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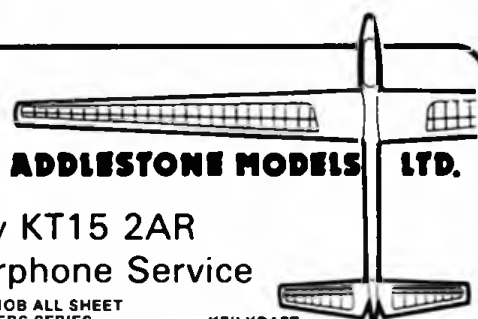


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AERO MODELLER

February 1985

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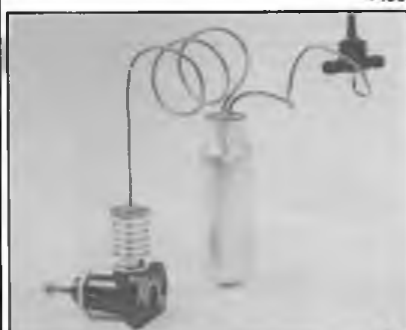
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Cover:
George Mathieson's super CO₂ powered free flight "ELF" (full size plans in this issue) has already caused a great deal of interest in M.A.P.'s offices with colleagues wanting early copies of the plan! The version shown here is a MK II with some slight alterations to incorporate the 'Turbotank' version of the Telco CO₂ - perhaps George will tell us how this performs in due course...

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February 1985

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HANGAR DOORS

S.M.A.E. 1985

The Annual General Meeting of the SMAE at Leicester was well-attended, with delegates from 81 clubs from all over Britain. After a wide discussion of possible financial courses, it was decided that the 1985 membership fee for Seniors should remain the same for a second year, in spite of inflation.

Competition licences will also be held at the same cost, except for Junior members they will cost £2, the Junior membership fee being cut to £3 to compensate. Thus for the next 12 months your SMAE membership will cost you just £5, with competition licences available for another £10.

It is worth recalling that two years ago an SMAE Full Member, the only category able to enter

the present SMAE executive Council, the general wish of delegates speaking at the AGM was to reduce the divisions within model flying — the 'us and them' attitudes, contest and non-contest flyers, and the feeling that one 'side' benefits at the expense of another one.

It seems that after a year when people have been joining the SMAE at a rate of over 1000 per month, many more now realise how the Society's work benefits all the country's model fliers.

Dambusters strike again...

Royal Air Force 'Tornados', taking part for the first time in the United States Air Force bombing competition 'Giant Voice', achieved spectacular success when they beat the best from



contests at the normal rate, paid £12.50; today's total of £15, giving the same privileges, seems pretty reasonable to most members, however many events they take part in.

The events the Society runs do cost money to organise, and of course each has an individual entry fee; the economic realities today are no different from those in 1983 when it comes to model flying...more's the pity!

Of course, everyone would like a low membership fee, just as they'd like petrol to be 40p a gallon, but there does seem to be more of an air of realism now about the true costs of looking after model flyers' interests.

Last year there were some people at the AGM speaking passionately in favour of cutting a proposed £6 fee to £5, — barely enough to run the SMAE, while at the same time having a beer and a couple of cigarettes that cost more than the sum they would save!

This time, with the exception of a couple of people not serving on

both the USAF and the Australian Air Force.

'Tornados' of 617 (Dambuster) Squadron won five 1st, 2nd or 3rd places in competitions for three prestigious trophies awarded for bombing accuracy, held in South Dakota, USA. It is only the second time any of these trophies has been won by teams from outside the United States. R.A.F. 'Vulcans' won the team event in 1974. This time the R.A.F. came back with two trophies.

The success of 617 Squadron in these strategic and tactical bombing contests, which involved both high and low-level sorties involved flights of several hours over 1500-2000 miles. Well done the Royal Air Force — let's make it all three trophies next year...

Well done fella...

For many years Bob Horwood has worked on the SMAE Council, as technical secretary, competition secretary, C/L technical committee chairman



Presentations at the SMAE's Annual Prizegiving on 24th November were made for the Society's major competitions and awards. Above, David and Janine Rawlins receive the Arthur Mullet Trophy from SMAE Chairman Dave Goodwin. This was awarded for their unstinted efforts in promoting aeromodelling amongst youngsters all over the Country. The competition awards were presented by Mrs Pauline Snook, wife of the Chairman Dave Goodwin. Awarded for promoting aeromodelling amongst youngsters all over the Country. Competition awards were presented by Pauline Snook, wife of the Chairman of the Royal Aero Club. A few of the winners are shown here. Left, Dave Hipperson, 3 trophies for Above far right, Julian Hopper, 2 Goodyear. Right, Jessica Nash for Ladies combined R/G/P. Below, the collection of the year went to Stafford Screen, 4 trophies for FAI Power and 1/2 A Power plus — surprise, surprise the Senior Championship Cup.



and, most recently, as the installer and de-bugging specialist of the Society's computer membership system.

He has even found time to compete in control-line racing events to good effect and has managed the British team at several World Championships. At the recent AGM he was unanimously accepted for the SMAE's highest honour, a Fellowship of the Society. Congratulations, Bob.



Nats '85

The date for the 1985 National Control-Line and Radio-Control Model Flying Championships is August 24-26th with Barkston Heath and Cranwell again the venues, by courtesy of the Royal Air Force. Full details will of course appear later, but will go direct to all SMAE competition licence holders. Details of the National Free-Flight Championships have not yet been decided.

Indoor Bonanza

The popularity of indoor models seems to grow and grow. Always a branch of aeromodelling favoured in the winter months — for obvious reasons — this season something like ten comps will have been on our calendars. The Northern low-ceiling events are now becoming part of the regular scene and have been joined by the Southern Area's trips to H.M.S. Daedalus.

SAMS event at the Watford Leisure Centre a couple of months back, looks like becoming another focal point for indoor, as



March 3rd sees a repeat performance. The Indoor Scale Nationals for 1985 will again be held at the Alumwell Centre, Walsall. Anyone intending to go should let Doug Sheppard know

as early as possible to help the organisers to plan ahead...see What's On.

Support Your Teams

In 1984 we were represented at World and European Championships for R/C and C/L Scale, Control-Line, Indoor, Free-Flight, R/C Aerobatics, R/C

Soaring and Helicopter. A very large part of the actual costs of these were borne by the competitors flying for Britain; we are talking about some 38 people, who have worked very hard for their teams and obtained some pretty good results for this country too.

Gold and silver medals in soaring, team-racing, free-flight power and glider are good for the prestige of our sport, but on average our flyers have paid

"Tornados" of 617 (Dambuster) squadron scored a resounding hit in a recent bombing competition in the U.S.A. Tornado Prototype PO3 seen here in typical low level attack configuration, carrying 8 1000lb bombs, long range tanks and E.C.M. pods.



What's On. . .

Feb 10	WIGAN LOW CEILING INDOOR MEETING EZB, HLG, PND, SCALE Venue Wigan, Contact Dave Yates Tel Wigan 214725 Rules from J. O'Donnell 061-427 3711	April 28	SMAE, INDOOR SCALE NATIONALS PEANUT, OPEN RUBBER, CO. Venue Alumwell Centre, Walsall Contact Doug Sheppard 13 Luckington Road, Monks Park, Bristol BS7 0VT Pre-entry only registration 50p, each event £2.00, non competitors £1.00 Send SAE for entry forms
Mar 3	SLAITHWAITE LOW CEILING INDOOR MEETING EZB, HLG, PND, SCALE Venue Slathwaite Contact Bernard Hunt Tel 0484 862353 Rules from J. O'Donnell 061-427 3711	May 19	GOLDEN ERA MODEL FESTIVAL Venue Old Warden Biggleswade Contact Radio Modeller Tel 0442 41221 For model designs of the 1920's 30s Period costume is encouraged!
Mar 3	SAMS INDOOR EVENT Peanut, EZB, HLG, CO; OPEN - FLY FOR FUN. Venue Watford Leisure Centre Contact SAMS Tel 0438 832011	June 15/16	AEROMODELLER SCALE WEEKEND Venue Old Warden, Biggleswade Contact Aeromodeller Tel 0442 41221
Mar 24	SOUTHERN AREA - INDOOR ALL SCALE DAY PEANUT, OPEN SCALE - FLY FOR FUN Venue H.M.S. Daedalus, Contact M. Leach Tel Emsworth (Hants) 5364 Flying times 1300-1800 hrs. Must register at least one week before event.	July 7	RADIO MODELLER FUN FLY-IN Venue Old Warden, Biggleswade Contact Radio Modeller Tel 0442 41221
April 3	THE GRANTHAM GRAND PRIX - OR, OP, OG, HLG COMBINED FAI Venue RAF Barkston Heath Contact Phil Ball Tel 0332 665361	August 17/18	AEROMODELLER VINTAGE WEEKEND Venue Old Warden, Biggleswade Contact Aeromodeller Tel 0442 41221
April 21	LARGE MODEL SPECTACULAR Venue Old Warden, Biggleswade Contact Radio Modeller Tel 0442 41221 Watch large models in spectacular flight come and fly yours	August 24/26	CONTROL LINE AND RADIO CONTROL NATIONALS Venue RAF Barkston Heath and RAF Cranwell Contact SMAE Tel 0533 58500 Full details will appear later
		Sep 15	DISPLAY TEAM CONTEST Venue Old Warden, Biggleswade Contact Radio Modeller Tel 0442 41221 For teams of three or more models - flying a 20 minute display

around £500 each to represent their country, in travel and entry costs!

It is tragic to think that a world-class competitor picked for a team might have to decline his place because he could not afford to go. This has happened several times in 1984. Of course the contest scene must aim to be self-supporting, but if this is extended to World and European Championship entry fees the domestic fees will have to rise to a level that would discourage all but the die-hards.

If the money is raised from a larger group the amount each contributes will be much less. For every SMAE member who flies in contests there are eleven who do not, but this does not mean that they are not interested in contests. After all, how many football supporters actually play?

Now you will be able to support national teams in a way that the current ultra-low SMAE subscription does not allow. For less than the price of a packet of cigarettes or hardly more than the cost of a pint of beer you can help to fund the British teams.

In return for £1 you will receive an exclusive team supporter's sticker and know that you are helping to keep our best flyers on the teams not just the rich ones.

Please send your cheques to: Team Support, SMAE, Kimberley House, Vaughan Way, Leicester, LE1 4SE, and don't forget the SAE for your sticker.



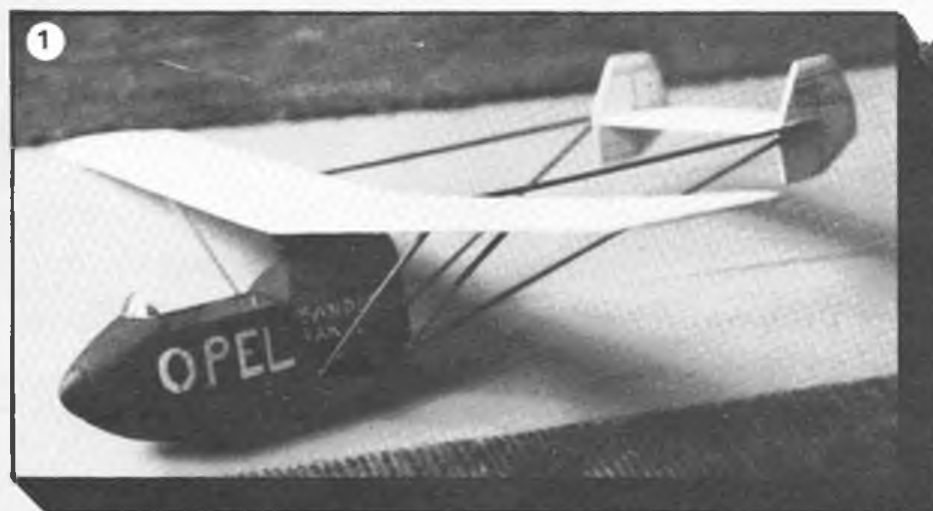
PHOTO PRIZE

Model News With Fliar Phil

Now Wood for Winners

100 Sheets of balsa, nearly 200 lengths of strip wood — some prize!

All you have to do is send Fliar Phil your photograph — good quality black and white or colour prints will do, with your name and address plus details of the model, its construction etc on the back. Post your entries to Aeromodeller Photo-Prize Feature, P.O. Box 35, Wolsey House, Wolsey Road, Hemel Hempstead Herts HP2 4SS. Photos will be returned after publication.



WINTER WINDS blow, and rain pours down! But in the workshop, balsa wood is being 'butchered', cement tubes squeezed, dope spilt — and rather rude words uttered, as that intricate former splits in two! Yes indeed, the coming season's models are being born. However, lay aside that lethal-looking knife and enjoy this month's gems from the world of model aviation.

Photo 1

Flair Phil is indebted to Joe Briffa of London, for responding to his plea in the October issue of *Aeromodeller* for 'out-of-the-rut' models. Here is Joe's scale model 'Opel Sander Rak I'. (Germany experimented with the real thing, using rocket power). Joe informs F.P. his model spans 12 1/2 ins, and is powered by a *Jetex 50*. It flies well with fairly steep-glide. Indeed an unusual model. F.P. likes it Joe!

Photo 2

Well known in its crop-spraying role, the *Piper 'Pawnee'* is a rugged, functional aeroplane. These qualities are well displayed in this excellent 24 in span model. 'Pawnee', sent to F.P. by Chris Hinson, of Cambridge. Built from an *M.A.P.* plan, it was originally rubber powered, but it has now been converted to CO₂. When launching your 'Pawnee' Chris, dare Fliar Phil comments: "Let us s-pray!!"



Photo 3

Photos are always welcome from "down-under". Perhaps F.P. should publish pics from Australia in the 'inverted position'! This, impressive model is a *Smith 'Miniplane'* (A *Sig Kit*), in the finish of the example in San Diego Aerospace Museum. It comes from Mr. K. Minty of New South Wales, Australia. Engine: *OS 45 SR* with special muffler. *Futaba R.C.* Mr. Minty says, "it flies lovely". Won first prize at Warrington R/C Society Scale Day. Certainly looks every inch a winner!



Photo 4

This finely detailed model of an *Armstrong Whitworth 'Siskin'* is the work of Geoff Spencer of Tipton, West Midlands. Built up construction, airbrush finished, with F.P. adds, a lot of fine work on that engine! Span 18 in. *Telco CO2* powered Geoff writes: "it appears he should have been cutting the grass, rather than building models". Take heart Geoff — Fliar Phil has been in the same situation — often!



Photo 5

Achtung-Spitfire! This fine model of the much-loved "Spit" comes from John Green of Kirkby-in-Ashfield, Notts. Faultlessly finished, the decor is unusual — but attractive. From A.P.S. plan 776 (Pentland C/L Spitfire), power is a *Fox 36X B.B.* 'Combat Special', fitted with prop-shaft extension, and suction venturi. 10in. x 6in. three blade *Tornado* prop. John says, "It flies like a rocket on 70ft lines".

Photo 6

Always an attractive subject for a scale model, this *Miles 'Magister'* in R.A.F. trainer yellow, comes from Peter Bull, of Kilkenny, Eire. From a *Bowman* kit, it spans 85 ins. Engine: *Condor 91* four stroke, *Skyleader 35 FM* five channel R/C. Peter informs Flair Phil it is under-powered. Performance is much better with a *Super Tiger 75* two-stroke. 90 degrees of flap needed to control 'float' on landing.



Photo 7 Winner

When you see a superb model, such as this P51 'Mustang', from Dipl. Ing. Ivo Ceresnak of Brno-Lesna, Czechoslovakia, who can say that rubber powered scale models cannot hold their own with any other type of scale job? Displayed by Dipl. Ing. Heini, Flair Phil suspects it is a design from "the stable" of Dipl. Ing. Koutny. Ivo says it weighs 55 grams. Flight performance: 50 seconds. Ivo, is deservedly, this month's winner.

Flair Phil guesses you are pleased with that new model! Send him a photo and let him feel pleased too!



Remember folks, this is YOUR feature and Flair Phil needs YOUR photos to keep it going!

VINTAGE CORNER

WITH ALEX IMRIE

Vintage Abroad

During the last few years the efforts of the American SAM organisation (*Society of Antique Modellers*) in reviving interest in old time models have not gone un-noticed in other countries, and the British Chapter (SAM35) being geographically closest to the Continent of Europe, has had French, German, Swiss, and Italian members for some time.

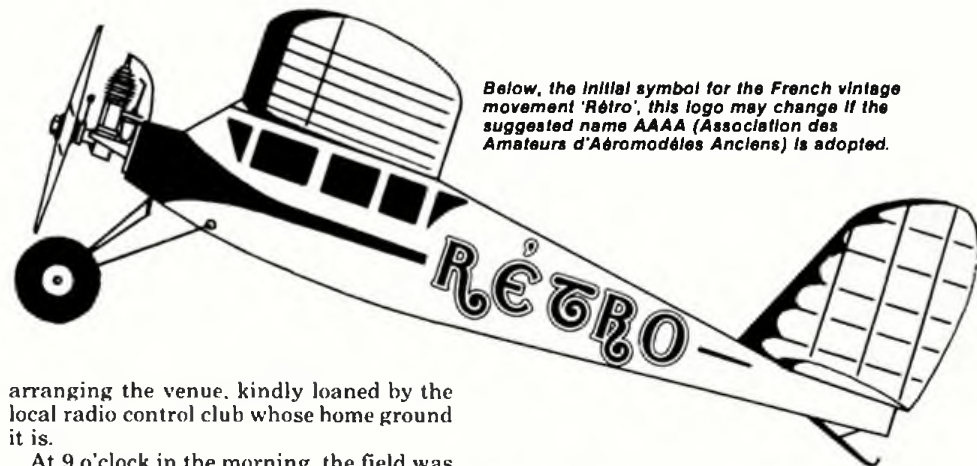
It is natural that these enthusiasts should have "looked around" in their own countries and begun to research their own Nations' models, instead of merely building American or British designs. This sort of activity leads to contact with other modellers of like mind, and eventually tracks down contemporary modellers from the vintage era who may have been dormant for some time. Although simple in concept, the actual bringing together of a country's vintage enthusiasts requires a great deal of effort. As a direct result of the industry of a few French and German enthusiasts, initial vintage meetings in their respective countries were held last year.

France

The first French vintage meeting was held at Coulommiers on 9th September, and one of its organisers, Jean Marie Piednoir has kindly sent us this report.

"The old timers were there, some newer modellers came and even two British SAM 35 members showed up! In due reverence to the presence of these last two (Geoff Clarke and Ben Buckle), the weather obliged by being typically British with the proper amount of rain and wind!

The model flying site, on Coulommiers airfield, is named after Edmond Swahlen. Serge Swahlen who is associated with the airfield, had been responsible for



Below, the initial symbol for the French vintage movement 'Rétro', this logo may change if the suggested name AAAA (Association des Amateurs d'Aéromodèles Anciens) is adopted.

arranging the venue, kindly loaned by the local radio control club whose home ground it is.

At 9 o'clock in the morning, the field was empty except for two radio control fliers who retired after a few flights, presumably to the local café! As one of the organisers I began to feel very lonely, wondering whether it was the right place, on the right day and even beginning to doubt whether I was there at all! Geoff Clarke did his best to cheer us up, then the old timers began to arrive. First was Cheurlot with his caravan (he had been around since the previous day!) then more and more of them, by 11 o'clock some thirty modellers were on the field.

The better known ones were: Beissac (the man who brought three models to the 1958 Coupe d'Hiver and placed 1st, 2nd and 3rd in appalling weather - it had never been done before or after), Cheurlot (the designer of such interesting models as 'Austria', 'Oizoraz' and organiser of the Wakefield Cup Competition in Brienne-le-Chateau), Doré (for the period US correspondent of MRA), Dupin (French power champion of the early 1950's and also a Coupe d'Hiver winner, a very meticulous builder), Fillon (now, everyone must know about Emmanuel Fillon!), Goetz (a very good A2 specialist, many years ahead of his time with high aspect ratio planked wings on his gliders in the early 1950's), Guillemard (who was part of the re-birth of modelling in France in 1932-34, created *Modèle Magazine* in 1948 and published the plans of many of his classic designs such as 'Dad' and 'Nyou'), Guyot (also a power specialist and great friend of René "The King" Jossien), Jossien

Below, the stamp of the 1st Horst Winkler Commemorative Meeting 1984 held at Winterberg West Germany 3rd-5th August 1984.



Below, Emmanuel Fillon with his original 'Champion' glider from 1946. Plans for this fine model are still available from MAP as G/260 price £7.20 plus 60p postage.



(who took over *Modèle Magazine* from Jean Guillemard and created such beauties as the 'Ailbass' Coupe d'Hiver model and 'Surpriz' Wakefield), Martin, (designer of 'Pinocchio') Morisset (designer of 'Jump' and 'Newlook'), Pierrard, Rennesson, Templier, Vaysse, Werler and Weber.

As can be well imagined when this lot got together there was some chin-wagging! The weather was soon forgotten and models sheltering in the lee of the cars were the subject of much attention. Sporadically the song of two diesel engines could be heard. The 'Dart' in my 'Ebenezer' pulling it up in more or less controlled gyrations rapidly terminated when the wind took over ... but was flying again soon afterwards. The



Above, cover of the 3rd SAM 35 Yearbook, the contents of which indicate that this is the best one yet!



faithful *Amco* .87 in Geoff Clarke's 'Pinocchio' tried its best to keep the model aloft until a wing failed. To the amazement of many people, 'Pinocchio' was put together again before lunch.

The other models were too large for any flight to be reasonably attempted, so we had to keep our frustrations to ourselves when we could not witness a launch of "Manu" Fillon's great glider 'Champion', now fitted with a 2-channel R/C. When time came for "dejeuner de midi" a caravan of many cars

cameras clicked! Gabriel was enjoying himself immensely.

In another corner, Emmanuel Fillon had opened a wonder box full of his magic Peanut Scale models, threatening to fly a couple of helicopters! The ceiling of the room was too low to try them out and "Manu" was busy apologizing and explaining that they could only fly for fifteen seconds anyway!!

A return to the field was made at 3 o'clock to greet those that might have come for the afternoon only. There is was decided to return to a room that the airfield authorities had made available. Now the models came out from car-boots and various boxes. Undisputed stars were the 'Champion' glider of E. Fillon and Pierre Vaysse's 'Bossu', the actual model that he had used in the summer of 1945 to break the International altitude record with a height of 1810 metres (6000 feet). The model still displayed the hole in its right wing, made by



Left, nose detail of the 'Champion' (note abbreviated name 'Champ'. Ahead of windscreens). Model is inscribed with its competition successes at Eaton Bray International Weeks in 1946 and 1947.

Historic French designs at Coulommiers. At left Chabot 'Corsaire' from 1945 (Micron 2.8) by Jean Marie Plednoir, Chabot 'Demon' pylon model from 1944 on the right (Micron 5cc) by Pierre Dupin, and in the foreground Jossien's 1953 Coupe d'Hiver design 'Ailbass' built by Jean Marie Plednoir.

the flying cork when the champagne was opened in celebration! Besides these historic models (E. Fillon is saving his 1937 Wakefield for an occasion to be celebrated in 1987, the 50th anniversary of his victory) one could see recently built vintage models like Ducrot's 'Papillon' fitted with a brand new 1.25cc *Allouchery* built by Monsieur Chaille, a Chabot 'Corsaire' powered by a 2.8cc *Micron* built by myself, a beautiful Chabot 'Demon' made by Pierre Dupin fitted with a 5cc *Micron*, a partly-built 'Civvy Boy' by Michel Pierrard, a 'Rudderbug' by newcomer to modelling, Monsieur Wechsler, René Jossien showed his 'Surpriz' and finally there was a 'Buzzard Bombshell' by an unnamed enthusiast.

It was a revelation to see with what awe newcomers gazed on all the display models. One of them was heard to remark that it was a shame that today's French modelling press seems to write only about radio control models and equipment (a notable exception being the historic flashback by Jean Guillemard in *Modele Magazine* in the April 1983 issue). We were pleased to have Denis Dupuy with us, present owner of the *Micron* marque, with samples of his products, including a prototype reproduction 5cc *Micron*. Ben Buckle with his plans, catalogues and kits made us especially happy, he had driven that morning from his holiday resort in Brittany and we hope that he had as enjoyable a day as we had. Around 6.30 pm it was time to depart, we all drove home with our heads full of ideas for the future.

This had truly been a good day and we could not have had a better start. We have to thank the local radio club members who stayed out in the weather over lunch to direct any late comers, the airfield officials for the room in the afternoon, Serge Swahlen for making it all possible, and last but not least, the two SAM 35 members for their effective support."

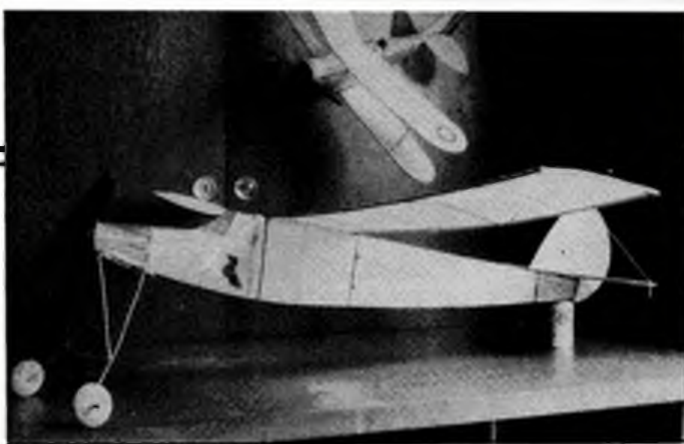
As a postscript to this French report, Jean

followed to the restaurant in Coulommiers. Imagine my thoughts, as a more or less anonymous modeller, to be leading the way for all these great people, some of them heroes of my youth!

A separate room had been booked in the "Restaurant de la Banque de France" for twenty people, but when we counted ourselves, we numbered forty-two! At the end of the reasonably priced happy meal, Michael Pierrard and I lectured the assembly on the subject of creating a Vintage Modellers' Association, which was quickly and enthusiastically endorsed by all present. Official business over, Geoff Clarke, with his SAM35 expertise, produced his 'Pinocchio', an 'Oomph' and a partly-built 'Jararaca' control-liner and suggested that we follow his example. He nearly passed out when Gabriel Martin brought out his prototype 'Pinocchio', boldly placed it alongside Geoff's model and obviously the

Below, hangar scene at Coulommiers on 9th September 1984. Ducrot 'Papillon' at rear, Pierre Vaysse's 'Bossu' in centre with punctured right wing panel caused by the champagne cork during the celebrations after the model had broken the international altitude record (see text). Historic Chabonat 'Yauville' glider from 1932 at lower right.





Above, Robert Guillemard's 1934 Wakefield model which made a flight of 17 minutes OOS from Issy Moulineaux to the Eiffel Tower that resulted in his selection to fly in the first French team entered for the Wakefield Cup Competition (see text).

Guillemard has written with some information on his brother Robert, who was killed on 25 August, 1944 while serving as a P-47 'Thunderbolt' pilot in the famous *Lafayette Escadrille*. Robert was an excellent modeller who had experienced some success in the early 1930's before he was selected to represent France in the 1934 Wakefield at Warwick. In the event he could not personally attend and his model was flown by J. T. Howdale, who was the French 'Warneford' representative, but the entry was scratched. Other French entrants were Mons Desnoes and Genay and although Genay did manage a flight of 50 seconds, the French machines were not commented upon very favourably. It was said that they had difficulty taking-off and their single-surfaced wings were deemed to be old fashioned. France was to make amends by winning the Wakefield three years later.

Germany

The first German vintage meeting took place at Winterberg/Hochsauerland in Western Germany during the "Ikarustages" model meeting from 3rd to 5th August. Known as the 1st Horst Winkler Commemorative Meeting 1984 in recognition of this pioneer of German model aviation, who gave us amongst other things the catapult and towline method of glider launching, the meeting attracted model builders from all over Germany, and followers of every branch of the hobby.

As a result the emphasis was on radio controlled large models with special functions, large sailplanes and power models of every description, even thundering jet propelled models. From the information to hand supplied by Herr Freidhelm Mink, one of the organisers, it is not possible to tell what amount of vintage activity actually took place. Herr Mink does state that the vintage models were really in

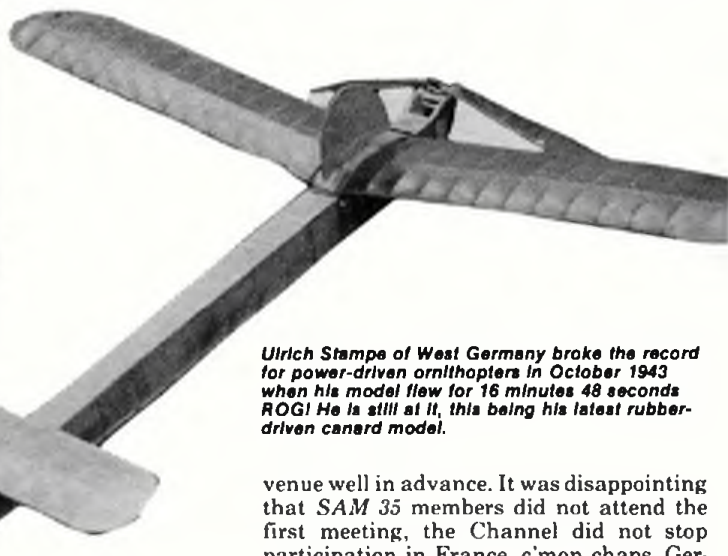
the background but replicas of such famous machines as 'Strolch', 'Grosser Winkler', 'Winkler Junior', 'Hummel', 'Goldhahn' and 'Junkvolk' were in evidence, and some 15 devoted vintage modellers attended, including Herr Juergen Ide who recently described his reproduction 1941 *Felgiebel* FG2 14.3cc ignition engine in *Flug und Modell-technik*.

If the meeting did little else, at least it allowed this minority group to get acquainted and they are unanimous that the 2nd Horst Winkler Commemorative Meeting should be held under different circumstances, where the vintage model will have pride of place. To this end a working meeting was arranged, to be held on 13th November in Neu Isenburg to decide on guidelines for the Antik-Flugmodellfreunden, whether the German movement will rejoice under this name or merely be known as 'SAM Germany' remains to be seen.

Their programme for the 13th November meeting includes the election of officers, provision of funds, institution of a catalogue of books and plans, preparation for vintage competitions and projected exhibition work. It has already been decided to have an exhibition of vintage models at the "Modellbau 85" hobby show at Dortmund in March/April 1985, and this is expected to be a good PR exercise, that should swell the ranks.

We look forward to hearing more from Herr Mink, especially details of the next Horst Winkler Meeting in order that British modellers keen to attend can be aware of the

Left, Vintage models at the Winterberg meeting 3-5 August 1984. The glider in the foreground is a 'Westmark I' made of hardwood with plywood ribs. Despite this strict adherence to original structure it seems a pity that the builder increased the span by two extra bays to cater for the weight of the radio control equipment. Below, a 'Grosse Winkler' going up on the line at Winterberg. Model has a profile fuselage only 16mm wide, but it appears that this builder has increased the fuselage cross-section in order to bury the radio. Oh! the evils of R/C!!



Ulrich Stampa of West Germany broke the record for power-driven ornithopters in October 1943 when his model flew for 16 minutes 48 seconds ROG! He is still at it, this being his latest rubber-driven canard model.

venue well in advance. It was disappointing that SAM 35 members did not attend the first meeting, the Channel did not stop participation in France, c'mon chaps, Germany is not much further, our support there would be greatly appreciated.

SAM 35 Yearbook No. 3

Although at time of writing I have not seen the finished article which is scheduled for publication before Christmas, I have had a pre-look at some of the main subjects and can honestly say that for my money this is the best Yearbook yet! All carefully researched, the articles are full of information not easily obtained elsewhere, on a whole variety of themes near and dear to the hearts of vintage modellers.

Here are some of the titles, The Other Pavely, Eddie Riding, Round The Pole, J. B. Allman, Wireless Wizards, Look, no Radio! (a history of automatic steering devices in Germany), Petrol Pioneers and Maestro-models (actual 3-view drawings to enable you to build McGillicuddy's models!) Price £4.00 which includes UK postage, obtain from: Tony Hogan, 30 The Courtway, Carpenders Park, Herts.; order early, the previous Yearbooks went like hot cakes!

Frank Zaic Visit

"The almost legendary figure of Frank Zaic back in England again was a source of great pleasure to the many who knew him only from his famous *Yearbooks* and the 'Thermic' series of gliders. Frank has quite the most fascinating and catching of all American accents ..." So wrote C. S. Rushbrooke 35 years ago, well, here Frank was again in London for a few days, en-route home after a European holiday, and "organised" to Dave Baker's home to meet some 50 vintage enthusiasts on 25th October last. Although for most of us he was the legendary *Yearbook* figure that Rushy described, a number of modellers were present who had enjoyed the privilege of personally meeting Frank down the years, and were able to renew that acquaintance. A quiet, unassuming man who has done the movement proud, we were honoured to be in his company.



AIRCRAFT DESCRIBED 262

GREGOR FDB-1

December 17th, 1938. Note large diameter, temporary radius-rods to the landing gear. On the left is CCF's test pilot, on the right Michael Gregor.



The Canadian Car and Foundry Co., Gregor FDB-1 described and drawn by Harry Robinson

ONE MIGHT perhaps be forgiven for wondering why, as late as 1938, when development efforts by leading aircraft manufacturers in both U.S.A. and Europe pointed so clearly toward the monoplane, that an embryo aircraft manufacturer in Canada, intent upon making an impression on the world of aviation by developing a new

was intended as a fighter/dive-bomber and featured an up-to-date, all-metal structure, fully retractable landing gear and a moulded, clear-view cockpit canopy.

Designer of this elegant, ingenious machine was Michael Gregor, a Russian who had emigrated to the United States in 1921 and become a U.S. citizen in 1926. He

both as fighters and in ground-attack, and was influential in CCF's decision to build a prototype biplane single-seat fighter to demonstrate the company's potential in production of modern, all-metal military aircraft while gaining valuable design experience.

Construction began at CCF's factory at Fort William, Ontario, in the Spring of 1938 and the ostensibly finished FDB-1, minus its eventual spinner and the CCF legend on its fin, was rolled out on a light carpet of snow at Fort William on December 17, 1938 for a series of publicity photos. Although this date is often given for the Gregor's first flight and at least one photo shows George Adye sitting in the cockpit, no flight took place that day and the FDB-1 was probably far from airworthy. Photographs show that all four radius-rod vees of the retractable undercarriage had been replaced by large-diameter temporary members; it seems likely that other items remained to be installed or developed.

Indeed, Gregor's new fighter did not fly until almost three months later. Although it is uncertain where the outstanding construction work was carried out, the FDB-1 was finally assembled at Montreal Airport (Cartierville) and it was from there that George Adye made the first flight on March 3, 1939.

Among the ingenious original design features of the FDB-1 were the built-up plate keel and single load-bearing cross-frame that between them served to distribute flying and landing loads throughout the structure, with wings, landing gear and engine all connected to one or other of these members. Wings were strut-braced with external wire bracing completely eliminated. The novel "stepped-web" spar construction, though evidently light and strong, was made up of numerous unequal Z-pieces riveted together, with channel flanges top



Taken during flight tests. The landing gear is now fitted with its regular radius rods and a spinner, slightly smaller than the final version, has been added, although there is little evidence of external aileron hinges or actuating horns.

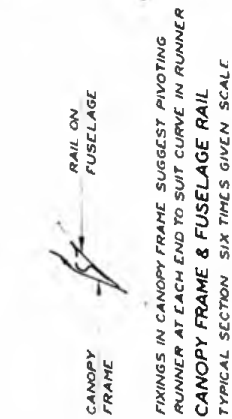
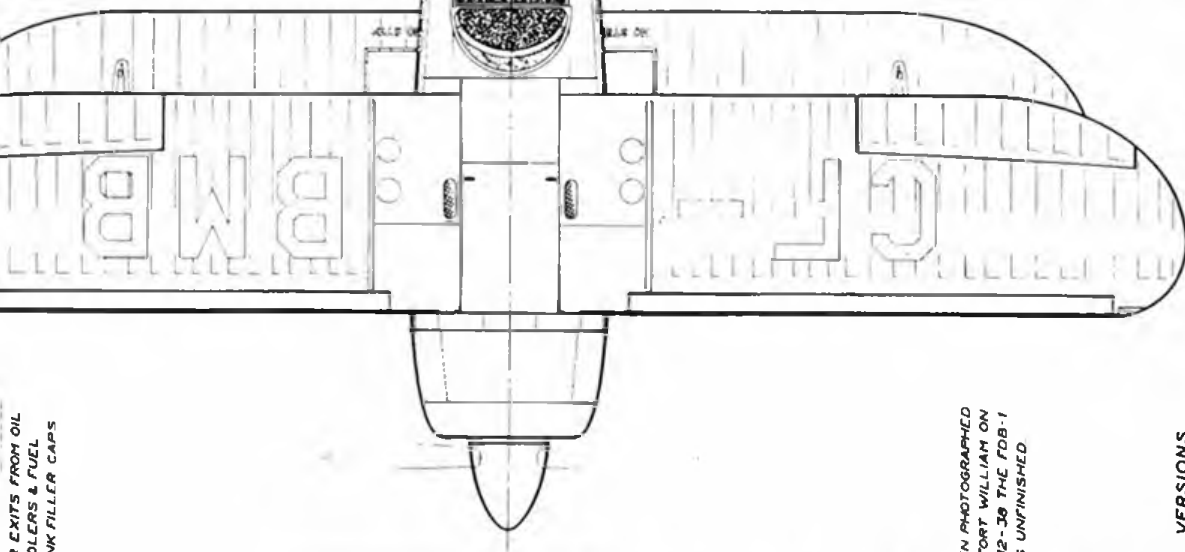
fighter type, chose the biplane layout.

Late 1938 saw the first appearance of the Gregor FDB-1, a private venture product of the Canadian Car & Foundry Co. This firm was better known as Canada's main producer of railway equipment but early that year had become a division of Canadian Associated Aircraft Ltd. As its designation implied, the single-seat FDB-1

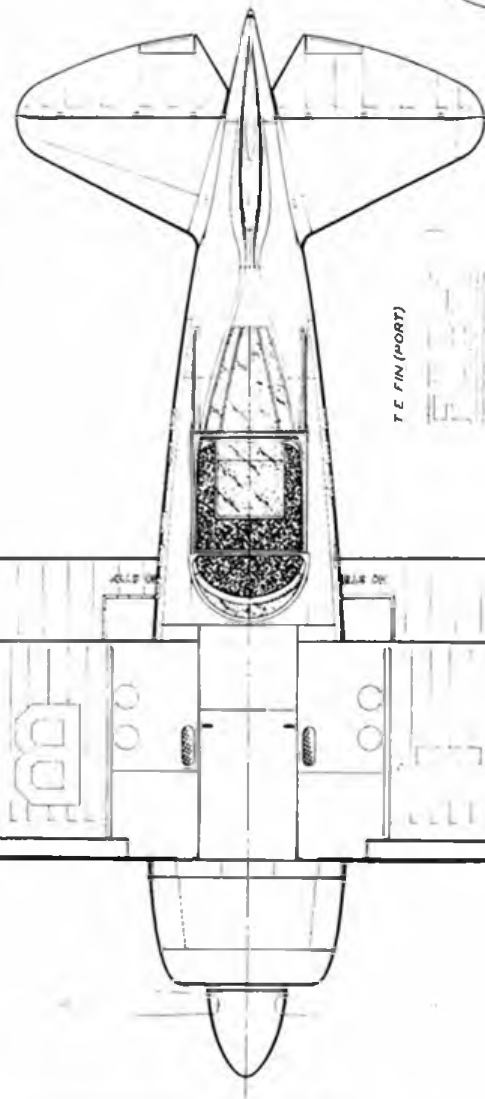
had worked as a designer for Bird & Seversky, in 1930 produced the Gregor GR-1 training biplane and in 1937 moved to Canada to become chief project engineer of Canadian Car & Foundry of Montreal.

CCF was then engaged in licence production of Grumman FF-1 two-seat biplanes. Gregor had been impressed by the performance of biplane fighters in Spain,

AIR EXITS FROM OIL
COOLERS & FUEL
TANK FILLER CAPS



FIXINGS IN CANOPY FRAME SUGGEST PIVOTING
RUNNER AT EACH END TO SUIT CURVE IN RUNNER
CANOPY FRAME & FUSELAGE RAIL
TYPICAL SECTION SIX TIMES GIVEN SCALE



TE FIN (PORT)

DESIGNED AND BUILT BY
FORT WILLIAM CO LTD
FORT WILLIAM CAN
FIN LEGEND (BOTH SIDES)
THREE TIMES GIVEN SCALE

EXHAUST
COLLECTOR IS
APPROXIMATE

DATA

UPPER WING	SPAN 4'-6"	CHORD 10'-3 1/2"	AREA 24'-0"
LOWER WING	SPAN 4'-0"	CHORD 9'-0"	AREA 21'-8"
OVERALL LENGTH	21'-8"		
WHEEL TRACK	5'-8"		
PROPELLER DIAMETER	2'-0"		
EMPTY WEIGHT	2-280 lb		
LOADED WEIGHT	4-100 lb		
* WITHOUT SPINNER	ESTIMATED		
LENGTH WITH SPINNER	22'-0"		

VERSIONS

- 1 ORIGINAL (7-12-38) TEMPORARY L.G. RADIUS-RODS, EXTERNAL POSITION LIGHTS, NO SPINNER OR FIN LEGEND
- 2 INTERMEDIATE SMALL DIA SPINNER, TRUE RADIUS-RODS
- 3 FINAL LARGE DIA SPINNER WITH CRANK-CASE SKIRT, BLACK BACKS TO PROPELLER BLADES (36" LONG) INSET L.E. POSITION LIGHTS, AILERON HORNS & HINGES & FIN LEGEND.

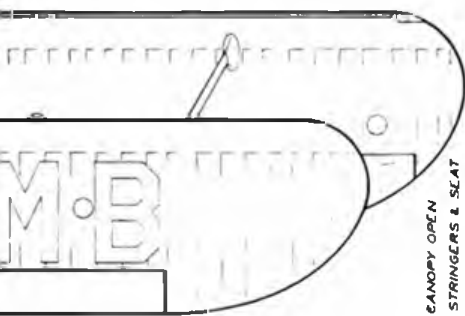
NUMBERS SHOWN IN BRACKETS AGAINST DETAILS
REFER TO THESE VERSIONS.

COLOURS

OVERALL FINISH - DEEP GUNMETAL BLUE
(*A LITTLE LIGHTER THAN A RIFLE BARREL*)
REGISTRATION LETTERING - ALUMINIUM
PROPELLER & SPINNER - ALUMINIUM
WHEELS & L.G. MEMBERS - NATURAL
& INSIDE COVER DOORS - METAL
EARLY L.G. RADIUS-RODS BELIEVED LIGHT GREY(?)
CCF CO" LEGEND ON FIN - WHITE
RUDDER STRIPING - RED & WHITE

A 1/24 scale dye-line print of this drawing is available from
Aeromodeller Plans Service, P.O. Box 35, Wolsey House, Wolsey Road,
Hemel Hempstead, HP2 4SS, price £2.10 plus 50p postage and packing
(Price Code D). Please quote Plan No. 3065 when ordering

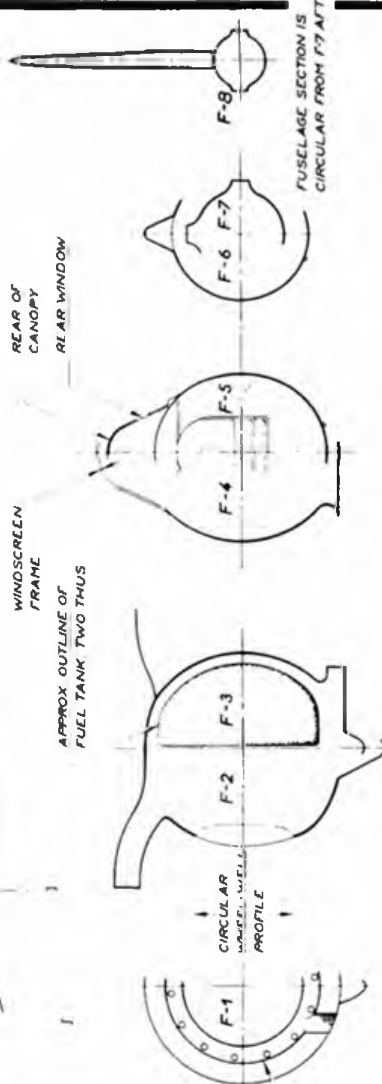
COWL PANELS ARE
SCREW-FASTENED



COCKPIT CANOPY OPEN
FRAMES, STRINGERS & SEAT
SHOWN DOTTED
SECTIONS NOT TO SCALE

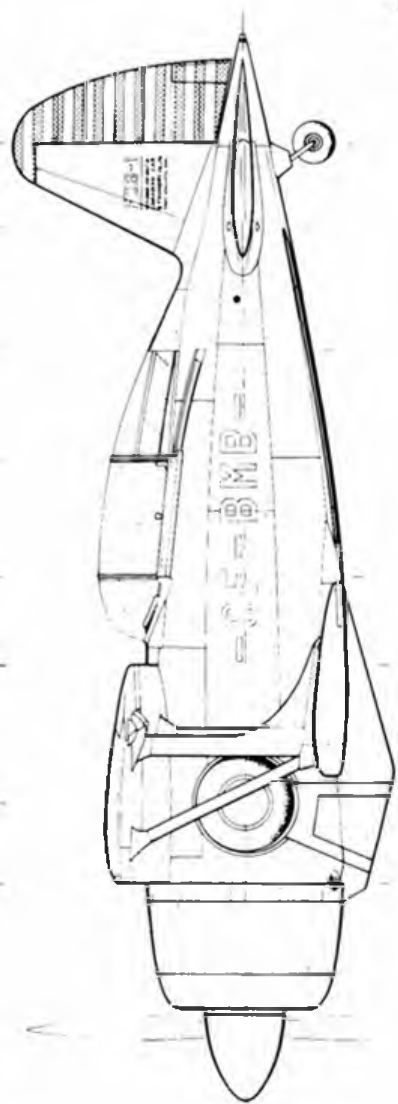
WINDSCREEN
FRAME
REAR OF
CANOPY
REAR WINDOW

APPROX OUTLINE OF
FUEL TANK TWO THUS



FUSELAGE SECTION IS
CIRCULAR FROM F-7 AFT

F-1 F-2 F-3 F-4 F-5 F-6 F-7 F-8



HOLE FORWARD OF TAIL PLANE (BOTH SIDES)
DID NOT APPEAR IN FINAL VERSION (3)

CANADIAN CAR
& FOUNDRY Co

GREGOR FDB-1

0 1 2 3 4 5 6 7 8 9 10"



The final version with larger diameter spinner, hinges and operating horns visible beneath the ailerons and inset leading edge position lights replacing original external "fish eye" type at each upper wing tip.

and bottom: production must have been time-consuming. Balanced Frise-type ailerons were fitted to the upper wing only, with split flaps mounted inboard and on the lower wing while Handley-Page automatic slots ran the full span of the upper leading edge.

The fuselage was a conventional semi-monocoque constructed about light transverse frames and longitudinal stringers. Two ventral spines located between lower wing and tailplane were simply external strengthening members: although fitted on December 17, 1938, their appearance suggests they were additions to the original design.

Landing gear geometry was similar to current Grumman practice with streamlined wheels projecting marginally beyond the fuselage flanks when retracted. Only the fixed, fully castoring tailwheel marred its clean, graceful lines when the FDB-1 was airborne. Its curved windscreen and large sliding canopy were each one-piece mouldings which were, notwithstanding their remarkably light framing, outstanding both as fighter design and as production engineering in 1938.

It seems very likely that fin and tailplane had a majority of common components,

including skin panels which appear to have been spot-welded to the structure. This was by no means common practice in 1938. Fabric-covered elevators and metal-clad rudder may also have used elements in common.

Provision was made for the installation of two synchronized .50 in machine guns plus 500 rounds per gun in the gulled centre-section of the upper wing, although it is not known that this armament was ever fitted. It was also possible to carry a 116 lb bomb under each lower wing.

Power for the FDB-1 was supplied by a 14-cylinder Pratt & Whitney R-1535-SB4-G Twin Wasp Junior of 750 hp with a 0.75:1 gear ratio driving a Hamilton Standard constant-speed propeller. The structure was stressed for engines up to 1200 hp but with the Twin Wasp Junior, RCAF tests of CF-BMB indicated a maximum speed at 13,100 ft of 261 mph, initial climb rate of 2,800 ft/min and an absolute ceiling of 27,700ft. These figures were significantly below CCF claims for the fighter. The FDB-1 stalled at 57 mph with flaps down and slots open and at 72 mph "clean": range was of the order of 1000 miles on 95 Imp gal of fuel.

Faults revealed during tests included severe vibration of the cockpit canopy at

high speed: the light framing evidently required strengthening but how this was done is not known. Aileron control proved over-sensitive but beyond the probability that control gearing was significantly reduced, nothing is known about actual modifications.

Blackest mark against the FDB-1 was its total lack of visibility on landing, taxiing and taking off. The late Howard F. Klein has described it as "blind as a bat" in these circumstances, and admitted this was a serious defect for which there was no cure. For take-off the tail could be raised quickly - but on the ground the graceful gull-wing permanently blanketed all forward view, notwithstanding the superb visibility above and behind.

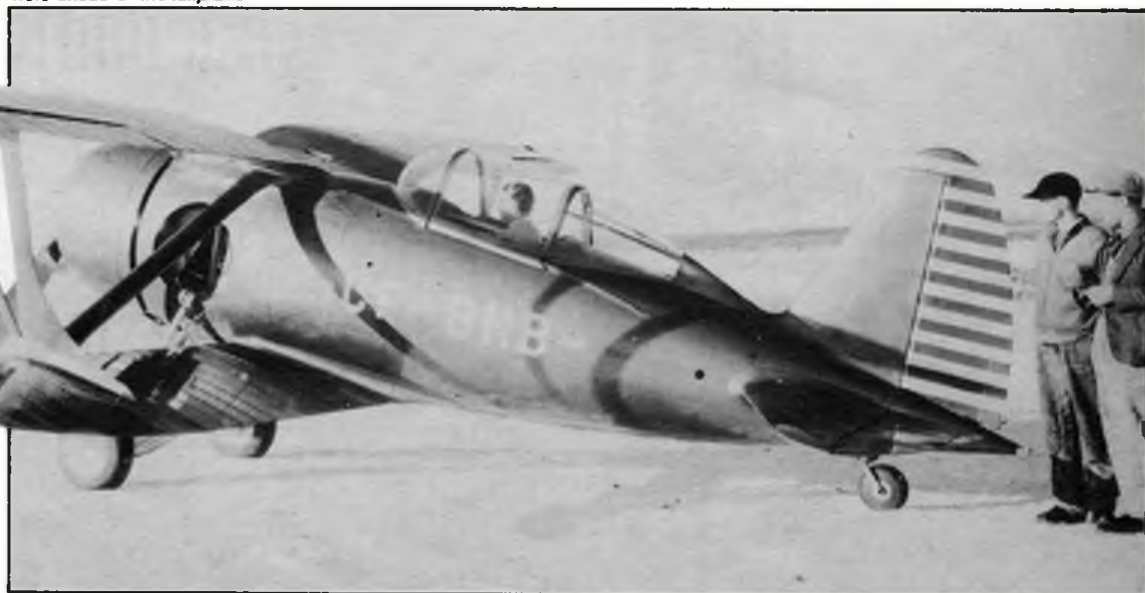
In the air, however, Klein found the FDB-1 "an outstanding airplane in every respect", with an exceptional speed range for which the full-span slots were largely responsible. A more detailed appraisal has come from Fred Smith, then a pilot with Canadian Colonial Airways, who flew the FDB-1 briefly in the autumn of 1941.

Smith records the Gregor's "instantaneous" acceleration and strong torque reaction that "corrected beautifully": effortless snap rolls, high-G loops and a quick, plummeting stall that easily became a spin from which recovery was simple and immediate. Smith found the FDB-1 "swift and responsive in everything" except the falling leaf: interestingly, for six years prior to taking up the Gregor, Smith had flown nothing but the Douglas DC-3.

Following exhibition flights and participation in the New York-Miami Air Race in January 1940, from which it had to retire at Hadley, N.J., with oil pressure failure, the Mexican Government expressed interest in the FDB-1, but beyond setting aside a Mexican registration nothing came of this move. The day of the biplane fighter had ended but Michael Gregor had developed the formula close to its ultimate with sound engineering and numerous novel, ingenious touches.

For some years the FDB-1 remained in storage at Cartierville Airport where it was destroyed in a hangar fire towards the end of World War II.

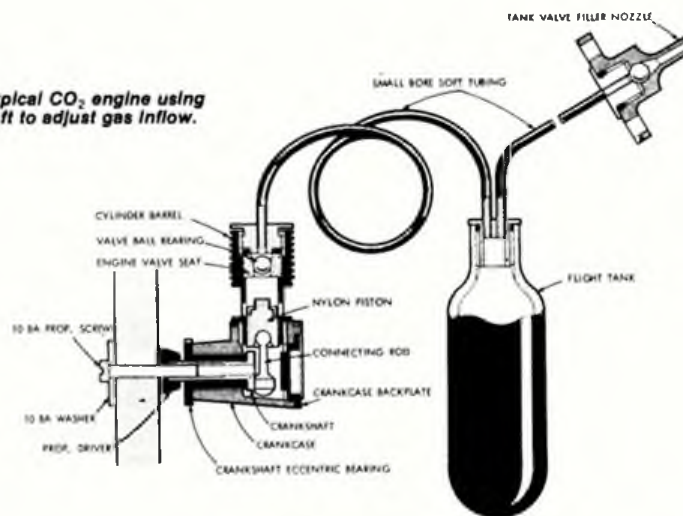
One of a series of publicity photographs taken at Fort William on December 17th 1938. Test pilot George Adye hardly seems kitted out for a flight and the FDB-1 did not in fact fly until three months later. Note what appears to be a lifting or access hole ahead of the tailplane.



THE GAS ENGINE is not a new phenomenon, in fact motors driven by compressed gases of some sort or another have been around for almost as long as aeromodelling itself. Gas powered engines of the sort we know today have filtered in from abroad in ones and twos and several attempts by U.K. manufacturers in the 1950s were short lived.

The late 1970s, however, saw a magic change in this supply situation sparked off by *Ticket Equipment Ltd.* who produced the first successful mass produced British motor. This was followed quickly by motors from *Powermax* and from *Humbrol*. Not only motors but ready to fly foam plastic models at almost pocket money prices, that suddenly rocketed CO₂ power from a minority interest to a workable model that

Gross section of typical CO₂ engine using eccentric crankshaft to adjust gas inflow.



GAS ENGINES

~ THE INS AND OUTS

Ian Peacock explains the principles of modern CO₂ engines.

anyone could fly (well almost!). However the CO₂ boom passed and production figures declined. *Humbrol* pulled out altogether and *Ticket Equipment* was taken over by the EMI group. However that doyen of the British model trade, Roy Scott of *Micro-Mold*, saw this takeover coming and negotiated the purchase of the CO₂ motor production. T.E.L.'s CO₂ motor was known, not surprisingly as *Telco* and this name has been retained by *Micro-Mold* who now manufacture the motors and export world wide. Other brands flourished in the late '70s with *Modela* being imported from Czechoslovakia and *Brown* (long established on the American market) single cylinder,

twin cylinder and a miniscule "peanut scale" size motors appearing on the U.K. dealers' shelves. Although with present exchange rates American motors are very expensive.

Just how then does a CO₂ motor work? Well, although there are detail changes between brands - concerned mainly with the method of speed control - the basic technology is common.

The CO₂ motor behaves basically like a steam engine except that compressed carbon dioxide replaces high pressure steam. Unlike steam which is hot, CO₂ when used in this manner cools, in fact in certain circumstances it actually freezes. It does

however bring with it a slight snag. To obtain the necessary expansion of the gas it should be warm; as it cools, the efficiency falls off as will be seen later.

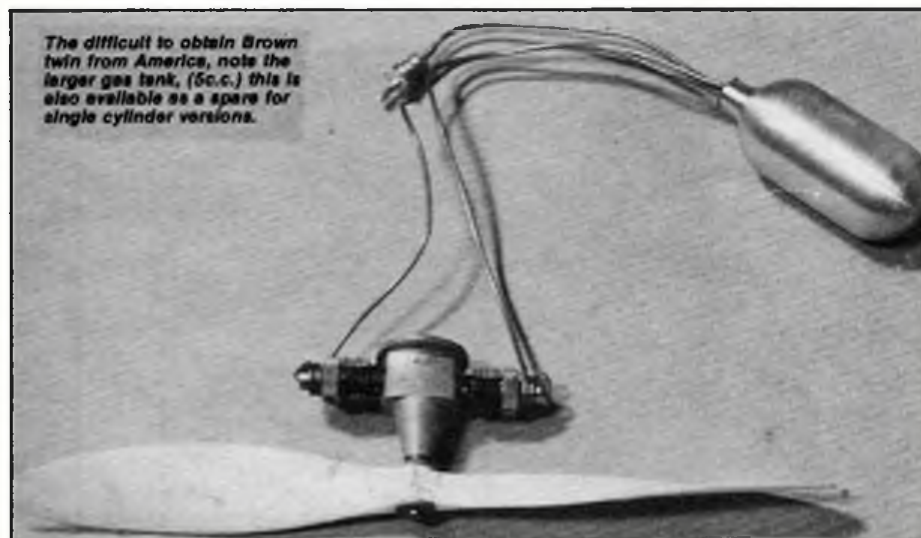
In appearance, CO₂ motors resemble small diesel or glo-plug motors with the cylinder fins acting as a "warming" surface rather than a "cooling" one. The "fuel", in terms of the pressurised gas, is held in a light-weight, spun aluminium cylinder connected by soft annealed copper tubes, both to the cylinder head of the motor and to a "charging" or "re-filling" nozzle. The cunning part of the whole set-up is the valve arrangement in the cylinder head that admits the pressurised gas at the right time to drive the piston down. This valve takes the form of a small ball-bearing in a moulded plastic seat.

Mounted centrally upon the crown of the piston is a small protrusion or "bump". The size and position of this bump is such that at top dead centre (T.D.C. for short) the bump lifts the ball from off its valve seat and releases the pressurised gas into the top of the cylinder. This pressure forces the piston down and the valve closes behind it. The spent gas exits through almost conventional exhaust ports at bottom dead centre, allowing the piston to carry on back to the top where the cycle repeats itself.

Forwards and backwards

From this brief description, two major facts emerge. First, the motor is symmetrically ported about T.D.C. allowing it to run equally well in *either direction*. However, be warned, many a good model has come to grief because the motor has started up accidentally in reverse (despite being "flicked" the right way!) and has been launched into the air without the modeller realising that it was going backwards. Always check, therefore, that propeller direction before launch! The second feature concerns the ability to vary the motor's speed by opening the ball valve for a longer or shorter time per revolution, thereby admitting a greater or lesser volume of gas, for obviously it is the expanding volume that causes the "urge".

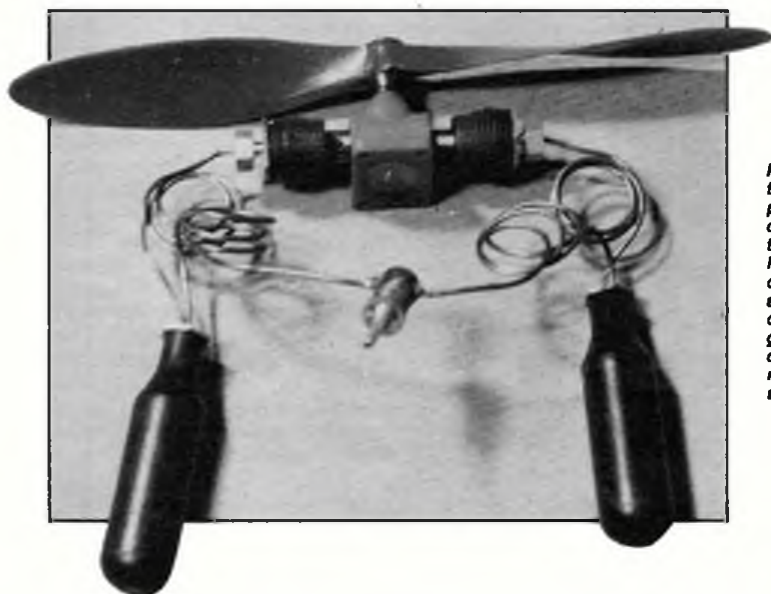
Varying this opening time can be achieved simply by raising or lowering the position of the valve relative to that of the "bump" at T.D.C. Most manufacturers arrange this by mounting the cylinder head on a screw threaded cylinder. Rotating the head, raises or lowers it relative to the piston, so controlling the amount of gas admitted. Simple - but effective. The only



disadvantages are minor. Twisting of the head may cause the soft copper pipe to fracture. However, this won't happen for a long time and can easily be soldered back in place. Also one must have access to the cylinder head, in an enclosed installation, a hatch arrangement needs to be provided.

Telco, on the other hand, have come up with a neat (and patented) alternative solution. They have adopted the eccentric crankshaft bearing... Here the crankshaft runs in a bearing that can itself be made to rotate within the crankcase. The effect of this "offset" is that rotating this "out of centre" bearing, raises or lowers the centre line of the crankshaft relative to the rest of the engine. As the piston is coupled to the shaft by the connecting rod, this causes the piston to raise or lower (at T.D.C.) relative to

valve (charging nozzle) to the tank. This valve is another plastic moulding that also contains a simple ball valve. Furnished with each motor is a charger which connects to this valve. The charger holds the CO₂ cylinder. For convenience, this cylinder is a *Sparklet* bulb. This is widely used in soda syphons and soft drinks dispensers and may be obtained from most chemists and off-licences. The bulb contains enough CO₂ for 5 - 8 flights (dependant upon duration) and is made of steel and is too heavy to be used as a gas source within the model itself. However its low cost and ready availability make it a natural choice for the "main" source of gas. Care must always be taken when fitting a new bulb to the charging holder and it is *essential* to check that the old bulb is *empty* before removing it.



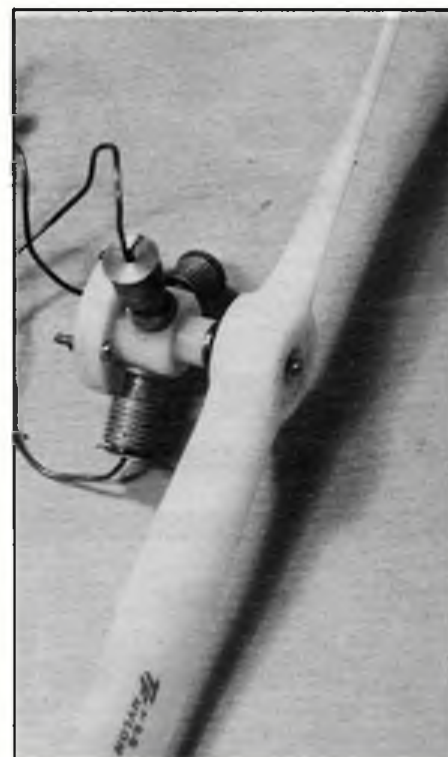
Right; An early Telco three cylinder prototype - quite a collectors item. Left; the Powermax horizontal twin cylinder version is still available as PMS 5 and costs £25.00. On a good one of these you can expect a longer run than on two singles!

the ball valve, varying the input charge of gas. The advantages of this method are: No twisting of the copper tube; and as adjustment is by rotating a "nut" immediately behind the propeller, this can be carried out externally - even with a fully cowed motor!

So much for the motor, the rest is simple. The spun aluminium gas tank has a brass top with two copper tubes, one carries the gas to the motor, the other connects the filler

Remember that CO₂ gas used this way is *under pressure*. NEVER mess about with or misuse a CO₂ container.

CO₂ is stored at about 800 - 900 psi (pounds per square inch) at *room temperature* and can rise to as much as 2000 psi if carried on the back window ledge of the car on a warm summer's day. The motors/tanks/pipes are designed to stand this pressure and so are the *Sparklet* bulbs - but *only* when they are properly used. SO



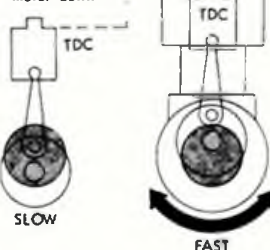
DON'T PLAY THE FOOL - TREAT CO₂ WITH RESPECT!!

Loading the CO₂ cartridge into its holder is a matter of just following the instructions, however loading from the charger into the tank can be achieved in two ways. The gas is stored in liquified form, allowing greater storage within a given volume. The *Sparklet* bulb will, when new, contain both liquid and gaseous CO₂ and if held *nozzle-downwards* during charging, will transfer mostly liquid. This is the most efficient way of transfer and will guarantee the longest flights. For short trimming flights, transfer the CO₂ by holding the charger nozzle upwards. This transfers only gas and results in greatly reduced running time.

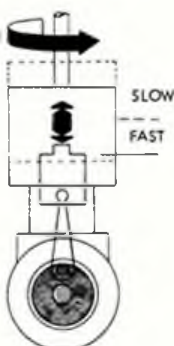
After 2 or 3 charges the *Sparklet* bulb will only contain gas and the flights will be of shorter duration. A neat trick is to have *two* chargers. Load from charger no. 1 for the first two or three flights and then load from no. 1 (now only containing gas) and top up

DIFFERENT TYPES OF SPEED CONTROL

By rotating the eccentric bearing carrying the crank shaft the effective stroke of the piston TDC is raised for more power or lowered to slow motor down



By rotating the complete cylinder liner (not just the screw in pipe fixing) the cylinder head is raised in relation to piston TDC slowing the motor, or lowered for more power



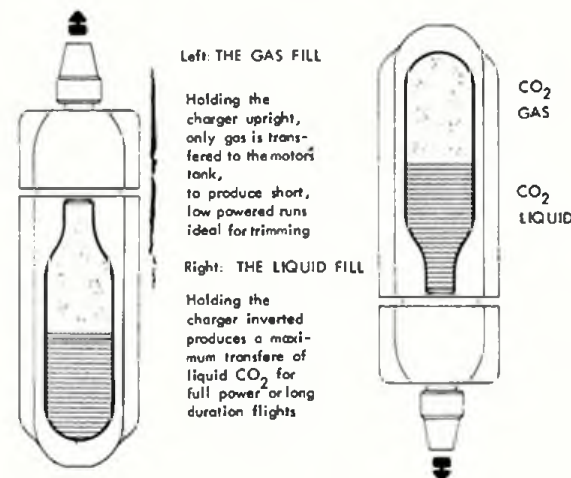
GAS TANK FILLING TECHNIQUES

Left: THE GAS FILL

Holding the charger upright, only gas is transferred to the motor's tank, to produce short, low powered runs ideal for trimming

Right: THE LIQUID FILL

Holding the charger inverted produces a maximum transfer of liquid CO₂ for full power or long duration flights

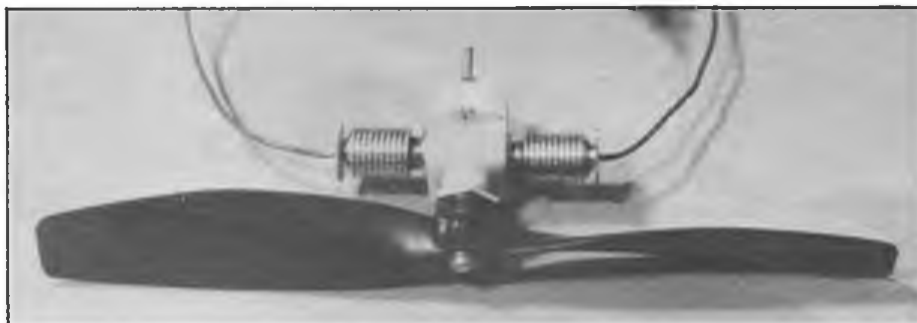


with no. 2 which contains a brand new bulb, thereby topping up with liquid. By the time charger 1 is empty, charger 2 is down to gas only. Fit a new bulb to charger 1 and then load with charger 2, topping up with charger no. 1 and so on. This trick enables a *full* liquid charge *every* flight for the financial outlay of just one extra charger. Of course those of us with two or more motors will have spare chargers already!!

There are, of course, many variations that can be played on the CO₂ theme. Both *Brown* in the U.S.A. and *Powermax* here in the U.K. produce horizontally opposed twin cylinder units. Twin tanks can be plumbed together to extend flight durations. *Telco* produced both twin and 3 cylinder units (the 3 cylinder motor making a very passable replica of the early *Anzani* petrol engines). However, hand assembly, made the price prohibitive and the few that were made passed quickly into the hands of collectors. *Powermax* geared 5 and 3 motor systems together to enable a bigger prop to be swung but the added weight and frictional considerations cancelled out any advantages that might have been offered.

Today, unless one digs deep into one's pocket for American motors, *Telco* and *Powermax* appear to be the only choice. I've flown consistently with both over many seasons and whilst I've had good and bad examples of both brands, I think that the performance and reliability of the *Telco* put it slightly ahead (unless of course YOU know different).

Available for the *Brown* motors are a number of different gas tanks ranging from 1.75 c.c. through, 5, 10 and up to 20 c.c. - Ideal for control line or R/C?



Another *Telco* prototype, this time a horizontally opposed twin - there always seems to be certain fascination to produce multi cylinder units!

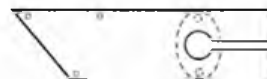
make a useful contribution. For out and out performance buffs, both *Telco* and *Powermax/Humbrol* motors have been the subject of a full review in Peter Chinn's 'Latest Engine News' for February and April 1977.

As said earlier, the greatest problem with CO₂ motors is that of cooling or even freezing. It is a physical law of nature that says gases cool as they expand. Flights on a hot Summer's day will greatly surpass those carried out in the Winter. There must be many who find that the shiny new plastic airplane delivered by Father Christmas just will not perform on a frosty Boxing Day!!

Micro-Mold in conjunction with *British Oxygen* have gone a long way toward improving this situation with the popular 'Turbotank' system. Put simply, the Turbotank surrounds the gas tank with a chemical filled jacket. As the gas is used, the temperature drop in the tank is absorbed by this chemical which may even freeze itself but in so doing gives up its own heat to warm the gas. This doesn't mean that one can go CO₂ flying at the North Pole but it does greatly assist cold weather flying and produces an acceptable compromise. In warm weather the 'Turbotank' really lives up to its name producing an increase in power and duration. The other basic difference with the 'Turbotank' is that the tank/motor/filler are now all one assembly. This makes for a simple one piece installation without the worry of possible damage to the soft copper pipes.

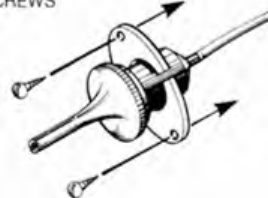
However, nothing comes free (!) and a one-piece motor/tank assembly reduces the

RIGID MOUNTING ADAPTION FOR POWERMAX FILLING VALVE



POWERMAX FILLER MOUNTING PLATE CUT TO DOTTED LINE & DRILL TWO NEW HOLES 3/32" DIA. DISCARD REST OF PLATE

FIT NEW PLATE TO REAR OF FILLER NOZZLE WITH SMALL DROP OF EPOXY. SCREW NOZZLE TO MODEL WITH SMALL WOOD SCREWS



ability to move the tank around to assist in obtaining the correct centre of gravity.

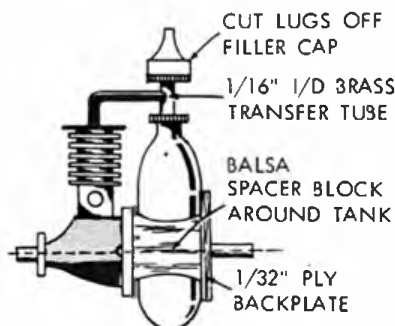
Duration and power go inversely together, greater power seriously reducing the motor duration. Larger tanks have been made but once more we tend to hit problems, with gas freezing in the tank.

It is probably best to accept the "little and often" philosophy, allowing the assembly to warm up between flights. With a standard *Telco* arrangement, typical motor runs will be up to two minutes for average models in average conditions, although some specialist models flown indoors, are capable of much longer motor runs.

Perhaps now is the time to break off and consider the types of models that can be successfully flown on CO₂...



JACK HEADLEY'S CONVERSION TO PRODUCE 'ONE-PIECE' TELCO



MODIFYING TELCO CO2 UNIT TO A MORE COMPACT VERSION

Instructions

*Remove all screw caps and 'O' rings from unit. *Drill tank cap from inside to suite transfer tube. *Counterbore filler cap 3/32in deep for transfer tube. *Drill transfer tube for supply pipe to engine (.040in dia). *Solder all joints together. *Replace 'O' rings and reassemble unit. *Make balsa spacer block between motor and tank, and 1/32in ply disc for backplate. Balsa block is to prevent crushing the tank when mounting.



The prototype BOC/Telco turbotank now developed into the 3000 unit. All up weight of 22gms and no coil of copper tube to hide out of sight...

One area letting these motors down is the propeller. These can be improved considerably, reworking with wet or dry paper will yield a *balanced* product. On small motors of this nature with limited output, chucking part of that output away by driving an out of balance prop is definitely bad news. Other brands of small prop are also well worth trying. *Williams Bros.* make a nice one - it too will benefit by refinishing - but it does work well. However one will need to shop around a bit to find a stockist. Props from the *North Pacific* "Sleek Streak" can also

FREE FLIGHT SCENE

Martin Dilly reports

Stafford Screen's Series 3-21

This is the F1C aircraft that Stafford used on rounds 7 to 11 during this year's European Championships at Livno, and is a 'bunter'. The entire variable incidence tailplane actuating system was described in the April 1983 *Aeromodeller* Free-Flight Scene, and is controlled by a Ray Monks 4-function timer. Ray modifies these from a Swiss musical box movement and normally has some available at most contests.

The aircraft is built to Staff's usual immaculate standards of engineering and is powered by a Rossi 15 Mk.III, with a steel piston and liner; the exhaust exits on the fuselage centre line immediately aft of the wing, and the motor swings a carbon-fibre-bladed folding propeller, also Screen-made! The wing is one-piece; the centre panels are covered with 0.6 ounce glass cloth, while the tips and the tailplane are covered with Dilly Japanese tissue. Wing skinning is $\frac{1}{16}$ in balsa, 6lb. density on the centre and very light on the tips; Stafford uses a carbon fibre reinforcing fillet along the lower rear face of the leading edge member, a strip of carbon sheet about $\frac{1}{4}$ in wide immediately behind the rear tip of the ribs and a one inch strip of light glass cloth on each of the pre-chamfered rear inside faces of the wing skins. The latter considerably increase the stiffness and warp-resistance of the trailing edge, in the absence of any actual spanwise wood spar there.

The fuselage is a soft quarter grain box structure with spruce longerons and triangular balsa inside corner fillers, but note that the $\frac{1}{8}$ in sheet is tapered in thickness to about $\frac{1}{16}$ in at the tail end to decrease the moment of inertia. The engine is mounted in a cast dural half pan, with a glass fibre full cowl; power to the glow plug is via a jack plug and socket in the fuselage side.

Part of Stafford Screen's contest consistency must come from his very thorough pre-flight checks that are now a natural part of his routine, — aided by a written check list on top of his starter box so he cannot miss it. Before each flight, for instance, he removes the spinner and re-tightens the propeller nut, so there is a minimum chance of the prop coming loose in flight or during starting. His wings live in shaped foam polystyrene slots in their carrying box, which holds about five, plus the tailplanes. Fuselages also fit into shaped recesses in a foam-filled box; all parts are thoroughly cleaned after flying to prevent oil soakage and that 'dog-eared' look.

Probably Not the Ultimate Snoopy Timer

Having reported in a past Free-Flight Scene on the ultra-light springless modification of a 'Snoopy timer', I have now spotted a still lighter nylon drive

Stafford Screen, Britain's number one power merchant, caught here in characteristic poses as he assists his screaming F1C model skywards.



A Balsa Hardness Gauge

The name of J.H. Maxwell was familiar to me from reading some of the first copies of *Aeromodeller* I bought during the War; one of his articles then dealt with a method of comparing the hardness of balsa by pressing into it a loop of curtain wire and counting the indentations produced by a constant load.

Joe Maxwell has recently started producing some useful 'Aids for Advanced Aeromodelling', including form blocks for laminating rubber-driven propellers for anything from EZBs to Wakefields and also a modernised version of the balsa hardness gauge. This one uses an inking pad to mark the instrument's serrated head, which then leaves a line of coloured indentations in the surface of the wood; the number of these marks is converted to balsa density from a conversion table. With the somewhat erratic actual, as compared to nominal, thickness of some commercially cut balsa, not to mention wood whose thickness varies across its width, simply weighing a sheet and then checking this weight against the marked thickness can give some odd results today. A hardness gauge could be the solution.

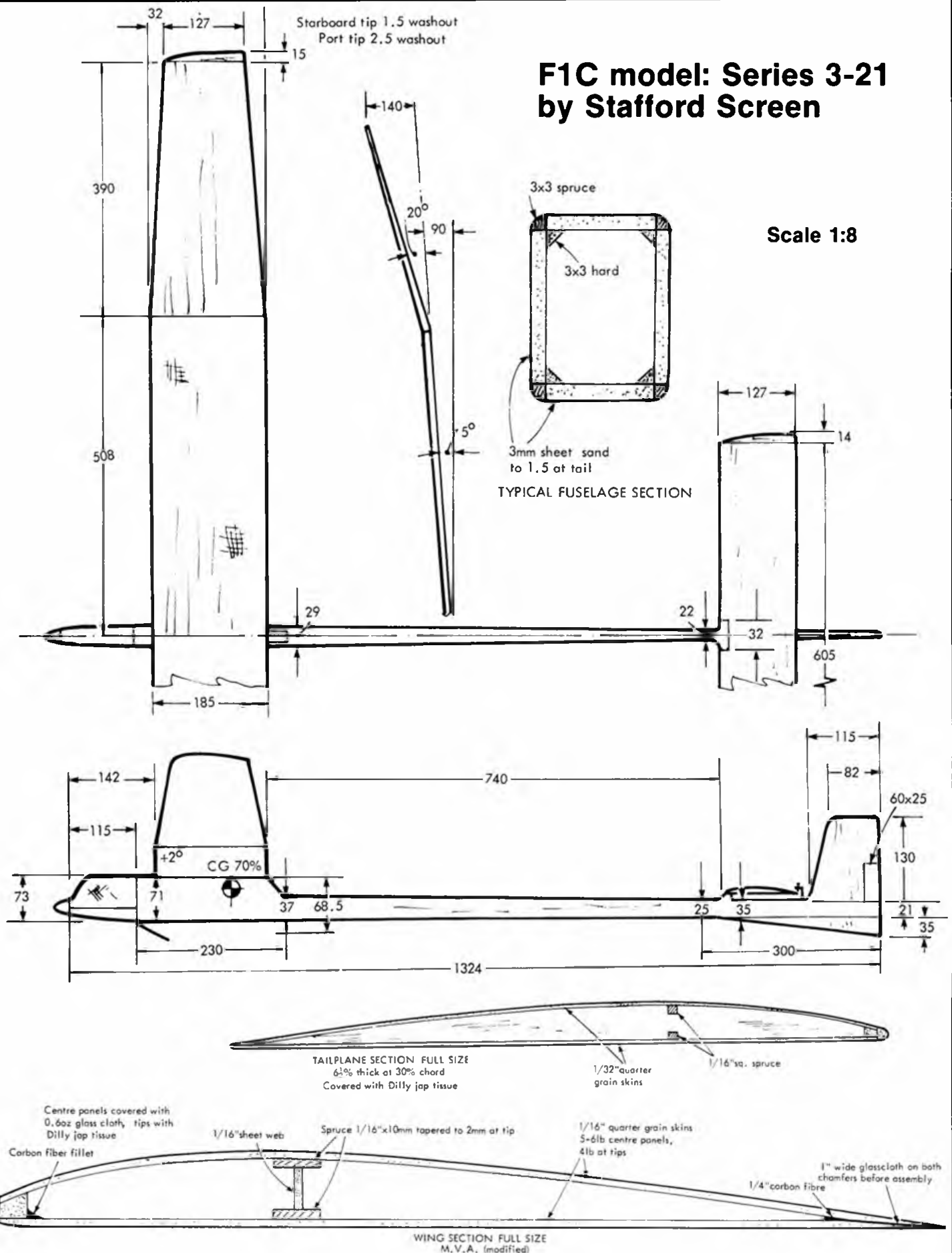
The complete 'Maxwell Hardness Gauge' with inker, pointer, tables and instructions comes boxed at a cost of £11.85. For details of this and other Maxwell aids send a stamped addressed envelope to J.H. Maxwell, 14, Upper Craigs, Stirling FK8 2DG.

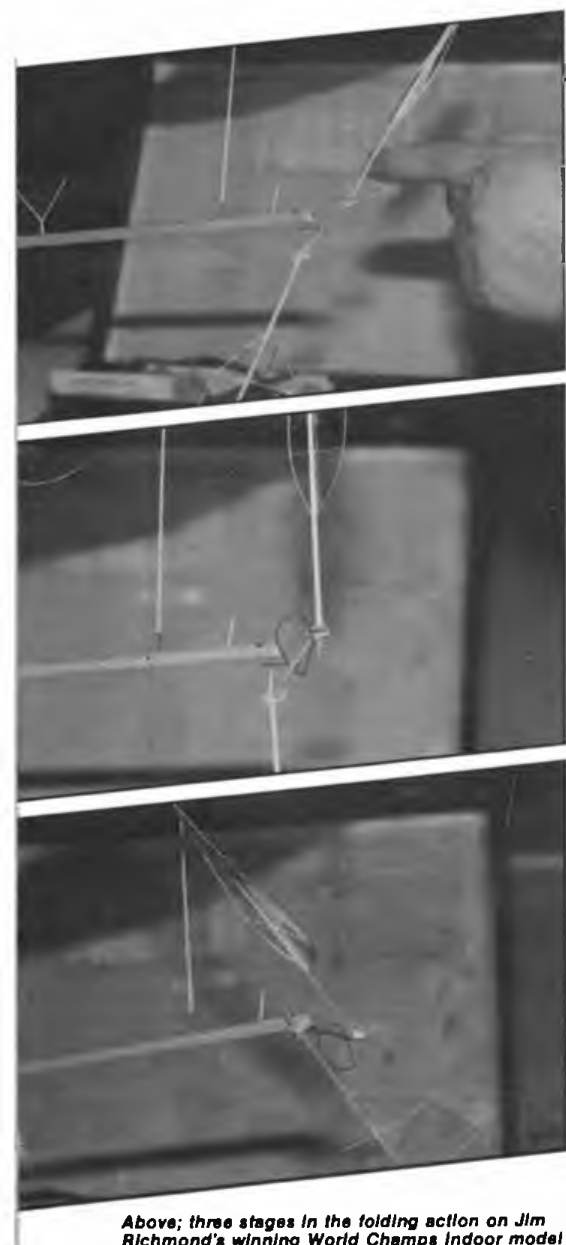
mechanism, this time in something called a 'Pencil Pet'. Lurking in some of the cheap chain toyshops, a 'Pencil Pet' consists of a powered 'head', typically a dachshund and an un-powered 'tail' with free-wheeling legs, if that is not a contradiction in terms. The original idea is that you push one of these parts onto each end of a pencil, wind up the front end and watch the whole thing waddle across the table. Not bad. . . However, a major lobotomy on the dachshund's head reveals a miniaturised and lighter version of the nylon mechanism we know and love. This one weighs 1.8 grams as opposed to the 2.7 grams of the basic 'Snoopy' drive and also seems to have rather sturdier gears. Surgery on the mechanism itself is a trifle fiddlier due to the smaller size but the 'Pencil Pet' drive can be adapted to either a normal, spring-powered timer or else the rubber band-powered type, utilising the tailplane hold-down band for two purposes.

Price for a 'Pencil Pet' seems to be around £1.80. Dimensions of the basic nylon moulding are 2.1 x 1.1 x 0.7 mm.

F1C model: Series 3-21 by Stafford Screen

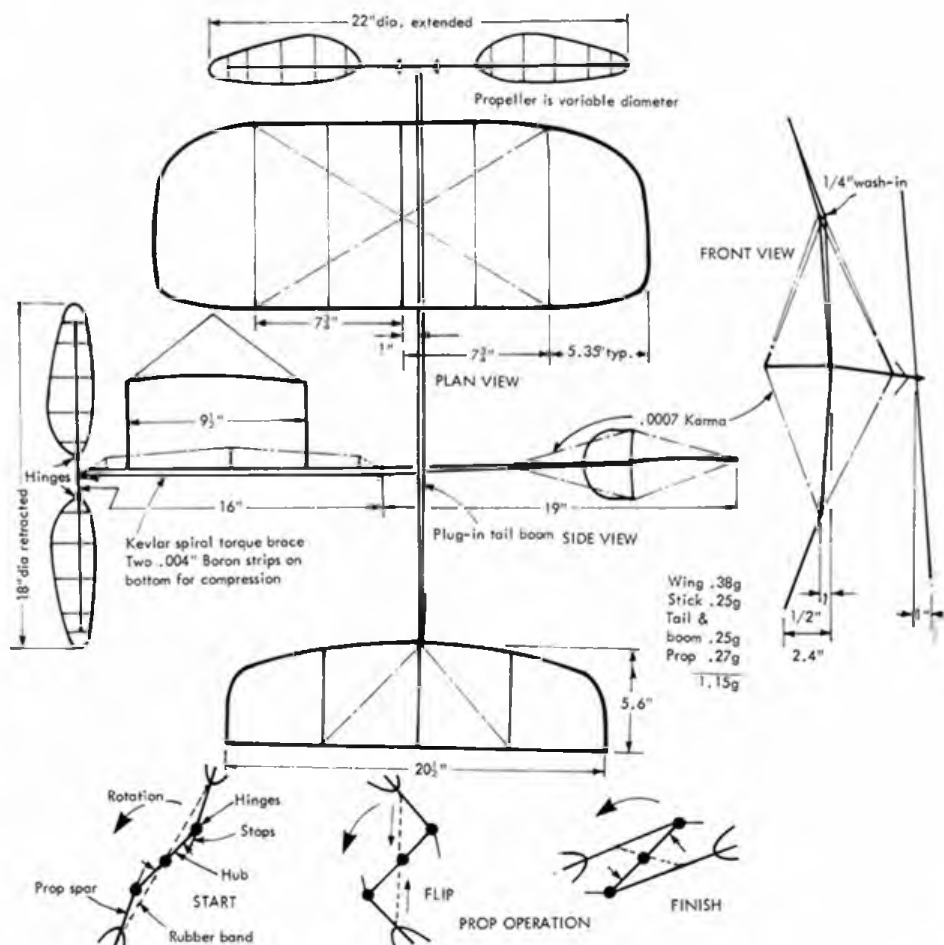
Scale 1:8





Above; three stages in the folding action on Jim Richmond's winning World Champs indoor model 'Flim Flam'. The actuating rubber band has been unhooked for clarity. Below; 'Flim Flam' on final approach after 39 minutes.

Flim Flam by Jim Richmond not only came first in the recent Indoor World Champs in Japan but also won the 'Original Design Contest'. This contest was for the Toyotomi Cup (actually a beautiful bronze statuette of the Greek Goddess Psyche). Toyotomi Kogyo Co were one of the Champs sponsors whose help and support made this meeting the success it was. Scale of drawings is 1:10



Glass/Balsa Wing Skinning

Oszkar Maczko, who is a regular member of the Hungarian F1C team, sent some details of a proven method of producing glass-clad balsa for wing skinning on free-flight models, or on F3B gliders.

He starts by sanding 1 or 1.5mm balsa sheet of a low density so it has parallel surfaces Oszkar uses a sanding machine but it should be possible to get the right result by using a sanding block and laying the balsa on a plate glass surface to avoid dents in the wood.

The next stage is to tape some glass cloth (25-40 gm/dm² is used by the Hungarians but a lighter grade will presumably work as well) onto the surface of a sheet of 5mm perspex or plexiglass, ensuring there are no

wrinkles in the cloth. It is then lightly soaked with a thinned epoxy resin (XB-2878 is used by Oszkar but I have no information on the manufacturer). It is important that the perspex is unscratched but it is unnecessary to wax it as the epoxy does not adhere to it. The perspex is laid on top of 10mm sponge plastic, the balsa on top of the epoxied glass cloth, another sheet of perspex on the balsa and the whole is weighted with about 80kgs of ballast! This has a squeegee effect and forces excess epoxy out of the sandwich.

The completely cured material has a high gloss surface and is used to cover the wing conventionally; Oszkar reports that wings using it are about as rigid as those skinned with 0.03 mm dural foil.

Tissue Dyeing

Chris Hayward of Crawley has come up with a solution to the shortage of coloured tissue. Dye some white! He uses a standard clothes dye, such as *Dylon* and thanks to the wet strength of *Modelspan*, the tissue can be immersed in the made solution and well sloshed about in it with little risk of tearing. When I tried the method I soaked the lightweight tissue in plain water first and added a tablespoon of salt to the dye solution as recommended in the instructions. When satisfied with the colour, which should appear a bit deeper than you finally require, remove the tissue, gently squeeze the surplus dye out and hang it up by one edge to dry.

I wondered a bit about the effect of all this on the tissue's shrinking properties. The dyed sheet was 1-1.3% smaller than the original size and tightened quite normally after water spraying and doping, so there seems to be no problem there. It would be interesting to hear about ways of producing lightweight coloured finishes on tissue; aniline dye in clear dope is one method that was used in the United States some time ago but tell Free-Flight Scene readers about your way.



HAVING OFTEN been struck by the almost complete absence of plans or kits for flying scale models of present day combat aircraft, I determined to make a serious attempt to design such a model. Two earlier models, a MIG 29 and a Saab Viggen were built and although not entirely successful a number of lessons were learnt that have made this model a success.

Although the F-16XL, as far as I know, never got into service, the general format is typical of the modern combat aircraft. On this basis, starting with a wing of adequate area to keep the model wing loading down to under 4 oz./ft², the 'ELF' design was tailored to an F-16 family resemblance, but with simplified lines. The concept proved to

The ELF in all it's finished glory looks very realistic in flight, take care with material selection for best results.



Build this modern free flight fighter model for CO₂ power designed by George Mathieson.

be quite untemperamental, and with it's light wing loading and low drag it has an adequate climb and a very flat glide looking very realistic in flight.

Not having attempted to keep weight to a minimum (it's 80 grammes) it's on the heavy side for the standard Telco, so I changed the gas tank to a Brown one of 6 c.c., which gave durations of over 1½ minutes. An additional Telco tank may be fitted if desired, total cost including extra tubing is about £1.50.

Access for charging nozzle is up front, requiring an extension of the Telco's standard length of tubing.



Fuselage

This is essentially a 1/16 in balsa rectangular box with an intermediate deck of 1/16 in balsa. Start by cutting out the ply formers, F2 and F4 (engine bulkhead) and balsa formers F1, F3. Former F2 also has attached to it the bracket for the engine charging nozzle, on both F2 and F4 epoxy the appropriate mounting nuts in place, as it will be difficult to deal with loose nuts at a later stage.

Next cut out the vertical fuselage sides from light sheet. Note that the vertical sides incline down at the front, level with the top of the nose yoke. After marking the position

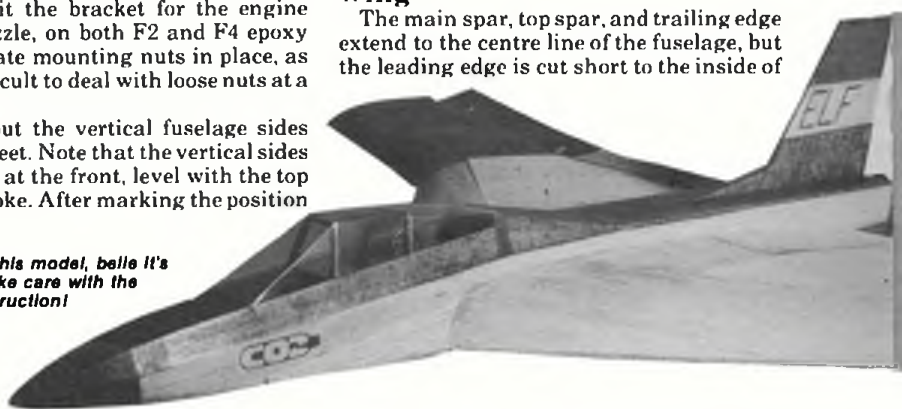
Smart lines of this model, belie it's strength just take care with the nose and construction!

of the formers, the vertical stiffeners are glued on, ending 1/16 in inside the outer edges to accommodate the horizontal stiffeners. Cut the nose yoke from hard 1/16 in balsa, and intermediate deck from medium grade, not forgetting to notch it's edges for the vertical stiffeners. The slots to accept the wing spars should be cut out at this stage, and a trial fit of formers, intermediate deck and the nose yoke to the sides. The front forward of F1, is not pulled

in yet. If everything is satisfactory, glue to one side and leave to dry. The bottom sheeting between F1 and F2 is glued in next, then the other side. After the bottom and top stiffeners, fit the rest of the bottom sheeting. The sides forward of F1 are 'painted' with water on the outside to assist in bending and glued (with P.V.A.) to the nose yoke (hold in place with a clothes peg). Fit the aluminium tube socket for the nose undercarriage leg as shown. The tank plate of 1/32 in ply should not be too snug a fit or it will prove difficult to insert and extract. Note that the top of the fuselage is left open, and should remain so until the wing is glued in place.

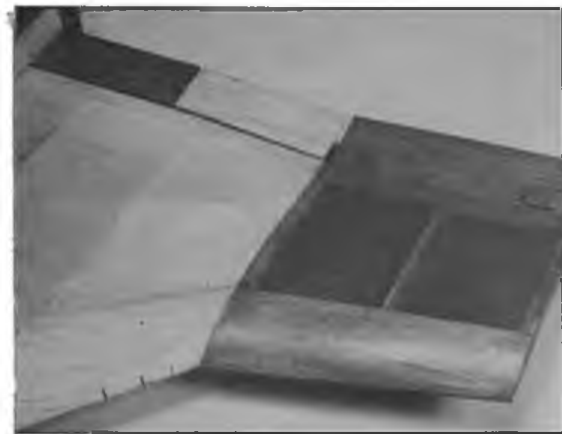
Wing

The main spar, top spar, and trailing edge extend to the centre line of the fuselage, but the leading edge is cut short to the inside of



the fuselage side sheeting. The main spar is in two sections with an overlap between ribs R3 and R4. These spars, together with leading and trailing edges should be fairly hard 1/16 in sheet.

Notch the trailing edge for the ribs and make the main spar as shown. Build the inner wing panels flat on the plan. Note the reinforcing root rib flange of 3/16 in x 1/16 in and the diagonal brace of 1/4 in x 1/16 in between this and the top spar. This brace is necessary to prevent the tension of the



There are three options for trim on both wings! Elevators, flaps and ailerons. See initial settings on plan.

covering distorting the straight lower edge of the rib which is eventually glued to the fuselage. When the inner panel is dry, prop this up and complete the outer panel — not forgetting to pack up the trailing edge to give the required washout. When all is dry, fit the wing sheeting and rib cap strips. Finally epoxy in the undercarriage sockets. If you wish, the wing may be covered and doped at this stage.

Cut the elevators, flaps, and ailerons from 1/16 in light sheet, and cover them with tissue for reinforcement. The hinges are not glued in place until covering and doping is completed. Note that the flaps and elevators are flush with the trailing edge, but the outer ailerons are located below the trailing edge to give a slot effect.

Fitting of Wing

Prior to fitting the wing, tissue cover and dope the vertical fuselage sides, cutting out the root rib location area using the rib template to ensure a wood to wood glue joint.

Each half wing is glued in place with P.V.A. After both wings have been fitted and the glue set, 1/16 in sheet joiners are glued at the trailing edge, main spar and top spar. The leading edge wing fillets are now fitted, using balsa cement as the surfaces to be glued are already doped. Do not be tempted to omit this fillet as it is not purely cosmetic. It performs the three vital functions of securing the leading edge to the fuselage, reinforcing the fuselage cut-out at the charging bay, and a brace for forefinger and thumb whilst charging the engine.

Finishing Fuselage and Fin

With the wing secured to the fuselage, the fuselage top may now be completed. First attach the tapered side piece behind the cockpit. Now cut out the inclined sides at nose and cockpit. These constitute a slightly tricky fitting job at the nose, but do reject any attempt which is not a good fit; this is the bit that hits the ground first! Again 'paint' the outer surface with water before bending to shape. Attach the top sheeting before glueing the rear section and accurately cut the slot to accept the fin spigot. The top and inclined sides are then tissue covered. Finally fit the fin and cockpit canopy.

Engine and pipework

The distance between tank and engine is such that an additional 7 in length of feed pipe has to be sleeved on to the standard length. This is available as a spare part. Soldering is a fiddly business, but

remember to keep all surfaces to be soldered very clean and wash the parts in thinners afterwards to clean off any flux. As there is a long contact area the sleeve may be stuck using cyano.

In the introduction, I advised that better performance can be obtained by using 6 c.c. of tank. The Brown 6 c.c. tank is rather expensive; an equally effective and cheaper solution is to put a further standard 3 c.c. tank in series with the original. This also is available as a spare part. The existing feed pipe from charging nozzle to tank is about 3 ins long. Cut it about 1 in from the tank, insert the two ends in the new tank cap after trimming and solder. The alternative tank plate is shown on the plan.

A small point here is that in earlier versions of the standard Telco engine, the cap of the orange coloured charging nozzle



Don't forget to reverse the prop on your Telco motor or you will find forward motion is minimal!

stands proud of the attachment lugs. With this type, open out the tank plate slot for the pipework to 5/16 in diameter to clear the cap or you will put stress on the lugs when tightening up the bolts.

The removable 'jet pipe' engine fairing, which comprises two sides and a bottom can now be made, two gussets carrying the cocktail stick dowels inserted in their bulkhead holes, and the gussets glued to the fairing. The propeller, turned round to run in the pusher mode, is then screwed on. I found the standard Telco propeller to be as effective as any.

Apart from any decoration to individual taste, the model is now complete. Mention has not been made of the undercarriage legs, as the plan gives all the information required. The model is *not* flown with the undercarriage in place, it is merely for display.

Trimming and finishing

The balance point is 5 5/16 in forward of the engine bulkhead. There is a tolerance of about 3/8 in forward or aft, but initially get it right by temporary plasticine ballast. The control surfaces have to be adjusted, and for a start alternative 'a' on the plan should be adopted. We are now in a position to try it in the air.

Most instructions say test glide, but as no offset thrust is likely to be required, you will be better off with a powered glide. Set the engine throttle so you can just feel the breeze from the propeller and launch level (or slightly upwards). Adjust ballast and throttle to get your powered glide, using differential adjustment of the ailerons to correct if it turns other than very slightly to the left. Once the glide seems satisfactory, the throttle can be opened up to test flight performance.

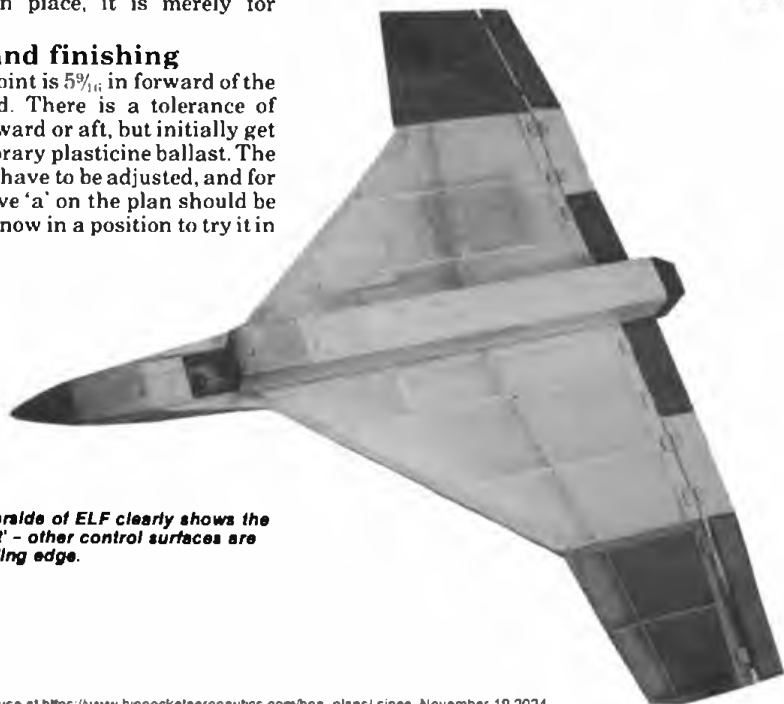
If the balance point is too far to the rear, recovery is slow, making trim difficult to achieve and generally resulting in stalling on the glide. Conversely with the balance point too far forward, this results in porpoising in flight, in the extreme case each cycle increasing in amplitude, leading eventually to a dive which embeds the nose in the ground! The glide is also too steep. It is only after careful observation of a number of flights that one can judge whether instability is due to use of excessive control surface incidence or wrong location of the balance point.

Adjusting the turn should be carried out by tweaking the rudder tab, since differential adjustment of the ailerons is likely to upset the longitudinal trim. It seems happier turning to the left.

The possibilities from trim adjustment are almost infinite, but personally I found that thrust angle and inner control surface alterations had only a marginal effect. Once trimmed to your satisfaction, the flight pattern is very consistent and performance with twin tanks and a liquid charge is very realistic. The weight of the liquid charge holds the nose down for the first 3 or 4 seconds, then with speed building up, the nose rises and the model zooms up at about 30° for some 60 or 70 feet before levelling out to a steady climb to about 150 feet.

By the way, if the engine is buzzing away quite happily, but the model just staggers around showing no inclination to reach for the sky, look at the propeller; have you remembered to turn it round?

I should, by the way, be very interested to hear from anyone who builds 'ELF' and runs into difficulties in trim or flight pattern. The prototype and I have done enough flying to feel that we know each other well, but there is always the possibility of a surprise. I don't think there should be any structural problems, unless it is trampled by a herd of elephants ...



View from the underside of ELF clearly shows the outer 'aileron slot' — other control surfaces are in line with the trailing edge.



THE GERMANS had an almost awe-some regard for the British *Sopwith 'Triplane'*, and the *Fokker Dr I* was intended as their answer to it. Paradoxically, the *Sopwith* machine was almost out of date when the *Fokker 'Triplane'* appeared: itself to be very soon outmoded.

Anthony Fokker, having been shown the remains of a *Sopwith*, told only some of what he had seen to designer Reinhold Platz. The latter, being really a "monoplane man", first produced a *cantilever* triplane. Such structures were little developed in 1917, and the wings shuddered alarmingly in flight. Interplane struts had to be fitted after all, but no bracing wires were employed for the wings.

The Germans had a large stock of *Oberursal* rotary motors: really 110 h.p. *Le Rhones*, and built under licence in Sweden. The 'Triplane' was essentially designed for this engine and when it was rapidly outclassed by British and Allied development, it was never satisfactorily possible to fit a more powerful motor. Also, it sometimes suffered from the collapse of wings in flight: *now*, bad workmanship appears the cause of this; however, at the time, the German authorities thought design faults were to blame, and called for various alterations.

Nevertheless, the 'Triplane' had a brief period of glory. Superb climb, and aerobatic capability more than compensated for its rather low speed. Ace pilots Richthofen and Voss scored many victories with the 'Triplane', though each was ultimately to die in one. It was considered tricky for lesser pilots though, and after production of only about 300 of the type, most surviving machines were withdrawn from the front, and after having their guns removed, were relegated to training duties. It is thought the Allies destroyed all but one of them at the end of the war, and although this was exhibited (in very non-standard form) during the 'thirties, even it was lost through bombing in the Second World War. Thus, no original *Fokker 'Triplane'* remains, though probably more replicas have been built than of any other aircraft. These often appear in films, but none appear to have genuine rotary motors. Maybe the "Red Baron" image is the main reason for the lasting popularity of the *Fokker 'Triplane'*.

Wings

The wings, for lightness and strength, are similar to those of pre-war *Frog* flying scale models, having a minimal structure covered, in this case, with *Daler "Canford"*

making sure the "grain" runs span-wise, and crease, not too sharply, for the leading edge. Curve slightly for undercamber, and apply to the underside of the framework first. P.V.A. woodworking glue is best for this purpose, and pins can be used if need be. When dry, cut excess away from ends and t.e., being careful around the scallops. Now apply glue to the top of framework and pull the cover paper down to the t.e., being careful to 'adjust out' any warps at this stage. When dry, trim as before. Cement the soft balsa wingtips on in rough form and trim them to shape with a sharp blade and sandpaper. Make slots in the wings where the interplane struts will pass. Ailerons are cut and sanded from sheet balsa, tissue covered for strength and fitted with zinc gauze hinges slotted in and embedded with cement.

FOKKER TRIPLANE

A 1/20 scale free flight CO₂ powered model with novel wing construction by Richard Halfpenny

cover paper, which is available at art shops. There is a great range of colours, but cartridge paper may be used, if you do not want self-coloured wings.

Pin out the balsa framework, propping up the front of the trailing edge with 20 s.w.g. wire to get the right section. When cement is dry, lift and sand in the scallops with sandpaper wrapped around a 1 1/2 in. diameter dowel. Cut pieces of cover paper oversize,

Fuselage

The basic fuselage framework is self explanatory but it is worth mentioning that a point not immediately obvious about the *Fokker 'Triplane'* is that the centre line of the airscrew is a little below the centre line of the fuselage. This means that the engine cowlings is a little wider at the lower corners of the fuselage than at the top. Consequent-



ly, on the model, soft balsa fillets are added here. They should be sanded to blend with the ply firewall.

It will also be noted that there is some reinforcing of the frame below the cockpit to take the pressure on the filler valve and to strengthen the lower wing.

Cement or epoxy the tubes in place for the undercarriage and centre section struts. Cover the top decking with postcard material, leaving a gap for the middle wing. Add all the structural details shown. Cover with lightweight *Modelspan*. Do not try to do the sides in one piece, because of the tapered fairing behind the firewall.

Middle and lower wings should "slot" into

Right, in fitting wings and interplane struts take great care in getting the alignment correct, before gluing. Alloy mesh used for machine guns, looks authentic...



Left, main components prior to fuselage covering and assembly, picture in the background shows one of the Fokker Dr I variants. Below, rear surfaces were increased in area slightly, otherwise model is pretty exact 1/20 scale.

place. Check alignment carefully before cementing. Scraps of tissue are all that is needed to fair the middle wing into the top decking. The tailplane, which can be easily assembled on a piece of glass over the plan, and sliced away when the cement is dry, can be added after covering. Make sure to cement the tissue at the points where it joins the fuselage. Tailplane struts are cocktail sticks sanded flat; cut to length, and then pointed and embedded in the rear spar, while the other end is PVA glued to the fuselage. The rudder is fitted by means of a single zinc gauze hinge, similar to those of the ailerons.

Wirework

Bend up the piano wire struts for the undercarriage and cabane (centre section).

When the simple undercarriage "wing" is ready, fit the ends of the u/c struts into the ends of the fuselage tubes. Fit the wing between the legs, and pass the axle under it, through the apexes of the wire. Lash with fuse wire, and apply Super Glue to these joints: also to the fuselage ones. A patch of sheet balsa should now be cemented over the lower ends of the legs to bond them to the ends of the wing.

Wheels should be Great War pattern, held on to the axle by short pieces of hard plastic tubing Super Glued on.

Similar procedure with the cabane struts. When they are in place, pass the ply interplane struts through the slots in the three wings, and glue them with PVA: check all alignments most carefully. When dry, use a few turns of button thread, pulled

through with a needle, to tie the top corners of the struts to the centre ribs of the top wing. Leave long loose ends at the front: these are the bracing wires for cabane and u/c. Lead them through holes pricked in the top decking; pull out beneath the fuselage; twist around top of front u/c legs, and pull them into slight nicks in the end of the u/c wing. Leave an end, so they can always be tightened. Apply PVA glue to the thread lashing of the wing.

The acetate, or celluloid, dihedral baffles, to compensate for lack of dihedral, should be Super Glued to the struts. For exhibition purposes, they can be left off.

Engine mount

Make a wooden block for mounting the CO₂ motor to give about six degrees downthrust, and two degrees sidethrust to the right. Three cylinders should be visible below the cowl, and two dummies should be made. Mine were turned from aluminium, to match the *Telco* cylinder, and provided all the forward ballast needed.

The balsa cowl is self explanatory, and the CO₂ piping should be arranged as shown, with the tank packed in place with foam plastic, and projecting a little into the slipstream. The underside front bay of the fuselage is left uncovered to facilitate this.

Finally...

Colour and decor of the model can be individual. Mine is based on a full size machine featured in a recent *Scale Models* "Warplane Special".

Check that the point of balance is about half chord of the top wing. Nose weight can be added by more coats of paint on the cowl. Set the incidence of the ailerons to match that of the tailplane.

Although the model is very crashproof, try to test it over at least short grass. Fore and aft trim can be adjusted by weight distribution, but ailerons and rudder should be set to prevent rolling and turning tendencies. On full power, the model tends to climb like its full size counterpart, and seems to prefer trimming for straight flight. Remember: it is always best to adjust ailerons UPWARDS. Downward adjustment increases drag on the wrong side, and can have the opposite effect from that intended.



AT THE LAUNCH PAD with John Wheddon

Model rocket stability

Most people recognise what is meant when the term stability is used about model rockets. Ideally the rocket is required to follow a predictable, stable flight path and not be too adversely affected by variations in wind strength and direction. Following from this it is understood that a stable model will automatically correct any disturbances in its flight path.

In full-size NASA style rockets there are complicated on-board systems using sensors, gyros and computers which sense deviations from the required flight path and utilise a variety of rocket thrusters and control surfaces to achieve the necessary in-flight corrections.

The full size solution is not applicable to models (yet!) so the stability has to be *designed* into models at the start. The methods involved in this design exercise and the pre-flight checking are really quite straightforward and involve ensuring that the rocket's balance point (centre of gravity) lies in the 'correct' place and checking that the fin area is appropriate to the body length and diameter. The centre of gravity (CG) of an object is the point through which its weight appears to act. Its position may be located simply by finding the point along the rocket body at which the rocket balances. It is important to remember that the CG position of a rocket may change considerably as the propellant burns so



Young Andrew Wheddon puts into practice Dad's swing test rule - model is an Estes 'Maxi Alpha'...a big fun bird! The 'Maxi Alpha' makes a fine demonstration model.

model is vital to stability.

The exact position of the CP can be calculated but the method can sometimes be rather lengthy... so it will not be discussed here! The "Handbook of Model Rocketry" by G. Harry Stine describes a method and both *Centuri* and *Estes* publish detailed reports on CP calculation.

Fortunately for us there is a very simple way to determine the approximate CP location. A full-size plan-view (or reduced but to exact scale) of the model, cut from thin card will balance very close to the CP position (Fig. 1). So having located both CG and CP the important consideration for stability is to ensure that the correct relationship exists between them. **CG must always be ahead of CP** (Fig. 2). There is an optimum separation of the two points for any particular rocket design, but fortunately another good rule of thumb comes to the rescue. In normal rocket shapes it is good practice to separate CG and CP by a distance equal to the average diameter of the body tube (Fig. 2). This provides a safe margin and also allows for the awkward truth that the CP position also varies in flight! As the model is disturbed by a gust, and the angle of attack increase, the CP moves forwards (Fig. 3).

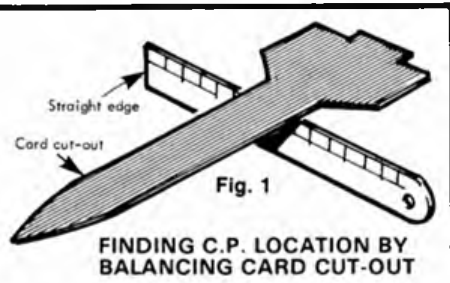
New designs can be checked for stability before launch by making a simple swing check. This is also a useful check before launching a model with a more powerful,

heavier engine (which may move the CG back further than you expected!). The swing check is carried out by first fully preparing the model for flight (with the recovery system in place and an engine installed) to ensure the accurate CG location. Then the model is suspended at the CG in a loop at the end of a 6 - 10 ft. length of string. The loop can be secured in place on the rocket with adhesive tape. Check that the area is clear of obstacles and then swing the model around in large circles.

Stable designs will fly smoothly around the circle, nose first, without any tendency to swing out, tumble or fly backwards. Models which do not pass this check easily may well be unstable and must not be launched before correction.

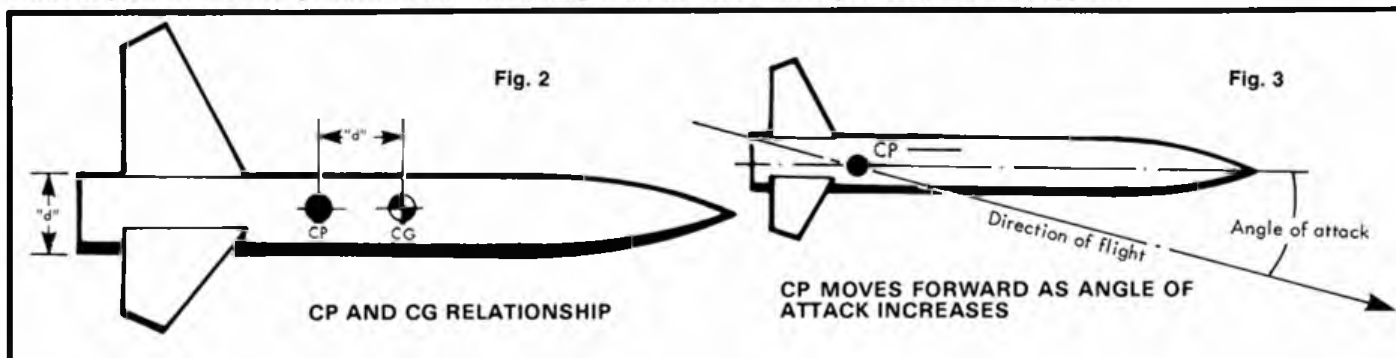
Instability revealed in a swing check can be corrected by adjusting the CG or CP location. CG correction is simplest - just add ballast to the nose-cone ensuring that the extra weight is securely attached. The CP can be adjusted (moved back) by increasing fin area. This can be achieved by adding extra material to the existing fins or by starting again with redesigned larger fins.

After making adjustments to a model the swing check should be repeated until a satisfactory result is obtained. It is also a good idea to check kit models before flight - just to make sure that no important components or weights have been omitted. It has happened!



when checking CG the model should be in pre-flight condition. That is, complete with a new motor or the exact equivalent in ballast and the necessary parachute(s) or streamer.

Fins are fitted to rockets to provide the required aerodynamic forces which will stabilise the flight. All of the aerodynamic forces acting on the model appear to concentrate at a single point known as the centre of pressure (CP). Its position on the



SCALE MATTERS

Free Flight with Bill Dennis

Czech scale

I recently received some photographs from Lubomir Koutny of Czechoslovakia; judging from the accompanying report, there is a very healthy free-flight scale scene over there, although it appears to be almost exclusively rubber. Lubomir does not go into great detail about how their contests are run, but it appears that the models are built to a common scale of 1/20, and that the flying performance is judged by duration. Certainly the flight times quoted for these models are much higher than those regularly seen in the U.K. - in many cases well over a minute. The models are immaculately built, using a large number of stringers to give a convincing shape to these predominantly WWII aircraft. The finish appears to be of coloured tissue, no doubt to keep weight down, although as I have said before very little will be added by a carefully applied spray finish.

The *Messerschmitt Bf 109H* 'stratosphere special' is a new one to me, but its proportions are ideal, with a very long nose. Another aircraft I have never heard of is the 'Arsenal' of Peter Koutny. Interestingly, another photograph of this model reveals an undercambered wing section, which would give more lift and a slower flying speed at the expense of not too many static points. The major problem with these clean monoplanes is not stability but excess speed, particularly at launch.

Indoor meetings

Nottingham MAC is holding a series of indoor fly-for-fun meetings at the Nottingham University Sports Centre on February 10th, March 10th and April 14th, between 6 p.m. and 9 p.m. The hall is 120 ft. x 120 ft. x 29 ft., and provides the ideal opportunity to get those scale models sorted before the Indoor Nationals (28th April, Alumwell Centre, Walsall...hint, hint). The centre is on the University Campus which is situated at the junction of the A52 and the Nottingham

A line up of WWII 1/20 scale fighters by Lubomir and Peter Koutny. Clockwise from the left they are: Re-1005, Arsenal V6, Yak-3, Bf 109E and F



A line action shot of Ing. Lubomir Koutny's 1/20 scale Yak-3...model flies for about 50 secs.

ring road (A614). Those travelling north on the M1 should leave at junction 25 or 26 if travelling southward. The contact man is Doug Hunt, Derby 672362.

Control Line with Vic Willson

Control Systems cont... Lines

Following on from last month's article dealing with handles and bellcranks suitable for control line scale models, this month's topic is the all important one of what lines... Whilst a poor choice of handle and/or bellcrank can adversely affect the performance of a control line model, badly made or maintained lines can be disastrous. In fact I have witnessed two scale models (and one carrier model) written-off by line breakages this season.

All the models we are dealing with will be flown on stranded steel lines, normally either three or five strand, tinned (*Laystrate*) or stainless (*Sullivan*). The stainless variety are much to be preferred and although more expensive initially, more than justify their cost by their superior durability.

Insulated stainless steel lines are also available and have specialist use for electric or electronic control systems. Although they are relatively heavy, with their nylon

sheathing, in practice they do not appear to have any drag penalty over conventional lines and additionally they have the advantage of being very resistant to kinking. The methods described here are very basic (some may think crude), but they are quick and reliable, require no special tools or expensive gadgets, and have served me well over the years for both sport and competition flying.

Forming the ends: Many ideas for forming the end connections on control lines have been used over the years, involving soldering (not easy with stainless steel), glueing, binding, etc., but although many of these methods have stood the test of time, I personally find the following method the simplest, especially when making lines to length on the flying field.

Select a piece of copper, brass or aluminium tubing of sufficient internal diameter to accept four strands of the line to be used. Cut the tube into a short length (approximately 10mm) by rolling under the blade of a *Stanley* type knife, pass the end of the line through the tube (Fig. 1) and leave a generous length to form the loop, etc. Run the end round to the other end of the tube and pass it through again (Fig. 2), pull the line tight - it will now be 'locked' around the tube - form a suitably sized loop and pass the end of the line back through the tube once more (Fig. 3), then run the end round and back through the tube for the fourth and last time (Fig. 4). The line is now held by the tube and all that remains is to crimp the tubing in a couple of places (Fig 5). We now have a strong, quickly made line connection loop, that I have used for models weighing in excess of 10lbs.

One final refinement that can save time and confusion on the flying field is to put a length of heat shrink sleeving over the line so that when the loop is finished the sleeve can be pushed up over the metal tube and shrunk in place with a cigarette lighter or match. This not only makes for a neater job, but also enables the lines to be colour coded. I use red for the down line, blue for the up line and white for the throttle. This minimises the chances of connecting the flying lines incorrectly with disastrous results or, less drastically, connecting the throttle line to one of the elevator lead-outs. This can be very disconcerting if not noticed before take-off!

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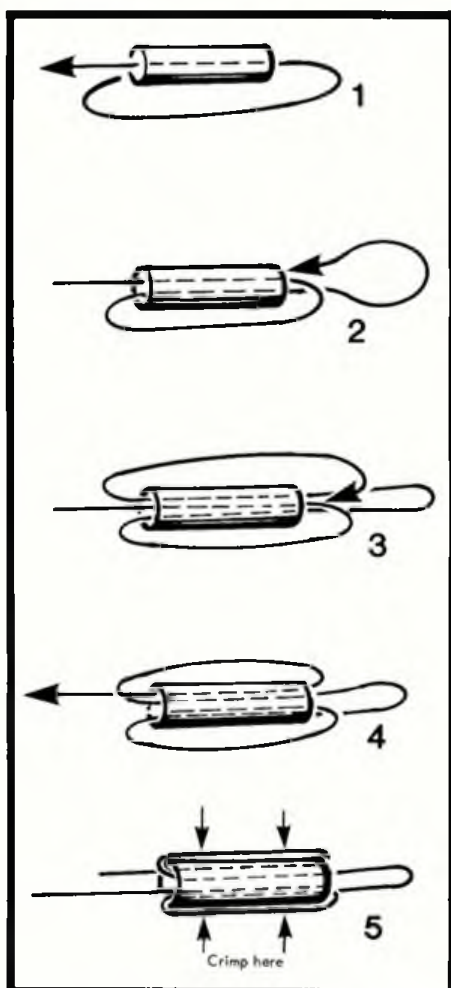
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Once one line has been made up to the required length (usually in the range 50ft. - 65ft. for scale models powered by 0.40 cu. in. - 0.60 cu. in. engines) one end should be fixed, i.e. over a nail driven into the ground, then the second line is correctly positioned. If this method is followed both flying lines can be attached to the same point and pulled tight to ensure that the final loop of the second line should end up exactly the same length. The third (throttle) line is a different matter. I prefer to make just one loop initially and then, with the flying lines attached to the model and the handle, connect the third line and make the final loop as appropriate.

Split links: For quickly attaching and disconnecting the lines to the handle and model(s) and also to prevent the line loops from becoming frayed and worn I use split links as sold in all fishing tackle shops in various sizes. These are normally sold with 'swivels' attached - discard these swivels as contrary to popular belief they do not prevent the lines becoming twisted but have been known to break suddenly with the expected result...

The links should be confined to one at each end of the lines, not as is sometimes seen, half a dozen assorted split links, swivels (perhaps even a small key-ring!) the result looking rather like a sales display of available fishing tackle. If this sort of arrangement is necessary the lines are not the correct length - every link is a potential weak link.

Storage: Now that you have a set of new lines, take care of them. Remember, that 1000 hour scale masterpiece has one line

break between it and reverting to the myriad components that it was made from!

To store the lines I use a twelve spoke nylon push-chair wheel (approx. 5½ dia.) with the tyre removed. Cut a slot in one side of the rim and screw a small cup hook into the nearest spoke. The lines can now be unhooked from the handle, attached to the wheel and with the index finger of each hand inserted through opposite sides of the spokes, the wheel is turned into a reel.

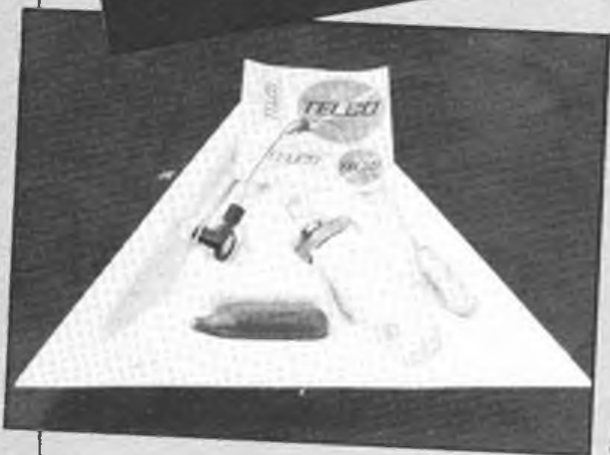
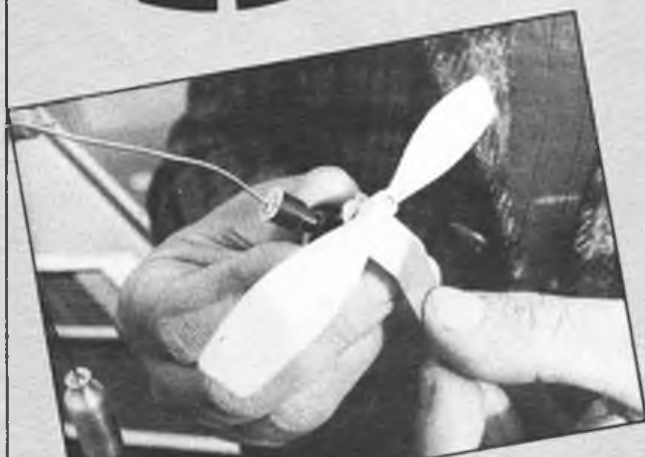
Wind in the lines (2 or 3 together) steadily against the tension of the model; finally detach the lines from the bellcrank lead-outs and secure them to the reel with a wide elastic band. A length of masking tape wrapped round one spoke is useful to note relevant details of the lines, i.e. length, date first used, any peculiarities, etc., and to protect against damp and corrosion (or for prolonged storage) the reel should be sealed in a polythene bag.

Unroll the lines in the reverse order, but before attaching them to the handle, moisten a piece of soft cloth with a mixture of 25% 3 in 1 oil and 75% paraffin and gently run the lines through this; checking for any kinks, broken strands, or other damage - you will be surprised how much dirt comes off the lines and how 'sticky' they become if not regularly cleaned. If one or both lines are suspect in any way - destroy them (do not leave them on the flying field) - don't be tempted to 'take a chance', it could be very dangerous not only for the model, but also for any spectators present.



WIN!

A Telco CO₂ Motor



Ico Telco Telco Telco Telc
The CO₂ motor for everyone!

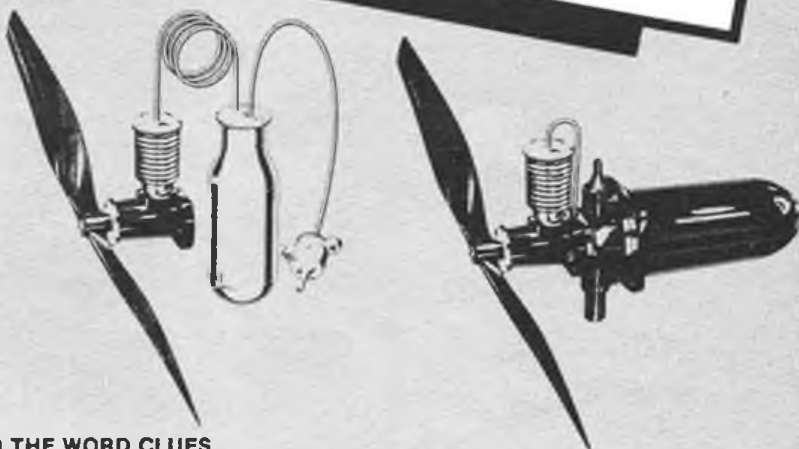
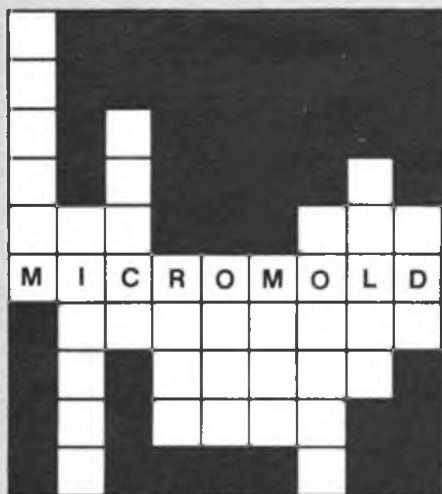
CO₂ motors can be safely used by everyone, from the novice to the expert, in or out of doors. There are no starting problems, little noise and no mess. Aeromodeller has two Telco CO₂ motors kindly donated by Micro Mold (the distributors for this competition — one standard version and one Turbotank 3000). All answers to the "find the word" puzzle can be found in the pages of this month's Aeromodeller — so get to it — read our mag then send off your entry. Just nine words to find and we've given you one vital letter for each word.

It's easy to enter, clip out your completed cross word and post it to:-

Aeromodeller Competition
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 Hemel Hempstead,
 Herts HP2 4SS.

COMPETITION RULES

1. The competition is open to all UK and Eire readers except employees of Argus Specialist Publications Ltd., their printers and distributors.
2. As long as an original cross-word from the magazine is used for each entry there is no limit to the number of entries per person. Photocopied cross-words will not be accepted.
3. All entries must be postmarked before 28th February 1985.
4. The prizes will be awarded to the first correct solutions drawn.
5. No correspondence will be entered into about the competition results.
6. The judges decision is final.
7. Winners will be notified by post and the results will be published in a future issue of the magazine.



FIND THE WORD CLUES

(All down — left to right.)

- 1) They make a 'Staggering' kit
- 2) Swedish forerunner to ELF
- 3) John W. writes aboutmodelling
- 4) Model Kits
- 5) Make of catalytic soldering iron
- 6) Billington's Engine Test
- 7) World War 1 CO₂ flyer
- 8) What this is all about
- 9) Gregor ... 1

ENGINE TEST

The tiny Telco CO₂ engine comes under Mike Billinton's magnifying glass...

AN ENGINE REPORT with a difference...operating at almost the lowest torque levels likely to be encountered by most modellers, the British made .06cc. Telco single cylinder engine seemed the most provocative choice your Editor could make with which to confound the new 'small Dyno', claiming as it does reaction sensitivity of 1/2 gm. cm.!

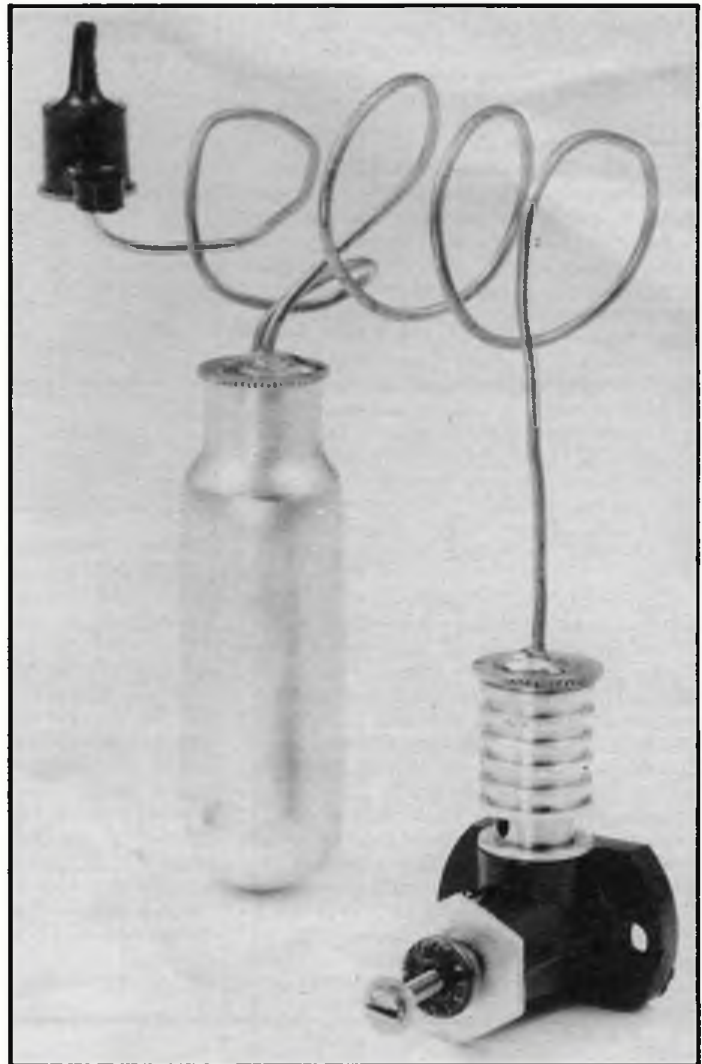
In fact the only problem proved to be the continual purchasing of CO₂ Sparklet charging cylinders to keep the test rolling because the unusual nature of this engine type threw up an array of assessment methods. After some 250 runs the 3 graphs encapsulate most of the information obtained.

The Telco's small cylinder capacity — around 1/3 size of the smallest Cox (.010), provided a curious contrast with last week's OPS 30 cc 3HP monster, however it seems the American Brown motor goes down yet further to 1/3 of the Telco size — at .02cc.!

The concept of using an external power source pipe-fed to cylinder (as opposed to a normal model engine burning its own fuel internally) is hardly new in the full-size world, with steam and compressed air engines being the prime movers from the earliest period of the Industrial revolution. Its use also featured in much model airplane activity in the early days of aeromodelling. However the modern CO₂ motor represents a triumph of scale such that, unlike that very creditable earlier activity, is now of such small size as to easily allow Indoor flying, and where the relatively high Torque level at low RPM uniquely available from the 'Gas' engine slots in very favourably with Duration events when compared with the almost opposite concept of the 25,000 rpm plus of a Cox 010.

Typical outdoor models for the Telco CO₂ motor would have wingspans up to 28in. with all-up weight up to 3ozs. Whether such

Shown here larger than life size, the Telco CO₂ engine and its associated spun aluminium fuel (gas) tank and charging nozzle. Spare tanks can be purchased and "added on" if you wish to extend the engine run of these popular miniatures. Normal retail price is £11.45.



a diminutive 'simple' power unit such as the Telco CO₂ benefits from the data arrived at here, now hardly matters — the figures are down on paper — for those for whom flying and enjoying is not enough.

Mechanical details

Constructional standard was, to this writer's eye, at an unexpectedly high level, for it is easy to see that the extremely small dimensions involved could lead to continual manufacturing headaches.

Piston: Of some help is the considerable use made by Telco Systems of precision injection moulding of certain critical parts — after all, the idea of producing, say, a piston ring to fit the Telco bore size of .18in. to withstand the 700 psi. charger pressure hardly appeals — so the use of a dimensionally stable plastic (*Hostaform*) for the piston and having slightly oversize flexible piston crowns (similar to pump plungers or hydraulic seals in braking systems) has proved surprisingly efficient. **Ball-valve:** A small projection on top of the piston crown opens a stainless steel ball (a one-way pressure relief valve) at the top of each stroke, and so admits an amount of 'charge pressure' into the 'above piston space' — this can't be called the combustion chamber, but it's the same place — The ball is housed in a hard plastic moulding which is clamped between the brass cylinder head and a shoulder in the cylinder.

Crankshaft bearing. The length of time the ball remains open is controllable within limits because the minute steel crankshaft runs in an eccentric aluminium alloy bush bearing and so 'top of stroke' position can be varied approx. .020in of which in practice only half is usable. Crankpin size is below 1/16in.!

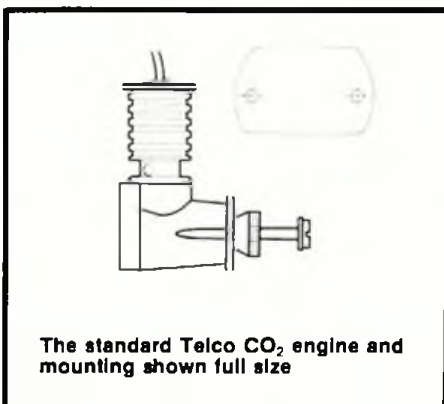
Connecting rod: All of 1/4in long between centres and easily lost under a thumbnail, this is constructed in solid phosphor bronze. It uses the familiar ball and socket little end — which in this engine then allows for its tight push fit into the plastic piston.

Prop-driver: In hardened steel, and about the size of a 4BA nut, this is a tight press fit onto the crankshaft nose.

Crankcase: The eccentric crank bearing is a tight sliding fit in the moulded black nylon crankcase which, though also only of thumbnail size, nevertheless incorporates all the precision work necessary to align crankshaft and cylinder.

Cylinder: Of aluminium alloy, and screws into the top of the crankcase. The bore size of 4 1/2mm. could have been a nightmare, but the critical sizing and surface finish is achieved here by a simple 'extrusion' process which forces a highly finished steel ball through the initially undersized bore. Two small exhaust ports are uncovered at the bottom of the piston stroke.

Ancillaries: At all critical points 'O' ring sealing is used. Copper piping has .020in



The standard Telco CO₂ engine and mounting shown full size

bore and is quite fragile. The weight of the aluminium alloy 'flight' tank is also kept commendably low at 4 grams, yet remaining sensibly robust enough to withstand the high pressures.

Performance

The standard grey nylon propeller (also 4 grams) is unusually sized at 5½ in diameter by 6½ in. pitch. This large pitch is used to fit in with the motor's normally low rpm levels. Possible rpm spread with this prop fitted and using the range of throttle settings, varied from around 600 minimum to 5,000 maximum.

The standard small 2.8cc. flight tank allows only a very brief period at high rpm at high throttle, and so measurements of rpm were somewhat hampered by the 1 second count time of the rpm counter used!

Very much lower rpm is possible (and thus considerable duration increase) if motor is fitted with larger diameter propellers (8 in) as are used in Indoor contest duration events.

Clearly the small flight tank provided a swiftly declining power source when using larger throttle openings and which give longer gas release times; therefore the Dyno testing of this engine/tank combination presented interesting features to say the least! Tank size affects length of the initial power burst as well as overall duration, whilst ambient temperatures affect CO₂ cylinder pressure (can be doubled at 40°C.) During this test temperature remained around 20°C and at which the normal 700 psi. obtains; whilst throughout all tests only the standard small flight tank was used. Both these points placed constraints on performance level and measuring methods.

However, the object was to achieve some

Again larger than life size, the components of the Telco. Clever use of modern plastics have made this CO₂ engine the success it is.



meaningful figures for the 'standard' product. Other tanks/other pressures will of course result in differing performance.

Continual monitoring of torque and rpm at 5 second intervals during each tank run was the normal procedure. Effect of different throttle settings clearly showed in both swiftness and amount of power release, as well as in duration terms. Differing loads, whilst using the same throttle setting enabled a power curve to be arrived at and having a similarity with I.C. engine performance curves, though it must be stressed that this indicates the power level reached only during the early stage of each charge release. Thereafter a varying decline sets in.

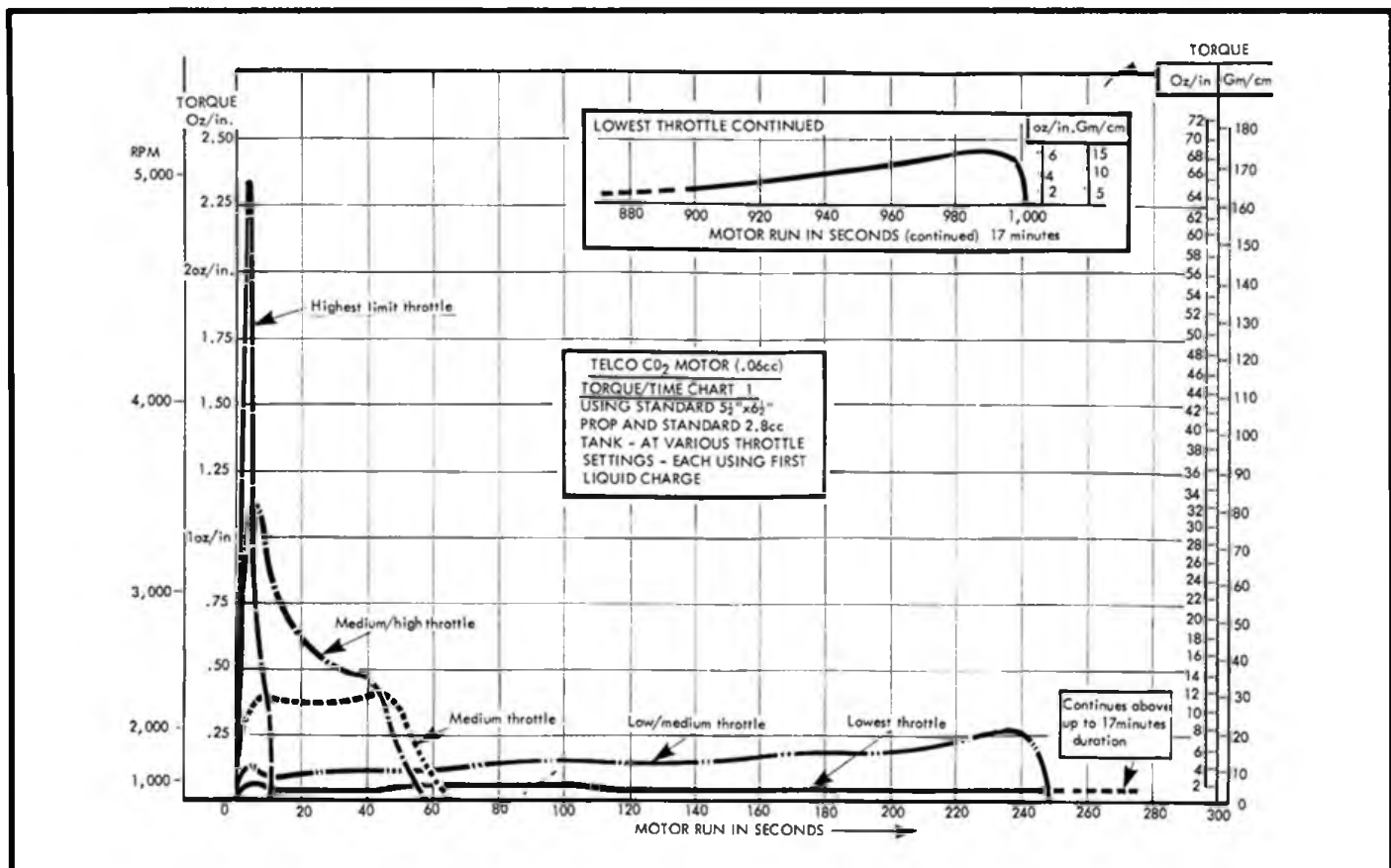
Contrary to some expectations, variations

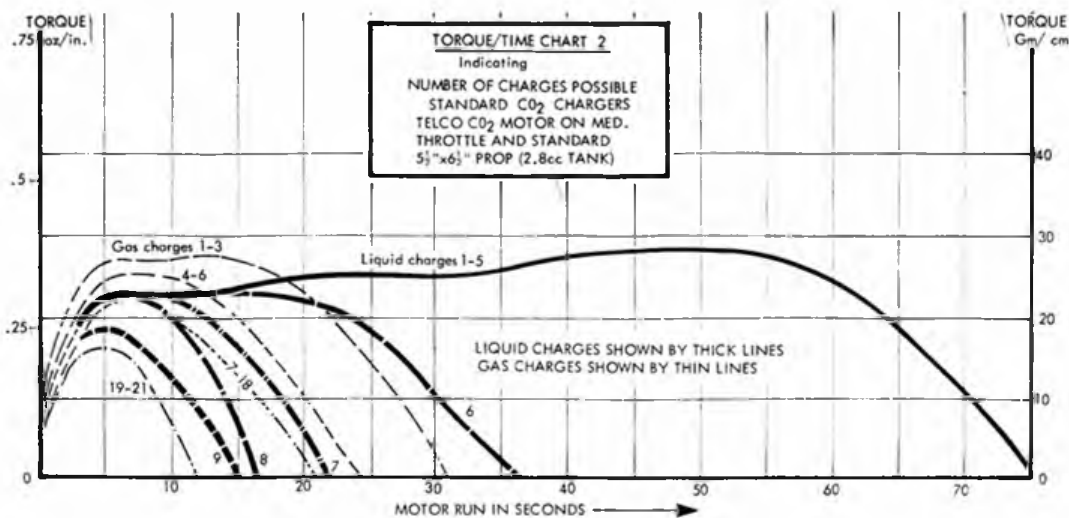
between *Sparklet* bulbs was not troublesome once consistent filling and operating procedures were adopted.

In all cases where it mattered, a new charger's first charge was the only one used; in order to obtain consistency of results.

Stall Torque: Both as measured on the dynamometer and as double checked rudimentarily by a spring balance at the propeller tip, this figure consistently averaged around 20oz. in. (equalling 1440 gm. cm.). On occasion this could be raised to 2000 gm. cm...So, some little way from quoted 19.20 gm.cm...Either the decimal point has slipped 2 places in the literature, or this tester is in error!

In fact the normal low-speed *running* torque itself was usually around that 19gm.





cm. area, with 100 gm. cm. often being 'snap-read' on high throttle.

Stalled (stationary) torque with piston fully exposed to maximum tank pressure should be very much higher even than that. Significantly, theoretical calculation based on charger pressure/piston area/crankpin throw, also comes out to similar figures of 20 oz. in.

Quoted figures for HP were almost exactly realised — at .003 HP at 2,500 rpm, though at higher rpm of 8,000 the rapid power release almost doubled this value. In both cases this was when using 'high' throttle position.

On strip-down the engine was in good condition and looked ready for much extra duty.

Summary

The writer is relatively inexperienced in matters CO₂, and the rich history of this power source was not too familiar. Clearly much time and effort has gone into these small, very viable engines and this test provided opportunity to learn much more. It also allowed a welcome reappraisal of engine test techniques.

The Telco CO₂ itself operated in exemplary fashion and even happily went through 3 deliberate 'shaft-runs' at 14,000 rpm in pursuit of rumoured performance increase after being so operated. A simple 'before and after' test actually showed no change in torque or rpm., though it is probable the engine was by then already at a well enough run-in stage not to need such

drastic loosening-up procedure.

In all, the Telco proved an intriguing engine with starting characteristics stupefyingly simple, with most effort being needed to stop it starting itself on being charged. It is easy to understand the attractions of these units as self-contained power sources either for very light indoor use or outdoor model aircraft.

Finally, it proved to be the only engine the writer has so far found possible to test at dead of night in a suburban area. This one at least has solved the noise problem!

TELCO CO₂ Gas engine

Dimensions & Weights

Capacity	— .00366 cu. in. (0.060 cc)
Bore	— .177 (4.49 mm)
Stroke	— .149 in. (3.80 mm)
Stroke/Bore ratio	— .846:1
Crankshaft dia.	— .098 in. (2.489 mm)
Crankpin dia.	— .586 in. (1.488 mm)
Crank nose thread	— 646 in. dia x 72 tpi (10 BA)
Connecting rod centres	— .266 in. (6.7 mm)
Width	— .75 in. (across radial mount)
Height	— 1.025 in.
Length	— .630 in.
Mounting holes	— .550 in. (14 mm nominal)
Frontal area	— .47 sq. in.
Weight	— 13 gm (incl. Fuel lines and tank.)

Performance

BHP	— .0058 at 7,800 rpm (Medium high throttle)
	— .0030 at 2,500 rpm (Medium low throttle)
Torque	— 1.24 oz. in. at 1,900 rpm (Medium high throttle)
	— .42 oz. in. at 1,900 rpm (Medium low throttle)

R.P.M. Standard propellers:

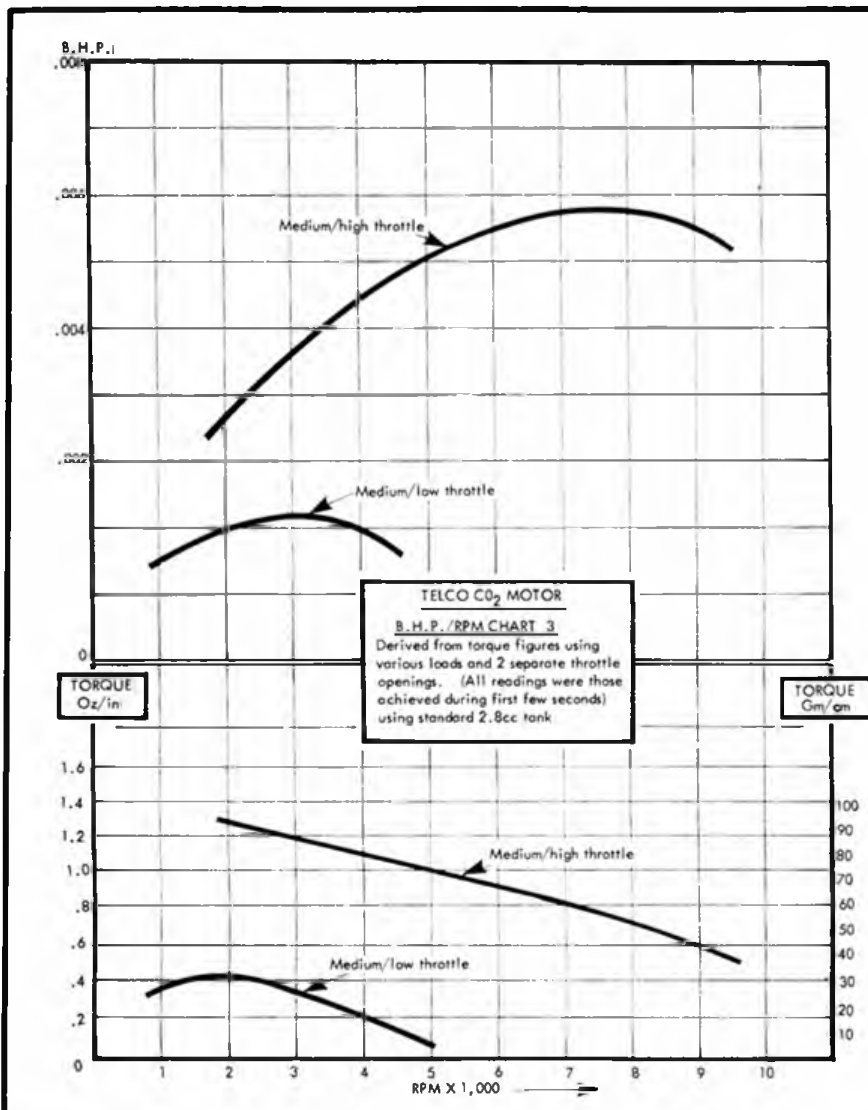
	High throttle	Low
8 x 4 Zinger	2,900	2,090
5 1/2 x 6 Telco	3,900	2,450
5 1/2 x 3 Grish	7,030	3,905

Performance Equivalents

BHP cu. in.	— 1.58
BHP cc.	— .096
Oz. in. cu. in.	— 338.8
Oz. in. cc.	— 20.6
Gm. metre cc.	— 13.3
BHP lb.	— .20
BHP Kilo	— .45
BHP sq. in. frontal area	— .012

Manufacturer:

Telco Systems,
Station Road,
East Preston,
Littlehampton,
West Sussex,
BN16 3AG.



Modelhob

BARON

Dave Cowburn reviews one of Micro Mold's Spanish imports — and enjoys it...

AS A KEEN control-line modeller I was very pleased to see *Micro-Molds* advert recently for a 'new' range of control-line kits. When the editor asked me if I would like to review one of these models I was delighted! It is some years since I last built a kit model so it was an interesting experience to once more look into a box of pre-cut bits rather than another sheet of wood.

First impressions

The box illustration shows a model of 'interesting' appearance, the style being quite in keeping with the modern trend in functional stunt design such as 'Uno' or 'Stileto'. Opening the box reveals a nicely packaged 'conventional' kit, hardware and smaller components being bagged while the larger die-cut components are retained in their sheets. The die cutting is so good, in fact, that at first sight I thought that plain sheet had been provided!

Well drawn plans are presented on two sheets, one for the fuselage and one for the wings. All components are drawn out on the plan so components needed to effect repairs, can be built from the plans. What instructions there are, are in the form of captions IN SPANISH but the plans are so detailed that anyone with a little experience would have no difficulty in interpreting them. (English notes are now provided.)

The plans are a pleasure to 'read' and a pleasant hour spent studying them before starting work on the model will be time well spent.

A very complete 'hardware' pack is provided which includes pre-bent undercarriage legs, wheels, tanks and even the tail-wheel, (always difficult to find in the smaller sizes). There was not, unfortunately, the very neat spinner shown on the box illustration but there are plenty of 1½ in dia. spinners available on the market ...

When building the model I wasn't quite so pleased with the wood supplied as I had

been on first opening the box, I felt that much of the wood provided was rather harder than necessary, especially as the sheeting is all quite thick, while some of the ribs were a bit soft. As this is a kit review I resisted the temptation to alter anything ... no problems occurred during building.

Building

The ribs were all eased from their sheets with the aid of a small knife to 'nip out' the corners where the die cutting blades had not quite met. The sections of trailing edge sheeting, spars and leading edges were then spliced together to give the lengths required for the whole wing — a task which requires some care as there is no spare length and the



Above, Dave's eight year old daughter Sara gives you some idea of the size of 'Baron'. Below, modern lines give this model a very attractive appearance.



job must be right at the first try (check twice, glue once!).

The bottom main spar can now be pinned down over the plan (port half if you have not cut and joined the plan) and the undercarriage spar glued in place. The bellcrank mount, complete with bellcrank is now glued in. Followed by all main ribs, holding vertical until set by placing pins at each side. Add bottom trailing edge (t.e.) sheeting and arrange lead-outs and push-

rod (the lead-out wire supplied is only just long enough, so do take care). The wing may now be moved to the other half of the plan and the rest of the main ribs fitted, together with top t.e. sheeting and top spar (which has to be relieved to clear push-rod). Add centre section brace to top spar, cap strips, riblets and leading edge. Glue in tips, lead-out tubes and tip weight.

The flaps can now be fitted after relieving the t.e. to clear the horn at full deflection (I did not like the large cut-out that this created, and added a bit of scrap balsa to compensate. Once the centre section sheeting is in place, however, this area is adequately stiff). The flap horn has to be bent up and the bearing tubes fitted, flaps drilled to take the horn and their 1/e rounded. Horn flap joint is reinforced with tape and the hinges are made with the same material. The push-rod can now be linked up and the centre section sheeted over.



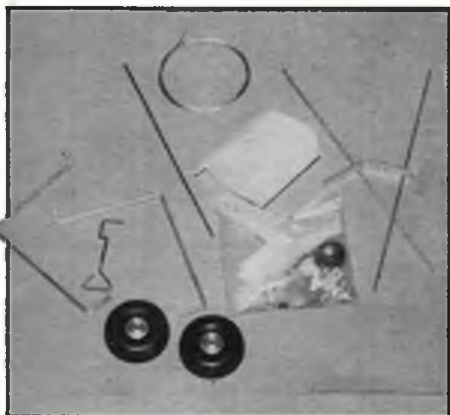
Baron, its box and assorted contents, the artwork of the decals is particularly striking. Kit costs £20.75 and should be available from your Micro Mold stockist.

Attention now shifts to the fuselage and the first thing is to check that the chosen motor will fit the bearer spacing. I used a P.A.W. 19 as I felt that this represented a likely choice of motor for modellers likely to build this model. It has a much narrower crank-case than that of the motor shown on the plan and bearer spacing had to be adjusted as a consequence. The bearer/former unit must be set up carefully and clamped until set. I used epoxy for this highly stressed area as it is also fuel proof.

While the bearer assembly is setting, the 1.5mm ply doublers may be added to the fuselage sides (take care to produce a 'handed pair') and left under weights to dry flat. While waiting for all this to set, make up the tail unit, rounding off the edges as shown on the plan and fitting horn and hinges as for the flaps.

Adjust the position of the engine so that the prop-driver will project through the nose block and mark through the engine bearer lugs with a sharp pencil. Remove the engine and drill for the engine mounting bolts. Check, and if all is well, counterbore the top side of the bearers for the captive nuts.

Temporarily bolt the engine in place and secure the captive nuts with a dab of epoxy. (Take care not to lose an engine bolt as they are not a size commonly used in Britain.) Fasten the tank into place, drilling F1 and filing the port bearer to clear the vents. Arrange suitable scrap packing to ensure that the tank is well held.



Hardware pack - pre-formed undercarriage legs will help prevent lopsided models! Note the neat tailwheel hiding away in the plastic bag.

The 'power pod' is now ready to be joined to the fuselage sides and it is a good idea to fill the gap between the bearers and the fuselage sides with scrap balsa to increase the glueing area. Add the remaining fuselage formers and draw sides together at the tail.

Glue nose top block in position (fill the space between this and the top of the bearers forward of F1 with balsa to help stiffen the bearer assembly) taking care not to kink the tank vent extension. Add the cockpit rear former.

Check fit the wing and tail, holding temporarily with tape and pins, and make up the push-rod. Glue in the tail-plane with push-rod fitted then add wing and link up controls. Retain push-rod with star washers provided. Add remainder of fuselage under wing and glue and tape fuselage upper-rear sheeting to top edge of main fuselage sides. Do not glue to formers yet. The top sheeting may be dampened with water on its outer surface to render it more flexible so that it may be moulded to the formers. Glue the

formers and hold the sheeting in place with plenty of tape until thoroughly dry. The top edge may then be cleaned up and the remainder of the fuselage blocks, cowling and rear decking, added. Sheet over fuselage bottom noting that the wood supplied for this should be cut into short lengths which are glued in place 'cross grain'. This greatly stiffens the fuselage 'box' in torsion.

Fit the fin and strake (after first sanding to aerofoil shape). Any small dents and blemishes should now be filled (*Polyfilla*) and the model sanded overall to a smooth finish. The wing root fairings should now be fitted and the whole model given a couple of coats of thin dope. At this stage I covered the fuselage of 'my' model with light-weight



tissue (not supplied) and the flaps and tail with some of the tissue supplied in the kit. I did not cover the wings until after painting and fitting the cockpit canopy to reduce the risk of damage while handling.

When the cockpit interior was thoroughly dry the canopy was held in place with tape and glued down by lifting one section at a time and introducing balsa cement into a prepared groove. Pins and tape then held the canopy down until thoroughly dry. The canopy was then masked off and the edge faired into the fuselage with a little cellulose filler (car boy putty) and the joint covered with strips of tissue and dope. This produces a very neat joint.

The wing was then covered, using separate pieces of tissue for the tips, and several coats of thinned dope applied (about five). (Small scraps of 3mm balsa were used to seal the ends of the U/C mount slot and give something for the tissue to stick to.)

Final finish was achieved by lightly blowing over with white primer (car body spray can), and a couple of coats of enamel applied very sparingly. Add Decals, fuel-proof and fit engine and undercarriage.

On the field

Eventually the day dawned clear and bright when I could take the 'Baron' to the club field, only to find a rather stiff breeze blowing from the most exposed quarter. Nevertheless, caution was thrown to the winds (groan) and after a couple of flights with lesser models to test the air 'Baron' was connected up to the lines, the tank filled and the motor started. The P.A.W. 19 was tuned up to full power, to cope with the wind, and a rather anxious reviewer took up the handle.

A short run and the model was smoothly into the air. Keep it low to build up a bit of speed to 'penetrate' the wind and the 'Baron' is flying well. A few 'wiggles' to check the control response, smooth in level

flight but plenty of 'bounce' and within half a dozen laps I tried a loop. Entered gently and pulled tighter before recovery 'Baron' went round easily and gained several metres of altitude for a safe recovery.

Then on to try a few more basic manoeuvres. Loops, bunts, lazy eights and wing-overs all flown with ease despite the rather stiff breeze, showing that the P.A.W. 19 had adequate power for this model and that the pilot was enjoying himself!

Level flight showed the port wing to be slightly low so before the second flight slight trimming was carried out by giving the flaps a slight twist to induce a roll in the opposite direction. Fuelled, engine started, and off once more. Reverse wing-over, consecutive loops and bunts, stunt eights as

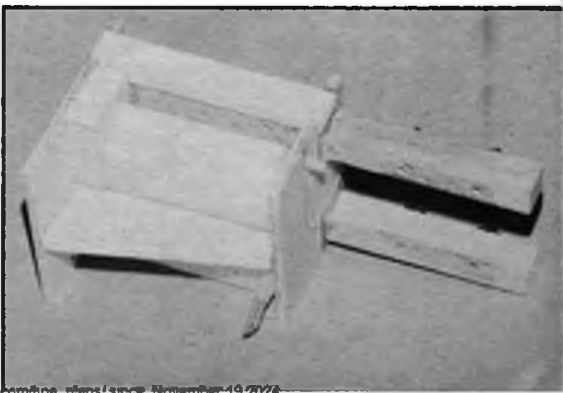
Baron just prior to finishing cockpit interior. Whitish patches are Polyfilla, used here to fill dents and blemishes.

well as 'lazy-eights' and a couple of vertical eights. The turning power of the model proved to be adequate to do the vertical eights with plenty of altitude to spare.

Conclusions

A nicely produced kit, a pleasure to build and fly. It is not a model for the raw novice, but for anybody who has built a couple of trainers and then learnt a few basic manoeuvres with a combat model it makes the logical next step. My only real criticism of the kit is the fact that all components are cut to exact size; there is no margin for error! Anybody who wants a more durable model could substitute a more robust covering material, such as nylon or one of the many films now available, but this could well be at the expense of performance. The P.A.W. 19 used in the review model has more than adequate power and any good 2.5 cc motor should be capable of powering the 'Baron'. I have really enjoyed building this model.

Tank and power pod assembly, use epoxy as this is fuelproof also check your tank before installation - it will not be easy to get to when the model is finished!



Small SMALL FRY

Build this miniature CO₂ Control Line Stunter by Ron Prentice

THE ORIGINAL 'Small Fry', which I designed in 1948, was powered by a Mills 1.3 diesel. It won the stunt control line competition at the 1948 All Herts Rally, proving that small diesels could hold their own against the large American motors.

The design was typical of the box type, lightweight stunt model popularised by the West Essex Club in the late 40's.

It was an extremely popular model and was built in numerous sizes by those wishing to learn to stunt on a low powered and inexpensive model.

Having recently made a replica of the original model, I rediscovered the fun and thrills of flying stunt control line with such a model. This prompted me to build the small 'Small Fry' for CO₂ powered indoor flying which is the subject of this article.

Fuselage

Choose medium 1/16 in square for the framework, build one side over the other in the usual way. Cut the wing and tailplane mounts from soft 1/32 in sheet and glue into place. When dry, separate the two sides and insert formers F1, 2 & 3, followed by the crosspieces. Drill former F3 as shown for the 20 swg wire bellcrank pivot. Make the bellcrank from 1/16 in ply and epoxy a short length of 20 swg alum. tube as a bush on the pivot point. Insert the plate into position and push through the pivot wire. When in place, fix permanently with a little epoxy. Glue in the two 1/16 in sheet CO₂ tank supports as shown.

Tailsurfaces

These are built from medium soft 1/16 in sq. Balsa, with a central section of 1/16 in sheet. The two sections of the tailsurfaces are hinged with fine cotton, sewn as shown. The control horn is cut from 1/16 in ply and slotted into the elevator. Glue the tailsurfaces into place after they and the fuselage have been covered.



Ron Prentice, seen here with both versions of 'Small Fry', 1948 version was originally flown with Mills 1.3.

Wing

Cut the wing ribs from soft 1/32 in sheet. Use medium hard 1/16 in sq. for the leading edge and the mainspars. The trailing edge is shaped to a triangular section from a piece of soft 1/8 in x 1/2 in before assembling wing. Start by attaching ribs to mainspars, then follow with leading and trailing edges, packing up t.e. with suitable bits of waste balsa. The centre section is covered with 1/32 in sheet top and bottom. Cement in the 1/32 in ply line guide as shown and add the wing tips.

Covering and Assembly

Insert the 20 swg push rod into position and solder a small washer at each end so that it doesn't come off. Cover the fuselage and fin with light Jap tissue, lightly spray with water and allow to dry, pinning the fin down to avoid warping. Cover the wing and tailsurfaces with indoor condenser tissue if available or if not, light Jap will do. Lightly spray wing with water and pin down to dry. Do not spray the tailsurfaces. When all are dry apply one coat of 25% Dope/75% Thinners to all surfaces except the tail.

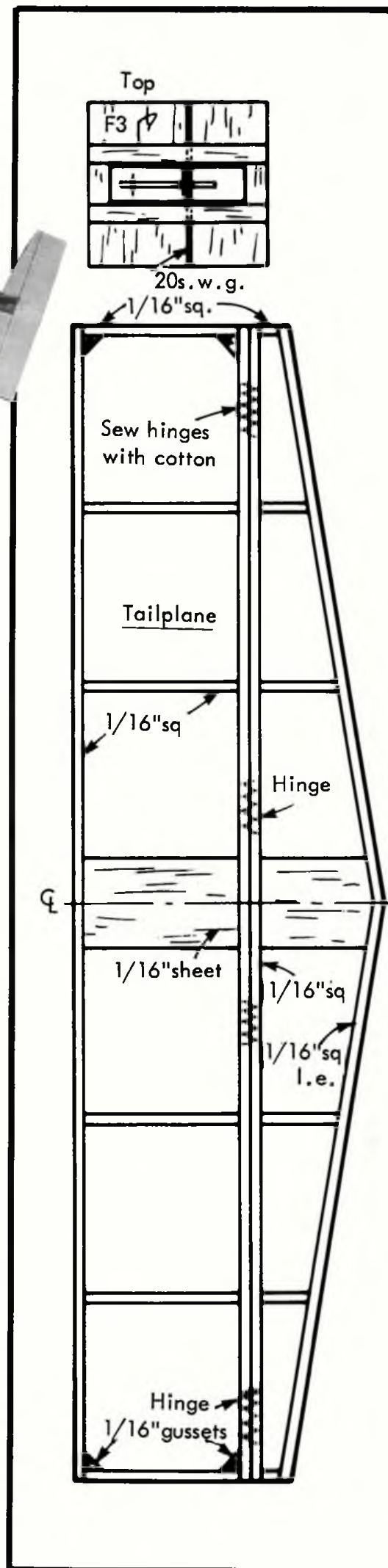
Fit the 24 swg leadout wires onto the bellcrank and extend out through the wire guides, terminating with line clips or loops.

Remove the tissue from the under sheeted section of wing where it touches the wing mounts and cement the wing into position. Cement tailsurfaces and fin into position.

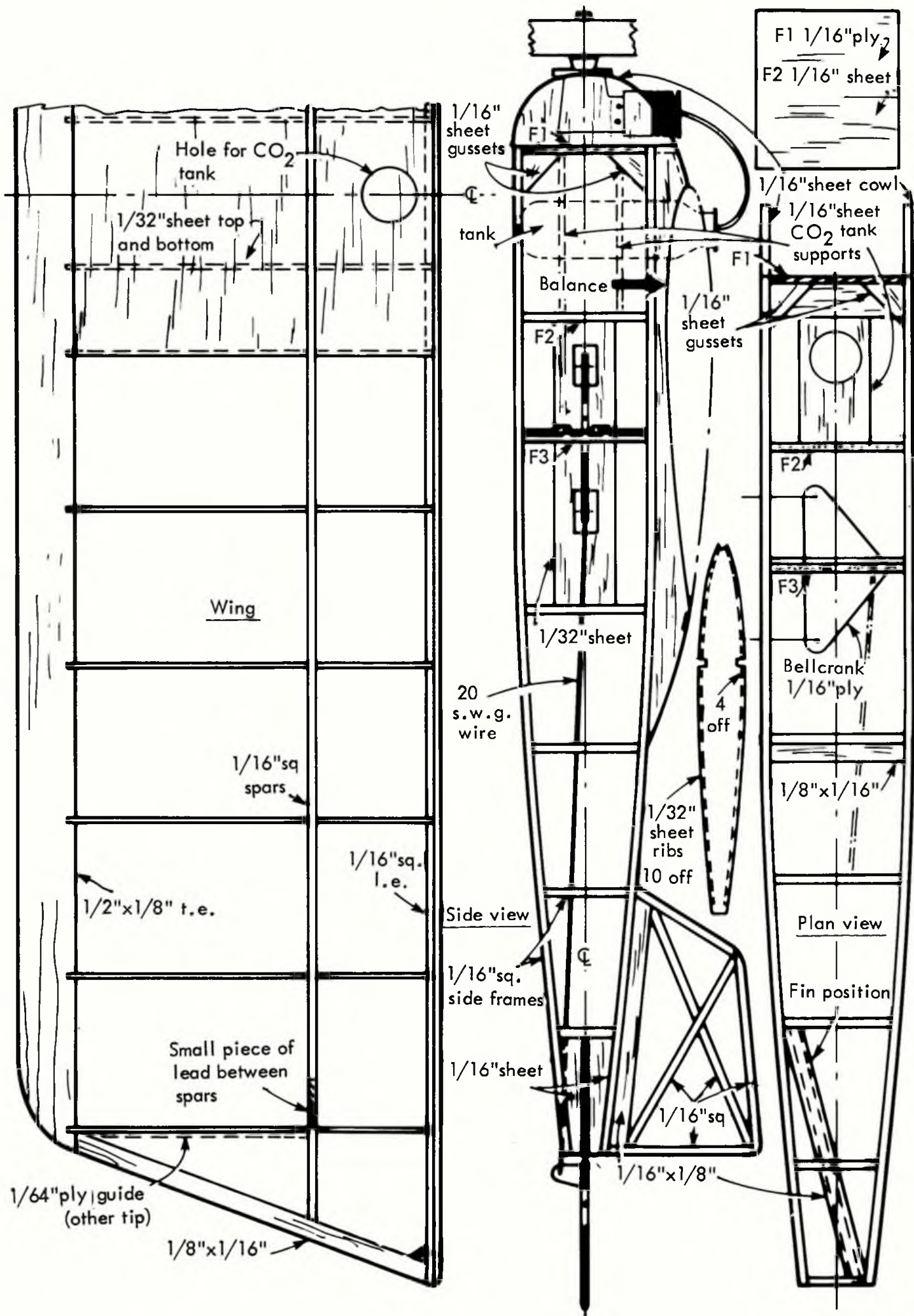
Mount the Telco motor onto the ply former with self tapping screws. Push the CO₂ tank into the mounting holes provided, shortening the copper pipe if desired.

My model flew well on 15 ft lines which were made of 8lb Nylon fishing line. I used a 6 in Peck Polymer propeller which is both more efficient and lighter than the standard Telco prop.

To anyone used to flying control line models, it will take a little time to get used to the complete absence of 'pull' when flying the 'Small Small Fry'. Adjust the throttle to provide just enough power to fly the model well, consistent with the longest motor run possible on liquid charge.



Component parts of 'Small Small Fry' before covering - care in wood selection and amount of glue used is important for good performance.



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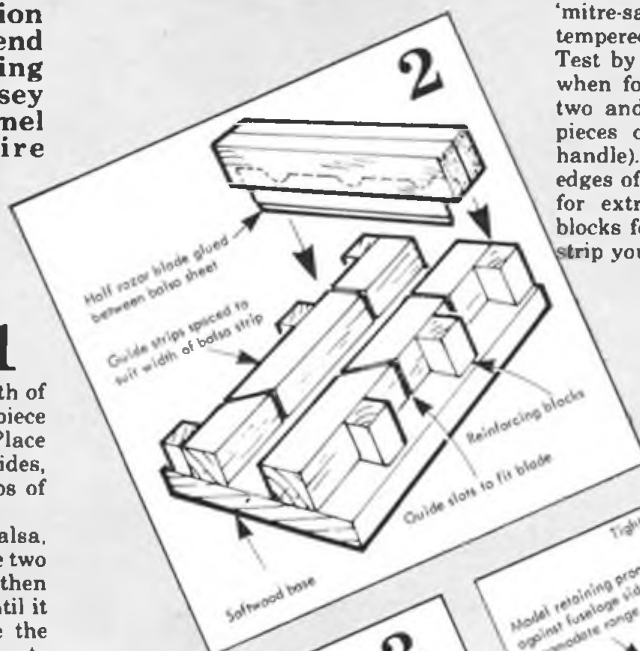
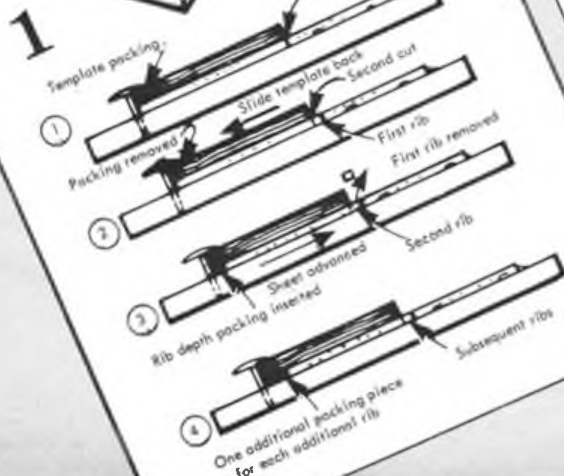
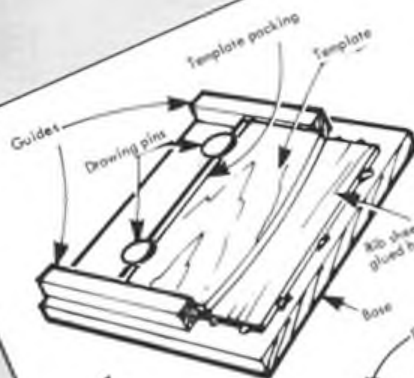
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Indoor rib jig T. A. Jolley - Merseyside 1

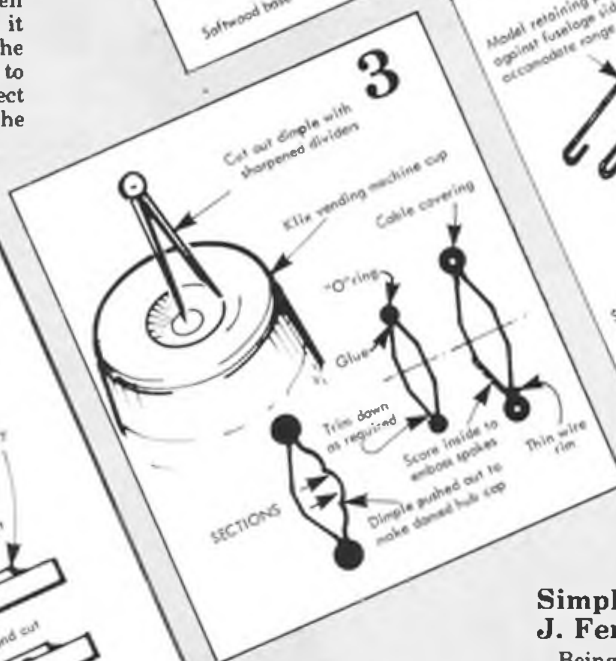
Cut airfoil template to required length of ribs, mount two parallel guides onto a piece of hardboard to suit template width. Place 'rib' balsa (cut to length) between guides, after putting three or four small blobs of superglue on the top edge of the balsa.

Make up spacers from scraps of balsa, place in position between balsa and the two drawing pins, make first cut and then remove spacers. Move the template until it touches the drawing pins and make the second cut. Remove rib and push balsa up to repeat for other ribs. The result is perfect ribs accurately cut with no distortion to the camber.



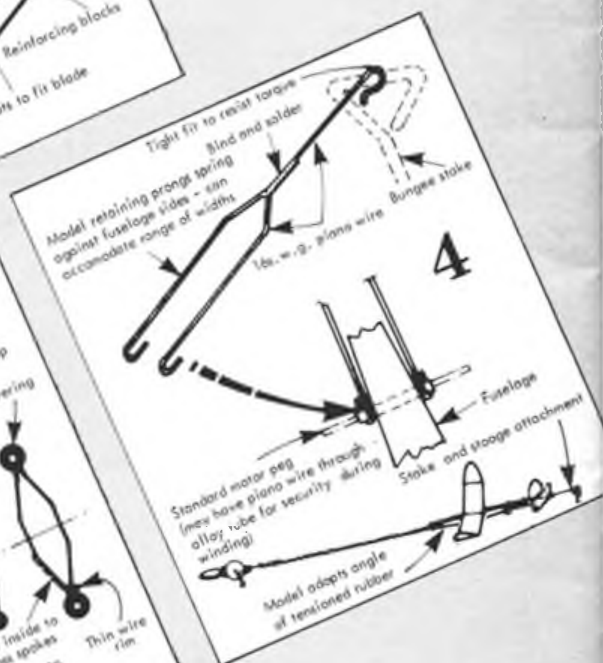
Balsa strip mitre block A. K. Desai - Bombay 2

Take a firm plywood base and fasten (screw) two lengths of hardwood block onto it. Adjust the slot between these two blocks according to the thickness of the balsa strip to be cut. Cut into the two blocks at two different places; angles of 45° and 90°. Use a 'mitre-saw' made out of a hardened and tempered razor blade (such as *Blue Gillette*). Test by folding the blade, it should crack when folded slightly. Snap the blade into two and epoxy the blade in between two pieces of thin sheet balsa (to use as a handle). Epoxy supports along the outer edges of the blocks (away from the angles) for extra rigidity. Make separate mitre blocks for the most common sizes of balsa strip you use.



Simple scale wheels J. Fergusson - Paisley 3

Being a typical scale modeller, the brain is always thinking, what could I use that for? So recently, when I spotted some plastic cups from a *Klix* vending machine... the dimpled bottoms just had to be useful. Using the base of cup only, and with a pair of metal scribing dividers sharpened to a knife edge on one blade, I cut out discs to various sizes. These, when glued back to back with balsa cement, make ideal wheel hubs. The tyres are best made with 'O' rings of appropriate sizes. When glued on to the rims with Cyano, a very realistic wheel results. These can be improved still further by using a piece of



copper or fuse wire to simulate a rim between tyre and hub.

Variations include: pushing out the rear of the discs with the thumb before gluing, this reverses the dimple into a convex hub, which is almost identical to the wheels used on the *Hawker* series of biplanes of the pre-war years. Splitting electric cable covering and making tyres this way was an earlier effort, but the joint always shows up. Scoring spokes on the plastic, from the inside before gluing together, gives the canvas covered hubs of the 20s and 30s. One flat disc and one dimple disc gives 14 in. - 18 in. *Sopwith* type wheels.

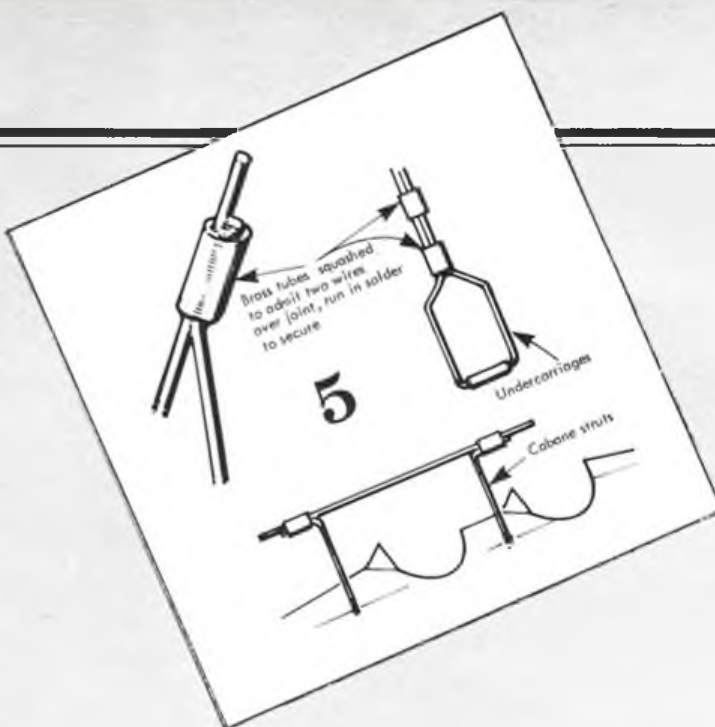
Simple stooge D. Brook - Surrey

4

This 'simple stooge' was developed for sport and single handed flying, as all others I have seen in your pages seem to consist of a stake held in place with many tensioning lines, etc, and usually some sort of complicated bracket to hold the model in place. My diagram should explain all...

The original is approximately 10 in. long and clips onto a bungee stake. It has proved reliable and simple in use, the model attaining the angle of the tensioned rubber (*Built in torque meter?.. Ed*). No problems have been encountered on my sports models with the rubber touching the inside of the model's nose, though a simple support could be used if desired.

I have used the stooge many times and while it does allow single-handed operation it is also far preferable to having a petrified member of the family holding the model. It is also highly transportable.



Golden Oldies...

Some ideas re-appear at fairly regular intervals, often the person using it has no recollection of where he first found it! Perhaps it has even been invented/discovered anew — who can say. The following are in that category but we feel they are worth repeating:— has 'flowed' right through from one side to the other.

Wire to wire joints G. Cross — Beverley

5

This method gives a neat and very strong joint when joining piano wire. It eliminates the time honoured method of having to bind with fuse wire, which always poses the problem of how to hold the two wires together whilst you whip them together! Brass tubing comes in a variety of sizes, so there should be no problem finding one that gives a good tight fit on whatever gauges of piano wire you are using. Just make sure that the wire is cleaned well before soldering the joint and if you use a flux to improve the solder flow — make sure you clean the entire assembly when you have finished soldering.

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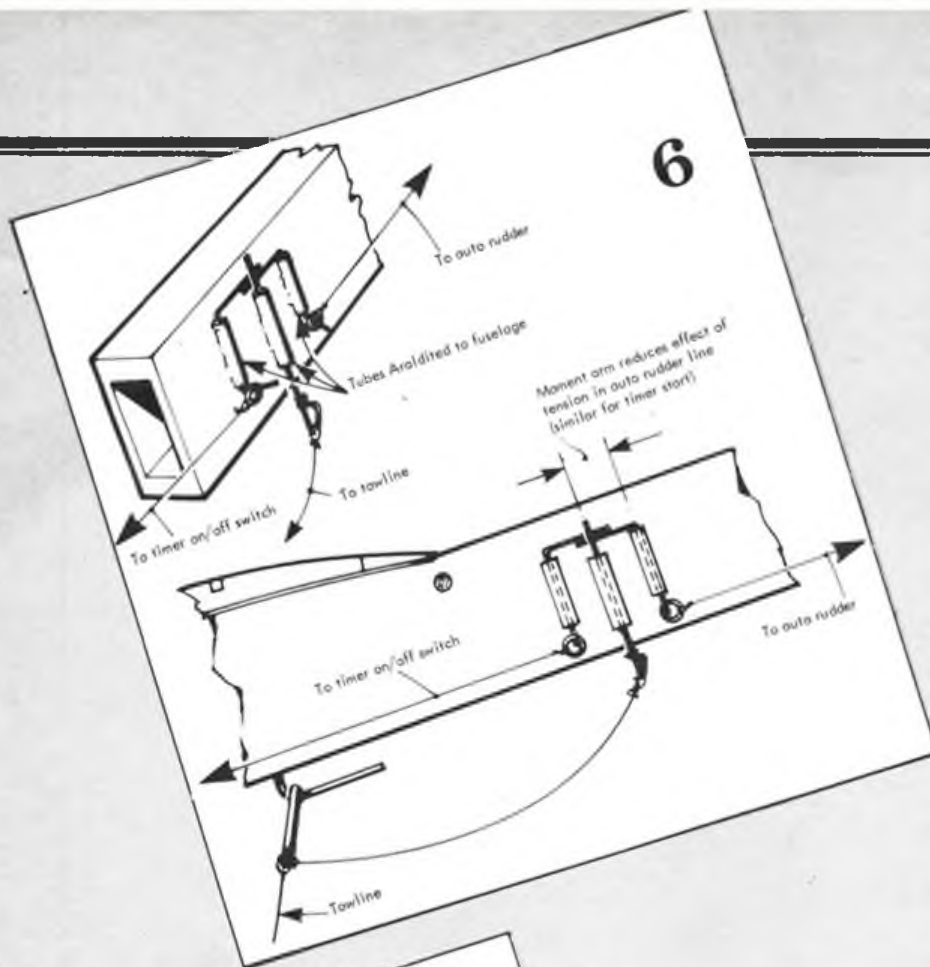
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Auto rudder and timer release A. Jones — Northumberland

6

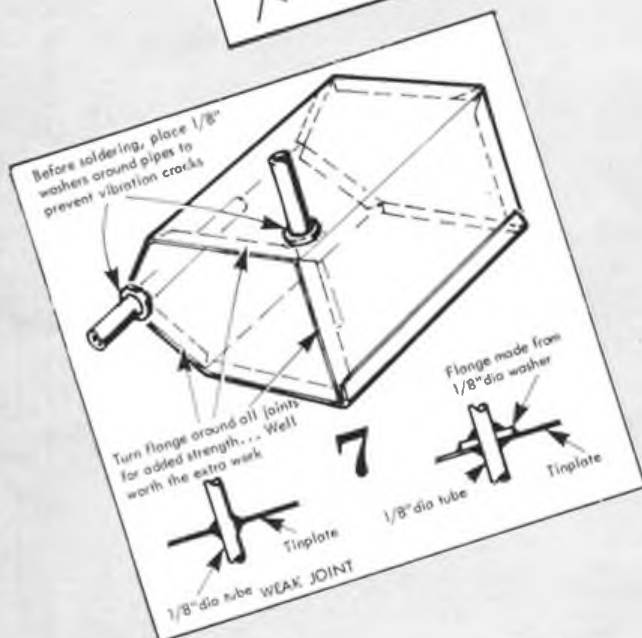
Not being a contest flier, I have no need of a circle tow mechanism (I don't know how they work anyway). Using straight tow and auto-rudder, I have found that adjusting the tension in the release lines for auto-rudder and timer start is awkward and I usually end up with a set-up which needs quite a hefty pull to release the pin. To get over this, I have a system of latches (similar to the release mechanism on a timer) to reduce the effects of these tensions...

Maintenance free tanks J. Tidey — Australia

7

If you have a metal tank that is going to be inaccessible after the model is completed — you certainly do not want it to spring a leak! Three ways to guard against leaks are:

1. Have a 'flange' on all possible sheet metal joints and ensure that the solder has 'flowed' right through from one side to the other.
2. Slip a small brass washer over any pipes down to the pipe/tank joint before soldering — make sure all surfaces are 'shining' clean.
3. If possible solder your pipes to the tank in more than one place. Once where they leave the tank and also to the tank wall inside the tank — try not to have an unsupported length of pipe inside the tank.



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SHOP TALK

NEW MODEL HOBBY PRODUCTS REVIEWED

STAGGERWING BIPLANE

Bentom
MADE IN JAPAN

Simple kits do not have to be boring – as shown by Micro-Mold's latest import from the Bentom range...

Beechcraft 17 Staggerwing

One of the latest from distributors Micro-Mold is the Bentom rubber powered model kit of the Beechcraft 17 'Staggerwing' biplane. This is aimed at the less experienced aeromodeller and wings, tailplane, fin and fuselage are all pre-formed (moulded) expanded polystyrene. The model utilises the now well tried, Bentom 2:1 gear box and enough rubber is supplied for a ten-strand motor. Everything to complete the kit is provided, including thin lead sheet for ballast and even a spare propeller. Stickers give minimum decoration and the instructions recommend the sparing use of acrylic or enamel paints (not supplied) to achieve a more realistic finish.

Wingspan is 22 inches and the finished 'Staggerwing' should make a most interesting and attractive free-flight model. Price of kit is £8.50 and should be available from any Micro-Mold stockist.

They're back...

A M (Allen Mercury) engines ceased to be available some years ago, but many thousands have given stirring service in models of all shapes and sizes. At the time of their introduction the lower capacity motors had a very healthy power to weight ratio – even by modern standards they are not weaklings! Forest Engineering Services Ltd. of Walthamstow have now got the A M 10 (1c.c.) and the A M 15 (1.5c.c.) and the A M 15 diesel engines are again in production...



(1.5c.c.) back into production. Look out for their distinctive green (10) and blue (15) anodised cylinder heads in your local model shop. Both are tough little workhorses and will make a useful addition to the range of diesel engines available. The A M's are distributed by Irvine Engines Ltd., and retail at: A M 10 – £14.95 and A M 15 – £15.95, both including V.A.T.

Field soldering iron

Have you ever tried to use one of these battery powered soldering irons out on the flying field – they are extremely useful but sometimes the elements are against them and they never seem to retain enough heat to do that vital repair.

Greenwood Electronics have launched a revolutionary new portable soldering iron, the Oryx 'Portasol', that runs on butane – but not by burning the gas in the conventional manner – Little bigger than a felt tip pen, the 'Portasol' works on an entirely different principle from conventional gas-powered irons. There is no flame during operation, the chemical energy of the butane gas is converted directly to heat by a patented catalytic converter. The conversion rate is adjustable to control the solder tip temperature and at its maximum setting, the iron delivers power equivalent to a 60 watt electric soldering iron.

The Oryx 'Portasol' iron will run for up to 60 minutes on one filling and re-fuelling is achieved in a similar manner to filling a gas cigarette lighter – and takes only seconds. Dimensions of the 'Portasol' are 175mm x 19mm diameter and it is available mail order from Greenwood Electronics, Portman Road, Reading, Berks., RG3 1NE and costs £17.25 including V.A.T. and postage – you may also use your Access or Barclaycard.

New Oryx 'Portasol' soldering iron runs on butane gas converted to heat but not by flame!



Yet more books...

For the aircraft spotter or anyone interested in full-size 'fings with wings...' there seems to have been a whole host of publications coming off the presses recently! This latest batch are published by the Haynes Publishing Group under the Foulis Aviation series of 'Aircraft Super Profiles'. In common with their previous titles, each book has 56 pages with around 50 black and white and 15 full colour photographs, which along with a fairly comprehensive text trace the subject aircraft from its birth, through its life and examine its derivatives. The latest trio are all by Christopher Chant and are: 'MIG-21' (ISBN 0 85429 439 2). The MIG-21 has been built in greater numbers than any other warplane since World War II. Although slowly disappearing from the USSR's front line, the

MIG-21 remains in production and seems set for many years of further service.

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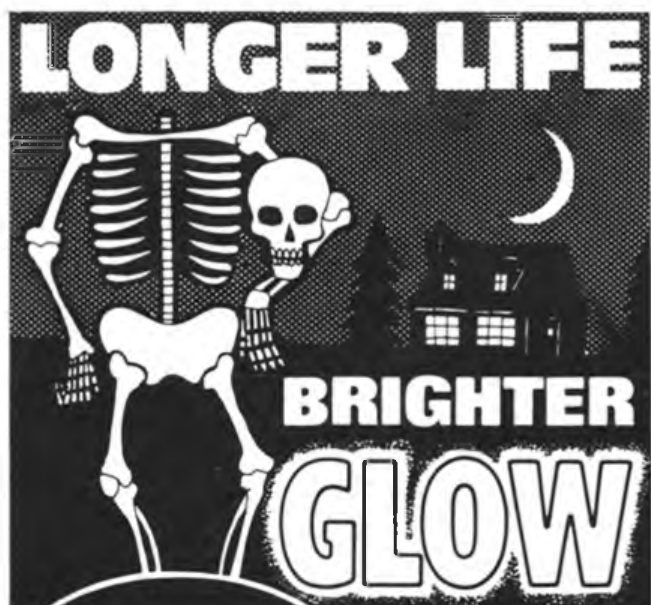


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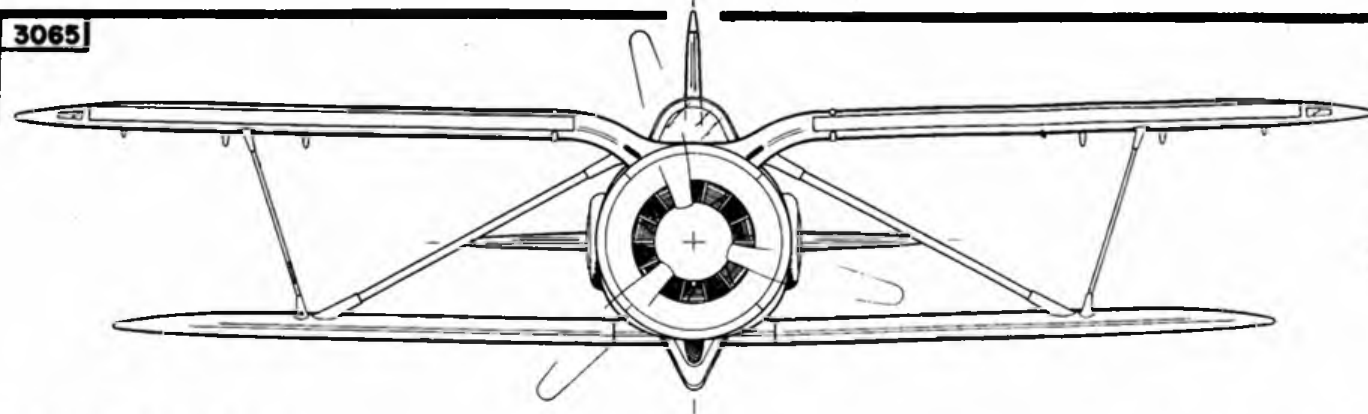
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UPPER	0	2.44	3.35	4.62	5.55	6.27	7.25	7.74	7.97	7.68	7.02	6.07	4.90	3.52	1.93	0.13
LOWER	0	1.46	1.95	2.55	2.89	3.11	3.44	3.74	4.03	3.92	3.56	3.05	2.43	1.74	0.97	0.17
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UPPER	0	1.97	3.14	4.75												
LOWER	0	1.16	1.68	2.43												

MODIFIED NOSE ORDINATES AS INDICATED BY PHOTOGRAPHS

AEROFOIL USED IS NOT KNOWN. NACA 2212 WITH MODIFIED NOSE AS SHOWN BELOW & LEFT COMPARES CLOSELY WITH AVAILABLE PHOTOGRAPHIC EVIDENCE. LOWER WING SECTION IS SIMILAR.

DETAILS OF CHAIN & MOTOR DRIVE TO SPROCKET-GEAR ARE UNKNOWN

ITEMS MARKED Δ ARE APPROXIMATE

FUSELAGE WITHOUT WELL WELL WITHOUT CUT-OUT

EXTERNAL HINGES & CONTROL HORN TO AILERON NOT FITTED UNTIL FINAL VERSION (3)

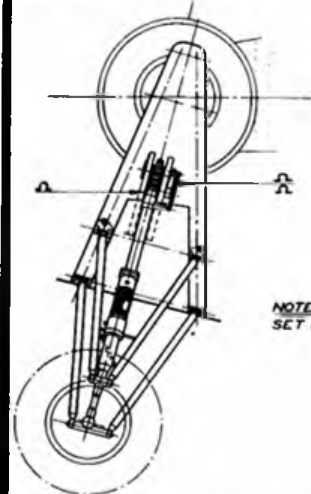
HANDLEY-PAGE AUTOMATIC SLOT

DURAL SEMI-BOX SPARS: CHANNEL FLANGES WITH SINGLE STEPPED WEB

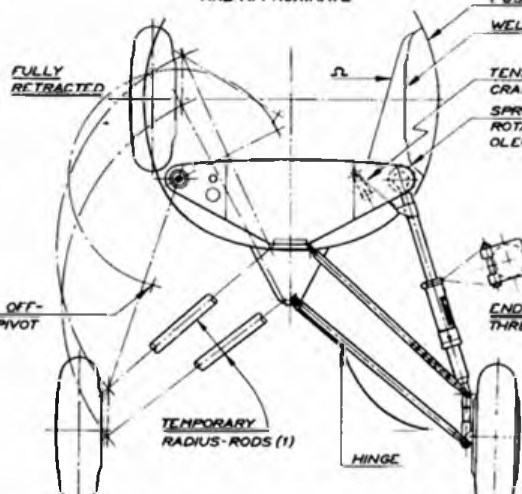
FLAP

AILERON

TYPICAL UPPER WING SECTION TWICE GIVEN SCALE



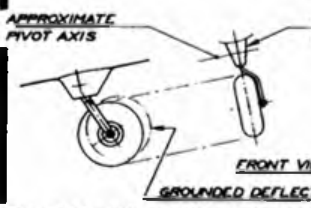
FULLY EXTENDED (NO LOAD)



AT ROLLING RADIUS

FULLY EXTENDED

LANDING GEAR RETRACTION. ONE & A HALF TIMES GIVEN SCALE: TRUE VIEW FROM FRONT.



TAILWHEEL: ONE & A HALF TIMES GIVEN SCALE. DETAILS OF CASTORING ARE UNKNOWN

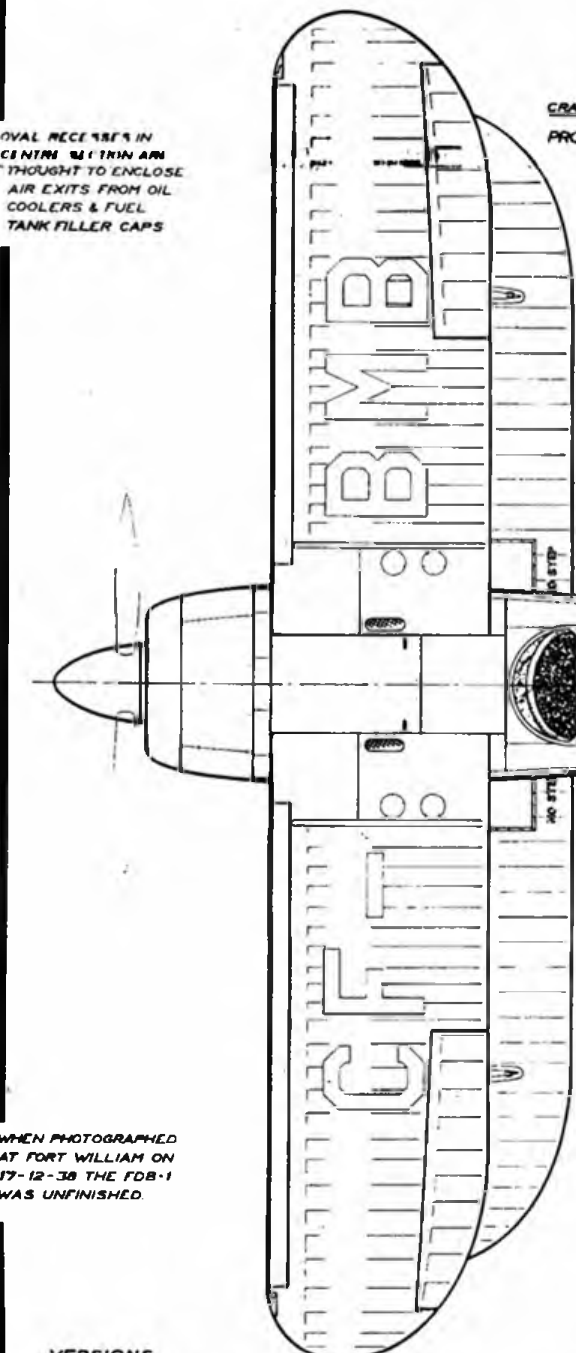
COVER DOORS (OMITTED FROM SIDE VIEW) CURVED SECTION HINGED & SPRING-MOUNTED ON RADIUS RODS FOR CLOSE FIT WHEN GEAR RETRACTED. DETAILS ARE UNKNOWN

EARLY SPINNER (2)

FINAL SPINNER (3)

PROPELLER DETAILS: ONE & A HALF TIMES GIVEN SCALE

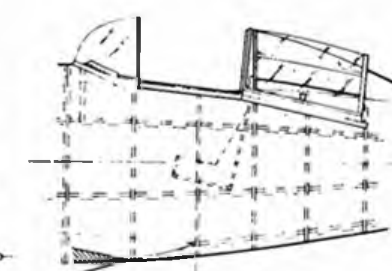
OVAL RECESSES IN CENTRE OF FIN ARE THOUGHT TO ENCLOSE AIR EXITS FROM OIL COOLERS & FUEL TANK FILLER CAPS



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FIN LEGEND (BOTH SIDES) THREE TIMES GIVEN SCALE

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DATA

UPPER WING	SPAN	26'-0"
	CHORD	4'-6"
	AREA	103.8 ft ²
LOWER WING	SPAN	24'-0"
	CHORD	4'-0"
	AREA	90.2 ft ²
OVERALL LENGTH		21'-8"*
TAILPLANE SPAN		5'-8"
WHEEL TRACK		5'-8"
PROPELLER DIAMETER		9'-0"
EMPTY WEIGHT		2 280 lb
LOADED WEIGHT		4 100 lb
* WITHOUT SPINNER: ESTIMATED LENGTH WITH SPINNER - 22'-0"		

COLOURS

OVERALL FINISH - DEEP GUNMETAL BLUE (A LITTLE LIGHTER THAN A RIFLE BARREL)
REGISTRATION LETTERING - ALUMINIUM
PROPELLER & SPINNER - NATURAL
WHEELS & L.G. MEMBERS & INSIDE COVER DOORS - METAL
EARLY L.G. RADIUS-RODS BELIEVED LIGHT GREY (1)
"CCF Co." LEGEND ON FIN - WHITE
RUDDER STRIPING - RED & WHITE

VERSIONS

PROGRESSIVE MODIFICATIONS SEEN IN PHOTOGRAPHS:

1. ORIGINAL (17-12-38) TEMPORARY L.G. RADIUS-RODS, EXTERNAL POSITION LIGHTS, NO SPINNER OR FIN LEGEND
2. INTERMEDIATE SMALL DIA. SPINNER, TRUE RADIUS-RODS
3. FINAL LARGE DIA. SPINNER WITH CRANK-CASE SKIRT, BLACK BACKS TO PROPELLER BLADES (38" LONG) INSET L.E. POSITION LIGHTS, AILERON HORNS & HINGES & FIN LEGEND.

NUMBERS SHOWN IN BRACKETS AGAINST DETAILS REFER TO THESE VERSIONS.

A 1/24 scale dye-line print of this drawing is available from Aeromodeller Plans Service, P.O. Box 35, Wolsey House, Wolsey Road, Hemel Hempstead, HP2 4SS, price £2.10 plus 50p postage and packing (Price Code D). Please quote Plan No. 3065 when ordering

HOLE FORWARD OF TAILPLANE (BOTH SIDES) DID NOT APPEAR IN FINAL VERSION (3)

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OCT. 1984

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FF F1C Model presented in FREE FLIGHT SCENE

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Elf by G. Mathieson

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[Document Page: 21](#)

Fokker Triplane by R. Halfpenny

1/20 scale free flight CO2

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[Document Page: 23](#)

Small Small Fry by Ron Prentice

CL CO2 miniature stunter

[Document Page: 34](#)

GREGOR FDB 1

Union page Added

[Document Page: 45](#)

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