

4° CONVEGNO di tecnica AEREO modellistica

Alessandro Benini

CONSIDERAZIONI ED ESPERIENZE DI VOLO LIBERO ELETTRICO

Per la storia ricorderò che il tema della motorizzazione elettrica dei modelli a volo libero nasce durante il 3° Convegno di Tecnica aeromodellistica e viene codificato nel Giugno '97.

Quasi nulli, per svariate ragioni, i contatti con il gruppo di lavoro, comunque a Dicembre '97 si definisce una filosofia da seguire e cioè:

- a) Modello sui 250 grammi in grado di avere un pieno di 120 secondi
- b) Energia elettrica disponibile all'asse pari a quella di un F 1 B
- c) Evitare se possibile, tempi motore predeterminati con timer.

Padovano tocca subito i punti più importanti e identifica nel motore Mabuchi 380 (in commercio con svariati nomi: Speed Graupner, Permax Robbe ecc.) e nelle celle Sanyo rosse da 500 mA a carica e scarica rapida i materiali più adatti. Certifica inoltre, con misurazioni specifiche, che nell'ipotesi di utilizzo completo dell'energia alla batteria, non si possano concedere più di 65 grammi di peso della batteria stessa (ad es. 3 celle da 500 mA o 4/5 celle da 270 mA).

A tutt'oggi, aggiuntivamente, vi è solo da segnalare l'inserimento degli E 30 nelle categorie della FAVLI e la partecipazione alle gare dell'AGO Torino di Barbieri.

All'estero o meglio in Gran Bretagna, il problema è affrontato ufficialmente nel 96 (vedi inserto 1 e 2) articolo di Jach Reid, poi più consistentemente nel 98 e 99 (vedi inserti 3-4-5-6) da Bob Wells ed infine (vedi inserti 7 e 8) da Harry Perkins e dove appare ufficialmente la denominazione della categoria "ELECTRIC OPEN POWER".

Per tale nuova categoria il Comitato tecnico per il volo Libero della BMFA (vedi inserto 0) emana le regole provvisorie che sono:

- nessun limite nelle misure e peso del modello
 - motore del costo massimo di 30 Sterline (?)
 - motore in presa diretta
 - pacco batteria di max 7 celle da 500 mA (8,4 V)
 - nessun controllo alle superfici, solo antitermica
 - tempo motore 30 secondi
 - tre prove quindi spareggi
 - altre regole come da regolamento BMFA motomodelli.
- Penso, ad esempio, il tempo massimo della prova in 180 secondi.
- Elaboratissimo, come era prevedibile, il sistema o meglio i sistemi per il tempo motore, infatti mancando il controllo "ad orecchio" come nei F 1 C, vi debbono essere garanzie di altro genere (in proposito vi informo che sto studiando un sistema elettronico).

Per la struttura dei modelli si è attento molto tra i motomodelli dei bei tempi o prima maniera.

Leggetevi gli inserti molto interessanti.

Certo, siamo in una fase in via di definizione, piuttosto interessante e passibile di rapida evoluzione soprattutto per i materiali (batterie, motori, eliche regolatori).

Qui però nasce una considerazione:

- si è imboccata una strada ove la potenza dei motori, i pesi, le dimensioni porteranno ad una situazione simile ai F 1 C cioè con contenuti altamente tecnici e perciò praticabili solo a pochi bravissimi aereomodellisti.

Personalmente sono invece più propenso alle soluzioni più semplici, per tempi di volo più contenuti e perciò per spazi più reperibili nonché alla più larga partecipazione.

Ed ora passiamo ad esaminare le mie esperienze.

Volo libero per me è:

“portare un modello più in alto possibile per un volo di 180 secondi concedendo il massimo di tale tempo al volo veleggiato”

Ho cominciato con gli E 30 (vedi foto 1) aventi queste caratteristiche:

- apertura alare e lunghezza fusoliera max cm. 75
- peso minimo 70 grammi
- motorizzazione libera
- energia, totalmente utilizzabile, 3 celle da 50 mA
- il tempo motore è attorno ai 45 secondi e la prova è di 120 secondi
- 5 prove per 3 valide con pieno per accedere agli spareggi.

Modestamente seguita questa categoria in G.B., in Italia solo Barbieri vola a Torino, altri seguaci “zero”, nonostante le mie numerose pubblicazioni e dimostrazioni su tutti i campi.

Ho solo una spiegazione:

troppo piccoli, troppo complessi elettricamente, troppo livellati nelle prestazioni.

Peccato, vi assicuro sono veramente pratici e divertenti.

Deluso ma non arrendevole mi sono buttato, da Old Timer, a motorizzare i 1/2 Texaco con gli speed 400 in presa diretta con eliche 6 x 3, batterie da 270 mA e tempi motore sui 60 secondi. Il tempo motore è deciso da una “camme” inserita sull’asse dell’antitermica e che accende e spegne con un micro interruttore, il motore, vedere la Foto n. 2, dove appare anche il carica batterie da campo. Salite angeliche, planate deliziose, efficienza dei vecchi

tempi ma anche indignazione dei puristi del volo libero e dei Old Timer ortodossi.

Ed allora ho abbandonato il campo per dedicarmi al volo elettrico, Old Timer Radio Comandato, campo nel quale, senza presunzione, ho raccolto discreti successi.

Poi però la vecchia passione del Volo liberista mi ha ripreso e sono ripartito dall'articolo di Guasco "Una scossa per il volo libero" Modellismo 1994, articolo veramente da "precursore" ed al quale manca solo lo studio della limitazione del tempo motore (vedi inserto 9-10-11-12).

Qui nascono i miei E 40, dove E sta per elettrico e 40 per quaranta pollici, circa il metro.

Primo presupposto "tempo motore limitato a 30 secondi" sia per privilegiare la planata sia per poter usare celle di maggior capacità e più bassa resistenza interna (è infatti essenziale dare al motore nel breve tempo la maggior quantità di energia).

Secondo, un sistema, batteria-motore-elica che abbia peso limitato, una tensione di esercizio bassa quindi poche celle per il massimo di energia all'asse. Da qui la scelta del K/P 02 che con i suoi 3,6 Volts ma con la riduzione 1 a 5 mi permette una buona coppia. Eliche preferibilmente ripiegabili 6 x 3 oppure 7 x 3. Celle da 3 a 4, di capacità e quindi peso a discrezione (uso sia le 4 da 110 mA come le altre da 500 mA).

Attento esame del peso del sistema elettrico per integrarlo con una struttura atta ad avere un carico alare adatto al volo libero.

Presa di corrente con deviatore per la carica delle celle anche sul campo (di regola carico a 1 (un) ampere) per un numero di minuti che sono il prodotto della capacità delle celle moltiplicato per 60 es. celle da 110 mA x 60 = 6.60 minuti, arrotondato 7 min.

Niente di trascendentale, sono in sostanza dei C.d.H. che salgono in 30 secondi a 50/60 metri e veleggiano per altri 90/150 secondi. Ho utilizzato velature dell'Agostino di Rebella e dello "Champion" di Vittori.

Naturalmente posiziono la "camme" a mio piacere rispetto allo scatto dell'antitermica e cioè subito dopo il tempo motore per le prove o al limite, dopo più minuti, in caso di spareggi.

Da evidenziare la sicurezza di non perdere il modello dopo l'avviamento del motore perché certamente ci sarà l'intervento della anti termica.

Le foto 3 e 4 sono relative a questi due modelli pur con motori differenti mentre la foto 7 è relativa ad un modello motorizzato con lo speed 400 da 4,8 Volts e quattro celle da 500 mA.

Le foto 5 e 6 sono invece relative ad un modello più specificatamente realizzato e con le caratteristiche che più sotto enuncerò. In particolare la foto 6 dovrebbe chiarire l'elaborazione del Timer per l'inserimento della "Camme" e del micro interruttore.

Il collocamento delle celle per la batteria è preferibilmente nel supporto ala ma non si esclude altro posizionamento conseguente al baricentro determinato.

Per l'elica 6 x 3 oppure 7 x 3 è necessario, usando il motore K/P 02, realizzare un'apposito mozzo in Alluminio, usando pale Graupner.

Ecco le caratteristiche del mio E 40:

- apertura alare	92	cm.
- corda media	16	cm.
- superficie	15	dmq
- profilo	Clark Y	10%
- baricentro	al 40%	
- lunghezza fusoliera	83	cm.
- profondità 35 x 9	3.5	dmq
- pesi:		
motore KP 02	35	gr. (Giri 7000 Assorbimento 5 Ah)
elica rip 6 x 3	10	gr.
4 celle da 110 mA	30	gr.
deviatore x carica	5	gr. (80 gr. sistema elettrico)
timer e micro interruttore	35	gr.
struttura	85	gr.
peso totale	200	gr.
carico alare	13,33	gr/dmq

Sino a qui le mie esperienze. una artrosi all'anca mi obbliga a lasciare il campo. Ho modelli da consegnare a volontari che vogliono continuare nella ricerca.

Auguri e buon lavoro.

Alessandro Benini

Pordenone, 08 Dicembre 1999

NEWS FROM THE BMFA FFTC

The BMFA Free Flight Technical Committee have issued following items, and seek your (as a BMFA member) comments and suggestions:

Electric Open Power

Two demonstration high powered electric class events will be run during 1999, to the provisional rules listed below, at the FF Nationals and at Sculthorpe on 7th July.

Provisional Rules:

- Unrestricted model size (within BMFA limits)
 - Electric Motors to a max RRP of £ 25.
 - Direct drive
 - Battery packs up to 8.4v x 500mAh
 - No timer controlled flying surfaces except DT
 - Motor run 30 secs max, verified by a time keeper who will either:
 - Note the timer setting & check with motor running on ground, then check the timer being reset, make sure timer is switched on before launch. The motor run in the air is not checked.
- Or:
- Ensure that the motor timing mechanism will release a streamer when the circuit breaking mechanism operates to stop the motor. This streamer to be a minimum of 1000 mm long x 50 mm wide with a max weight of 5g. The motor run in the air will be timed till the release of the streamer.
 - Contest to consist of 3 flights, max to be set on the day.
 - All other rules to the BMFA rule book.

Editor's Note: *Aeromodeller* will be there competing (sorry demonstrating) - Bob Wells has given you a good guide to getting started (concluding in this issue) - why not have a go yourself!



Away nicely goes Phoebe, the "Electric Wakefield" which has given Jack Reid so much pleasure.

construction. The fuselage is a simple 1/16" sheet box, 7/8" square at the front, tapering to 3/8" square at the tail. The drawing gives dimensions and some construction details. The wing uses the Jedelsky EJ airfoil section. Usually, wings using this airfoil employ a solid front section, but this one is built-up. It goes together quite quickly, though, and is very strong in torsion. The wing tips are washed out approximately 2°, which comes naturally by tapering the trailing edge on this kind of construction. I covered the top surface of the wing with Japanese tissue, for colour mostly. Note that the EJ section must not be covered over on the underside, as this would turn a highly under cambered, quite efficient airfoil section into a thick, flat bottomed one. The tailplane uses a flat bottomed 8% thick airfoil section.

At 87 grams, the model turned out heavier than I originally imagined, but then an all sheet design isn't the lightest approach. I

expected the performance to be marginal at best. I was pleasantly surprised - it flies very well indeed. The D/T is a definite must, as the model thermals easily. Trimming was easy as well. The wing and tailplane incidence angles were set in the workshop. Glide circle was set by tilting the tailplane and adding just a touch of right rudder tab. Then, to get the desired flat glide, the battery was moved, which established the CG position. After setting up the glide, no thrust adjustment at all was required. This is not surprising, I suppose, as the power to weight ratio is not very high. It behaves very much like a small rubber powered model, in that there is a slight initial power burst, followed by a long cruise and a slow tailing-off of power which sets the model up into its natural glide attitude.

I find the flight characteristics of these small electric models very satisfying. IC powered models can be difficult to adjust. At least they always were for me. The transition from power to glide trim caused by their sudden loss of power could be quite tricky to handle. In comparison, a small electric model like this is a doddle to trim, and a joy to fly.

Model No. 2 - 1994

Cheered by the ease of flying this little 30" model, No. 2 was built. Its design was based on the Klasse "E" specification, used by some continental flyers, but relatively unknown here. This is a very open specification, in that it allows for a wide variety of model size. Klasse "E" sets a maximum total model weight of 550 grams, a minimum loading of 12 g/dm², and a maximum battery weight of 12% of the total model weight. I'm not sure whether the loading requirement is wing loading or overall projected wing plus tailplane area loading, but I suspect it is the latter. The 12% battery restriction is quite tight. Its effect is similar to the 150 mAh restriction in the E-30 class. An E-30 pack, say 3x50 mAh cells, will weigh about 11 grams in a model weighing not less than 80 grams, or about 13% of model weight.

This approach, of using Klasse "E" as a design basis, means that, like No. 1, the model is much more of a powered glider than what is generally considered a typical IC powered competition F/F model. Model No. 2 has a 40" wing span, 200 square inches of wing area, and is powered by a Graupner Speed 300 motor driving a Graupner 6"x3" folding propeller. It uses three 120 mAh Sanyo cells. These three

cells weigh 18 grams, so by the Klasse "E" specification the model should weigh at least 150 grams all up. At 165 grams it is again a bit overweight, but this is typically what happens with new models, I suppose.

The layout of the model is virtually a 133% enlargement of No. 1. The fuselage is a rolled balsa tube, two layers of 1/32" at the rear, but with an extra layer of soft 1/16" on the inside at the front to stiffen it. The wing airfoil is derived from the Schwartzbach section I used on my old F1B models of circa 1975. The wing spars are hard balsa, 1/4" wide at the root and tapering to 1/8" wide at the tips. I built the wing on a form shaped to the lower camber of the section, and this made it easy to build in the 2" of tip washout. The tailplane airfoil section is a simple flat bottomed one, 8% thick. All open structures are covered with Japanese tissue.

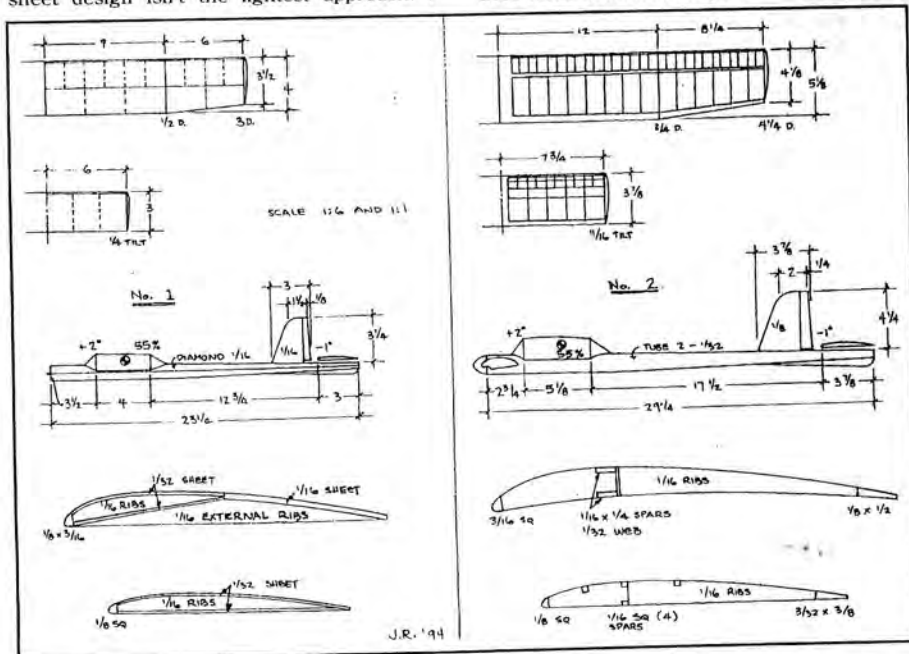
Table 1 - Weight comparison of the 1994 models:

Component	No. 1	No. 2
motor	18grams	50grams
propeller	2	11
battery	11	18
wiring and s/w	6	6
wing	23	35
tailplane	6	8
fuselage and fin	21	37
Total	87grams	165grams

The model was set up in an identical manner to No. 1. After adjusting the glide, the first two flights were at reduced power, as I didn't know what to expect with this model. It has a slightly higher power to weight ratio than No. 1, due to the better efficiency of the motor. I needn't have worried about problems under power. Once again no thrust adjustments were necessary and by the third flight full power was on. This one flies even better than No. 1, and a D/T set on every flight is a must. I flew it, along with No. 1 and one of my old F1B Wakefield models, in August at the 1994 SAM European Champs weekend at Middle Wallop. As far as I could tell No. 2 was climbing almost as high as the F1B. Picking air that day was a bit tricky, but whenever I managed to avoid sinking air it soared away very nicely. This model convinced me that electric F/F for competition classes is a real possibility. That day I had the most fun in modelling I'd had in a long time.

Phoebe - The Electric Wakefield - 1995

When it came time to look back on the 1994 season, I was particularly happy with No. 2, the Speed 300 powered model. I began wondering what a model powered by a Speed 400 motor would be like. I started thinking about the design of one, which would have about 250 sq in of wing area. Some early sketches and weight estimates for the various bits soon began to suggest that such a model would be around the size and weight of an F1B modern Wakefield. The F1B specification calls for a model with 17 to 19 dm² of projected wing plus tailplane area, a minimum total weight of 230 grams and with a maximum of 40 grams of rubber to power it. Could my new model be built to mimic this F1B specification, that is, 19 dm² maximum of projected wing plus tailplane area, minimum 230 grams total weight and with not more than 40 grams of battery to



ELECTRIC FREE FLIGHT DURATION MODELS

**Jack Reid tells us
about his work in
this new field and has
come to some
important
conclusions.**

Do you agree?

It has been a long time since I last had much to do with power models. My modelling started with rubber power, and it has always been my favourite, being such a clean, quiet form of model propulsion. However, the recent availability of many different kinds of model sized electric motors, and advances in battery technology, have made electric power for F/F models a real possibility. In the last couple of years I've tried to find out what I could about it, and although a bit doubtful at first, my experience has been very positive. One aspect that I find particularly appealing is that the power characteristics of electric models are so much like rubber powered ones, rather than IC powered ones. That, I have found, makes trimming the models a lot easier, and that in turn adds a great deal to the pleasure of flying them. So, to encourage more of you to give these clean, quiet and environmentally friendly models a try, I'd like to describe the ones that I built during 1994 and 1995, and some of the design thinking that went into them.

Much of the material for this article was first written for "Without Feathers", the newsletter of my local club, Cornwall Vintage Aeromodellers. Others in the club have also been experimenting with electric F/F, and it was felt that these trials would perhaps be of interest to a wider audience.

Model No. 1 - 1994

This was my first electric F/F model, constructed early in 1994. It was designed to be roughly to the E-30 specification, as I understood it then. Subsequently, the BMFA has adopted provisional rules for an E-30 class, and this model appears to qualify. It spans 30" and has 120 square inches of wing area. The motor is driven by three 50 mAh Sanyo cells, and the propeller is a Cox 4.5"x2". The model weighs 87 grams, ready to fly. I obtained the ST-2 motor from Scientext, 48 Whitney Street, Westport, CT 06880 USA.

I wasn't sure how much bouncing around the model might sustain in trying to sort out any bugs that might come with a new design and an unknown propulsion source. Hence, the model is of all balsa sheet



**Model No 1 takes to the air at
Middle Wallop in 1994.**

**At Middle Wallop again we see
Jack pushing model No 2 into
the air for another good flight!**

power it? If so, then it would be rather an electrified F1B Wakefield, or F1Be if you like. Voila, Phoebe was conceived!

I had used three Sanyo N120TA cells, weighing 18 grams, in the Speed 300 model. As a test, I tried six of these cells, weighing 36 grams, on a Speed 400 7.2V motor, driving a standard Graupner 7x3 folding propeller. On bench static tests this set-up gave an initial 8000 rpm (at about 6 amps of current draw), which dropped off to about 7000 rpm at 30 seconds, 5000 at 45 seconds and which was down to about 4000 rpm at 1 minute. The duration of run looked good, and so I compared these rpm figures with published power output curves for this propeller. This suggested an initial thrust of about 200 grams, dropping to 150 grams at 30 seconds, 80 grams at 45 seconds and about 40 - 50 grams at 1 minute. It is generally thought that thrust of around 1/4 of total model weight is a minimum for anything more than level flight. Therefore, these figures looked acceptable, and I settled on this arrangement for the design of Phoebe. Essentially, the model is an enlargement and stretching of the Speed 300 model, but the final layout was influenced by the proportions and constructional details of my old F1B models. The drawing gives details of the final design. Wingspan is 54 inches, actual wing area is 250 sq. in., and tailplane area is 50 sq. in. Wing and tailplane airfoil sections are the same as for the No. 2 model, that is, a Schwartzbach derivative for the wing, and a 8% flat bottomed section for the tailplane.

Weights of the components of Phoebe:

Drive system

motor	74 grams
propeller	24
battery pack	37
switch & wiring	7
TOTAL	142

Airframe

wing and joiner	48
tailplane	6
fuselage & fin	49
TOTAL	103

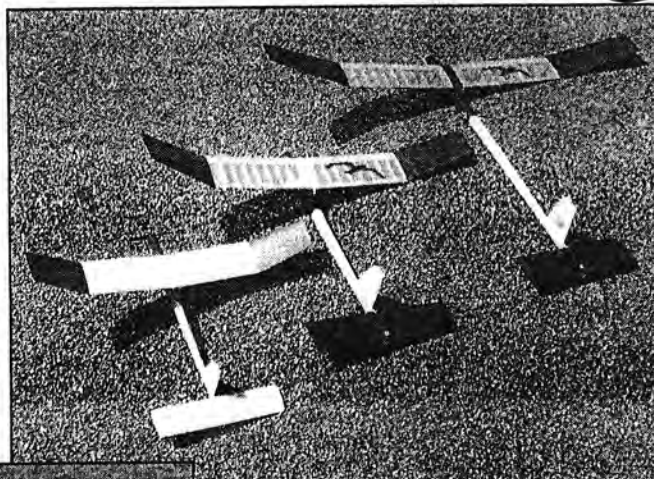
TOTAL MODEL 245 grams

Both inner panels of the two piece wing are flat, with both tip panels having 2° of washout to help control any tip stall problems. The wing halves are joined to the fuselage with a 3.2mm carbon fibre dowel. This two piece wing arrangement is useful, in that differential wing incidence is easy to accommodate. I find this easier than warping the wing panels.

The weight table illustrates a minor drawback of electric models when compared to rubber or IC powered ones. The relatively high proportion of total weight taken up by the

The family of models which Jack has used to investigate some attractive possibilities in Electric Duration for the serious flier.

Jack prepares for another quiet power flight with Phoebe. No burst rubber motors, no stooge, no torque meter, no expensive front end - but he definitely does need a D/T.



fixed weights of the drive system components doesn't leave much left over for airframe, if a particular total weight target is to be met. Even after being careful with material choices in the airframe, the total weight of Phoebe is 15 grams over my 230 gram goal. On reflection, I suppose this drive to airframe weight relationship is rather like that of an open rubber model. I wanted a fairly robust model, however, so the airframe owes more to F1B design than it does to open rubber. Still, Phoebe's wing loading of 4.9 oz./sq. ft. is not far off the 4.7 oz./sq. ft. figure of my old F1B models.

The model was set up to give a right hand glide, using tail tilt and a touch of right rudder tab. With the decalage set at 2.5° (+1° wing, -1.5° tailplane), the battery pack was shifted to give the required glide attitude, a wide, flat right hand circle. This placed the CG at 65% of the root chord. With the calculated neutral point at 81%, margin of stability is 16%, which I felt would be adequate for normal and still air flying. I thought that if problems showed up in rough weather flying (assuming I wanted to fly in rough weather), the decalage could be increased and the CG. shifted forward to increase the margin of stability to 20%, or even 25%, but this glide set up looked safe for the first powered flights. As it turned out, the first powered flights were at Middle Wallop, during the August 18-20, 1995 SAM European Champs, exactly one year after the Speed 300 powered No. 2 model had its first flights, on the same field. Using reduced power, the first flight showed a fairly tight right hand climb, and with too much of a power wasting bank. Shimming in a little left thrust and shimming down the right wing a bit opened out the climb circle and reduced the banking to almost nothing. The tailplane incidence was adjusted to maintain the 2.5° decalage to the average of the incidence of the two inner wing panels. I

later measured the left thrust at 2° and the wing incidence at 1° for the left wing and 1.5° for the right. By the fifth flight Phoebe was on full power and climbing well in the light breeze and soft thermally conditions. The model showed no apparent vices. As with the other models, transition from power to glide is automatic. As the power from the batteries runs out the propeller folds with the model flying level, just like a rubber powered model.

For a short time two flyers set up nearby to trim their modern DPR equipped, carbon fibre and mylar high tech state-of-the-art F1Bs. These have spectacular initial vertical climbs, which Phoebe cannot emulate. However, the drop off in power from initial burst to cruise is not nearly as severe with electric power as with rubber, and so Phoebe makes slower, but steadier, progress in the climb. The consensus seemed to be that Phoebe's altitude after about the minute of useful power run was at least as great as the similar sized F1Bs. Unfortunately, they couldn't stay long and more direct performance comparisons were not possible. I, however, continued to enjoy myself all day long, and with D/Ts set for around 1:45 the model was taking from 30 seconds to well over 2 minutes to descend. Launching into really good air on a couple of occasions, the model was nearly out of sight directly overhead after about one minute, the time which marked the end of the useful power run.

I am certainly very well pleased with the experiment. Phoebe flies as well as I could have hoped for. The model has plenty of duration potential, and if I can ever find some still air I'll try to find out what that is.

Some thoughts on a large model electric F/F duration class

The UK does not yet have a F/F competition class for electric models larger than those in the E-30 class, and trying to come up with ideas for one can suggest all sorts of things. If you start to think of electric models in the same way as IC power models, then limiting the motor run is suggested. Technically this can be done. However, electric models are essentially silent, and their propellers are quite small compared with rubber powered models, so how do you ensure that motor runs are within the required time limit? Besides, IC power models have, by their current state of development, lots of power, which can often even accelerate the models during their climb. Just watch a modern F1J or F1C model, and you'll see what I mean.

Electric powered F/F models, on the other hand, don't have this surplus of power, and behave much more like rubber powered ones. Perhaps, therefore, an approach to class

A CONTEST ELECTRIC POWER MODEL - 3 part 1

Bob Wells outlines his progress todate in developing a possible NEW class for competition...

WHY ELECTRIC?...

The model described here was built to test the viability of a specification for a free-flight electric class proposed by the BMFA. The reason for this proposal is that increasing complaints of noise are now beginning to affect our major contest sites. Looking to the future, power model enthusiasts are going to have to do their thing more quietly. It would also give the opportunity to many people to fly 'power' on their local fields where noisy models may be prohibited; my own club field is a typical case where we cannot run motors during the Summer evenings.

The use of electric power in radio control models is now well established and these models can do anything that their internal combustion counterparts can do, perhaps to a slightly less but still acceptable extent. No such advances appear to have been made in free-flight, presumably because the necessity has not existed - but it probably soon will. Many electric free-flight models have been flown, but these have tended to be of the small 'sports' type, requiring only low power and the motors allowed to run until the battery is exhausted. The one official class, E30, falls into this category.

WHERE DO WE START?...

What we want now is a 'real' power model having a short, fast climb and a long, slow glide, comparable with the very popular 'Slow Open Power' class. To achieve this sort of performance will not be easy, but nothing worthwhile ever is. To my knowledge, no details or reports of performance for a model of this type have ever been published. No doubt someone,

somewhere, has tried such a model - please let us all know if you have.

INITIAL PROPOSALS...

A start has to be made somewhere and the BMFA proposed that the models should be inexpensive, simple, of unrestricted size, powered by a specific motor (the Graupner Speed 600), using a 6 cell (7.2v) battery of 500 mAh capacity, with the motor run restricted to 15 seconds. Comments on these proposals were invited and I gather that there were a surprisingly high number of opinions expressed, generally suggesting that the battery power would be insufficient, and that there should be a choice of motor. Based on my experience with many radio controlled electric models over the last few years and a contest free-flight upbringing, my own views were much the same.

However, in order to gain practical proof, I built a model basically to the proposed rules, but using a seven cell battery of 900mAh capacity (heavier, but more powerful than that proposed). This was because I already had seven-cell packs which I was not prepared to dismantle and neither was I prepared to buy a six-cell pack which would, in my opinion, almost certainly prove to be worthless.

The good news is that this model flies.

It will climb to around 200 feet from a motor run of some 15-20 seconds and although our local field is too small to allow an extended glide, it looks reasonable and could well stay up for a further two minutes. This falls a little short of the hoped for (dreamed of?) performance, but a 30 second motor run could well result in a three minute flight. I do not need to try it to know that with a six cell battery, the performance would be very disappointing.

However, this is the first attempt and I am sure that progress would be rapid if the class were taken up by the contest experts, whose ability to find ways of achieving more performance never ceases to amaze me.

THE PROTOTYPE MODEL

Because of the BMFA's reference to slow open power, the design of the model was based on contest models from the mid fifties/early sixties, a style of model which even now is extremely popular both in this country and abroad. The design has no features peculiar to electric power, except for battery space; it was however built as light as I dare to try and offset the battery payload.

The wing area is around 350sq.in., the motor a Master Aircscrew 1051 (same motor as Speed 600 7.2v), fitted with an 8" X 6" Kavan fixed-blade propeller and powered by a 7 cell battery of 900 mAh. capacity. Motor control is through a micro-switch operated by a 'Tomy' timer, which also does the D.T.

These details may raise a few questions such as:

Q: Why a Master Aircscrew motor?

A: Because I already had one, and it is the same motor as a 7.2v Speed 600.

Q: Why a Kavan propeller?

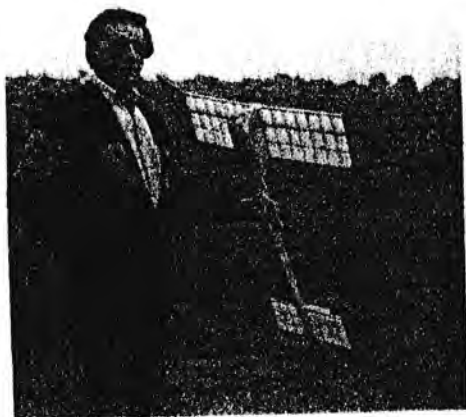
A: Again, I already had it and I thought that the flexibility of this type would help protect the thin motor shaft on landing.

Q: Why a 7.2v motor with an 8.4v battery?

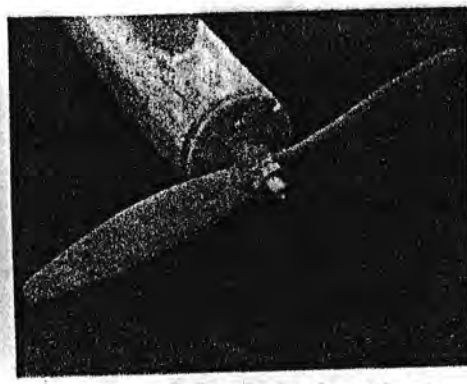
A: The voltage rating of these motors is nominal; they will operate over a wide range. Generally, a motor with a lower voltage rating will have a higher nominal speed (rpm) and the 7.2v motor is over an ounce lighter than the 8.4v version.

Q: Why a battery of 900mAh. capacity?

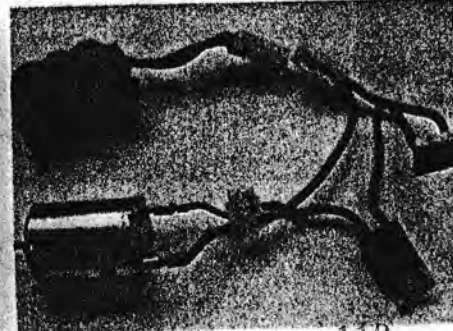
A: This again, I already had. Although a couple



Bob and his as yet un-named model - Is there anyone else who can do this?



The business end! Speed 600 motor, direct drive propeller, the narrow

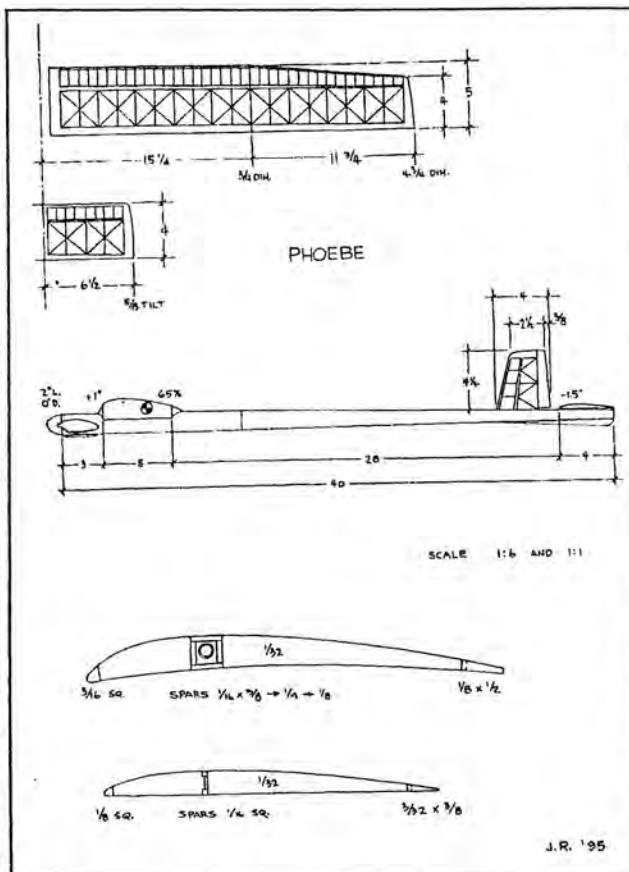


The complete harness. Note the in-line fuse and the micro switch. (This is an early version - latest wiring is much shorter).

4

specifications for them should be based on rubber powered models, rather than IC powered ones. So, do you have an absolutely "open" class of electric model, which allows any combination of motor and batteries to be used? This approach, an electric version of open rubber, is an easy option. However, I fear that the performance capabilities of such models would soon be colossal. For instance, I could put 7, or even 8, cells of the size I've used in Phoebe in a lighter model of about the same size, or I could use just 6 cells of a larger capacity. Either way, the potential duration would go up. And that's just using a humble Speed 400 motor. Personally, I don't think we need a performance level greater than that of the modern F1B Wakefield class - we just don't have the flying sites to accommodate it.

This brings us back to considering some sort of limited power. The continental Klasse "E" specification allows a wide range of model size, although larger ones would be favoured by the loading part of the specification. However, the 12% battery limit is very strict, resulting in models more like powered gliders than what we think of as power models. Perhaps more "oomph" than that is needed. The F1B specification (40 grams of rubber in a 230 gram model) means that up to about 17.4% of total model weight is available for the power source. Perhaps this would be a better limit, although restricting the total area to 17 - 19 dm² (as per F1B) could pose model



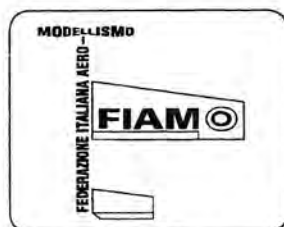
design problems - configuring a battery pack to give a desired number of cells within a 40 gram fixed weight limit can be tricky, as battery pack weights are not as easily adjusted

as strands of rubber. Despite this, an electric version of the F1B specification (17 - 19 dm² of total projected area, 230 grams minimum total weight and 40 grams maximum battery weight) could be an interesting class - certainly there is no shortage of proven F1B designs available, which could be modified easily to electric power.

Another approach could be a derivative of the E-30 specification. That is, limit the total battery pack capacity to some figure relative to some model size limitation, such as wing area. Phoebe uses 6x120, or 720, mAh of cells within a 19 dm² total projected wing plus tailplane area limit. Purely as a suggestion, how about a maximum of 350 sq. in. of actual wing area and a maximum of 1000 mAh of battery capacity as a very simple, and easily verified, specification for an "open" electric F/F duration class?

Electric F/F is still in its infancy, but it seems to me that it offers tremendous scope. The models can be built in a wide range of sizes, and the motor/battery combinations can be tailored easily to the builder's performance requirements. They are clean, reliable, and above all, will not unduly bother the neighbours. Electric power has been used quite a bit for sport models. It seems well suited for use in vintage models also.

For all-out duration competition it would appear to offer great potential as well. I'd like to see it develop. If you agree, let Aeromodeller have your views.



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"associarsi è sinonimo di maturità"

ELECTRIC CONTEST MODEL - part 2

In the second part of his 'progress to date' report, Bob Wells looks at the power system options..

MOTORS

Whilst motors come in a bewildering array of shapes and sizes at prices from around £5 to several hundreds, this need not bother us unduly because, sensibly, the BMFA are proposing that the motors be an inexpensive unmodified type - in this case, the Graupner Speed 600. This motor is sold by Graupner as one of their 'Speed' series. Other people such as Robbe and Master Airscrew sell the same motor with a different name; the 'Power 600' in the case of Robbe and the '05' from the American company. The same motor probably appears in other guises as well.

The BMFA have by no means formalised the rules and it may well be that other sizes of motor will be permitted, although it is likely that they would be confined to the basic unmodified ferrite motors. Sorry about the jargon - 'ferrite' means that the motors use basic iron magnets in their construction, as opposed to other exotic materials, such as Cobalt, found in the more expensive types.

The motors would also have to be 'direct drive'. This means that the propeller is connected directly to the motor shaft and not via a gearbox. So, for present purposes, the type of motor required would be termed a '600', '480', '500', '540' or '600'. These figures indicate the length of the motor, the 600 being about 6cm, etc., the diameter also varies.

BATTERY

The battery consists of a number of cells connected in series. All cells have the same nominal voltage of 1.2v so the nominal voltage of the battery pack will be number of cells X 1.2 volts. For example, a battery made up of seven 500mAh cells will have a total power capacity of 7(cells) X 1.2(volts per cell) X 500mAh.(cell capacity) X 1000(mA perA) which comes to 4.2 Watt hours. This means that this fully charged battery will be discharged after one hour, if power is drawn off at a rate of 4.2 Watts. Now, 7.46watts = 1bhp. So, if we want power of say 0.2bhp (1.19.2watts), a 4.2 watt hour battery will provide that for 4.2/1.19.2 hours = 1.68 minutes = 101 seconds.

Putting it another way, an 8.1 volt supply, to provide 1.19.2watts, requires a requires current to flow at 18 amps, because watts = volts X amps.

Whilst cell development continues apace, the best cells, in my opinion, which can reliably discharge at these rates, are the Nickel Cadmium type (NiCads) made by Sanyo with an 'R' somewhere in their codes. In our case, they will be 'AR' - others, such as 'SCR', are much bigger and heavier with capacities beyond the needs of a free-flight model.

Bearing in mind that you are going to need a motor run of about 30secs, allowing for messing about on the ground, a 500mAh battery is only going to give two good runs per charge. This means that you will need at least two batteries for competition work, because you may not get back in time from the previous flight to re-charge - the second battery would be left charging while you are away. Larger capacity 700 and 800 AR cells are available, but they are about 50% heavier than the 500mAh, which weigh 19g per cell. The choice is yours.

BATTERY CONNECTOR

There are many different makes of connector, most common being the Tamiya type. Whilst these

are adequate, the general consensus by experienced electric fliers is that gold plated connectors cause less resistance - but whichever you choose, you will need more of the same for the charger and any future batteries and models.

PROPELLER

For this type of model with a direct drive motor, standard fixed blade (as opposed to folding) power propellers can be used. The propeller speed is going to be in the region of 10000 rpm so the more flexible ones will suffice and will help to prevent the shaft from bending on landing. Most power is obtained from the motor when the propeller is of a size to reduce the motor speed down to about 50% of its nominal unloaded speed. Bigger propeller means more power, but don't go beyond 50% - if you do things can get very, very hot and the power reduces.

SWITCH

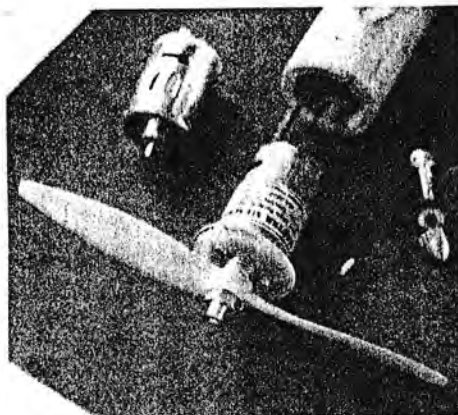
This can be a micro switch as sold by electrical component retailers for something around a pound or so. They are small, and are operated by a spring-loaded button, some incorporate a built-in lever; this type is probably the most convenient for our purpose, the lever can easily be removed if not needed.

I have used switches rated at 5amp AC, for many, many operations without trouble, but if you want to be really safe, find one rated at 16amps AC, it's only a little bigger.

WIRING

Wiring should be kept as short as possible to reduce the resistance (ohms) and all joints should be soldered. For 20 amps, the wire should be at least 2.5sq mm and extremely flexible for ease of installation. Whoever supplies the battery will almost certainly have this type of wire.

To allow easy removal of the motor, particularly on the field, I solder short wires to the motor which are then connected to the rest of the circuit with a 5 amp, electrical strip connector.



Motor installation. The Master Airscrew 05 motor is screwed to a glassfibre plate, which is screwed to a ply plate on the hollow-tube fuselage, allowing easy adjustment of thrust line. The prop adaptor is a SLEC fitting retained on the shaft by a grub screw.

FUSE

For safety sake, incorporate a fuse, of not more than 25amp, somewhere in the circuit. This can be the 'spade' type most conveniently mounted in a holder available from car accessory shops.

CHARGER

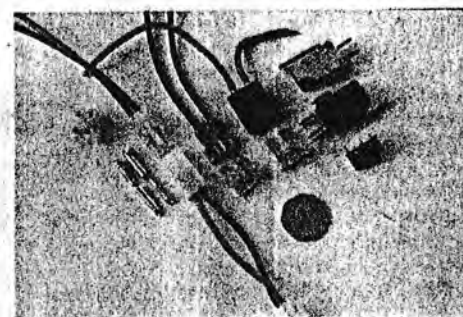
There are many chargers on the market. The type required should have an adjustable charge rate which allows the correct rate to be selected with regard to the battery capacity, automatic 'Delta Peak' cut off, automatic switching to trickle charge after fast charge switches off and should be suitable for 12v Car battery. You should not have to pay more than £25 for a charger of the type. **AM**

Next month, in the final part, we look at the installation, wiring up and operation of the system.

If you want information in this respect or to talk about anything else, telephone me on 01245 226338 and I will be happy to chat for hours - providing you are paying for the call



A selection of different configuration power packs, the charger connects to a dedicated connector run through from the car battery to the boot (saves having to open the bonnet!).



Typical connectors, fuses/holders and micro switches. The strip connector on the left is used to connect the harness to the motor, for ease of removal. The gold plated connectors (below it) are expensive, but the power gain is substantial. The micro switches can be found in places like Tandy or Maplins.

A CONTEST ELECTRIC POWER MODEL - part 3

Bob Wells concludes his discussion on electric contest feasibility with a close look at the wiring system...

REPRISE

To summarise the size/power combination experiments, from my experience, the following combinations would be suitable for a model of the type we have been discussing:

Motor	Nom. Voltage	Battery	Wing Area (sq. in.)	AUW (ozs)	Propeller
400	6.0	7 cell	200-250	12	6x3, 6x4
480	7.2	8.4	250-300	15	6x4, 7x4
540	7.2	8.4	300-350	20	7x4, 8x5
600	7.2	8.4	350-400	22	8x5, 8x6

Note that the smaller motors can use smaller sized cells, which is reflected in the all up weight.

WIRING THE SYSTEM

The electric wiring is basically very simple - it is only necessary to connect the motor to a battery with a switch in the circuit. However, once the operation, timing and safety aspects are considered, it gets a little more complicated.

To limit the motor run the switch needs to be operated by a timer. It is a fairly simple matter to operate a switch from our usual motor cut-off and dethermaliser timers. Suitable switches are readily available from electrical/electronic component retailers. The type of switch required is either a V3 or V4 micro-switch. The V4 is very small, approx. 20 x 10 x 7mm, but is only rated at 5A, 250V AC. However, I have used them in excess of 15A, 10V DC with no trouble. It may be safer to use the V3, rated at 15-16A, 250V AC which, although larger, is still small at about 28 x 17 x 10mm and will handle current far in excess of our requirements. The switches are available with a choice of operating devices, most suitable is the 'lever' type. This simply has a pivoted flat plate lever attached to the switch housing which bears down onto the spring loaded on/off button. The lever is convenient for operating from a timer released trigger (which could be attached to the lever) (See figs 1 & 2). The timer can be any of those normally used on power and rubber models, from 'Tomy' conversions through to multi-function types.

SAFETY CONSIDERATIONS

Whilst the switch and timer are the only items required to operate the model, consideration must be given to safety. The electric motor is probably more dangerous than an IC engine, in that once the battery is connected, the motor can start at any time if a switch is inadvertently operated - particularly by someone not familiar with the model who may pick it up and fiddle.

The minimum requirement is a fuse of the correct rating. At least if the propeller fouls something the fuse will blow, thus preventing further damage. Also, if the model hits the ground with the motor still switched on, the fuse should prevent the stalled motor from starting a fire - it can happen! The fuse is also very useful as a switch. The model can be prepared for flight and the timer set up in complete safety with the fuse removed - the fuse is then plugged in to start the motor immediately before

launch.

Serious consideration should be given to a further cut-off switch (even though I haven't incorporated such a device on my model - yet!), to break the circuit when the model lands, so that the motor cannot start if handled by someone finding the model downwind. I would envisage something on the lines of the arrangement shown in Fig. 3. This could be further developed to incorporate the fuse and maybe even the timer switch - there is plenty of scope for improvement and development. This suggested system is not foolproof, but to start the motor would need both the cut-off and the timer switch to be operated at the same time - which is a much less likely possibility.

Care should be taken to fit the correct size of fuse. The lowest possible rating should be used - a fuse with too high a rating is of no use. The best way to find the correct rating is to buy a selection, say 5, 7.5, 10, 15, 20 and 25 amps, install the smallest and run the motor with the biggest propeller you are likely to use. If too low, the fuse will blow, in which case fit the next rating up and so on, until you find the lowest rating that will take the current (always use a fully charged battery pack). This operation will also give you a rough guide to the current your motor is drawing - if you haven't got an ammeter.

If you decide to arrange to plug the fuse into the side of the model, you will need something for it to plug into. A purpose made fuse holder is convenient and can be obtained from car accessory shops. The fuse holders do vary in style and I cannot recommend any particular one. Sometimes they come in a bank of four or more in which case it is possible to cut off one. Sometimes they will have cable already connected but this may not always be suitable.

Basically, all the holder consists of is a pair of 1/4" blade receptacles moulded into a casing. The same thing can easily be achieved by embedding two blade receptacles in balsa (Fig. 4). The blade receptacles and fuses are again obtained from car accessory shops.

MAKING UP THE HARNESS

The electric harness cable must also be the correct type for the job. For the current level involved, it must have a conductor (wire) cross sectional area of at least 2.5sq.mm and must be extremely flexible, to ease installation without putting excess strain on connections. The flexibility is obtained partly by the insulation, commonly silicone, but mainly by the wire which is made up of many strands, often hundreds, of very small diameter. This cable is sold in model shops specialising in electrics. A good alternative is used for connecting Hi-Fi loudspeakers - it has a conductor area of 3.24sq.mm, made up from 413 strands of 0.1mm dia. wire and is very flexible.

Wherever possible, all wiring connections should be soldered. An exception is the motor, which you may want to make easily removable. One way is to solder receptacles onto the wires which would then slide onto the blade terminals on the motor. If you do

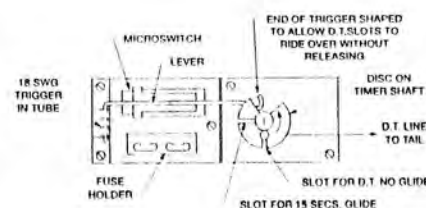


FIG. 1. SWITCH/TIMER SETUP

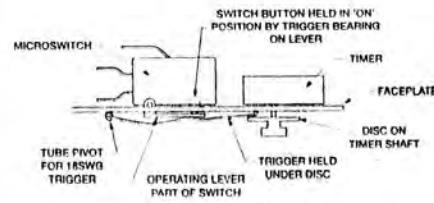


FIG. 2. PLAN VIEW OF TIMER & SWITCH

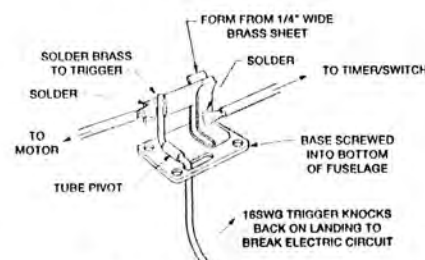


FIG. 3. LANDING CUT-OFF SWITCH

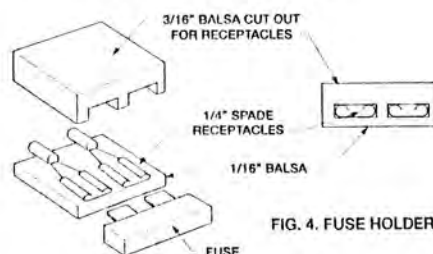


FIG. 4. FUSE HOLDER

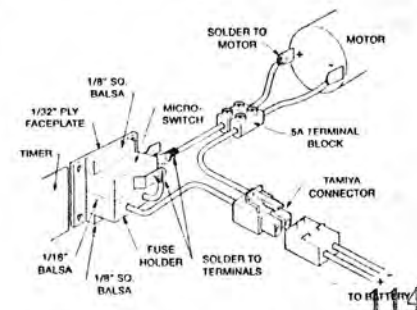


FIG. 5. ELECTRICAL INSTALLATION

Open Electric

Harry Perkins tells how his foray into this experimental class of model is progressing...

INTRODUCING 'EL CUDDY'

Let me begin by stating that my knowledge of all things electrical is at best very limited. My initial interest began with the three articles by Bob Wells in this magazine a few issues ago. My friend Albert Duncan was already into the E30 class of model so I decided to seek his opinion before committing myself to what amounted to a completely new power source (for me). Over the next few weeks and a lot of phone calls we decided on using the speed 400 size motor (4.8v) a six cell pack of Sanyo 500s which according to the chart in Bob's article would give us a decent sized model with a reasonable loading.

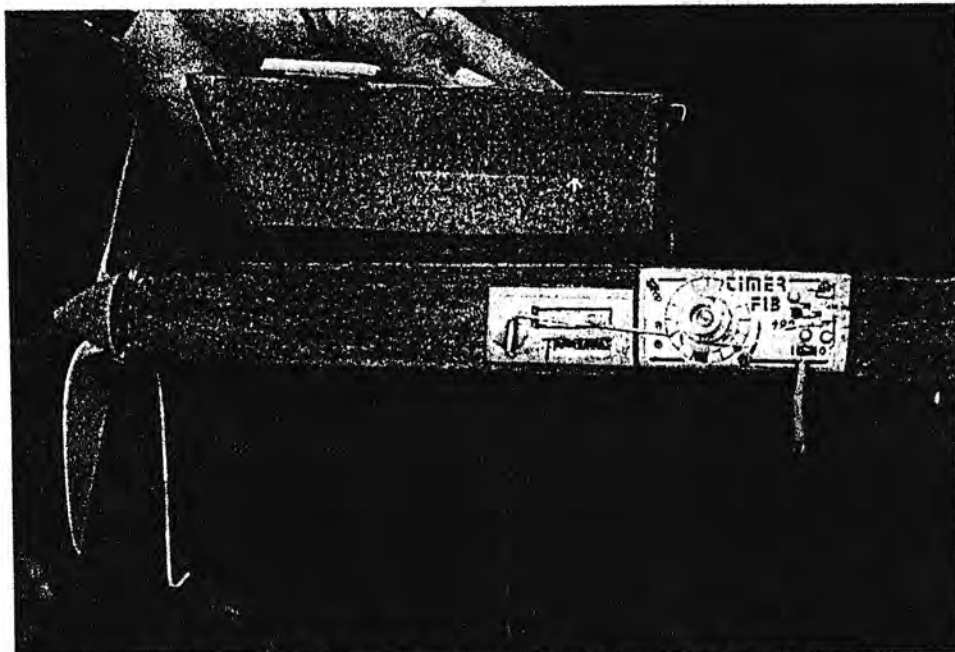
I came to the conclusion, rightly or wrongly, that the 400 motor would give me roughly the power of a standard 049 and so began looking at 1/2A size models amongst my collection of plans. What I was looking for was a simple to build, fairly large model, that could be easily adapted for electric and would be easy to repair during the experimental stage. Stand up TONY CORDES! - designer of 'CUDDY' a 45in span power duration model, which was a free plan with the September 1973 Aeromodeller - and still available from NEXUS Plans Service No. PET1207. This model had everything that I was looking for and needed little in the way of alteration, so construction began. The mods required are only to the nose area and the pylon (shown in the accompanying sketch) and the switch, fuse and harness as described by Bob. Fitted with one of my clockwork timers (I was already using them in my SLOP models), the A.U.W. was just under 12oz. So, with no more ado - it was off to the field.

THAT SUCCESSFUL FEELING

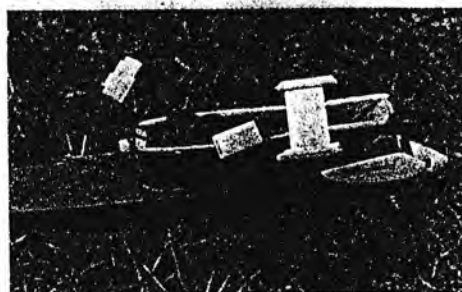
On arrival, I gave the flight pack a 5min charge which I calculated would be enough for initial trimming. It needed only a bit of 1/16" packing under the tail to give a surprisingly long glide, with just a hint of right turn. Living on the Lincolnshire coast as I do, it is pointless waiting for a calm day, so I set the timer for a 15sec motor run, D/T for 45sec, put in the fuse to complete the circuit - and launched. To my joy, EL CUDDY climbed away in a right hand spiral climb during the motor run, with a smooth glide power off, before D/T'ing safely down. Feeling very pleased with myself, I had a couple more test flights and decided that I was ready for the inaugural event at the F/F Nats.

THE TRIALS OF DEVELOPMENT

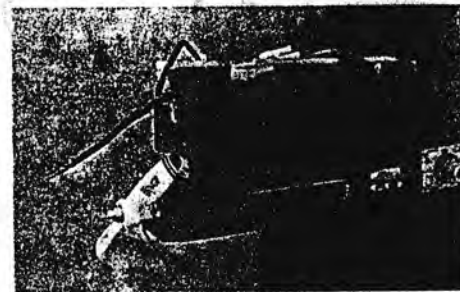
After I got home, I rang Albert to bring him up to date (brag) with my success. We compared notes and it appeared that we were both having very good results with the 400 motors in our different models, and decided to try upgrading the motors props and cells. We purchased the 6v 400 motors while at the next Old Warden meeting - but before I could fit mine, Albert phoned, giving me a real ear-bashing for talking him into buying it. It seems that even with an extra cell (7) it was not as good as the 4.8v, when it came to actually



The modifications to the CUDDY plan just involve the pylon and motor mount. Harry used the control system suggested by Bob Wells, detailed in Bob's earlier 3-piece AM article. Pictured at Old Warden, the no.1 model has the Graupner folding prop fitted, after 'hairy' trials with a coarser pitch fixed prop!



The battery pack is a sliding fit in the pylon, up against the front pylon upright - this is a good safety feature, for on a hard arrival (no.2 model) the inertia of the pack knocks out the front upright, ejecting the battery and minimising the damage.

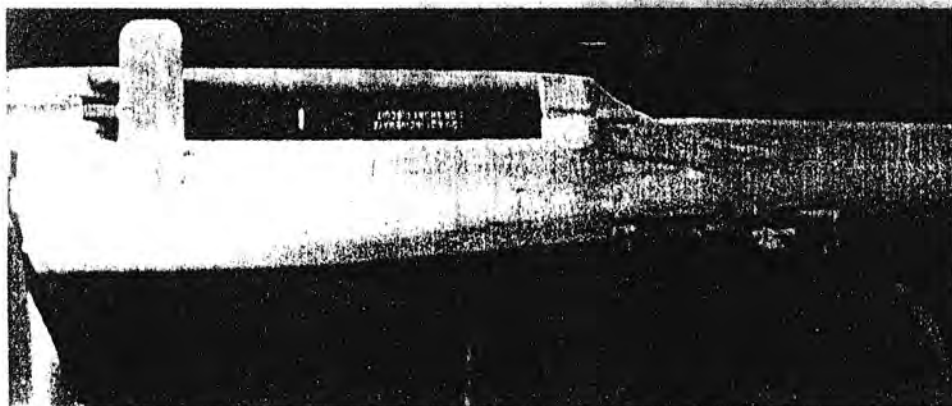


flying the model. Our next major experiments concerned props - Albert preferring folders, while I started with fixed. This time, it was me who was talked into change, but found, on my model at least found, little difference between the Graupner 6" x 3" folder and my usual Master 6" x 4". Albert also came to the same conclusion - having tried 7" dia props with no great success either, so we returned to our own particular favourite. A couple of weeks later, I bought a 6" x 6" and a 6" x 5.3" and, as I now had two EL CUDDYs in trim, I fitted one to each and took them to Old Warden for Silent Flight weekend - I was in for quite a surprise as to the effect of what I thought was a minor change.

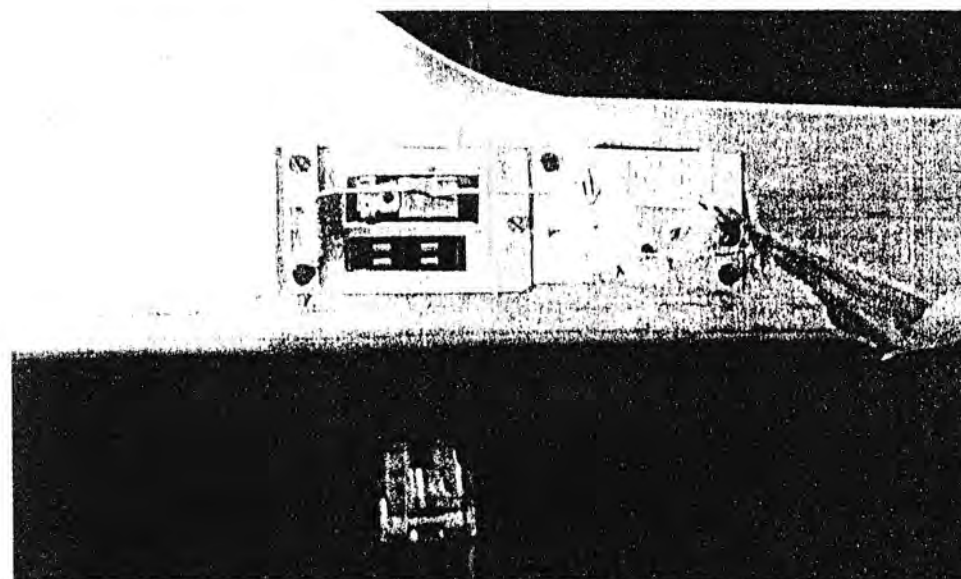
The original model was selected for the first test, mainly because it has become my favourite and something of a good luck charm. I gave the flight pack a casual charge sufficient for a couple or three trimming flights and, after a quick test

glide to check all was well, faced into wind and launched. The model did its usual steady right turn, but instead of climbing away, it dipped sharply, did a quick bit "grass-cutting" and THEN climbed away as per normal. Height was quickly gained and after the 15sec motor run, followed by the DT 15secs after that, she landed just inside the perimeter. Thinking of the unpredictable turbulence at Old Warden, I repositioned myself and tried again. Now this model is nothing if not consistent, and promptly repeated its previous flight - apart from this coming down into the large thorn tree down by the stream. Recovery was duly completed by my pal John Hook, with no structural damage other than the flying surfaces resembling a tea bag, and I decided to rest that one and re-enter the fray with M2.

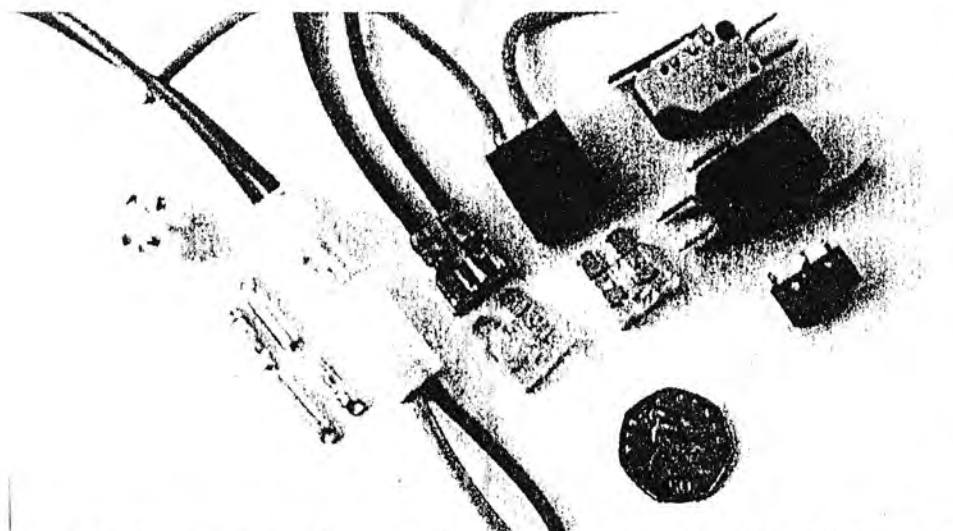
I carried out the same procedure as I had for M1 and prepared to launch. This time, however, the 10 amp fuse blew after a few seconds, some-



Access to the battery pack is through the top of the pylon. Note the small AA size cells used.



Timer, fuse and switch arrangement. The fuse has been pulled and the switch trigger released. Note the label reminding Bob of the timer operating times. The ribbon is tied onto the timer stop/start pin.

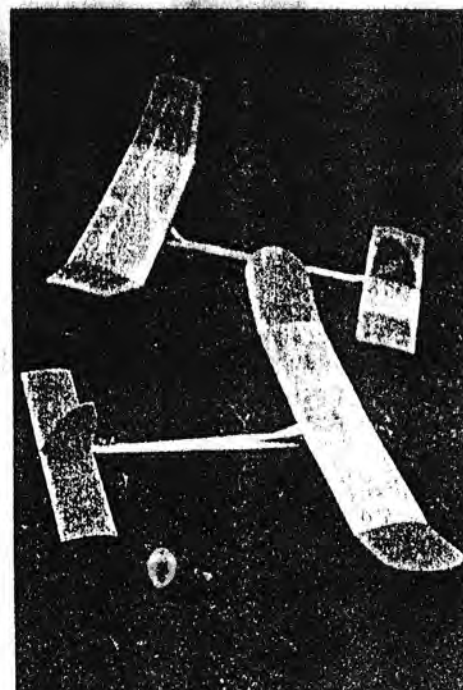


A sample of available connectors, fuses and micro-switches. The 'Tamiya' connectors are widely available, but the gold 'banana' connectors are more efficient (and more expensive!). The micro switches on the right, from top to bottom are rated at 10A, 15A and 5A (250V).

this, make sure the receptacles are well covered with insulation and that they are a very tight fit on the blades. Any exposed metal connectors which come adrift in the model can short out the battery which can be disastrous. The heat generated from a shorted NiCad can easily start a fire and even cause the cells to explode.

Another way to connect the motor is through an electrical terminal block; in this case it will be nec-

essary to solder short lengths of wire to the motor (see fig. 5). The battery needs to be removable from the model for charging and it is best to fit a polarised plug and socket (it can't be connected the wrong way round) between the model wiring and the battery. There are several types available, the most common being the 'Tamiya' type which is sold in most model shops, especially those specialising in car-racing. There are several other types which your model



Two of Bob's development models - the larger one (rear) forms the basis of this article.

shop may offer; just make sure that they are suitable for a continuous current of about 30 Amps. Whichever you choose, remember that you will need the same connection on the battery charger. Most NiCad battery suppliers will sell the battery with a Tamiya Connector ready fitted so this may influence your choice.

All of the electrical work should be done outside of the model and tested before installation. It is therefore necessary, when building the model, to leave access for the electrics to be threaded into the fuselage. On my model, the micro-switch and fuse holder are glued together to form a unit which fits into a hole in the side of the fuselage about 1" sq. This hole is adequate for the electric wiring including the battery and motor connectors to be installed.

Most of the bits and pieces you will need are readily available from good model shops and car accessory shops. If your local model shop does not have what you want there are several good specialist suppliers who give a good mail order service, get their addresses from specialist magazines such as Silent Flight. If you are not quite sure what you want give them a ring first - I have always found the proprietors to be patient and helpful.

SOURCES OF SUPPLY

The micro-switches are obtainable from electric/electronic component retailers such as Maplins. They have shops nation-wide, telephone 01702 552911 for your nearest. Their catalogue of over a thousand pages contains all sorts of bits and pieces you never knew you wanted.

Maplin's order code and description for the 5A V4 switch is FP42V Min M-Sw with lever; for the 15A V3, it is GW72P Std-Microsw lever; for a better quality 16A V3, the code is FP45Y Lever Microswitch.

A selection of timers is available from Mike Woodhouse at Free Flight Supplies, 12 Marston Lane, Eaton, Norwich, Norfolk NR4 6LZ. Tel. 01603 457754. His range includes single and multi-function types based on the 'Tomy' mechanism and a good range of Polish made ones, with the 3-function one, intended for use with FIB, probably being the most suitable. Mike can also supply the mechanisms for making your own Tomy timer.

If you want to get into electric contest - I hope that this discussion has been of some use - it's all a learning curve! Hopefully the BMFA will be holding an 'electric fly-in' later this year - why not have a go?

thing that had never happened before. I made a couple more attempts with the same result, before deciding to fit a larger rating fuse. This done, I immediately felt a surge of power as the model pulled against my grip. With bated breath I launched - she soared away at a great rate of knots, did a wingover worthy of Bill Draper - and returned to earth with a bang.

The damage was minor, once more testifying to the strength of the model and I retired to effect repairs and ponder an what had gone wrong. I just could not believe that such a small change could result in such a drastic change in my normally rock-solid docile model, and decided that if it wasn't the models fault, then it must be mine. So with repairs completed and dope dried, I tried again. A quick test glide revealed all was well so, timer was set, fuse inserted and model launched. Once more, consistency showed in the form of another, but not so tight and fast, wingover. After a great deal of thought and some input from John and Tony, it was decided that if the only thing that had changed was the props - so that must be where the problem lay. The last flight had been saved from another disaster simply because the battery pack was an its last legs, slowing the motor enough for the model almost to hold its own. I was determined to find out for sure, so changed the prop to a Graupner 6" folder (this being the only spare I had with me), gave the flight pack a few minutes charge and returned to the fray. The model was now virtually back to its original configuration (reverting to a 10 amp fuse), so timer was set for 10secs motor run this time, fuse inserted and, with a quick prayer, faced into wind and launched. She immediately settled into her normal right climbing pattern, handling the stiff breeze with contemptible ease and after drifting across in front of the control tower and car park, D/T'd into the R/C pits area.

I expected to be given a bit of a roasting, but after apologising for the intrusion of my air-

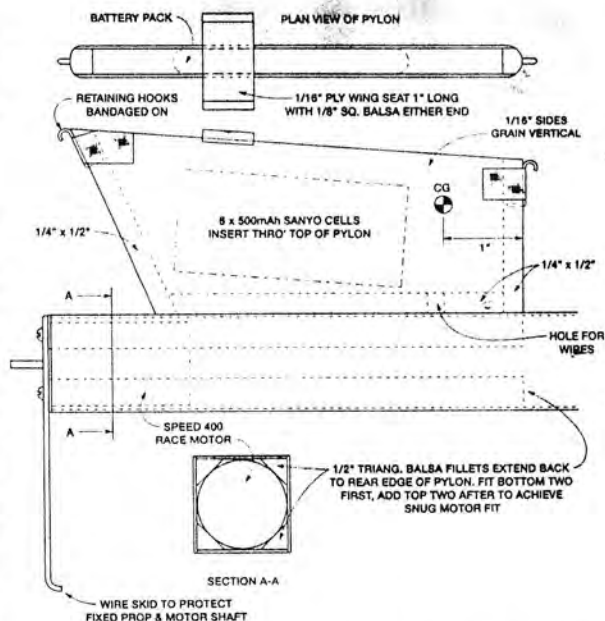
space, I was well received and spent some time describing the model and its various functions to an interested audience of bemused R/C flyers!

CONCLUSIONS

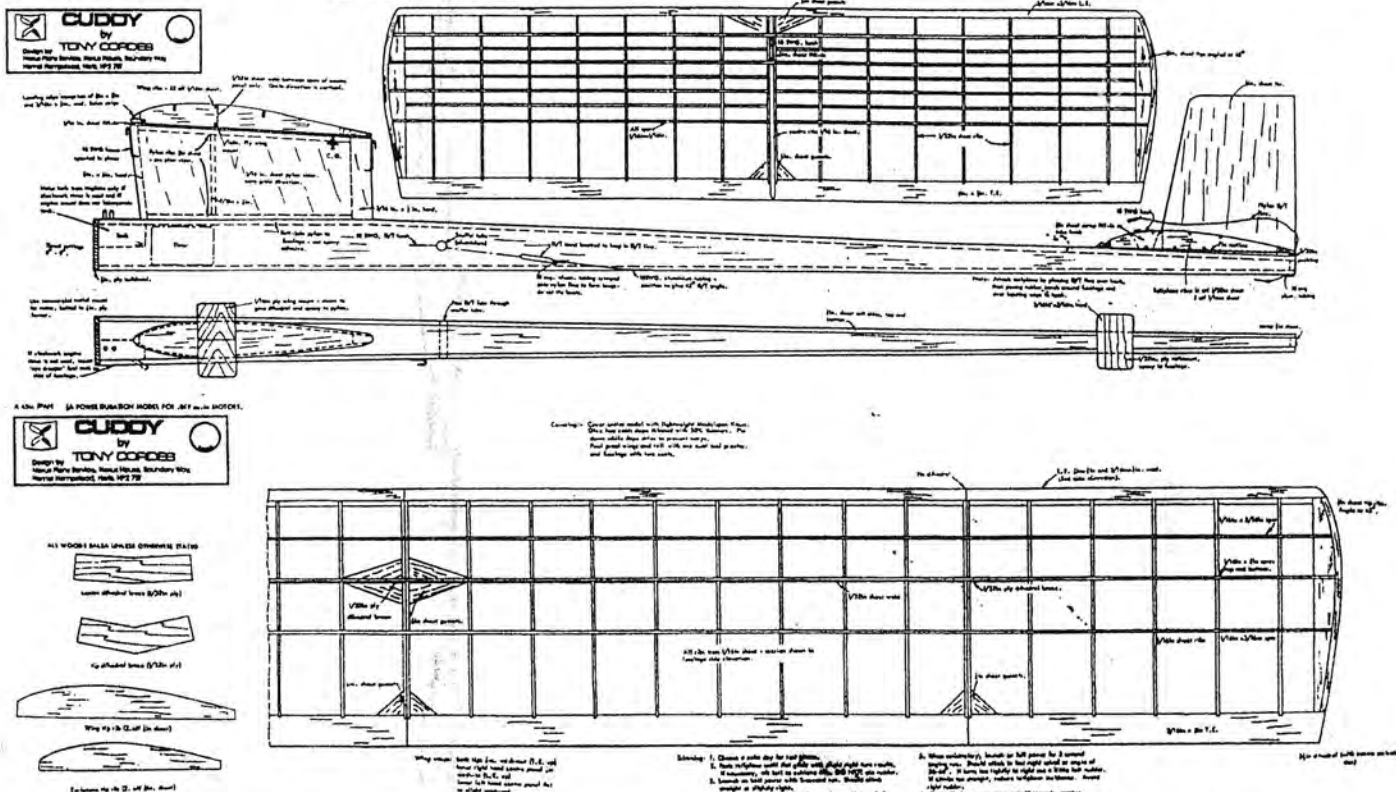
The first and obvious conclusion is that my original layout and motive power was the optimum for this particular model - at the moment I can see no way of improving the already very reasonable level of performance and excellent reliability under a wide variety of weather conditions. Whilst there are, no doubt, many other models available just as good, perhaps even better, I have found EL CUDDY to be very strong and safe, even for the most clumsy (me) amongst us. The weight can no doubt be improved upon, as I made no attempt to build light, building both models just to see what was possible, for as little as possible. The end result has exceeded expectations to such a degree, that I am now totally hooked on this type of flying and hope that my ramblings will have encouraged a few more out there to have a go at this infant class, that gives SO much pleasure, for so little outlay.

"IT WAS THIS BIG - HONEST, MISTER"

If you are wondering what happened at the NATS, on the day of the contest I thought a quick test flight was in order and, after going through my usual pre-flight checks, I launched during a calm hot spell, typical of the day. As she carried on climbing, it dawned on me I had forgotten to release the hold off! There wasn't a lot of drift, so I grabbed my bins and watched her for a good 12 mins, almost OOS, when she started to come back.



This didn't last long however, and she soon disappeared from view in the direction of Belton. My Skegness clubmate Bill volunteered to help try and locate the model and off we went more in hope than expectation. We spent a while searching in vain and I was all for calling it a day and relying on the name and address label (YOU always fit one, don't you?) but Billy said we may as well give it a bit longer, as he thought it possible she had gone further than we thought. As we cruised slowly along, Bill suddenly spotted a model sitting in the middle of a field full of sheep - could we really be this lucky? - Yep! The model was completely undamaged but by the time we had returned to Barkston, it was too late to enter so I'm left with that "what might have been" feeling - at least until the next event at Sculthorpe! AM



VOLO ELETTRICO

UNA "SCOSSA" PER IL VOLO LIBERO

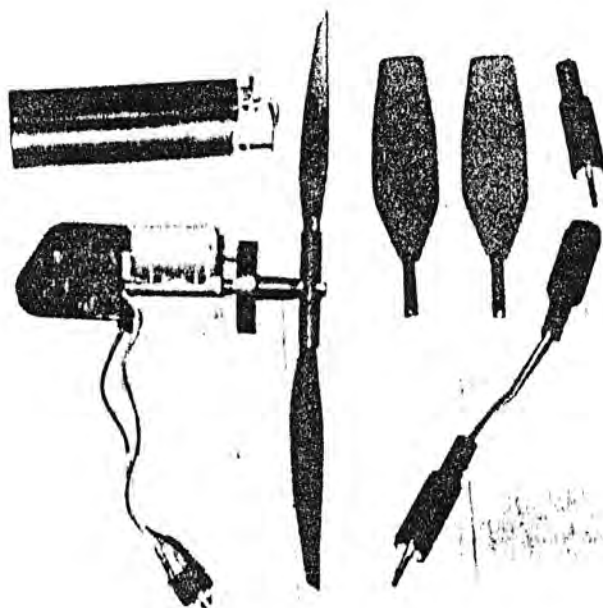
di Carlo Guasco

Come (quasi) tutti sanno, il volo libero comprende tre grandi categorie di modelli: i veleggiatori, gli elastico e i motomodelli.

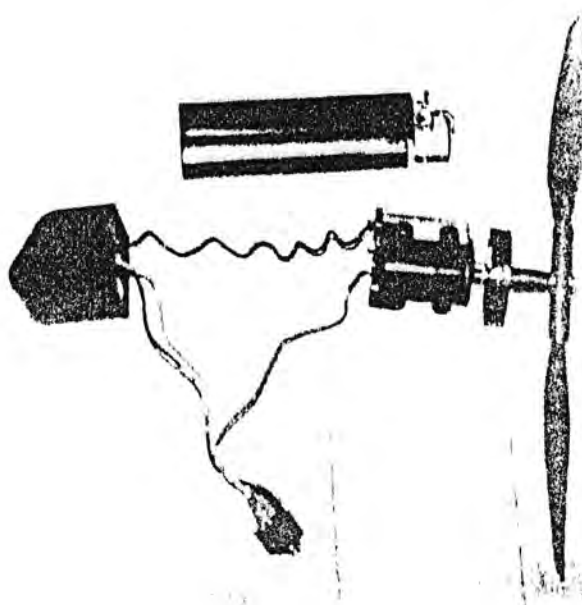
Gli elettrici non sono (per lo meno in Italia) quasi mai stati presi in considerazione, se non da qualche solitario "fanatico".

A pensarci bene, un modello da volo libero elettrico presenta i vantaggi del motomodello uniti a quelli del modello ad elastico: sale infatti in maniera autonoma, non fa nessun rumore e non comporta, come vedremo in seguito, nessuna complessa attrezzatura da montare sul campo. Nei Paesi aeromodellistici più evoluti (quelli in cui chi pratica il volo libero non è considerato un pirla retrogrado) la motorizzazione elettrica è impiegata da diverso tempo su modelli di tutte le fogge, e vi sono ditte specializzate che commercializzano tutto quanto serve per lo scopo (motori, riduttori, eliche, batterie e via dicendo).

Qualche mese fa, il mio amico Alessandro Benini di Pordenone mi informava che stava realizzando un modellino in stile oldtimer (il "Senator") da volo libero dotato di motore elettrico. Al Raduno Nazionale di Pavullo il "coso" in questione mi veniva mostrato in tutti i suoi... 75 centimetri di apertura alare. Visto che ritenevo (e ritengo) la cosa interessante, mi sono fatto dare tutte le informazioni del caso. Il gruppo motopropulsore, comprendente motore, batterie, riduttore ed elica, è un KP-02 e può essere acquistato direttamente in



Nella foto in alto: il KP-02 appena estratto dalla scatola con i suoi accessori (elica di riserva, presa di ricarica) a confronto con un comune accendino. Nella foto in basso: il KP-02 con il "pacchettino" batterie separato dal motore.



Gran Bretagna (per corrispondenza) al prezzo di 22 sterline circa, spedizione compresa. Ovviamente me ne sono subito procurato uno, e, prima di costruirvi intorno un modello, ho effettuato alcune misurazioni. L'alimentazione è assicurata da 3 batterie al Ni-Cd da 110 mAh (3,6 Volt nominali); il peso dell'insieme è di 58 grammi (senza l'elica). L'elica fornita con il motore misura 7 pollici di diametro (cioè 178 mm) ed è in plastica rigida: le pale sono fra loro separate ed intercambiabili. Come si può vedere nella foto, le batterie possono poi essere staccate e portate fino ad una distanza di circa 5 cm dal motore qualora vi siano particolari esigenze di centraggio. Sul motore è installato un riduttore ad ingranaggi, con rapporto 5:1. Con l'elica di serie la trazione sviluppata è sufficiente per modelli con apertura alare fino a circa un metro e peso di 250-280 grammi. Caricando al massimo le batterie si ha a disposizione un tempo motore di circa 50 secondi (per esperienza è meglio limitare la carica al 50% o anche meno, onde evitare di fare dei chilometri per il recupero o, peggio, veder sparire in quota il modello, rapito da una termica). Due parole devono essere spese riguardo al sistema di carica delle batterie, visto che non servono complesse apparecchiature, ma solo quattro celle da 1,2 Volt, 1200 mAh da collegare in serie (vedere schema qui sotto), che possono essere ricaricate a loro volta con il comune caricatore della radio e che possono

stare comodamente nel taschino della camicia. Sul motore è già installato un connettore, che serve sia da presa di carica sia da interruttore: quando il jack della batteria di carica vi è inserito, il motore è spento, e parte non appena questo viene sfilato. Con una sola carica delle "batterie di ricarica" si può volare per tutta la giornata, con la sola preoccupazione di... andare a recuperare il modello.

Per un modellino piccolo come il "Senator" il KP-02 ha però una potenza esagerata, che obbliga ad installare il motore con molta negatività e molta destra. Resosi conto che era necessario un modello più grande, il solito Benini mi stupiva al Concorso Nazionale oldtimer di Molinella, il 18 giugno, presentandomi un bellissimo modello bideriva con fusoliera bitrave (qui accanto), dalla salita tesa e dalle grandi doti planatorie. La configurazione bitrave a gondola centrale è stata scelta per avere la possibilità di spostare la stessa gondola fino ad ottenere il giusto centraggio, e per orientarla a destra fino ad ottenere una salita corretta.

Il modello (che Benini, non avendogli dato un nome, ha successivamente battezzato "L'Innominato") è schematizzato nella pagina accanto: ala in polistirolo, travi di coda in fibra (cimini di canne da pesca), fusoliera a cassetta e, per contenere il peso, stabilizzatore in struttura tradizionale. Con un autoscatto autocostruito il peso in ordine di volo è di 164 grammi (con una

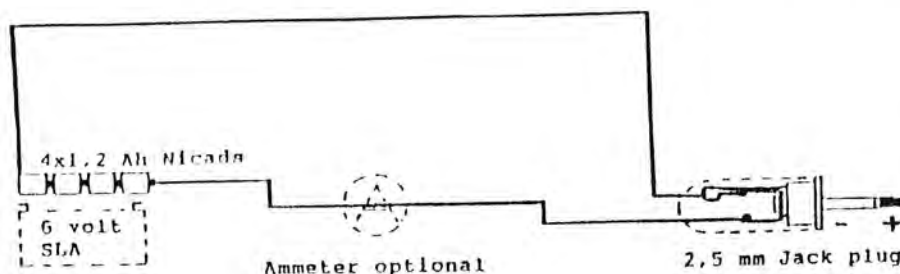


Molinella, giugno 1994:
Sandro Benini presenta "L'Innominato",
bitrave bideriva con motore KP-02.

superficie totale di poco meno di 17 dm², il carico risulta essere 10 g/dm²). Nel disegno sono anche riportate tutte (o quasi) le indicazioni necessarie per la costruzione.

La molla era scattata: dovevo avere anch'io un modello così! Il tempo per costruire è purtroppo poco... ed allora si deve fare di necessità virtù e frugare fra le cianfrusaglie, che non bisogna MAI buttare via (per evitare danni fisici al sottoscritto, non fate leggere a vostra moglie queste ultime righe, vi prego!).

Ho tolto la polvere (tanta...) ad un vecchio Coupe d'Hiver, ho rattoppato i buchi della carta e mi sono messo all'opera per effettuare la conversione. Il risultato di due sere di lavoro è l'EL-EL (elastico elettrico... chiaro?), che vedete a pag. 15: la cellula ha un peso di 80 grammi, cui ne sono stati aggiunti una sessantina di gruppo motopropulsore. Il carico finale è di 10,4 g/dm², più che accettabile per un modello ad



Circuito caricabatterie per il KP-02

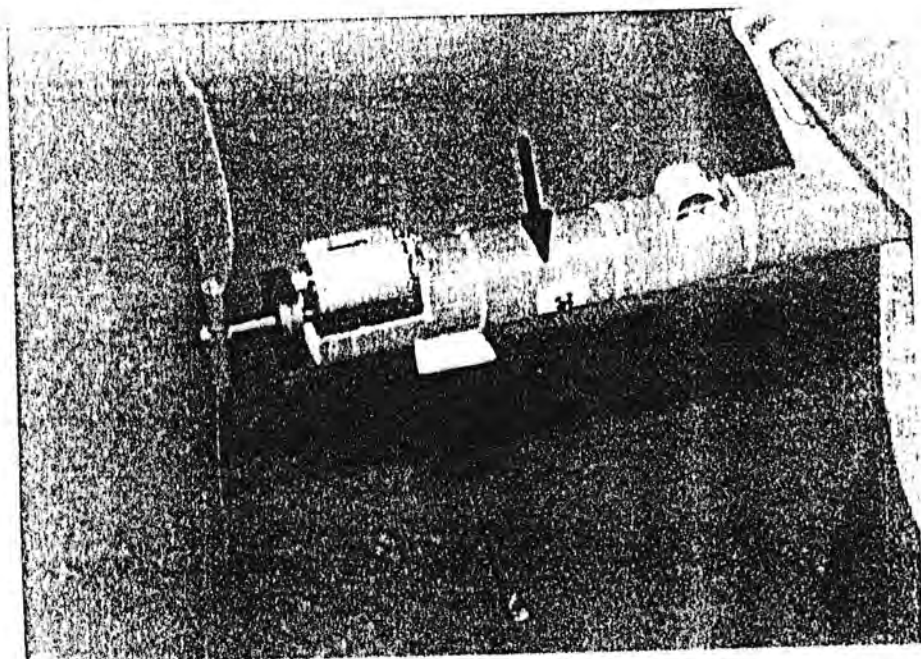
elastico di queste dimensioni. Volendo partire da zero è possibile eliminare, per praticità e leggerezza, alcuni dei "caratteri genetici" del Coupe d'Hiver: la fusoliera può essere costruita in un sol pezzo, il muso può essere accorciato di qualche centimetro, la pinna di supporto dell'ala può essere ridotta (non abbiamo problemi di sezione maestra minima...). Ali e timoni possono essere costruiti in maniera tradizionale (perché cambiare ciò che va bene?). La fusoliera del mio "EL-EL" è costituita da un tratto anteriore cilindrico e da un trave di coda conico, entrambi in balsa da 1,5 mm arrotolati, rivestiti con due strati di carta modelspan pesante.

L'ala, con struttura centinata tradizionale, ha i longheroni in balsa duro da 4x2 e le centine in balsa da 1,5 mm, così come il timone.

Il modello è interamente ricoperto in carta, tesa con 3 mani di tendicarta diluito. Nella parte anteriore era stato aggiunto un "baffo" d'acciaio da 1 mm in stile motomodellistico, per evitare la possibile rottura dell'elica in atterraggio: tale baffo è però prematuramente "defunto" al secondo atterraggio, e da allora ne ho fatto a meno (fortuna che l'elica è abbastanza flessibile...). A causa del ridotto diametro della fusoliera e per non accorciare troppo il muso (comunque quattro centimetri sono stati asportati...) ho sfruttato la possibilità, di cui ho parlato poco fa, di allontanare le batterie dal motore; ho eliminato inoltre il contenitore delle batterie per sfruttare l'attacco radiale del motore, così da poterne agevolmente variare le incidenze (non avendo riferimenti, non potevo sapere a priori di quanta negativa e di quanta anticoppia avrei avuto bisogno). La presa di ricarica/interruttore è stata messa nella posizione più arretrata possibile, così da essere più facilmente accessibile e, soprattutto, lontana dall'elica. Non essendo in origine previsto l'auto-

scatto, ne ho nuovamente fatto a meno, impiegando la vecchia e sempre valida miccia. Ho posizionato il baricentro al 50% della corda alare, ho... caricato le batterie del caricabatterie (!!!) e sono andato sul campo di volo. La prima operazione da effettuare riguarda il centraggio in planata: si devono fare tanti pic-

ho dato 20 secondi di carica, corrispondenti a circa 5" di tempo motore. Sicuro che il modello avrebbe dato una bella "nasata" per terra (la mia esperienza vololibristica è purtroppo assai limitata), con un po' di scetticismo l'ho lanciato, con una spinta molto leggera e 10-15 gradi di inclinazione verso l'alto.



Un dettaglio del muso dell'EL-EL. Si vedono chiaramente il motore, l'elica e la presa di ricarica (contrassegnata dalla freccia). Le batterie sono parzialmente annegate nella fusoliera.

coli lanci a mano, variando progressivamente baricentro e/o incidenze fino ad ottenere una traiettoria tesa e lunga quanto più possibile, senza scampanate. Al corretto centraggio si può arrivare spostando avanti o indietro le batterie (aggiungete piccolissime quantità di piombo solo se strettamente necessario).

Poiché l'elica corre qualche pericolo, è preferibile, per queste prove, curare sempre che sia in posizione orizzontale prima di lanciare.

Una volta ottenuta la planata corretta, si deve passare alle "prove motore". Ho cominciato con un paio di gradi a destra e 5° di negativa. Attaccato il carichino (attenzione: lo spinotto deve sempre essere inserito a fondo, per evitare di "friggerlo")

Nonostante un'impennata di notevole entità, l'EL-EL si è rimesso senza troppi problemi dopo aver fatto una decina di metri di quota (e questo, naturalmente, con mia enorme soddisfazione...).

È bastato aumentare la negativa (sono arrivato a 12° circa) per ottenere un'arrampicata regolarissima con virata a sinistra. L'angolo di salita è notevole nei primi secondi della scarica, ma si riduce progressivamente mano a mano che si esaurisce lo spunto delle batterie (se si cerca di eliminare l'impennata iniziale aumentando ancora la negativa, si arriva ad avere, sotto motore, una traiettoria parabolica che finisce... "a talpe"!), portando l'EL-EL ad una transizione alla planata puli-

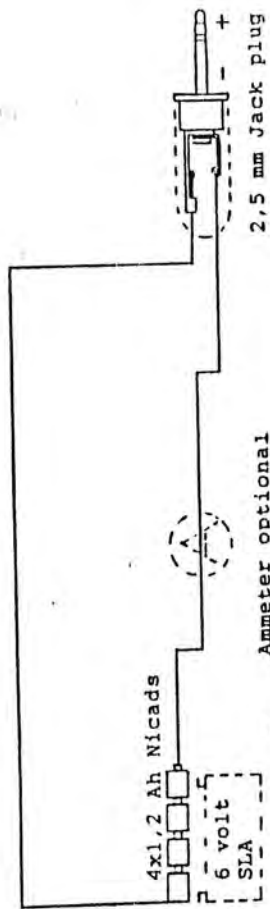
KP 02

KP 02 Model aircraft electric power system.

Weight less propeller 58 gm
Battery 3x110 mAh cells in series 3.5 volts
RPM with KP 178 mm dia propeller 4000
RPM with KP 153 mm dia propeller 5000
Model size 1 metre span 280 gm wt maximum

X
Modelli zinc a
280 grammi di peso
e propeller Alare
oltre 1 metro

Suggested charging circuit with either four
1.2 Ah Nicads or one 6V 3Ah Sealed Lead Acid Battery.



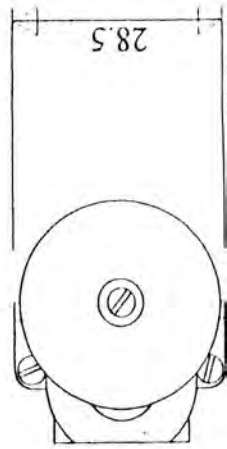
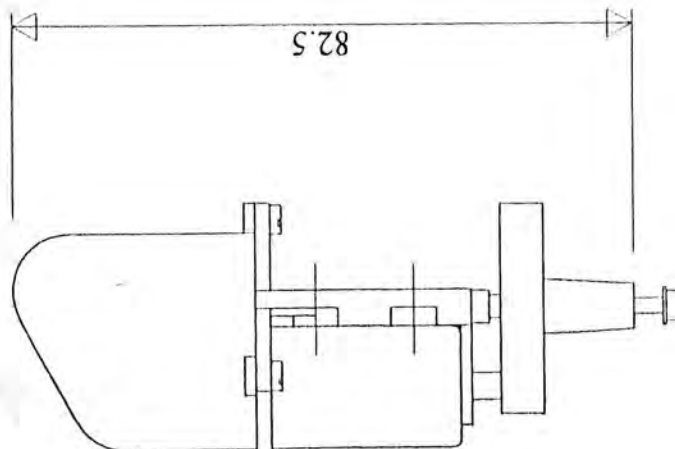
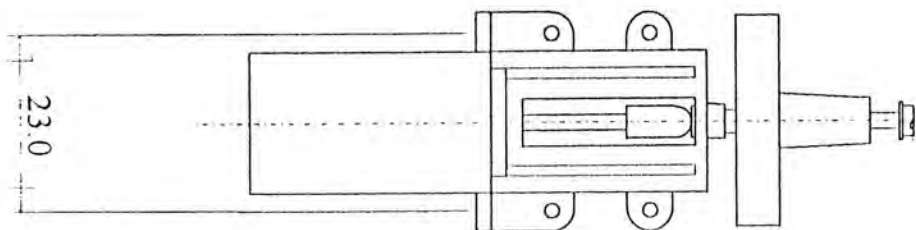
The battery may be unscrewed and the motor/gear assembly radially mounted. There is app. 150 mm of extensior lead in the battery housing if the battery is to be used for centre of gravity adjustment.

Charging the motor in the aircraft.
The motor will start when the jack plug is removed from the socket, it is recommended that the switch lead is inserted in to the aircraft socket then the charger into the switch lead socket. When the desired charge is complete remove the charger prior to the switch lead.

NOTE.

Ensure the jack plugs are fully inserted into their respective sockets to prevent short circuits and subsequent damage to the system.

Contents.
One KP 02 electric motor unit, two 178 dia propellers, four each M2 screws, nuts and washers, one jack plug and one switch lead.



ta e priva di scampanate. Caricando le batterie per un minuto ottengo un tempo motore di una quindicina di secondi scarsi che portano, in aria calma, all'effettuazione di voli della durata media di un minuto e mezzo. L'unico problema resta il recupero, anche se correte la bene...

Chiunque può provare a realizzare un modello analogo, impiegando come base di partenza un vecchio Coupe d'Hiver, ma anche un FIB (più leggero è, meglio è).

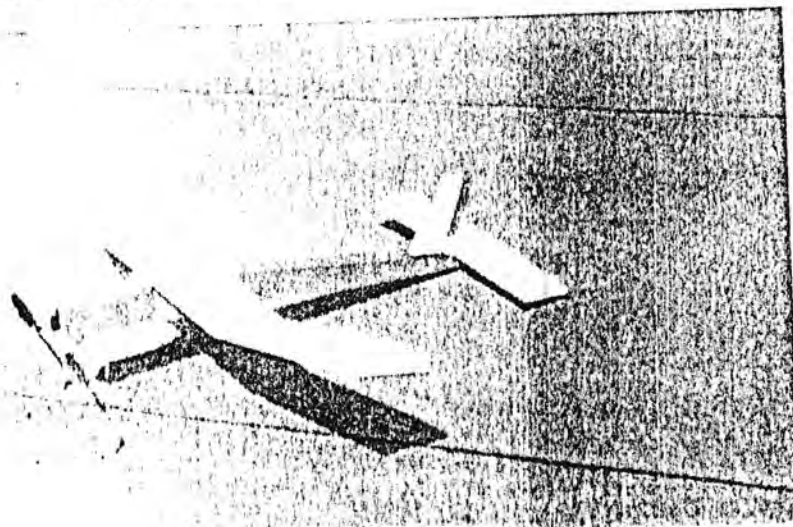
Se invece il modello da "cannibalizzare" non ce l'avete, potete farvene

direttamente a:

*Knight & Pridham Engineering Ltd.
Castle Road, Rowlands Castle,
Hants PO9 6AS - England*

(Se avete la carta di credito, riceverete la merce a casa vostra nel giro di soli 10 o 15 giorni dall'ordine, senza nessun problema di dogana: Italia e Inghilterra fanno parte della CEE, non lo dimenticate).

Per qualunque informazione supplementare, dubbi, problemi, preoccupazioni, perplessità, potete scrivermi (sempre...) o telefonarmi (solo di sera dopo le 19).



L'ultima fatica di Benini: un prototipo di modello-scuola ad elastico di Giorgio Baracchi, convertito al motore KP - 01. 100 grammi di peso per circa 10 dm² di superficie garantiscono una buona salita e un'ottima planata.

uno, visto che il KP-02 è installabile senza troppa fatica su qualunque modello ad elastico (forse un Jumbo scale è troppo grande ed un Peanut troppo piccolo... vedete voi).

Del nostro motore esiste anche una versione più piccola e leggera, denominata KP 01, adatta a modelli di più ridotte dimensioni (fino a 70 cm e 150 grammi), come le mini riproduzioni a volo libero, di cui si possono trovare molti disegni o scatole di montaggio, oppure piccoli modelli scuola nati per la propulsione ad elastico. Chi vuole ordinare il motore o richiedere cataloghi, informazioni, eccetera, può rivolgersi

Buon divertimento!

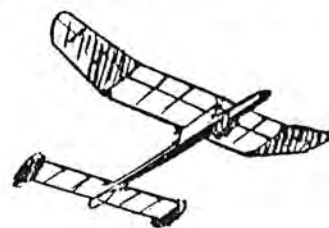
*Carlo Guasco, Via Galimberti, 10
15100 Alessandria tel. 0131/223535*

P. S.: cosa succede all'estero...

Come già detto, il volo libero a propulsione elettrica è una novità in Italia, ma una realtà consolidata in altri Paesi. Basta leggere la rivistina "Electric Flight - UK", organo ufficiale della British Electric Flight Association, per vedere quale enorme quantità di modelli di tutte le fogge venga realizzata in Inghilterra (riproduzioni e non, modelli da durata, sperimentali, Snoopy, scope volanti, plurimotori...), e altrettanto

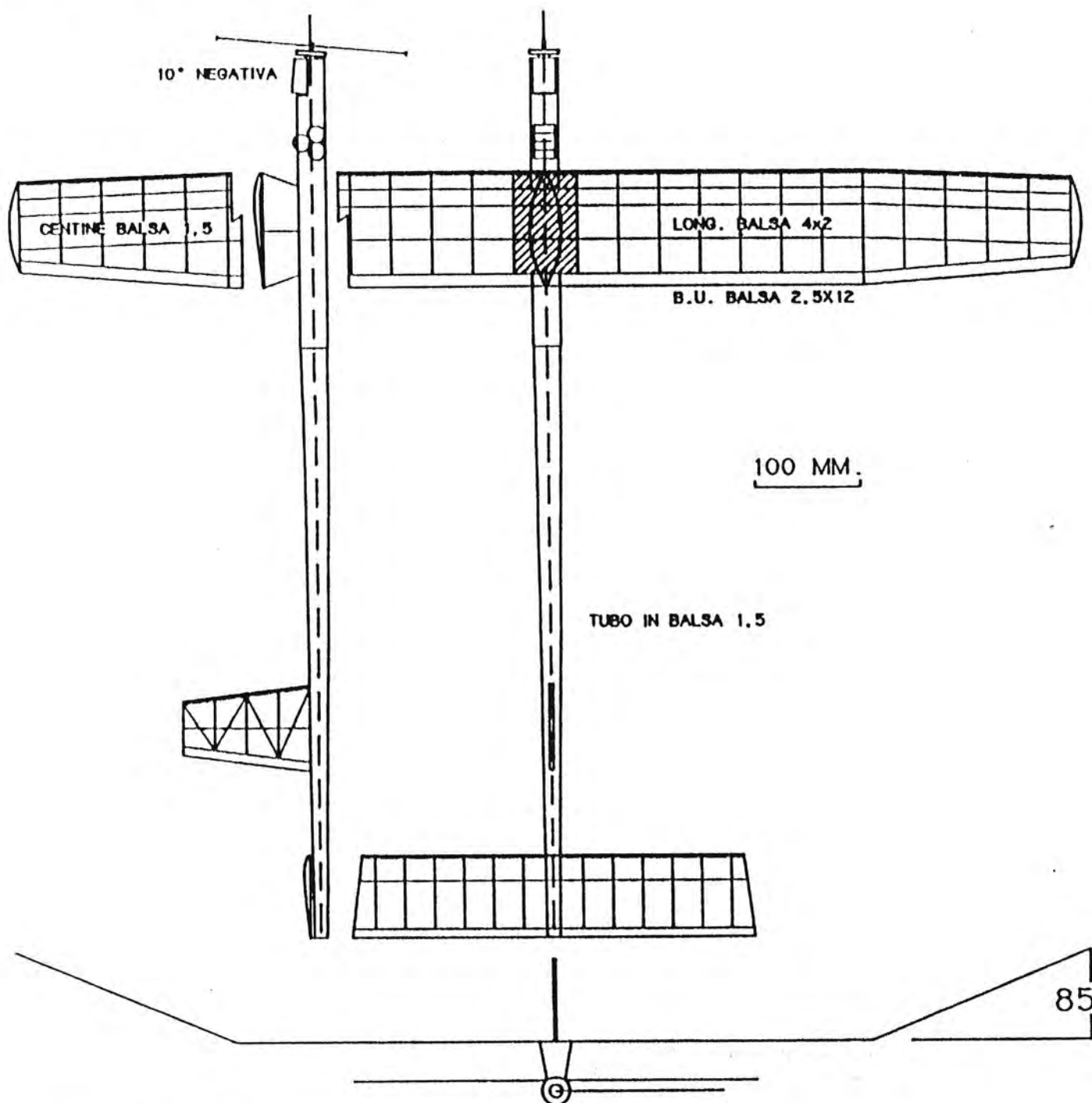
dicasi per gli Stati Uniti, la Germania e la Svizzera.

E vengono ormai organizzate anche competizioni, principalmente nella categoria E-30, in USA ed Inghilterra. Tali modelli (estrapolati dai P-30 ad elastico) devono avere le seguenti caratteristiche: dimensione massima (lunghezza o apertura alare, non importa) di 30 pollici (circa 76 cm), capacità totale delle batterie fissa (da 100 a 150 mAh, solitamente); motore, elica, peso sono liberi. Si tratta di una categoria che, date le ridotte dimensioni dei modelli, la semplicità costruttiva ed i costi contenuti, ha attualmente un buon successo in tutti i luoghi in cui viene praticata. Sempre in Inghilterra si stanno sperimentando i C.d'H. elettrici (proprio come il mio EL-EL), più performanti degli E-30, ma al momento non so se si facciano gare. In Germania si sta attualmente studiando una formula "seria", destinata a chi ama l'agonismo spinto (con l'intenzione di farne una categoria FAI), detta "Klasse-E", rispondente per ora a queste specifiche: peso massimo di 550 grammi, carico minimo di 12g/dm², peso massimo delle batterie uguale al 12% del peso totale. Tali modelli sono adatti a motori della taglia dello Speed 400 Graupner, e... staremo a vedere! Perché non provare a proporre anche da noi una formula di gara riservata ai volo libero elettrici (regolamento da definirsi, ovviamente, ma propongo una formula tipo E-30 o C.d'H., per non complicare troppo le cose) e disputare una garetta sperimentale, magari in concomitanza con una gara di volo libero FAI? Chi è interessato può, come al solito, contattarmi. ✈

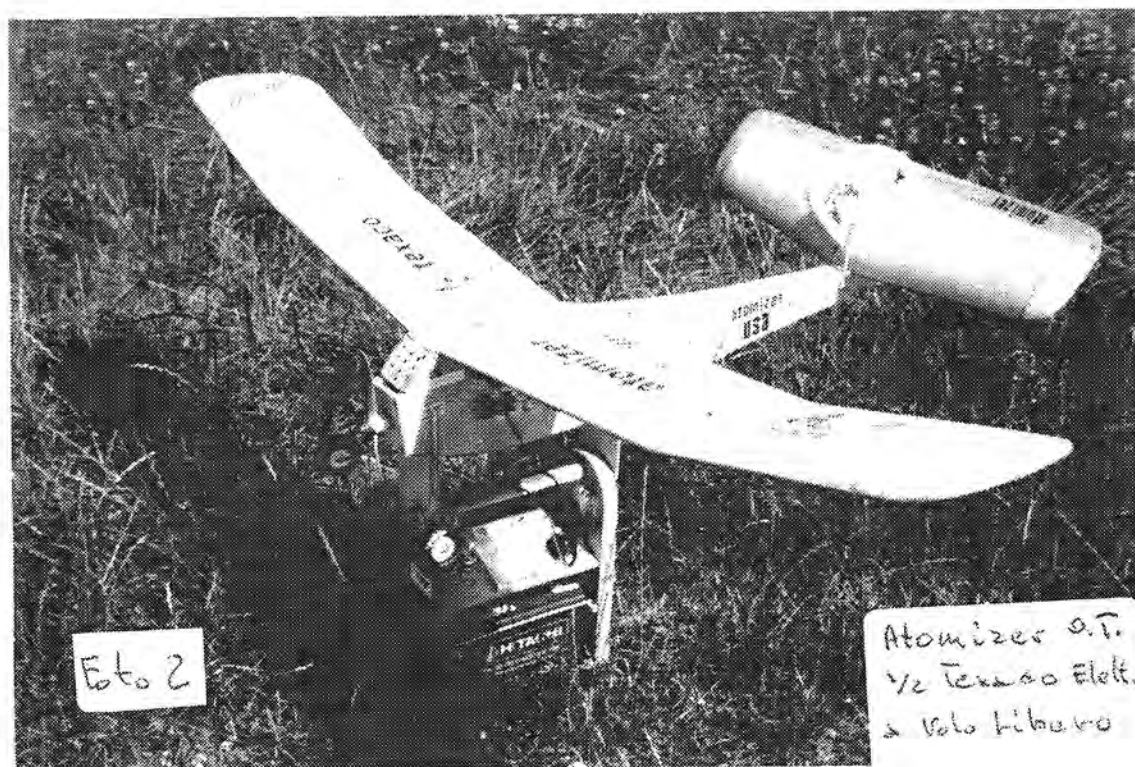


EL - EL

MODELLO COUPE D'HIVER ELETTRICO
DI C. GUASCO



APERTURA ALARE : MM 995
 PROFILO ALARE : BENEDEK B7406F
 PROFILO TIMONE : PIANO CONVESSO 7%
 SUPERFICIE TOTALE: DMQ 14
 CARICO : G/DMQ 10
 MOTORE: KP-02
 PESO : G.135



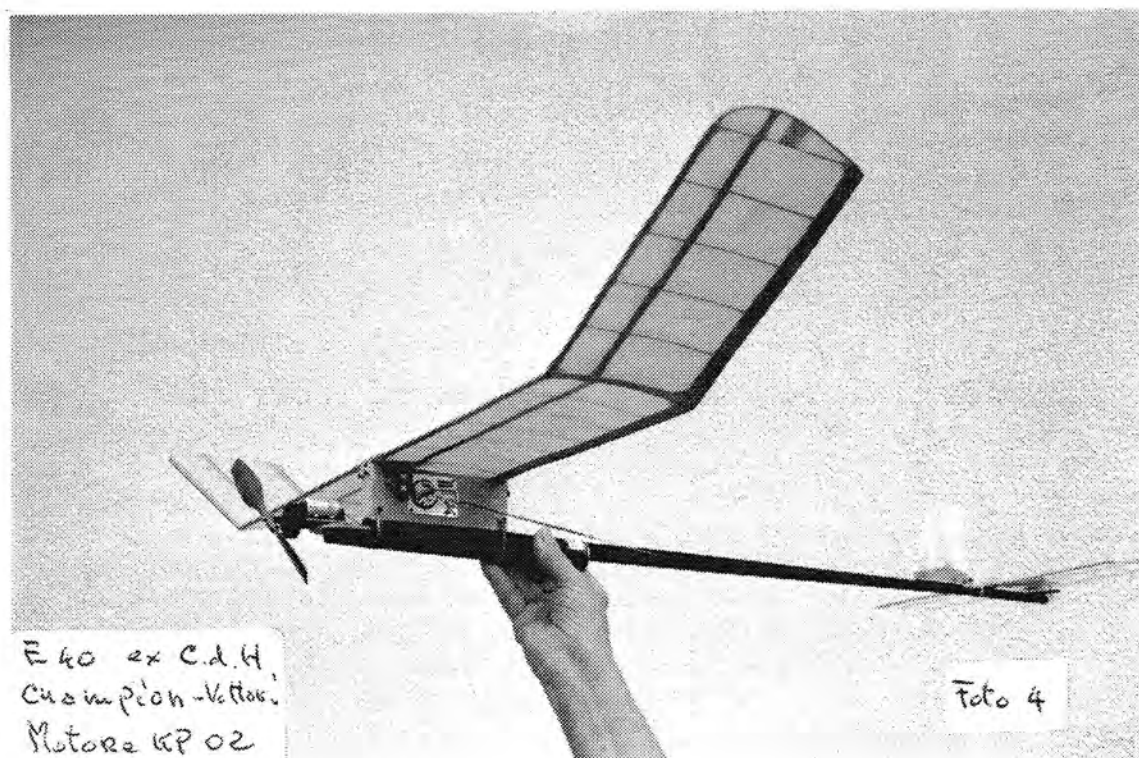
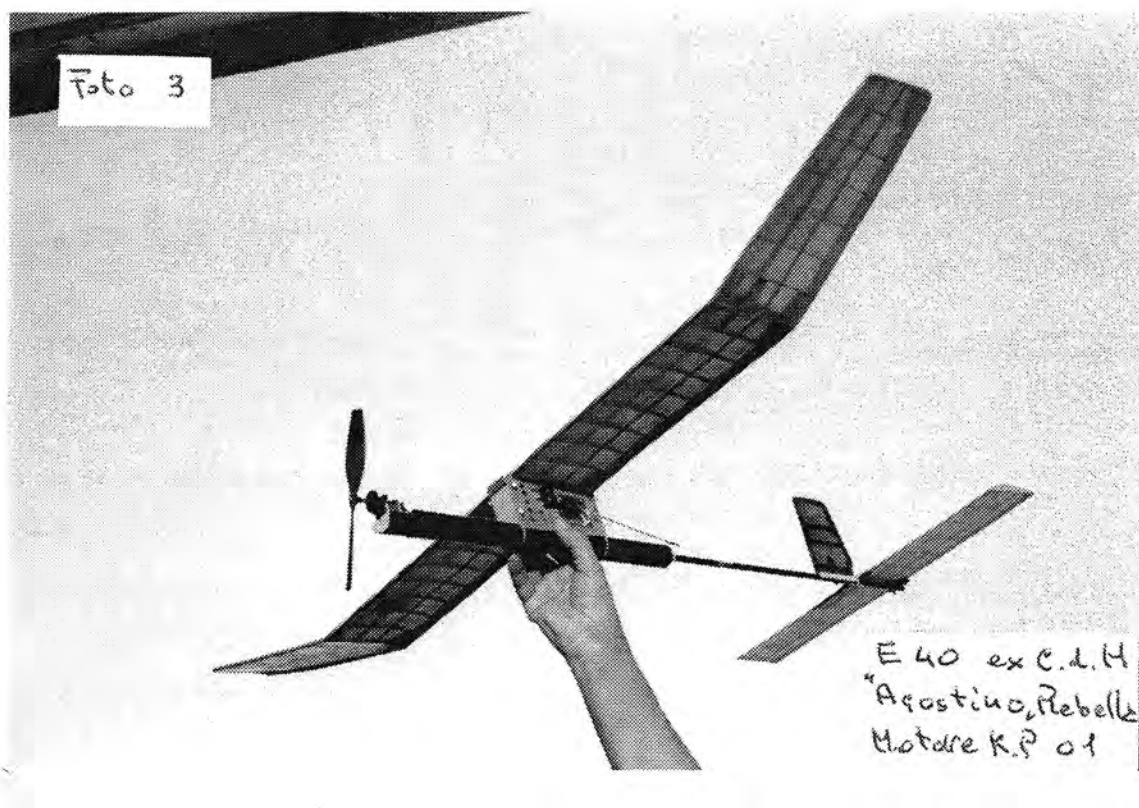


Foto 5

E40 - Progetto
Bekici - KPO2
3 celle 500mA
o/ 4 celle 110mA

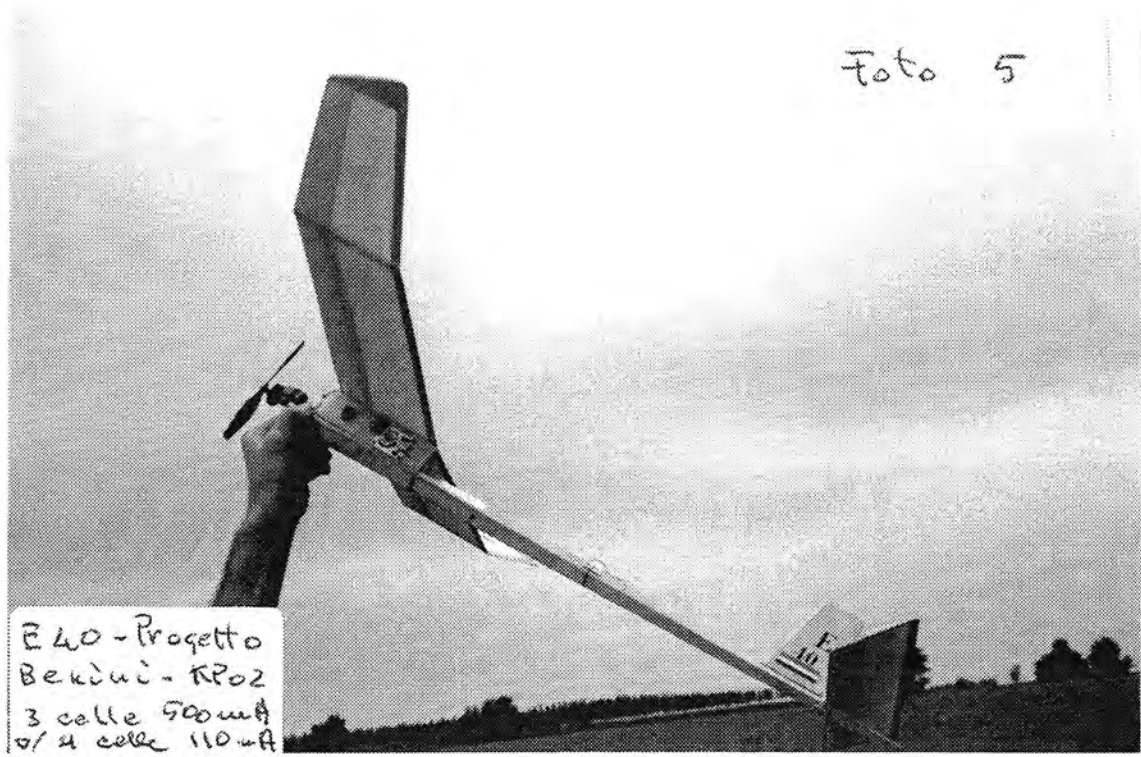
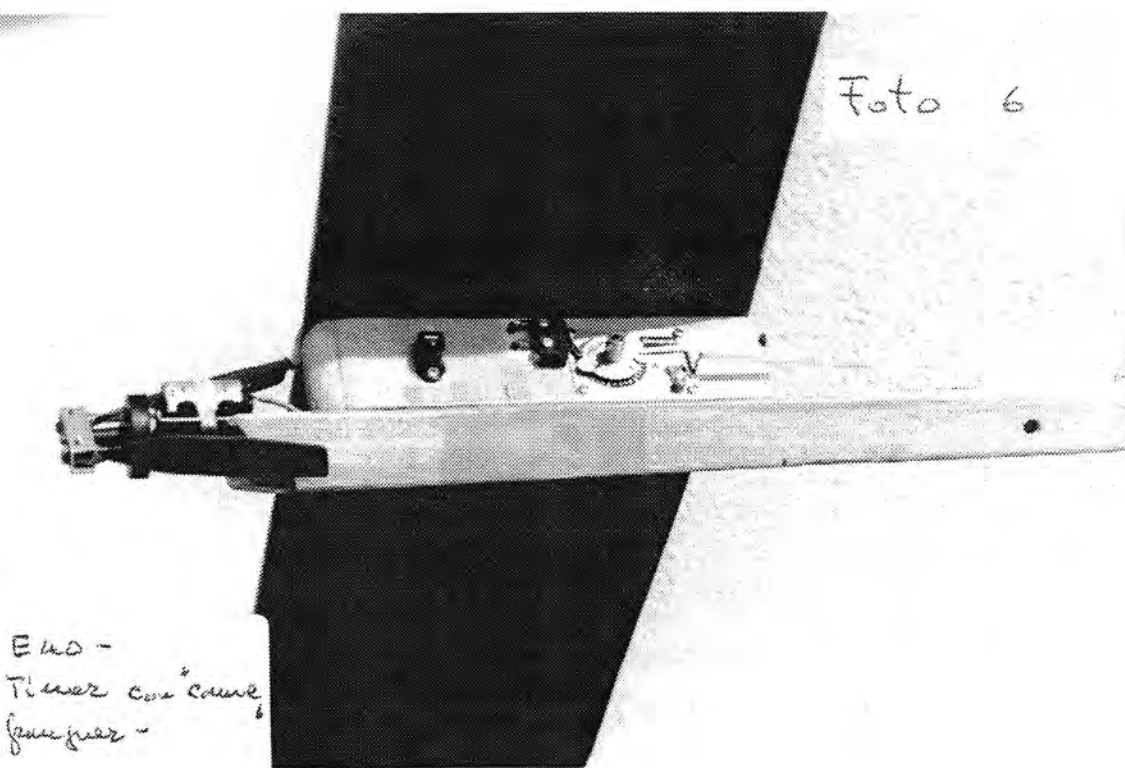


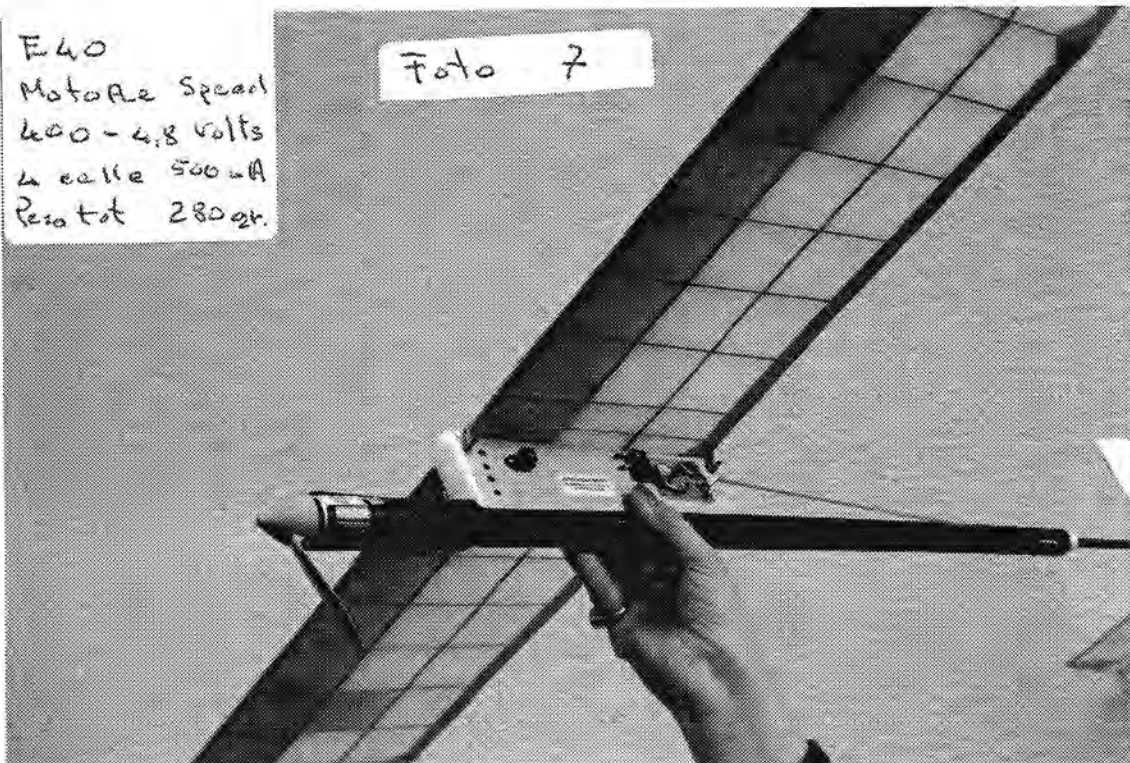
Foto 6

E40 -
Timer con "cane"
fascia 1/2"



E40
Motore Special
400 - 4.8 volts
L. e. 116 500 mA
Peso tot 280 gr.

Foto 7



Questo modello non è stato provato. È molto vicino
a quelli inglesi.