Diary

20-22nd May Genk, Belgium	3rd International Indoor Contest. F1D,EZB,Peanut, Pennyplane. Details from FFn or contact J Melis, Kampstraat 25, 3600 Genk, Belgium.
22nd May Port Meadow Wolvercote Oxford	Oxford FF rally. A1, CdH, HLG, vintage rubber (pre 51, ROG weather permitting). No power models.Start at 10.00, 90 minute rounds except HLG. Contact A Crisp, tel Oxford 53800.
28-30th May Barkston Heath	SMAE National Free Flight Championships. Saturday : CdH, A1, ½A Power, HLG, CO2. Sunday : O/R, O/G, O/P, tailless, Women's Cup, Junior, Vintage. Monday : F1A, F1B, F1C. Entries to SMAE office or contact for details D Hipperson at 35 Anthony Road, Boreham Wood, Herts (tel 01 207 0179). FAI LIKELY START 6am
12th June Area venues	SMAE 4th Area Centralised event. F1C (Astral), Team Glider (Model Engineer), CdH.
18-19th June Beaulieu	South Coast Gala (SMAE Southern area). O/R, O/G, O/P, FAI (7 rounds over 2 days), Mini (5 rounds). Camping, barbeque facilities. Contact & pre-entry Barbara Tyson at 19 Wilverley Ave, Strouden Park, Bournemouth, tel : 0202 303748.
19th June Beaulieu	Croydon Dawn Patrol. Sunrise contest for F1A, F1B, CdH at 06.00 (cocoa promised for 05.45).
18-19th June Orleans, France	Indoor International F1D, F1D beginner.
25-26th June Barkston Heath	RAFMAA/SMAE. F1A, F1B, F1C, also progressive FAI fly-off event on evening of 26th. Camping on the Saturday night. First round on 25th starts at 12.00. No pre-entry. Contact B Baines, tel : (0526) 21458 (weekends) or 033 483471 ext 420 working hours.
26th June Cardington	SMAE Indoor. EZB Novice/expert pairs. Contact L Barr, tel 0628 25595.
26th June Church Fenton	SMAE Northern Area Clubs Team Championships. SMAE members only, restricted parking. Contact J Godden tel 0532 521002.
3rd July Driffield	SMAE Centralised Mini. A1,½A,CdH,HLG,CO2. SMAE members only. Contact D Hipperson,tel 01 207 0179.

APRIL 1983 83/04

FFn

FREE FLIGHT NEWS

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The plan of CMELAK was drawn by Andrew Crisp from the original publication in Modelar; thanks to both.

8 Blenheim Court, Farnborough, Hants, England GU14 7DS

Compiled and published by Ian Kaynes, Paul Masterman, Malcolm Wood.

wings covered in that type of cloth but they had encountered great problems in keeping those wings straight. I was very interested in the story as it all sounded so familiar. The Israelis had then executed some pull tests on the cloth and found that it was not equally strong in each direction. There was a ratio of 7 to 3. Thus what happens is that when the glass cloth is glued to the sheeting with the weave at 45 degrees it cannot evenly counteract forces acting on the wing and warps it. These forces (besides the ones in flight) appear all the time as the wooden structure moves under the influence of temperature or humidity. All this resulted in me using the 25 g/sq m cloth again. The increase in weight is minimal, since the lighter material is more porous an thus absorbs more epoxy - an increase of 5 g/sq m.

The above story applies to glass cloth supplied by Interglass. Perhaps there are other brands of 18 g/sq m cloth on the market without this disadvantage. But be warned and when you find a new cloth ask the supplier for all the technical info you can get before you start using it.

LIST OF ITEMS NEEDED

1 Balsa, 0.8mm thick
2 25 g/sq m glass cloth. This is set with the weave at 45 degrees to the wing chord, so that both threads will be taking equal forces and thus most effective in countering torsional forces.
3 Epoxy plus methanol. Equal parts of methanol and epoxy are used to give a thinned resin. The epoxy I use comes from R Schley in West Germany and is called type 799.
4 Moulds. These are cut from high density foam (35 to 38 kg/cu m) using a hot wire and templates. Two moulds are needed, one for the upper and one for the lower surface. See figures 3 and 4.
5 Soft plastic sheets 0.5mm thick. These are used to work on and they are also needed to counteract any small imperfections of the foam mould.
6 Wax. The plastic sheets are treated with this. I use a Ciba Geigy product QZ-13.
7 A good quality soft brush.
8 Clamping plates. See fig.2.

WORKING ORDER

As mentioned before we are going to work on the plastic sheets. The side we are going to work on should be completely free from dust and then a coat of wax is applied to it. This will make the epoxy spread more evenly when it contacts the sheet, so needing less epoxy and thus saving weight and also giving a better surface finish. After the application of the wax, a piece of glass cloth is laid on the sheet of plastic and then the 50/50 thinned epoxy is brushed on to the cloth. Be careful to do this evenly. Next the wood is laid on top of the cloth and this is in turn covered by a second plastic sheet. This sandwich is then placed between the moulds (fig.4) and tightly pressed using the clamping plates. The epoxy needs at least 10 hours to cure and this at a temperature of at least 21 C. It will be completely cured after 2 weeks but it is not necessary to wait that long. As Holland is not a warm country I build a dryer box for curing the epoxy. This is made out of foam and heated by an old hair dryer. The temperature inside is controlled at around 25 c with a thermostat from a tropical fish aquarium. When the moulds are opened after at least 10 hours the sheets are finished and ready to glue to the core. To check if the job is well done an accurate weight check is required. The glass cloth plus epoxy should not have added more than 40 to 43 g/sq m; if the density for the 0.8mm balsa is 0.1 g/cc then the total weight of the sheeting should be 80 + 40 = 120 g/sq m.

So much for the sheeting, now to the core. This consists of straight ribs plus an upper and lower spar. The ribs are made the traditional way between two templates, which must be accurate and are preferably cut from 2mm dural. The spar notches are included in the templates. A very important factor for the ribs is the wood quality, since the ribs take quite a lot of the torsional forces. The most efficient results so far, in terms of weight-stiffness ratio, were obtained using quarter grain balsa with a density of 0.17 to 0.18 g/cc. The upper and lower spars must be be prepared. The size depends upon the layout of the model; those on AH-25 and 26 were 8x2 tapering to 6x2 for the upper and 8x1.5 to 6x1.5 for the lower. Be careful about these sizes as my models are completely built around their wire struts, this gives a completely different pattern of forces on the wing when compared with a standard model.

When all these parts are finished we can commence the actual building of the wing. This is when the carbon rovings come into use. Carbon fibre is a material that is able to take large forces but only in tension. Carbon fibre is used in almost every glue joint. In 98% of the cases its purpose is to counteract the tension forces developing in the joints, while for the remaining 2% it acts as a filler - but this shouln't be overdone. Let us have a look at what is happening in detail at the glue joints, in figure 5. First the leading edge, where there are quite big tension forces when the wing is bending. To counteract these a strand of carbon fibre is laid between the lower sheeting and the balsa leading edge and another strand between the upper sheeting and the leading edge. There are similar bending forces at the trailing edge. To counteract these and also to prevent deforming of this thin part of structure, a strand of carbon fibre is used in the bevel joint between the upper and lower sheeting. Tension forces are also working on the lower spar and for this reason carbon is

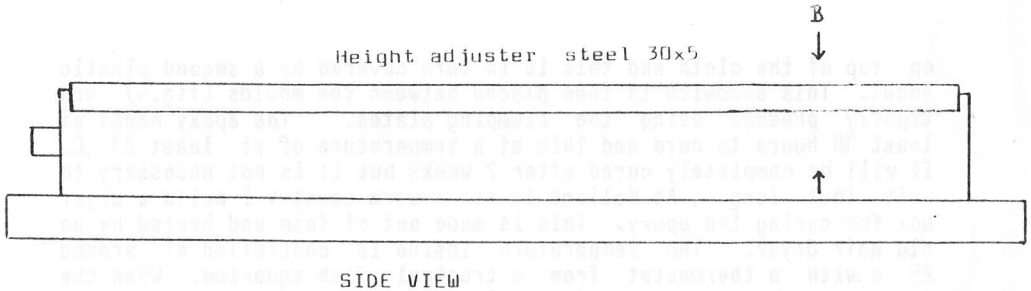
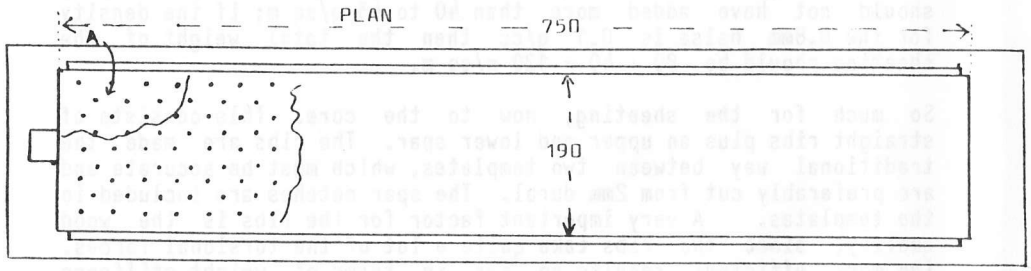
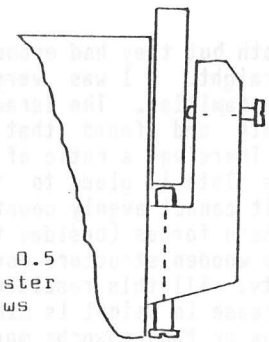
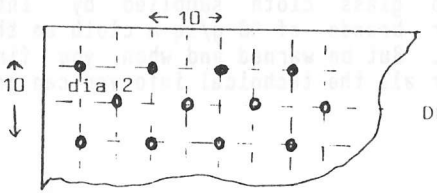


FIGURE 1







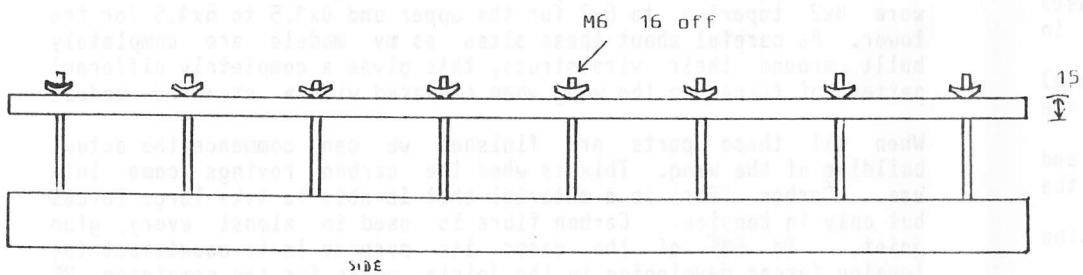
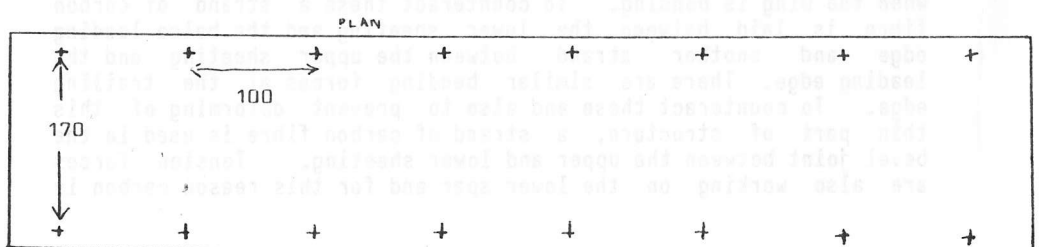


FIGURE 2



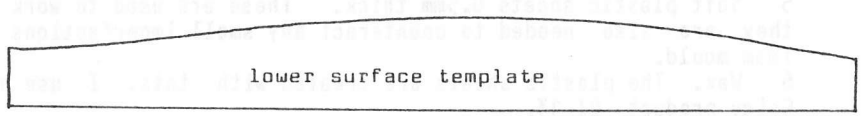
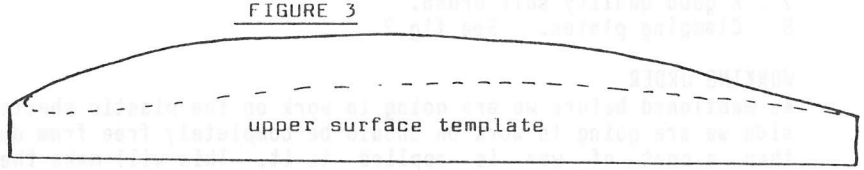


FIGURE 3



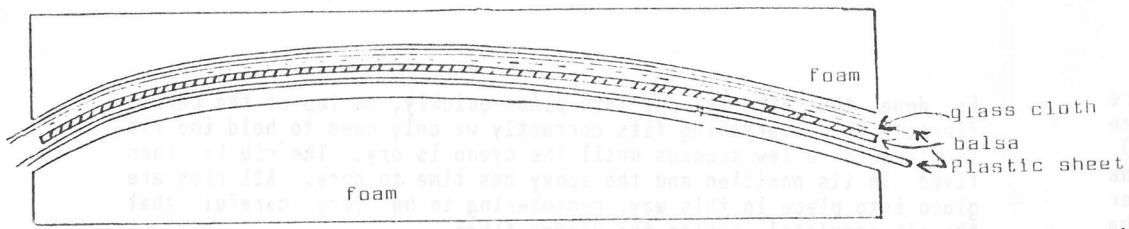
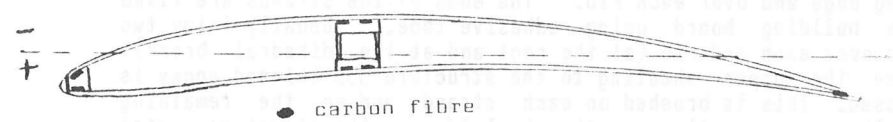


FIGURE 4

FIGURE 5



Note for fig.5 - the carbon fibre is drawn quite thick but when it is compressed by the shheting it is less than 0.2mm thick and so there are no grooves to cut in the wood.

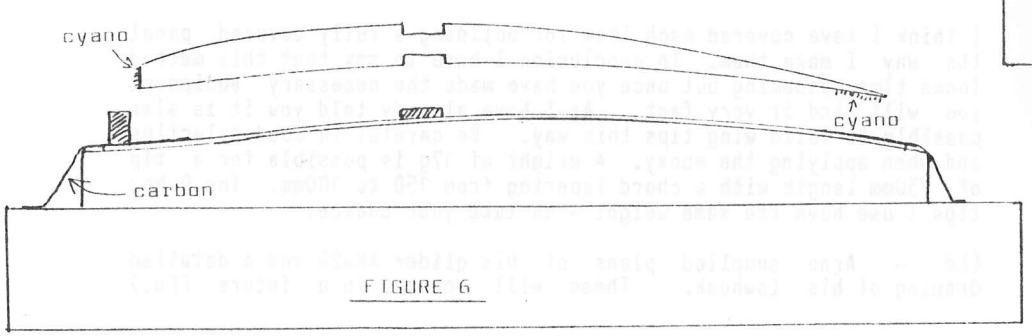


FIGURE 6

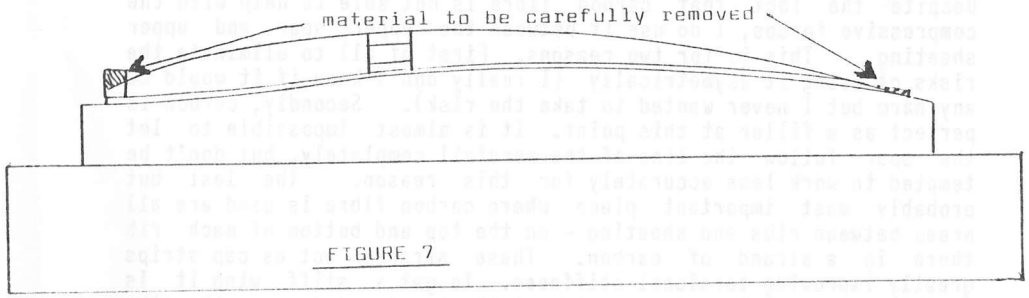


FIGURE 7

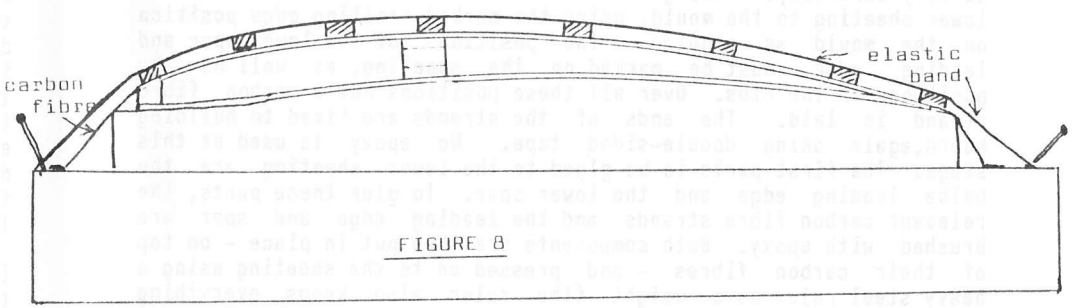


FIGURE 8

included between the lower spar and the lower sheeting. There are only compression forces in the upper part of the aerofoil and these are being taken mainly by the upper spar (90% by my estimate). Despite the fact that carbon fibre is not able to help with the compressive forces, I do use it between the upper spar and upper sheeting. This is for two reasons. First of all to eliminate the risks of using it asymetrically (I really don't know if it would do any harm but I never wanted to take the risk). Secondly, carbon is perfect as a filler at this point. It is almost impossible to let the spar follow the line of the aerofoil completely, but don't be tempted to work less accurately for this reason. The last but probably most important place where carbon fibre is used are all areas between ribs and sheeting - on the top and bottom of each rib there is a strand of carbon. These strands act as cap strips greatly improving torsional stiffness. To get a stiff wing it is absolutely essential to counteract the tension forces on the ribs which result from twisting loads on the wing. This is also the reason why it is very important to use the right wood for the ribs. A last word about the carbon fibre. It is difficult to describe the size of strands used. I get my carbon in the form of a roving and for the strands in the leading edge, spars and trailing edge I use about 1/10 of the roving. The strands on the ribs are about 1/16 of the roving.

Now finally to the building of the wing. We are going to work on the lower mould (fig.6). To keep it perfectly flat, this mould is first glued to the building board, which must itself be flat - check it very carefully. Using double-sided adhesive tape we stick the lower sheeting to the mould, using the marked trailing edge position on the mould as a guide. The positions of the lower spar and leading edge must be marked on the sheeting, as well as the positions of the ribs. Over all these positions now a carbon fibre strand is laid. The ends of the strands are fixed to building board,again using double-sided tape. No epoxy is used at this stage. The first parts to be glued to the lower sheeting are the balsa leading edge and the lower spar. To glue these parts, the relevant carbon fibre strands and the leading edge and spar are brushed with epoxy. Both components are then put in place - on top of their carbon fibres - and pressed on to the sheeting using a heavy steel ruler as a weight (the ruler also keeps everything straight). Be careful that the carbon roving is completely under the spar and the leading edge.

When the epoxy has cured the ribs have to be made to fit. It is of the utmost importance to obtain a good fit between the rib and the spar. The ribs are glued in place using epoxy (35% thinned) and cyano. The bottom of the rib is brushed with epoxy, with the exception of the last 10mm and the front end. On the front end and the last 10mm a low viscosity cyano is used (see fig.6). When this is done the rib is put into place quickly, on top of the carbon fibre. When everything fits correctly we only need to hold the rib in place for a few seconds until the cyano is dry. The rib is then fixed in its position and the epoxy has time to cure. All ribs are glued into place in this way, remembering to be very careful that the rib completely covers the carbon fibre.

The next few steps after the epoxy has cured are quite conventional. First fit in the wing joiner tubes. Then glue in the webs making them slightly oversize. When this is done make the notches in ribs the correct size to take the upper spar. Then make up a long sanding strip (longer than the length of the panel) which shouldn't be any wider than the spar. Use this sanding strip to sand down the webs which were all slightly oversize. With this method it is very easy to obtain a good fit between the spar and the webs. When the top spar fits, it is glued into place with epoxy. Hold it in place by putting the heavy steel ruler on top of it. When this has been done, the leading and trailing edges have to be sanded into shape (fig.7). Again, a warning to be very accurate since this is the last chance for sanding the edges. When shaped, carbon fibre is laid over each glue area - the leading edge, the spar, the trailing edge and over each rib. The ends of the strands are fixed to the building board using adhesive tape. Usually I lay two strands over each end rib (at the root and at the dihedral break). To glue the upper sheeting to the structure 35% thinned epoxy is again used. This is brushed on each strand and on the remaining area. The upper sheeting can then be laid over the structure, using the trailing edge as a guide line. The sheeting is gently pressed down using balsa strips and elastic bands (fig.8). After the epoxy is cured two things are left to finish the centre panel. These are to add a hardwood leading edge and to make up a root rib. Because the root rib has to take quite some forces I make this item from epoxy plate (as normally used for making printed circuits). It is not necessary to apply any more finish, but it is not bad to spray the wing lightly with a polyurethane lacquer since the glass cloth takes up dust quite easily.

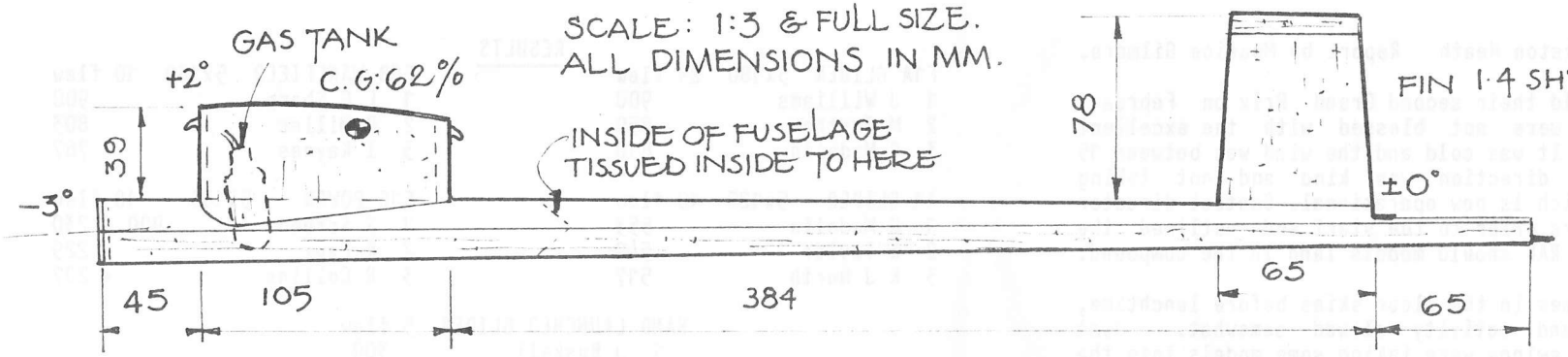
I think I have covered each item for building a fully covered panel the way I make them. In conclusion I have to say that this method looks time consuming but once you have made the necessary equipment you will find it very fast. As I have already told you it is also possible to build wing tips this way. Be careful in wood selection and when applying the epoxy. A weight of 17g is possible for a tip of 430mm length with a chord tapering from 150 to 100mm. The D-box tips I use have the same weight - so take your choice.

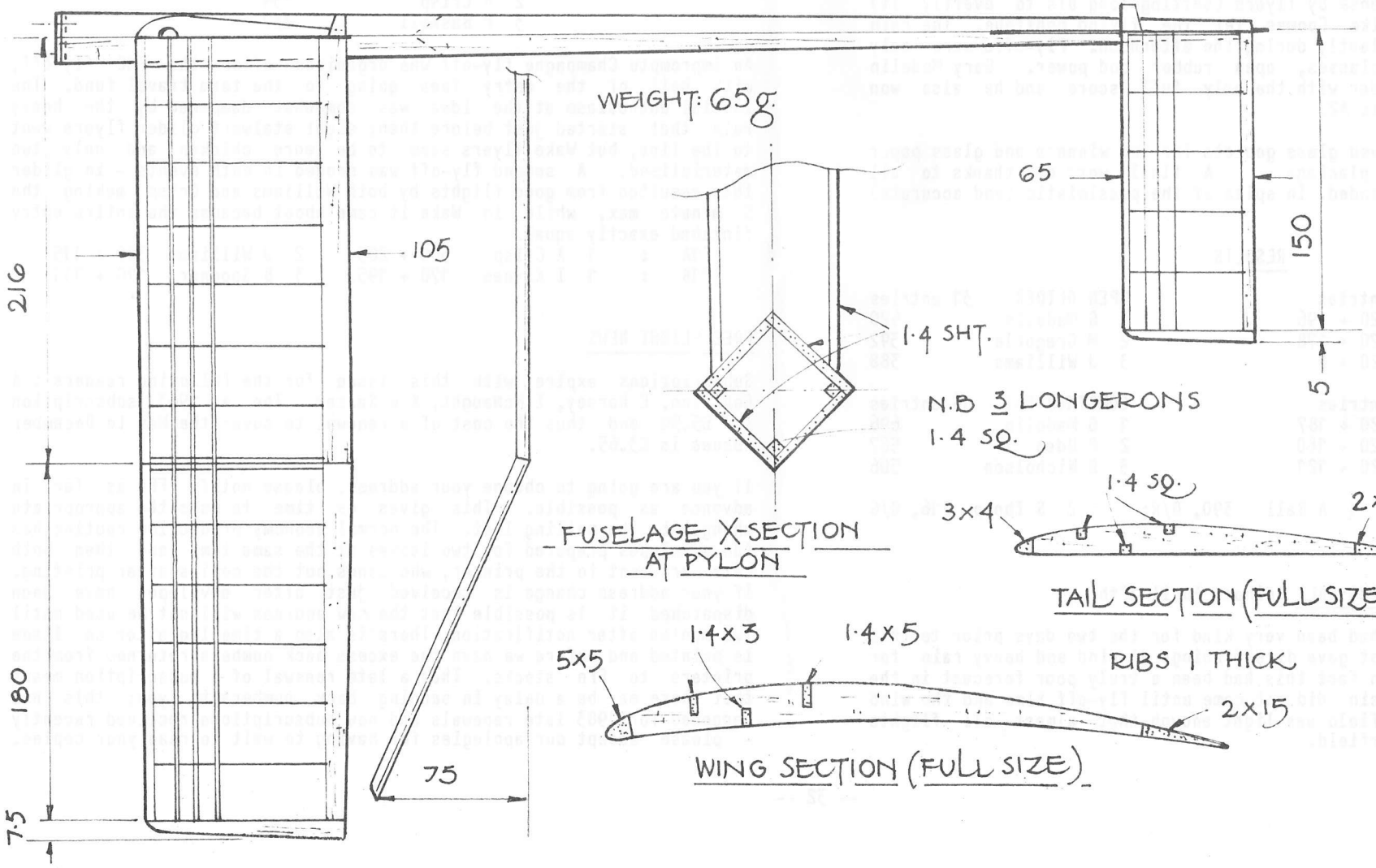
(Ed - Arno supplied plans of his glider AH-26 and a detailed drawing of his towhook. These will appear in a future FFn.)

ČMELÁK C02

by EDVARD SKŘEPA

SCALE: 1:3 & FULL SIZE.
ALL DIMENSIONS IN MM.





FUSELAGE X-SECTION AT PYLON

TAIL SECTION (FULL SIZE)

RIBS 1 THICK

WING SECTION (FULL SIZE)

GRANTHAM GRAND PRIX Barkston Heath Report by Maurice Gilmore.

Grantham and District MAS held their second Grand Prix on February 27th. Unfortunately they were not blessed with the excellent weather enjoyed last year. It was cold and the wind was between 15 and 20 mph. Fortunately the direction was kind and not taking models to the compound, which is now operational. Contest director Phil Ball assembled the flyers prior to the start and outlined the instructions given by the RAF should models land in the compound.

Flying was brisk in all classes in the clear skies before lunchtime, but then the rain started and activity slowed somewhat. Just before the rain, odd wind swings were taking some models into the compound. Common sense by flyers (setting long DTs to overfly it) and liaison by Mike Coomes let the flying continue. The rain carried on intermittently during the afternoon. Fly-offs were only required in two classes, open rubber and power. Gary Madelin cleaned up open glider with the only full score and he also won combined FAI with his A2.

Prizes were engraved glass goblets for the winners and glass paper weights for other placings. A final word of thanks to all competitors who attended, in spite of the pessimistic (and accurate) weather forecast.

RESULTS

OPEN RUBBER	10 entries	OPEN GLIDER	31 entries
1 J Carter	420 + 196	1 G Madelin	420
2 T Dilks	420 + 178	2 M Gregorie	392
3 M Croome	420 + 0	3 J Williams	388
OPEN POWER	9 entries	COMBINED FAI	16 entries
1 P Harris	420 + 187	1 G Madelin	696
2 S Screen	420 + 160	2 P Uden	567
3 R Peers	420 + 121	3 B Nicholson	506

TOP JUNIORS : 1 A Ball 390, O/R; 2 S Thorp 216, O/G

SOUTH EAST AREA SPRING GALA Odiham, April 17th

While the weather had been very kind for the two days prior to this contest, the forecast gave dire warnings of wind and heavy rain for the actual day. In fact this had been a truly poor forecast in the sense that the rain did not come until fly-off time and the wind blowing across the field was light enough that almost all flights ended within the airfield.

RESULTS

F1A GLIDER 5x180	24 flew	F1B WAKEFIELD 5x180	10 flew
1 J Williams	900	1 F G Sharp	900
2 M Fantham	850	2 R Miller	803
3 G Madelin	810	3 I Kaynes	787
A1 GLIDER 5x120	10 flew	F1C POWER 5x180	10 flew
1 G Madelin	553	1 S Screen	900 + 230
2 K Taylor	549	2 K Faux	+ 229
3 R J North	517	3 R Collins	+ 207

HAND LAUNCHED GLIDER 5 flew

1 J Buskell 300
2 A Crisp 234
3 P Buskell 232

An impromptu Champagne fly-off was organised after the F1C fly-off, with half of the entry fees going to the team travel fund. The initial enthusiasm at the idea was somewhat dampened by the heavy rain that started just before then; eight stalwart glider flyers went to the line, but Wake flyers seem to be more chicken and only two materialised. A second fly-off was needed in both events - in glider this resulted from good flights by both Williams and Crisp making the 5 minute max, while in Wake it came about because the entire entry finished exactly equal.

F1A : 1 A Crisp 300 + 203, 2 J Williams 300 + 115
F1B : 1 I Kaynes 170 + 195, 3 B Spooner 170 + 111

FREE FLIGHT NEWS

Subscriptions expire with this issue for the following readers : A Gouillon, E Horsey, I McNaught, K W Salzer. The a 1983 subscription is £5.50 and thus the cost of a renewal to cover the May to December issues is £3.65.

If you are going to change your address, please notify FFn as far in advance as possible. This gives us time to make the appropriate changes to the mailing list. The normal economy production routine has the envelopes prepared for two issues at the same time and then both sets are sent to the printer, who sends out the copies after printing. If your address change is received just after envelopes have been dispatched it is possible that the new address will not be used until two months after notification. There is also a time lag after an issue is printed and before we have the excess back numbers returned from the printers to FFn stocks. Thus a late renewal of a subscription means that there may be a delay in sending back numbers to you; this has happened for 1983 late renewals and new subscriptions received recently - please accept our apologies for having to wait to read your copies.