site in the right wind I have had flights approaching fifteen minutes.

Finally...

The Beaufighter looks the part in the air and does all that it should for a model with

only three functions. I love it and can foresee me flying it for some time to come, overcoming a deep rooted tendency in me to move on to something new the moment a model is sorted. **EFI**

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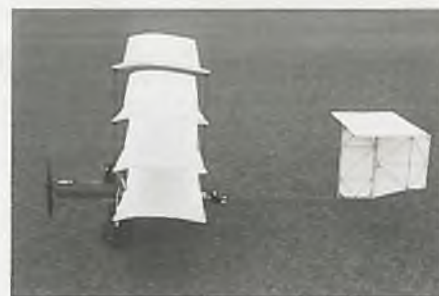
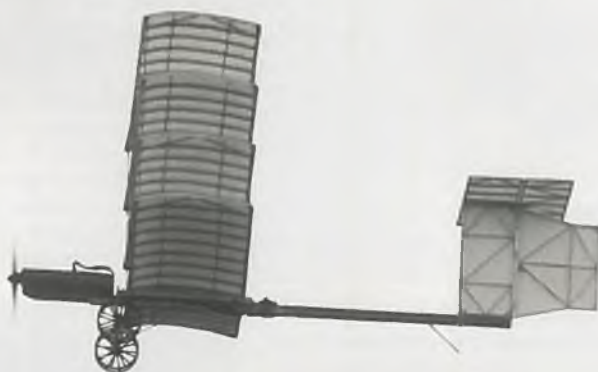
Aileron differential
Gud flap and spoiler mixing (Butterfly, Crow braking etc.)

Elevator-to-flap mixing

Flapperon/V-tail mixing



Sport and Fun at KRC



▲ Meanwhile, Don Bosquet from Narragansett cornered the market in carbon fibre rod - he used thirty feet of it in 'Four of a Kind'. Over 1,000 square inches of wing flies on the staggering power of a Speed 300 motor, VL gearbox and a 7.5" (190mm) prop rotated by six 600AE cells. Litespan covering, 16 oz (450g) AUW, for some 2.3 oz/sq. ft (7g/sq.dm)! See the title shot, Nate Bosquet proves that it flies very well too. Father Don gets to fly his creation too, if he behaves.

REVIEW BY: DERECK WOODWARD

It happens every year! Nineteen years ago, Pennsylvania's Keystone RC members invited a few friends over for a get-together of enthusiasts for the newest form of model propulsion around - electric motors. Any year, it gets bigger.

The 1998 descendant of that little get-together involved 265 registered pilots, Allentown's Queen City airport's second runway, a marquee for a control area, outside caterers, a hangar for a dinner and nearly everyone who sells e-flight goods in the USA. Folk travelled from Canada, Puerto Rico, England and Sweden, possibly more. Almost every US model magazine was represented, along with yours truly for Traplet Publications.

The event is a fliers' meet - not a traders' show. The venue is good if you love tarmac, perhaps not so good if grass is your preference. KRC is now held on an airport because it outgrew local club fields, both flier and spectator numbers making a large parking area essential. The show doesn't just 'happen' - there is a big team with defined roles, under a KRC manager. In short, 'KRC' is a business - all the more remarkable as KRC has around 100 members - not that large by US standards - and is not 'electric flight only'. Though 'KRC' stands for 'Keystone RC', the host club, those initials stand for this event to electric flight enthusiasts in the US.

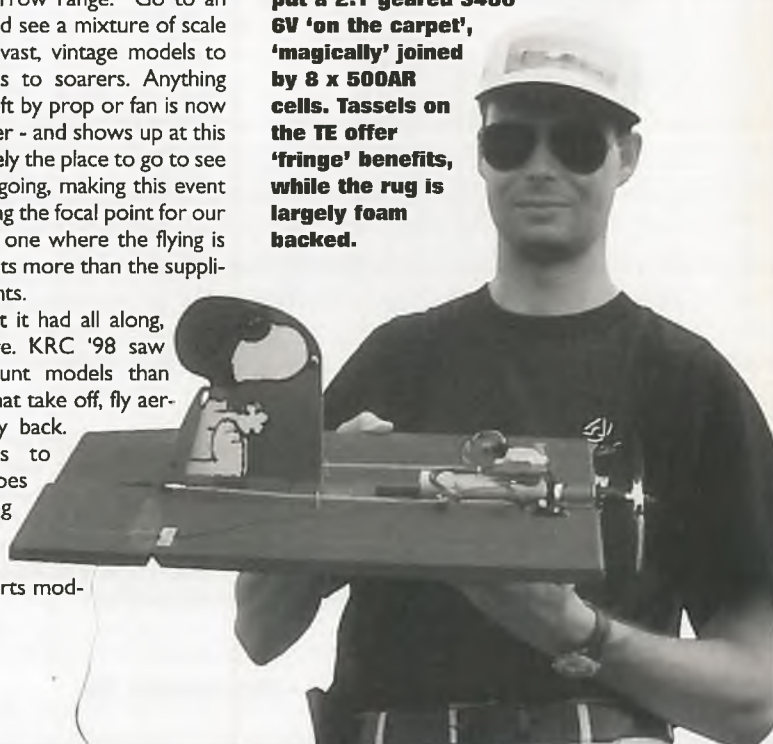
Now, e-flight is a strange mixture of the aeromodelling spectrum and electric power. Other aeromodelling events are specialist - scale, aerobatics, large models or whatever, events cater for a narrow range. Go to an electric flight event and see a mixture of scale models from tiny to vast, vintage models to jets, sports aerobatics to soarers. Anything that has ever gone aloft by prop or fan is now flying on electric power - and shows up at this event! 'KRC' is definitely the place to go to see where your hobby is going, making this event unique in not only being the focal point for our side of the sport, but one where the flying is done by the participants more than the suppliers to those participants.

E-flight is finding feet it had all along, but seemed to ignore. KRC '98 saw more higher cell count models than ever, sports models that take off, fly aerobatics, land and taxi back. An undercarriage is to practice touch and goes on, not something shunned as excess drag. Even retracts are showing up in sports mod-

els as well as scale, while electric powered scale reels in 'wet' power - this year, many high quality models matched anyone's definitions of 'scale' and 'large'. The older ideas that held us back are now being swept away - if you wanted confirmation that a low powered seven cell soarer is the worst way into e-flight if you can already fly, this year's KRC was the place to be.

In contrast to the big ticket scale models, the babies are well established. Speed 400 motors climbed out of soarers, proved their mettle in S400 racers and now power delightful small

▼ Kicking off this year's report with a good, sensible model from Stockholm. Martin Lagerstedt came over from Sweden (on a regular flying device!) put a 2:1 geared S400 6V 'on the carpet', 'magically' joined by 8 x 500AR cells. Tassels on the TE offer 'fringe' benefits, while the rug is largely foam backed.





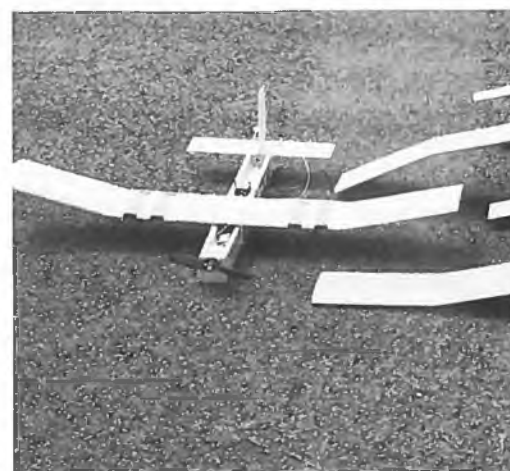
▲ Here's Don Belfort - E-flight scribe for 'Flying Models', pushing the \$400 limits. His 36" Bv 141 is a scale up of A. A. Lidberg's 22" (560mm) rubber model. 220 squares (14sq.dm), 17 1/2 oz (500g), 7 cells and a 5 x 5 three blade prop. Controls are rudder and elevator; side to side balance is at mid-span - thought you might ask that one. The Me163-ish device - A Gus Morfis 'Batty' - spans 28" at 16 1/2oz (468g) and is ground catapulted off a wheeled dolly, while a small firework in the tailpipe provides a realistic smoke trail on take off!



▲ Hottest shape at the meet! Scott Black has been working on his 'Pond Racer' for five years. Fuselages are foam and brown paper, wing and tail from balsa. 50" (1270mm) span, 315 squares (20sq.dm), 56 oz (1590g) and bungee launched - the hook is on the wing LE and she's launched with motors running. Initially had a series power set-up, now has an Astro 035, six cells and a controller on each side, with the receiver under the canopy. Looks superb in flight, handles well but grass covered rocks broke an outer nacelle on landing.



▲ At the other end of the complexity scale, the model of 1998 - the 'Blue Foamie'! Sold for a staggering \$15.00 by Pat Mattes (centre). Uses ultra modern composites - blue foam and parcel strapping tape - and the ubiquitous \$400. That's yours truly with well flown old nail on right, while John Cserneck from Limerick, PA, taking off P51 'Old Boy', is on the left.



If you put a slow-fly or the newer park-fly, model in the hangar - the area needed really shrinks. Many of these were out in the early morning calm - yours truly was prevented from flying by a micro receiver that just doesn't like company, but I was the last to fly on Saturday night, as my lonely Kolibri circled a car park across the street from the airport at 9 pm. You don't need that much light to fly that close and slow!

This look at KRC 98 is favouring 'small' and 'sports' models, those some reports overlook. Martin Irvine and I plotted this - our scale guru will cover scale, which tends to include 'big' and 'exotic', so here's what the weekend pilots are flying! Wherever possible, I've included models' statistics in the captions, so here's plenty of 'what works' to add to your database - so here's KRC 98, as seen through the viewfinder!

Flying off into the sunset

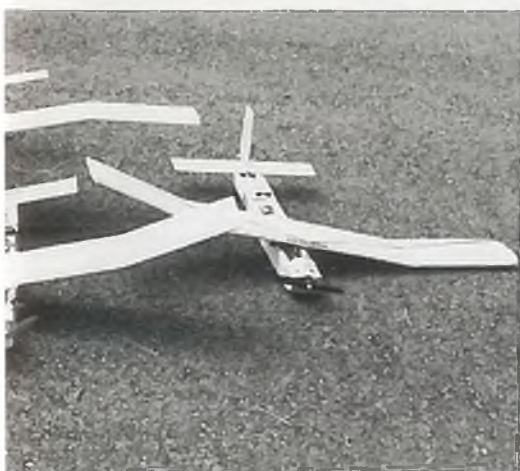
Memories of KRC? Well, the AULD went to Karl Benson who won with 2 hrs 10 minutes and 18 seconds. We often wondered how long he could do - in AULD tradition, the winner lands after it becomes obvious, to free up the field. Second place Cliff Schaible ran him to 2hr 3min 33sec, so the organisers let Karl go to dead batteries.

Keith Shaw and Dave Grife flew the Saturday



▲ **Fast, aerobic - tailless too!** Bill Winters' Polestar inspired Dan Gantt's 'E-Star'. 48" span, 576 square inches and 64oz. Power is a MEC Turbo 10, 5:1 MEC gearbox and 10 x 1700 cells. Fast model is Dan's first attempt at 'own design'.

▼ **Secret rehearsal for a 'Blue Foamie' formation fly-past!**



▼ **For a change from John Chapls and his designs - here's Connie Chapis and her favourites from hubby's fleet.** Both are 'skinny scale', or maybe 'fat profile', with all balsa Jedelsky type wings, for geared S400. The Mustang has ailerons but can be built rudder/elevator with more dihedral. John is heading towards kits of his designs, had some short kits on show at KRC.

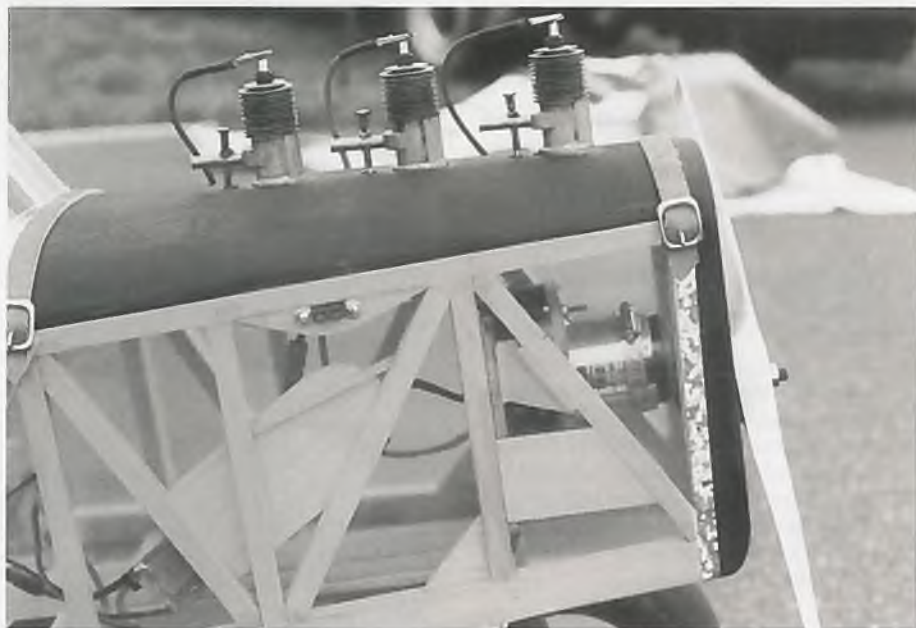


demo with 12 aircraft in historical sequence from WWI to Keith's 82" Bearcat representing the pinnacle of the 'prop era'. Perhaps '99 will see some of the other notable models invited to fly in demo style on Sunday? For example, Robert Wagoner had his awesome EDF A10, while Dave Baron has fitted retractors to his ex-Joe Beshar 11 foot B17 - it would be good to see their ilk in the sky on their own-some.

As 'The Team' gets the hang of Queen City Airport, the hangar dinner is taking on a character of its own. This year, Jim Boxmeyer shared his composites knowledge, while John Worth and Keith Shaw did 'Little and Large' talking about opposite ends of the spectrum.



▲ **At the other end of the scale - Jerry Smartt regards some folk's ideas of 'big' as 'schoolyard scale'.** This is his 15 feet span 200% replica of Bassett Brown's 1933 'gas model'. The wing is in three pieces; those black dots in the fin are the rudder servos.



▲ **Scale models should have an appropriate dummy engine - as Jerry Smartt's model is twice life size, he fitted three dummy 'Brown Junior' cylinders.** Tiny electric motor is a geared Astro 90! Note the leather 'bonnet straps'. Even KRC's runway wasn't big enough to tempt Jerry into flying this gentle giant.



▲ **If you're going to launch a range of e-flight models, KRC is the place to do it!** Derek Nunnally (on right) brought 'Delta Wings' all the way from Georgia to Pennsylvania. His F-16 and 'Python' (on left) are all foam profiles with a rear mounted 480 or Astro 020 brushless running a pusher prop. They look the part in the air, fast and easy to handle - not for the novice, but jet looks with minimum fuss.



▲ On the other hand, Bill Griggs is a long time KRC regular - this is his new Bede BD 10 DF kit, all CAD cut. Bill sells everything from the kit to a complete package with fan and motor. Adrenalin, in a handy pocket size!



▲ Jack Sowle, master of slow and graceful aerobatics, and Sig Four Star 40 (yes - mine's similar!). Takes off easy, aerobats with impeccable manners, lands slow like every Four Star 40 - but won't upset the neighbours. MaxCim MaxNEO-3Y, 20 cells and a 13 x 6-10 Zinger make this five and a half pound model really perform.



▲ At the other end of the performance envelope - Roger Tennyson flew from California to a dental conference in Pennsylvania the week before and his little Avro 560 tagged along in its carry case. 48" rudder/elevator model has removable wings and tail for easy packing, 'Airtronics' micro servos and Rx/ESC, HY42 motor a 7" prop runs on 5 x 600AE cells. Flies like the real thing - a leisurely climb, while manoeuvres are left and right turns!



▲ Better have one scale model - this is Joe Beshar's third and smallest B17. Fed up with the hassle of large models, he's now flying ever-smaller ones. Joe has close ties to this particular B17 - he flew her over Europe in WW2!

A look at the future - six of Kyosho's mould-fed foam T-33's were launched (nearly) together. With timing, this could have been the world's first EDF AULD! With a mixture of catapult and hand launch, plus one brushless version taking off its tiny wheeled UC, the sky was briefly full of whistling jets. Not as dicey as it sounds - some do look different from the others.

As long as KRC remains a fliers' meet, fliers will come - after all, there aren't many meets where a scale model takes off dodging a slow fly as a jet whistles overhead, while only one thing mars the peace - dare we hope the PA will be less intrusive next year! This year, traders remarked on how little they saw of their prime pit areas - too busy selling their wares in traders' alley. Areas eyed by fliers who found themselves at the far end of the line and would be much happier pitting near to, the flight line.

Thank you, one and all at KRC, for putting on the meeting. Same time, next year? **EFI**



▲ What Dave Baron flies to relax after missions with his 11 ft, 32 cell B17 - 36" model is designed around a geared S400 on eight cells. Structure is simple, basic wood aeromodelling throughout. Battery goes in through the 'windscreen' for fast changes, who wants to stop when they're having fun? There might well be a kit of this one eventually, if we're lucky.

Don't worry if you have missed a copy

Electric Flight

INTERNATIONAL

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Reviews of the Robbe Dash, the Apex Mite 400, the King Bee, the Climmax and a Chipmunk plan. We look at models in the US & some research into airfoils.



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ISSUE 10
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ISSUE 13
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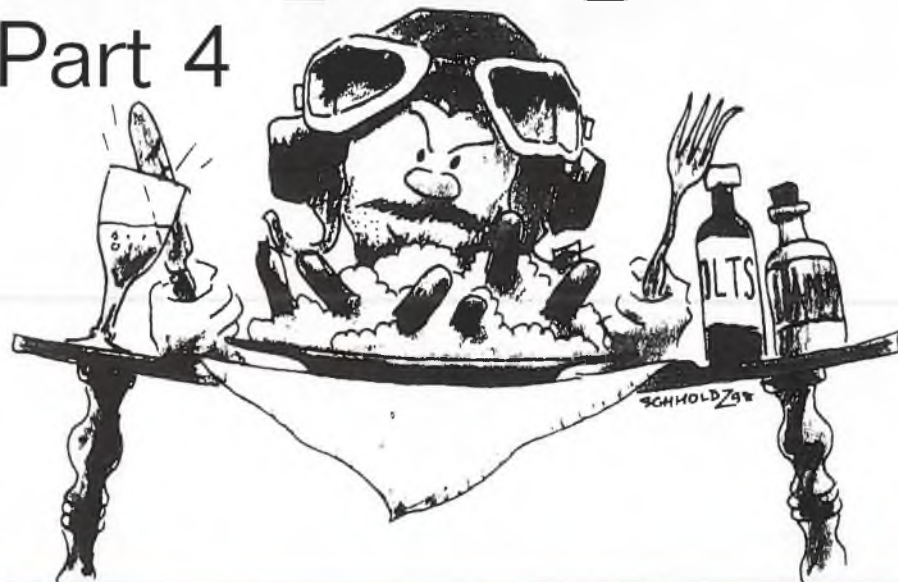
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ISSUE 3 - SOLD OUT ISSUE 8 - SOLD OUT

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Another Large Helping... Please!

Part 4



REVIEW BY: **CHRIS GOLDS**

Work progresses on the B-52. That strangely hinged undercarriage is persuaded to work and their doors to close too.

Fitting Out

I could progress no further without putting some wheels onto my railway coach for two very good reasons; the first was that the space occupied by the main trucks would not be available for power pack cells (40 x 2000!) and this helped to guide me towards the location of the cells and their cooling fans in order to achieve the correct C of G. The second reason was that the complicated six-leg undercarriage and its large doors was bugging me! So, if you have got an itch - scratch it!

I 'phoned Mark Wood of IRVINE and he went "beep-bop, beep beep bop" on his computer and said "yes, Springairs of your size ARE in stock". "Right" I said "two complete sets, two large packs of extra tubing, four line break connectors and one of the old-style toggle switch air valves - if possible!". Young Mark is not easily thrown and he replied "Oh no! Not another B52!". What an intelligent young man he is to be sure!

The positioning of the main legs was very much a task of cut 'n' fit, because of the peculiar angles that the legs follow when they fold, left legs half forward and right legs half backwards. I tried drawing it all out but



▲ Gear bay skin being formed in mould.



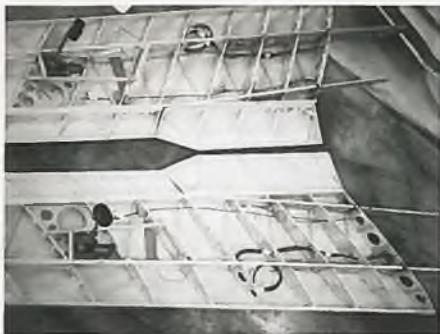
▲ Skin finished and ready for doors removal.

failed so using my original 'covered wagon' (see part 1) as a guide I made patterns of the units mounting plates and shuffled them around until I achieved a proper fit.

Next I made a dummy copy in 1/8 (3mm) light ply, fitted the real units to the ply and pinned it into place in the forward bay (the rear bay is virtually a copy but is much simpler due to having no steering to worry about!). I made and fitted a dummy truck unit comprising two 3 inch (76mm) wheels, 3/4 inch (19mm) thick with a 3/4 inch gap between them, all fashioned from balsa with a 1/8 alum rod standing in for the eventual leg of 8 SWG piano wire. I could now pump the leg up to the retracted position and see where it went and the travel space it required. Next, I cut from card a pattern 'bottom' to the bay and pinned it into place. With repeated 'ups' and 'downs' of the truck I eventually found the odd shape of the gear bay doors which would allow the trucks free travel. Written, it takes but a few seconds but in practice it took over two hours to find the answer.

Now there was a major task - to bend and form the supplied legs to accept retraction with units facing both forwards and backwards (for which they are NOT intended) then cut them to length to accept the double-wheel axle adaptors which I had previously fashioned from 1/2 inch (13mm) soft aluminum rod, drilled and tapped for 4mm grub screws. With that done, all four units could be dummy fitted on 1/8 light ply pattern copies of the gear plates and retraction tests could be carried out to check for 3D mistakes. All went well so the patterns were used to make the proper gear mounting plates from 1/4 (6mm) light ply with 4mm blind nuts fitted to accept the mounting bolts. As usual, I fitted 1/2 (13mm) inch thick slices of rubber ball between units and plates to give an extra layer of 'bounce' to the gear legs.

The 'jockey legs' out towards the wingtips were easier to fit and will present few if any problems with doors as they are attached to and move with, the leg itself. So now I had all six legs in place and the time had come to fit the air lines, the charging point, the three break point connectors, the on/off valve, the tank and six 'tee-piece' connectors to complete the circuit. The tank is about four times the volume of the one supplied with each set and it took a LOT of pumping to charge it! In fact it took a very GREAT deal of pumping and still gave no retraction! I went over the circuit drawing I had made to see if I had got anything backwards but no, the 'map' looked correct. So what was



▲ Outboard wing panels with jockey legs in position. They retract in concert with main gear.

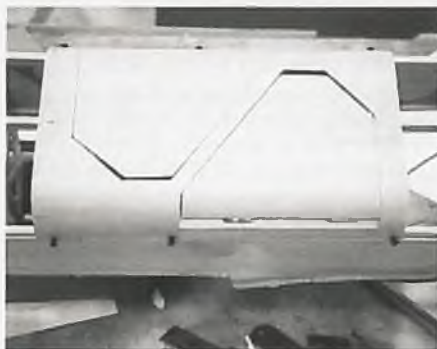
wrong? And then I twigged! - because the model is so large I had not fitted the right out-board wing panel and thus had left the right-hand jockey unit line un-coupled and acting as a leak. I remedied this and started the pumping again. Twenty-five, thirty, thirty-five, forty, forty-five, fifty. That should do. I selected up and LO! the jockeys both snapped up but the main trucks simply unlocked and hung halfway up. Another twenty pumps on a by-now red hot hand pump and up came all the gear. WOW! Did she look NICE with all her boots tucked away. I selected down and with six solid 'klunks' the wheels all locked down. That was a happy end to a long, long day. But the morrow loomed like a coming visit to the dentist. The doors! Ugh! In real jets I have had them stay locked up, or down, or fall off or get damaged or come loose, in general doing anything they were not supposed to do - so I do not like doors! Ugh!

I had planned to slave the doors to the legs so that as the latter came up, the former did likewise but it soon became apparent that this would not work as the legs could be forced to rotate against the pull of the doors by virtue of the steering connections. I was taught in the RAF to always have a Plan B - in case! So my plan B was to drive the doors by a separate means either air or servo, to get a firm up and down position. Air would mean separate air valves, one per door, with all the extra weight and complexity of such a system. So servo drive it had to be. I decided that I could use one 180 degree UC servo (at the moment I use HITEC 75BB) per pair of main doors using the 'strength' of the last 30 degrees of movement to lock the doors up or down. Remember! These doors are big being some seven inches long by six inches across the triangle and would need considerable force to move and lock them.

I built a 'mould' from four bulkheads of 1/4 inch balsa to the shape of the underside of the fuselage, these were connected by 1/4 square strips and glued to a heavy wood base plate. I butt joined enough 3/32 (2.4mm) sheet 12 inches long to make a 'skin' and ammonia soaked it. This, when ready, was patted dry and pinned into the 'mould'. The previous thin card dummy bottom skin provided the shape and location of the doors and was drawn onto the balsa. Ten minutes with the heat gun had everything dry and I could begin to build in the various reinforcements to form the doors.



▲ Forward gear bay with legs 'up'.



▲ Forward gear bay with everything 'up'.



▲ Gear installed and belly skins being fitted.

By this time my curiosity was pulsating and I was desperate to know whether the scheme would work. So I released the skin from the mould and cut out the doors. The skin was attached to the fuselage belly and after a bit of shuffling backwards and forwards I could raise and lower the legs without fouling the skin - half way there - time for a cuppa tea and a dogs walk!



▲ Outdoors put-together to check alignment of motor pylons.



▲ The scale motor pylons spacing is well worth building a whole new model!

Refreshed and back in the workshop after fruitlessly chasing numerous rabbits, I could hinge and fit the doors and hand-drive them up and down. The 180 servo was in position above the bay and the next difficulty to be overcome was the shape and placement of the 'horn' of each door by which the 180 servo would snake-drive the doors and lock them in position. This was one of those critical jobs by which the 'satisfaction' of the model would stand or fall.

Now began one of those times when nothing - but NOTHING! - would go right and I made seven horns from 3mm ply, one after another with different clevis pin-hole positions, pinned into position and connected up to the snake, the doors were driven up and down.

Either, they would go down but not fully up or else vice versa. Or they would go up but the servo would stall - and so the drama progressed, backwards, until I gave up and locked the workshop for the day. I wondered how much a Penny Black would cost (my wife Lauri has long said "if it is that bad, take up stamp collecting!").

Next day was a domestic one with shopping and Mother-in-law visiting filling the time and I was glad it was so! The day after, with Lauri back at work I tackled the door problem again and had the answer in about ten minutes of determined early morning clear thinking. The doors work over a range of about 145 degrees, lock up tight and are stiff enough when 'down' to stay in place.

▼ The kit of bits for outboard drop tank pylons and inboard bomb pylons.





▲ A little bit of fun - full cockpit with both pilots from thighs upwards plus full instrument panel and throttles.

However they are delicate and will definitely require careful ground handling. What a pity we do not have 3,000 PSI jacks available to drive them! The last undercarriage task was to arrange for the doors to be moved up and down AFTER AND BEFORE the movement of the legs. I had planned to do it by manually switching first the gear then the doors and vice versa on the way down. I have used this method before - and got it wrong by forgetfulness! So I thought that a better way would be to yoke the doors servos in with the retract switch servo and use only ONE switch to do the whole job. Unfortunately this would mean the removal of the air-flow restrictor which gives a slower and more realistic movement of the legs. The legs would have to be allowed to 'thump' up followed by the doors taking about two seconds (180 degrees HITEC 75 servos). I managed to set the model up on my centre-bench and fit the outboard wing panels ensuring this time a leak-proof join for the jockey-legs air lines. With the front and rear door servos yoked to the retract servo I pumped up the UC reservoir checked for 'down' and switched on. A deep breath and 'up' was selected -THUMP THUMP-THUMP THUMP, WHRRR CLICK and everything was up, locked and clean! What a relief! I crawled around underneath and admired the view. I had done it! No doubt future field damage will change the status quo but I was

▼ Awaiting the canopy - note the different head angles. Figures carved from balsa.



pleased that I had achieved what I had set out to achieve with tight-fitting doors covering the large wheel bays.

The time had come for an 'out-doors put-together' so I set up the model bit-by-bit out on the patio and checked for pod incidences and jockey wheel ground clearances and all the things not 'checkable' in the workshop. I was pleased to find that the C of G was at bulkhead N (only four inches behind the design position) with motors and fans to bring it forward and the power packs to refine it. I did a total weight check and read 11.5 pounds including undercarriage units (12.5 pounds empty airframe allowed weight PLUS all the metal work) which meant I would be about one pound below budget, 24 pounds (11kg) AUW if all went well!

Back Inside

The final skinning of the fuselage and wing bottom surfaces would be preceded by the installation of the wiring loom, the servo extension cables, the lighting circuits for the wing leading-edge landing lights, the main gear door landing lights and the flashing anti-collision lights both on top and bottom of the fuselage. I have certainly NOT built a model like this before but I have seen others do it (Hans Buhr especially) and I think I can do it too!

For the lights I wanted the kind of powerful pencil beam that comes from some modern mini-torches. Lauri had just such a one and donated it to science. It was a DURACELL flip top torch running on 3 volts. I obtained four such torches and butchered them to produce an 'almost' cube of about 3/4 inch (19mm) sides containing the special bulb, reflector, plastic cover and connectors. Mounting and wiring the units was simple (listen to me..... two years ago I thought electricity came out of holes in the wall!) though my desire to fit the wing landing lights to show through the outboard leading edges was not granted. There is just not enough space to have the unit close enough to the front to prevent it from shining down a 'tube' and thus being very heading dependent. Also the units have to be accessible for such things as bulb changes so I selected an underwing fairing as the best compromise, just inboard of the drop-tank pylon. The gear door landing lights were easier to fit and when the whole lot was jury rigged and switched 'on' - my little old heart gave a giant leap - another 'must have' had been achieved!

With all the internals in place, the wing bottom skins were fitted - a total of eighteen sheets of 4 x 36 x 1/16 soft balsa - almost a

▼ Canopy with framing mask and hand-painted card instrument panel - great fun to do!



whole tree! These sheets were butt joined to form appropriate size skins and this required a prodigious amount of cyano. I now use FLASH CA Super Thin from J.Perkins and I find it excellent for almost every task - including gluing my fingers together! This latter is now solved by using PRO-BOND de-bonder, also from the Perkins emporium. The aileron and flap panels (four) were then separated and re-attached with hinges. For the flaps this meant making the hinges from ply reinforced with thin carbon nylon bearing plates to achieve the low hinge point and the slotted flap' effect required.

This was followed by dry-fitting the motor pylons and gluing in the inboard bomb beam pylons and the outboard droptank pylons. A fun-day was the manufacture of 24 x Mk82 500 pound bombs from 3/4 inch balsa dowel using 0.4mm ply for the fins. The first bomb took thirty-five minutes to complete; the rest were mass produced but nevertheless took all day to finish. They will not be 'dropable' but will certainly add to the dressing-up factor, as will the hollow foam drop tanks.

A final pre-paint put-together allowed the incidence angles of the motor pylons to be matched accurately to allow their final fitment to the wings. With flap and aileron servos fitted all that remained to do was install the fans and motors and prepare for the paint-job which promised to be a mammoth task. From the first drawn line on the plan to a complete airframe ready for decoration had taken just over eighty working days (weekends free). It is not until you read an article like this that you realize just how much work there is in a large and slightly complicated model. And there is yet more to come. In the next instalment I had planned to cover the painting and finishing of this model and this promises to be another large task as the real aircraft which I have modelled was really scruffy from much use, with different colours and replacement panels being only one of the problems. There are however a lot of intricate detail components on a model so large and complex and I may still be fiddling with those before I can get to the painting. **EFI**

Our Favourite Teddy

were two yellow foam wings, a blue foam fuselage, blue tail fin and rudder and yellow foam tailplane and elevator. Also in the box, several plastic bags full of small parts and an orange box containing an electric motor and propeller. There were some nice stickers too, but dad said don't put them on just yet.

Putting it together

First we mixed the glue and stuck the plastic control hinges for the rudder to the tail and elevator to the tailplane. Next, the two wings were joined and left until the glue had dried. Dad did some of the tricky bits next and put in the radio control and motor parts. My Teddy was almost ready, it just needed the stickers put on, my favourite part.

Dad writes

Robert really enjoyed assembling his first RC model. The accompanying multi-lingual instruction booklet is very thorough.

Drawings of the sub-assemblies are given for every stage, but an exploded diagram of the whole model, naming the various parts, would be helpful. If solo assembly is attempted by a complete novice, some points might prove a little tricky. The

fuselage underside hatch retention for example, is very ingenious but requires care to execute correctly. The use of Epoxy adhesive needs careful supervision in young hands, it can be a messy and a potentially hazardous task even for those accustomed to it. I would therefore suggest the 'Teddy' is an ideal joint project, where an established RC model builder & flier can assist and guide the newcomer. Nevertheless, the model is very quick to assemble (a few hours) - a real bonus for the eager and excited young pilot!

Where possible, I left Robert to carry out the assembly, though I installed the radio equipment, motor, speed control and flight pack. The control linkage is made by wire snake, I suggest careful installation of these to ensure smooth operation. I replaced one wire inner with a narrower diameter piece to ensure the rudder control did not bind and stall the servo. At this stage, no other deviations were made from the instruction booklet. Multiplex supply their variant of the '280' size motor, complete with white Günther



► Robert enjoyed sticking the decals onto his Teddy.

REVIEW BY: DAVE & ROBERT DURNFORD

The Multiplex 'Teddy' will make a great Christmas gift for any youngster wanting to get into the model flying hobby.



▲ Robert (with a little help from Buzz Lightyear) examines the Multiplex Teddy.

Robert Writes:

When I came home after my summer holiday, I came through the front door and there waiting was a big parcel. It had my name on it and was from my good German friends Raimund and Ulrike Fuxa; they had sent me a present...hurray! My dad helped me open it, and there inside was the best Teddy I have ever seen.

The Bits In The Box

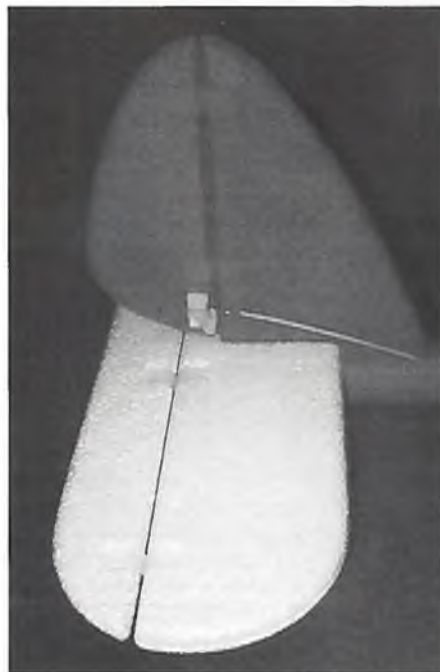
This Teddy was an aeroplane, my model. I unpacked the box carefully, and together with my dad, we examined the parts. There



▲ A good sign! A young modeller weighing the components.



▲ Great fun! Applying the glue.



▲ Rudder-fin assembly. Note plastic hinges secured with epoxy. Care is needed to ensure smooth operation of control snakes.



▲ The supplied 280 size motor and Günther prop, both later replaced.

Specifications:

SPAN:	1170mm
LENGTH:	785mm
AREA:	28.3sq.dm
SECTION:	Thickened Benedek, mod
WEIGHT:	504g (with supplied '280' motor) 607g (with Speed 400 motor & 1250mAh cells)
CONTROLS:	Rudder, elevator and motor.
(Model can be flown using 2-channel - no elevator - and using standard size servo and receiver equipment)	
MOTOR:	Multiplex 280 6V & 125 x 110 Günther prop (supplied) Graupner Speed 400 7.2V & 6 x 4 Master prop
ENERGY:	6 x 500AR Sanyo & 6x 1250mAh (AA) NiMH
RC EQUIPMENT:	Multiplex Pico-Line Tx with 'EIN-STEIN' (two servos, receiver and On/Off switch in one unit)
SPEED CONTROL:	Schlotman, includes BEC

prop and soft spinner. It is suggested this prop is secured, (in 'pusher' mode), using epoxy. After a few motor runs, I found this method insecure and felt safer using a Graupner prop adapter instead.

RC Equipment

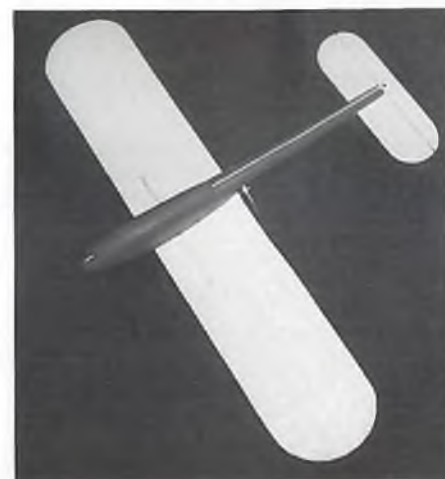
The model was equipped with the Multiplex Pico Line 'EIN-STEIN' combo (i.e. two servos, receiver and switch in one unit). This is an excellent idea, revisited from 'brick style' control systems of the past, enabling quick, uncomplicated installation and interchange of RC gear between models. Control was made using the petite, stylish (and ergonomic for small hands) Multiplex Pico transmitter. Competitively priced in Europe, this delightful Tx features the four primary functions associated with twin sticks. It easily adapts so you may add a further three proportional functions and a variety of useful mixers if desired. These are already programmed into the transmitter as standard and so cater for the aspirations of the modeller and his subsequent models. These include V-tail Mixing, Power Mixing and Aileron Differential. This transmitter features 6 x Sanyo N-600AA cells as a power supply (easily charged by an RC buggy charger that many youngsters have). Whilst giving a reasonably good duration, I chose to replace with a pack of Nickel Metal Hydride 1250mAh AA cells, thus more than doubling the operating time.

One minor hitch occurred when retracting the very delicate aerial on one occasion - snap! it broke in two - but the very helpful and efficient Multiplex service dept soon had a replacement in the post to us.

A Schlotmann speed control with BEC and 6 Sanyo 500AR cells completed the onboard



▲ Snake control wires need care in installation to ensure smooth, bind-free operation.



▲ Underside view, note wing reinforcement spar, sufficient for normal non-aerobatic flight.



▼ Radio installation consists of Multiplex 'Einstein' unit (features 2 servos, receiver and switch in one easily fitted module) and 6 Sanyo N-500AR cells.



flight equipment. The CG was checked at the recommended 90mm (measured from the leading edge). With cells charged, a range check carried out, there was no excuse but to fly.

At the park

Conditions were good for the first flight, almost calm, just an occasional zephyr. Test gliding (power off) is not recommended, so the throttle was advanced to full and Teddy given a firm hand launch. At an AUV of 504g (17.7 oz), the model was not over-powered. The model needed careful flying to gain height and I felt it unfair to hand the control to Robert just yet. The model also displayed a tendency to pitch up when turning into wind. An adjustment to the CG and more power needed, I landed the model safely and we returned to base.

Adjustments

Removing the supplied motor prop combination, it was replaced with a drive Speed 400 7.2V and 6 x 4 prop. This takes a little care when cutting away foam from the motor pod and also ensuring adequate cooling air for the new set-up. Coincidentally at this time, I received from Multiplex an addendum instruction sheet (Dated 5/98), suggesting fitting a 400 size motor and moving the CG at least 10mm further forward. This was done and the model readied for another session.

Teddy Fun Time

What a difference the new set-up made; Teddy quickly climbed to a safe altitude. The pitching moment had been cured and so I checked out the control responsiveness and stall characteristics. Very manoeuvrable on the control deflections specified, with a docile, straight ahead stall. Confident in the model, I now called Robert to the transmitter and he flew a couple of circuits left and right, with dad 'covering' the sticks with his thumbs, great fun-flying for both!

After about 5 minutes, the motor control BEC cut-off indicated time for a landing. On the glide, the model remained predictable and steady, despite some large inputs by the tyro pilot!

Conclusion

An excellent model for a youngster to learn the skills of electric model flying with. Multiplex have (and continue) to listen to end-users experience (as the addendum sheet testifies). I would though, suggest you fit the '400' size motor from the outset. The supplied '280' size motor, is really only suited to absolute calm days (or indoor flying perhaps?) and even then has to run flat out, just to maintain height. The extra thrust the '400' can give, assures a good quick climb out and to a height where control of the model can safely be introduced to the ab initio flier. This allows more time to correct those inevitable situations the novice gets into and thus learn the flying skills of the hobby.

If you should suffer a nasty 'bump' with your Teddy, then 5 - 10 minutes work with the epoxy repairs most damage, with the back up of new replacement component parts being available from Multiplex if required. A worthwhile increase in flight duration can be made by using 6 x 1250mAh Nickel Metal Hydride AA size cells, the extra weight forward, compensates for the larger motor and moves the CG to where now recommended. There are a range of complementary Pico Line items available from Multiplex for 'Teddy' (and new electric fliers) including - a compact simple to use charger and several speed control units with BEC facility. Starting

► A very happy new convert to Electric Flight - Robert Durnford with HIS favourite Teddy.



▲ Teddy fitted with Graupner Speed 400 7.2V and 6 x 4 prop (Shaft-Saver fitted here). A cooling duct has been cut into the foam.



▲ Multiplex Teddy ready to fly - version one, 280 motor.

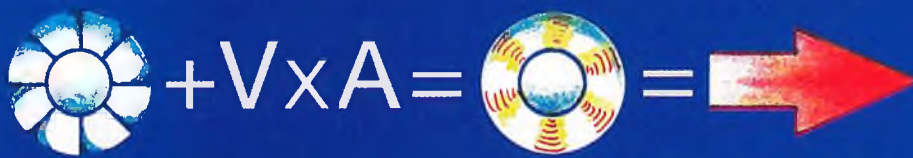


▲ Robert checks the controls of his Teddy using the Multiplex Pico-Line transmitter.

out has never been easier, and certainly the best 'Teddy' that we've both enjoyed playing with!

Full Charges and Happy Flying,
Robert & Dave Durnford **EFI**





The Light Fantastic

CHRIS GOLDS

Those were the days! The models you keep showing me - remind me of earlier times, with the big ones.

Overloaded!

In the dim and distant past, when the Queen's enemies clustered thickly about us in the North Sea, I was given my first command. Four Hunter F Mk6s with loaded (but not fused) 30mm cannons, six pilots including myself, a Chief Tech engineer with about twenty men and half a dozen armourers. As we flew off to RAF Wattisham to do our two-week stint of 'Q' short for QRA, short for Quick Reaction Alert, I was delighted - at the tender age of twenty-four - to be in charge of something at last at the lowly rank of Flying Officer. On 'Q' we sat in our aeroplanes for one and a half hours on a rotating shift from just before dawn to just after sunset, with the night fighter Javelins taking the dark bit. You sat there in the cockpit, rain, hail or shine, just praying for a scramble call. With no warning there would be a "beep beep", STANDBY - STAND-BY, followed by a mission number and target and radio frequency details - then silence over the telebrief 'phone connection from operations. Then suddenly, Mission so-and-so, scramble - scramble - scramble and another lump of the best flying a young man could have would begin.

At the end of the mission you would RTB (return to base) very disgruntled because all you had found was an airliner wandering about off-track and so you would run into the circuit at warp snot (about 580 knots) making a helluva din and slam hard left onto the downwind leg prior to slowing down to gear speed. One morning I did just this and thought "the ailerons feel a bit soft" but by then I was dumping more flap and wheels to begin my finals turn-in to land. I taxied back onto my ORP (operational readiness



◀ Richard Jones with his Me262 and almost finished Horten IX.

platform) slot and shutdown. As I was signing the aircraft over to the menders the line Sergeant said: "scuse me Sir, but I think you just broke 'Hotel' (my aircraft) - come an 'ave a look". I did so and lo and behold, the port aileron was dangling down on its hinges - something a Hunter never did. By the end of the day we had the answer: up at homebase (Leuchars in Scotland) it transpired that the torque-wrench used to set up the power controls pushrods had been mis-set by a factor of 10! Which

meant that most of our Hunters had overloaded pushrod ends and could fail as mine had. An aileron usually has to move very few degrees to do its job - not so the flaps which were driven to eighty degrees down at full deflection. Think of the force upon such a surface and the catastrophic results of a one-sided flap collapse. (It happened to a pilot on my Flight some years later but he JUST survived!).

Model Loads

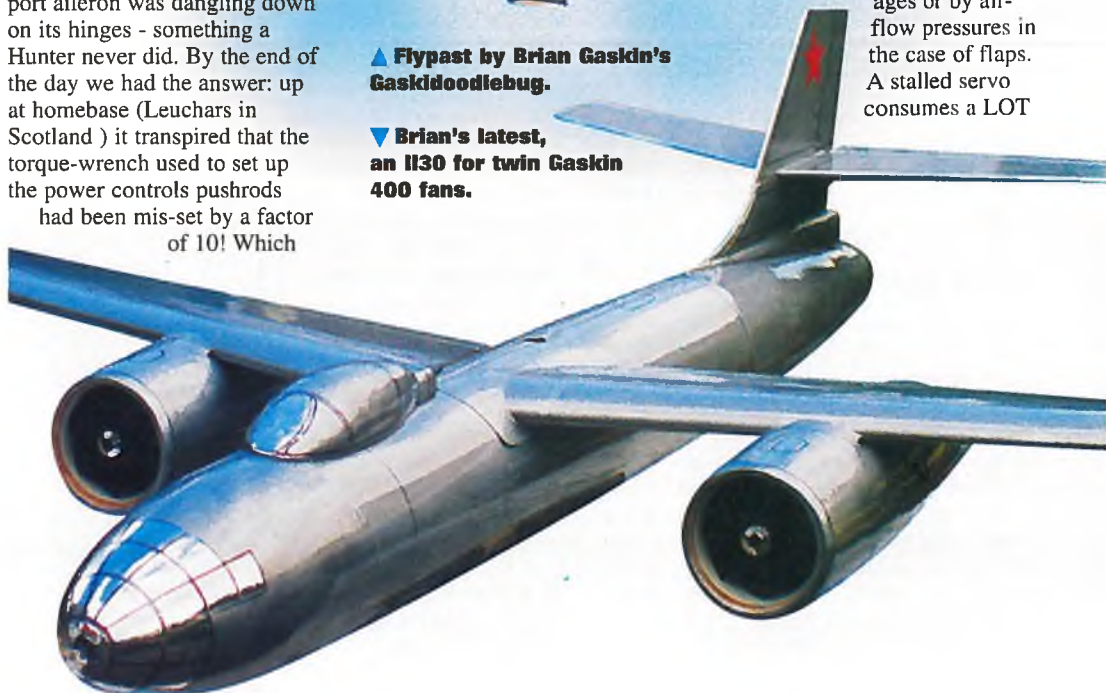
So into model-mode and we should consider the loads upon our model flying control surfaces. Modern servos give plenty of power - even the micro ones and I have recently used the NARO servos in my electric jets (from J.Perkins) with great success. But, any servo can be stalled in its movement either

by incorrect linkages or by airflow pressures in the case of flaps. A stalled servo consumes a LOT



▲ Flypast by Brian Gaskin's Gaskidoodlebug.

▼ Brian's latest, an Il30 for twin Gaskin 400 fans.





▲ Lee giving scale to Grandad's IL30.



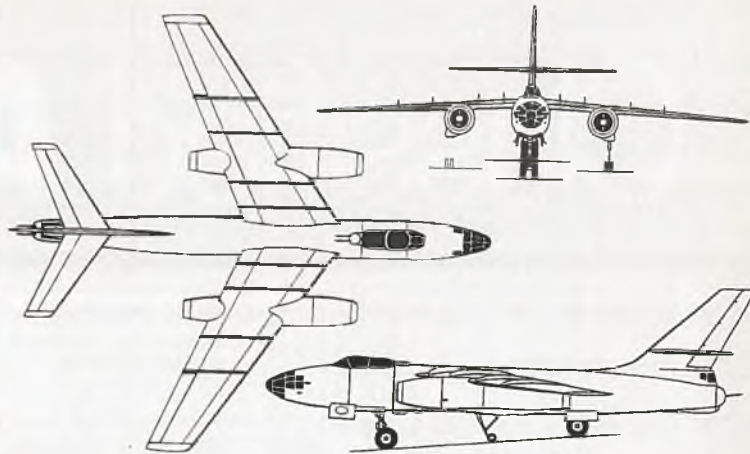
more power than a servo operating normally and if you stall a number of them all at the same time then I think your Rx might just be starved for volts.

These problems crossed my mind as I designed the flaps for my latest B-52 for EDF using eight Plettenbergs running eight WeMoTec 480 Mini Fans. The flaps are big, having a total surface area of three hundred and forty four square inches or 2.4 square feet (more than the whole wing area of my latest single EDF, the Attacker!). So I decided to drive their four separate sections by four 180 degree retract servos whereby the pushrod passes through (or actually over) the servo output disc centre at both up and down so that the servo cannot be 'torqued' and thus stalled, at full deflection. I have used this

idea before notably on my gas turbine powered Swift where the flaps were BIG and bang-bang where the locked-down back pressures would have been enormous. Lets hope we can all design our control surface pushrods, linkages and servo positions to give us what we require. At the shows which I have attended this season I have seen a number of very, VERY fast models which might be approaching the point of servo overload. Think about it!

So to business

First, from Richard Jones of Newton Regis in Staffs comes a photo of him holding a "much modified from plans" Me262 which flies - just - on two 480 size fans and eight cells. It is bungee launched and



Richard hopes for a much improved flight performance once he has re-motored it with two Plettenbergs. From my own experience with Plett-powered models the performance should become quite 'electric'!

At his feet is Richard's Horten IX built from my Traplet plan. It is now finished and flies very well though he has had to learn NOT to slow down too much for landing as, if severely provoked, it will flick! Into grass it suffers no damage but I would not like to try it over concrete! His next project will be the DH 110 for two Plettenbergs/WeMoTecs again from my plan published by another 'house'. He has promised photos and details - well done Richard.

Next comes news from one of our regulars (probably my ONLY regular!) His Fanness the Gaskoid of Kent. The first photo shows a fly-by of the Gaskidoodlebug featured last month showing its aggressive shape to good effect. The next shows in close-up, Brian's latest EDF model of the IL 30 swept wing light bomber of the very late forties. The Russians produced vast numbers of prototypes very few of which saw service and this one was no exception. It was in fact a swept wing version of the IL 28 'Beagle' - a sort of Russian Canberra which we tried to catch as they poked their noses into West German airspace in 1957. Needless to say we did not catch them in our Venoms! Then comes a shot of

▲ The exciting shape of a jet bomber of almost 50 years ago.

Grandson Lee, giving scale to the IL 30's large size.

Details are:

SPAN	54" (1372mm)
LENGTH	49" (1245mm)
WEIGHT	60.5 oz (1715g)
MOTORS	2 x 480 BB Race
FANS	2 x Gaskin 400
ENERGY	7 x 1700mAh

Structure is a mixture of light foam and balsa and I envy Brian his finished weight. The last photo shows it flying - proof of the pudding if you see what I mean! Well done Brian and Lee - his pilot.

This month's GCSE in English Studies concerns FANDANGO as in the lively Spanish dance. So if you see the Holy Gaskoid capering along the grass he is not hand-launching - he is Fandangoing-going-gone!

Well another season is over and I wish all of you a Happy Christmas and a safe flying New Year. Let's hope we can have an EDF meeting somewhere next year then we could meet and swap ideas. Please send me photos and descriptions of your EDF model even if they have not yet flown. We can all learn from each other.

See you next issue.

Chris Golds, Hideaway, Lower Loxhore, Barnstaple, N.Devon EX31 4SX

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GRAUPNER JR MC15 Tx, 3 position 5th channel, rates, suspension, as new, boxed with English instructions, £125 or swap for large glass glider. 01924 400543 anytime, West Yorks.

CONCEPT EP, wrecked, stripped for spares, no boom or flybar, otherwise everything else boxed, can deliver, offers. 01476 578367 Grantham.

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SANWA Conquest, perfect condition, not used since service by Irvine, four servos and all the bits, boxed, only for sale as now using computer radio, £85 no offers. 01485 571055.

100 mags 82/87 RCMW, RCME, RM, QFI, SF, AM, free (collect), also require copy of gliders by R.H. Warring (late 40s). Rog 0151 6772929 Wirral.

FUTABA FF6 radio + covering, tools, box of wood, flight box, £200 ono. 01493 844298 Gt. Yarmouth.

NEW unbuilt kit, SIG "Tri Star", Canard for 05 electric, 09 wet and slope soaring, kit still shrink-wrapped has improved landing gear over the early kits, £50 ono. New unbuilt kit, JM Glasscraft "Barbarian", USA kit with glass fuselage and foam wings, deluxe kit, ready for 05 electric or 09 wet, described as an aileron trainer or hot aerobatics (on more cells), picture of aircraft in the "Electric flight manual" book, £50 ono. New unused, boxed HS80MG servo with 2 sets of output arms, £22. New, unused direct drive Speed 400 6v flight set with extra new 5X5 cam prop and 3 new prop drivers, £15. Steve Greenfield 01403 253882 Horsham, West Sussex.

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PSS AMD Zero kit, NIB, £40. 1/4 scale glider, RTF, with 4 x JR servos and batt., £200. New ASW 20 kit, £125. Also wanted good hot electric motor. Tony 01772 682825 Lancs.

SWAP new still boxed, Sony car stereo with removable front, XR6600 RDS for 6-8 channel, nicad Futaba or similar with servos, etc., must be in good condition or sell £180. 0181 224 0056 Surrey.

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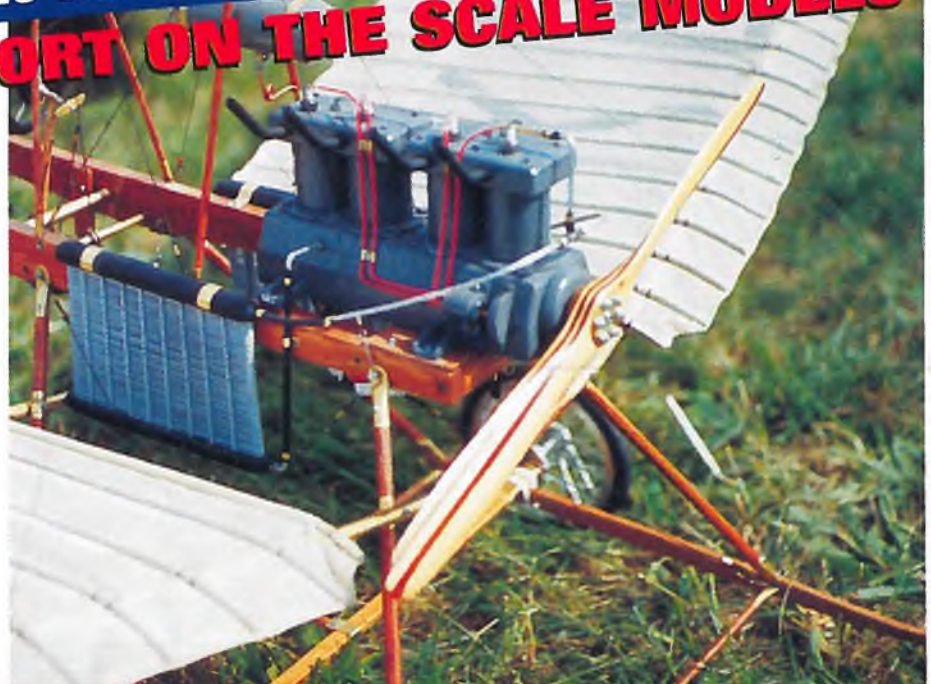
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MILLING PRECISION ROUTING FLEXIBILITY

CHOOSE THESE ALL BRITISH MACHINES for

**RAPID PROTOTYPING
ON-LINE DESIGN/ DEVELOPMENT
RAPID BATCH MANUFACTURE**

If your business is:

- Aerospace • Precision Engineering
- Light Aviation • Architectural Fittings
- Marine Construction • Specialised Furniture and Decor
- Film, TV and Stage Sets • All kinds of Model Fabrication

All models feature • Swarf extract • Vacuum bed

- Computer c/w integrated CAD and CAD/CAM software and hardware
- Outstanding ease of use • Full sequential control of 998 layers for 2 1/2/3D work
- High Quality 17" Monitor • Solid UK Support.

They will cut • Metals • Wood • Plastics • Composites • Laminates, all up to 2" thick and beyond. They are designed to operate continuously if required, and without extensive training or computer skills.

Options include • Knife (vinyl and card) • Precision Engraving • 3-D G-Code Interface • Auto Tool Set • Auto Tool Change • Ultra High Speed Spindles.

31 WELLEY ROAD, WRAYSBURY, STAINES, TW19 5DW. Tel: 01784 482829 Fax: 01784 482846

SEQUOIA
Systems



FIRST to recognise and develop the benefits of precision ball-screw CNC production allied to a very special user interface. Over FOUR YEARS of PROVEN profitable service for kit manufacturers, precision engineers and component suppliers of many disciplines - ALL enjoying the unique benefits of SEQUOIA ownership.

And now..... the new DASH TWO Series! 908-2 and 915-2 feature floating head, (for precision engraving) and Auto Tool Set as standard - Plus 1700w Perske Spindle and 4" (102mm) throat. And of course, as usual the unique and extremely functional user-interface and 0.0005" (0.012mm or 12 micron) resolution for close tolerance cutting and exceptional fits all the time. This allows the machine to be used for high value work not possible with lower specified machines.



SEQUOIA 908 Bed 900 wide x 800 long
SEQUOIA 915 Bed 900 wide x 1525 long
Also available: 700 Series

PRICES FROM £17,500

Robbe Schlüter

PERFORMANCE AND QUALITY AT AN AFFORDABLE PRICE

**FULL CATALOGUE
AVAILABLE FROM YOUR
LOCAL STOCKIST OR IN CASE OF
DIFFICULTY CONTACT US ON NO. BELOW**



RANGER (3093)

Powered Glider for the beginner. This model is ideal for the beginner or the intermediate pilot as it offers a high level of stability and smooth aerobatic capability. Constructed from Robbe's high density styrofoam, the kit includes the electric motor and 2-3 channel flight switch. Wingspan: 2,000mm RRP:- £104.99



GNAT (3082)

Simple to build and fly electric ducted fan, fast flying and aerobatic uses inexpensive 400 motor and fan unit. Ideal first ducted fan. RRP:- £59.99



LIBRA (3089)

Almost ready to fly electric powered glider. This model features high quality epoxy fuselage and pre-covered wings and tail surfaces. Extremely stable and smooth flying is what the Libra does best! Wingspan:- 1,820mm RRP:- £109.99



K-RAT (3087)

Latest electric glider from Robbe epoxy fuselage with foam composite one piece wing. Wide range of motor combinations from tame to ballistic. Wingspan 1800mm RRP:- £149.00



SPITFIRE (ME109)

Semi - Scale aerobatic electric powered 'fun' fighters. Available in painted or un-painted high density Robbe Styrofoam. The model is powered by a powerful 600 series motor. These models are ideal for those multiple model 'streamer' dogfights. Wingspan: 1,025mm - 1,000mm. RRP:- Painted:- £94.99 Un-Painted:- £69.99



BAE 146 (3081)

Extremely impressive both statically and when being flown electric powered aircraft. The model utilises four of the 'Rojet' impellers or that extra scale sound and appearance. (3081) RRP:- £169.99 Powerset RRP:- £99.99



CT2 / CT4 (4048)

Versatile and low cost highly efficient gold connector system in either 2mm or 4mm format (No 4077) RRP:- CT2 (PAIR):- £4.25 (No 4048) RRP:- CT4 (PAIR):- £3.99



POWER PEAK INFINITY CHARGER (8153)

The ultimate charger, charges/discharges up to 30 cells, fully programmable microprocessor controlled yet simple to use. RRP:- £189.99



RSC 118 (8360)

Extremely small and low cost speed controller for 400-600 motors. Single direction, 18/25A, operating voltage 6-12 volts. RRP:- £27.99



WEBRA NANO 6 CHANNEL RECEIVER

Compatible with either JR standard crystals or Futaba non dual conversion crystals. Extremely compact and lightweight design make it ideal for electric flight. Order no: W.20252/351. RRP:- £36.99

All of these products and many more are now available from your local model shop, for further enquiries contact us at:

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