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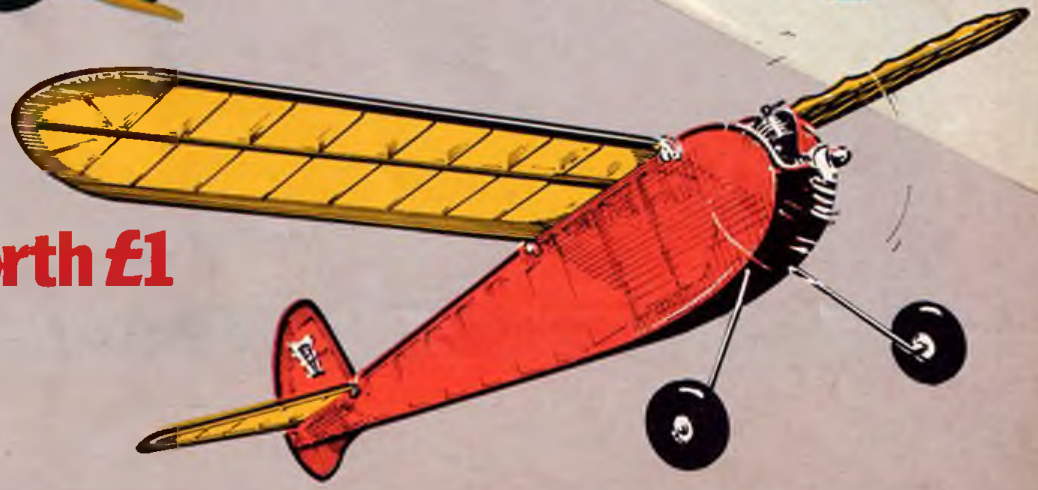

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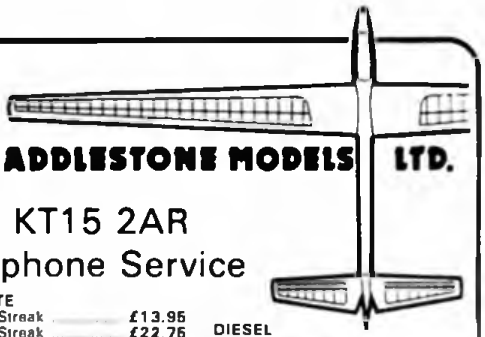

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AERO MODELLER

June 1984

Volume 50
Issue No. 581

Contents

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M. Gray

Editorial Director
R. G. Moulton

Cover

Seen in all its glory at last year's British Nationals, Bill Draper with Superhawk. Many models have a fine pedigree and sometimes a good contest record. 'Superhawk' must surely be one of today's living greats, as shown by Bill's contest successes. Although the model is too big for us to include full size plans, we are pleased to be able to add it to the famous range from Aeromodeller Plans Service, see page 272

Subscriptions:

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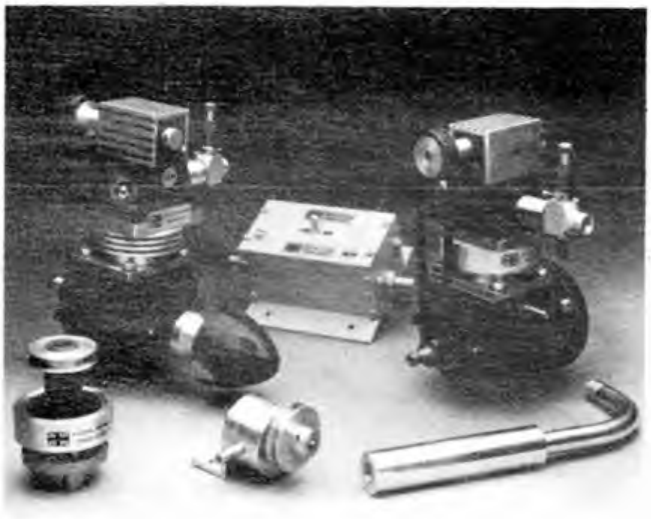
4 STROKE GLOW PLUG AND SPARK IGNITION SP AERO AND MARINE ENGINES



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HANGAR DOORS

RCM&E R/C Scale Aircraft Special

Scale enthusiasts will welcome the 1984 issue of the annual *R/C Scale Aircraft Special* now on sale. Two full size pull-out plans are included, a 1/8th scale *Sopwith* 'Dove' for .15-.19cu.in. engines and three function radio control and the *Found* 'Centennial,' a high wing cabin monoplane of very simple construction (for .75-1.00cc engines). Both models are eminently suitable for conversion to free flight purposes, the generous dihedral and sweepback on the 'Dove' wings should make this model even superior to the 'Pup' for F/F work.

Practical articles covering 'Liquid cooling for engines,' 'Retract systems,' 'Forming Corrugations,' 'Complex decorative schemes,' 'Rigging,' *Fairchild* "Argus" Construction' and a wide variety of pictorial and instructive features makes the *R/C Scale Aircraft Special* an essential part of the scale modeller's library. Available from model shops and bookstalls, price £1.70.

Aerobods fly 747

Several clubs have mentioned that the odd club evening (aren't they all . . .) has been used to train novice 747 pilots by using a number of the computer simulations now available for the more common personal computers. So . . . we are thinking of using a *little* of our precious space looking at this sort of computer programs. If you have a computer or even if you haven't let us know what you think . . . Would you like to review some of these programs for Aeromodeller?

Further into the Electronic Age . . .

MAP have always aimed at moving with the times, we don't always do it but we do aim to! Nowadays everywhere you look you see a personal computer, in fact some of the wretched things are stopping good aeromodellers from having a jolly good time in the great outdoors. You know . . . when you come home sopping, with your clothes covered in mud, having just max'ed into that big oak at the end of the field! Anyway passing craze or not *MAP* have now reached out to those pallid faced computer types with some computer programs of their own. *MAP Software* now produce for your edification, a number of programs for the *ZX Spectrum*. Seven of these to date are 'utility' programs that will help to make your aeromodelling activities more fruitfull 'Aerofoil Drawing' cassette No. MSS7 will do just that! Choose thickness, washout, planform, rib positions, skin thicknesses etc. and this program will print out a whole set of ribs for you on the *ZX Printer* — lengthways down the paper, so you are not limited to about 4in. chord! Thirty airfoils to choose from — £9.95.

A must for any budding or old hand scale buff is 'Scale Models' cassette No. MSS2. Program lists major dimensions of original prototype . . . all you do is to choose *one* dimension — say wheel diameter, tell the program you want to use 2⅜in. wheels and all other dimensions will be adjusted to suit *your* chosen wheels . . . neat, eh! Forty well known and loved designs are included on the tape — or fill in your own favourite. Cost: £8.95. Space precludes more now but watch this space for more bytes in the future!

Ouch!

The best laid plans . . . etc. Our scale drawings of the *Pace* 'Spirit' Aircraft Described, *Aeromodeller* December '83 came in for a severe attack of the *gremlins!* Fortunately sharp-eyed reader David Foster of Cumbria spotted that something was not quite right . . . Both the fuselage cross-section at station 'D' and the wing planform were slightly off(!). The 1/12th scale dye line prints available from *Aeromodeller Plans Service* were held up until corrected. Our apologies to all those that had to wait for their copies. Please forgive us kind 'Spirit'.

The sun rises on Indoor

The Indoor World Championships for class F1D will take place at Nagoya, Japan in October. Should anyone wish to travel with the U.K. team to Japan, please contact *Laurie Barr on 0628 25595 as soon as possible.* The closing date for notification of supporters is 31st May, 1984 so you will have to make up your minds . . . *pronto.* It is planned to travel out to Japan on 12th Oct. and return on 20th Oct. To take advantage of the special air fares offered, this means, start and finish in Paris, France. Cost will be about £1,100.

What's On . . .

May 19 — **'MODEL 84,' MODEL EXHIBITION — ALL TYPES OF MODELS**
Venue: Hurst School, Baughurst, Tadley, Hants. Contact: K. Searle. Tel: Tadley 2254. Organised by Air Training Corps No. 2403 (Aldermaston) Squadron. Flying field and pool (electric only) and room for cars — all modellers welcome.

May 19, 20 — **INDOOR — 2nd F1D TRIALS**
Venue: Cardington. Contact: Laurie Barr. Tel: (0628) 25595.

May 20 — **CONTROL LINE SPEED COMPETITION — ALL CLASSES**
Venue: Old Parade Ground, Piddington, near Bicester. Contact: Dick McGladdery. Tel: 01-994 6320.

May 20 — **SMAE 3RD AREA MEETING. F/F, F1B (Weston Cup & Plugge), O/P (White Cup), O/G**
Venue: Local area venues. Contact: Area Comp. Secs. OR SMAE (0533) 58500.

May 20 — **SMAE SPRING SCALE COMPETITION. R/C ONLY**
Venue: Merryfield. Contact: Vic Willson. Tel: 0734 471946.

May 26, 27, 28 — **BRITISH F/F NATIONALS MOST F/F CLASSES**
Venue: Barkston Heath. Contact: SMAE, Kimberley House, Vaughan Way, Leicester. Closing date for pre-entry May 5.

May 26/27/28 — **1984 MODEL CRAFT & COUNTRY SHOW**
Venue: National Agricultural Centre, Stoneleigh, Kenilworth, Warwickshire. Contact: Mary White, Argus Specialist Exhibitions Ltd., Berkhamsted, Hertfordshire HP4 3EY. Tel: (04427) 73291.

June 2, 3 — **SOUTH COAST GALA — F/F: OPEN AND FAI G/R/P**
Venue: Beaulieu. Contact: G. Madelin, 51 Vesey Close, Farnborough, Hants.

June 2, 3 — **SCOTTISH FREE FLIGHT NATIONALS. Sat. F1A, F1B, F1C. Sun. MINI, OR, OP, OG**
Venue: Weston Farm, Newbigging, Carnwath, Strathclyde. Contact: Ron Sabey, 53 Rederech Crescent, Hamilton. Entry: £1 per event (50p Juniors). Pre-entry preferred.

June 2, 3 — **ROTHWELL AERO MODEL SOCIETY. VINTAGE SCALE AND SPORTS FLY-IN**
Venue: Nostell Priory, Nr. Wakefield. Contact: J. Webster, 9 Cautley Drive, Killinghall, N. Yorks. HG3 2DJ. SAE for details and entry forms.

June 3 — **F3B LEAGUE EVENT (EUROPEAN CHAMPIONSHIPS TEAM TRIAL)**
Northern venue. Contact: Mike Proctor, 8 Church Rise, Holtby, Yorkshire. Tel (0904) 489386.

June 3 — **SMAE CONTROL LINE MEETING — F2B, F2C, SPEED, GOODYEAR, ½A & A COMBAT, ½AT/R, CARRIER, NOVICE AEROBATICS**
Venue: Hullavington. Contact: Bob Horwood. Tel: 0272 48769.

June 3 — **INDOOR — UNIVERSAL CONTESTS AND FUN FLYING**
Venue: Cardington. Contact: B. Hunt. Tel: (0484) 862353.

June 3 — **SMAE — SLOPE SOARING F1E**
Venue: Sheffield. Contact: T. Faulkner, 4 Birchitt Close, Bradway, Sheffield.

June 3 — **YORK RALLY: SCALE AND VINTAGE FLY-IN, FREE STYLE AEROBATICS, F3B LEAGUE EVENT**
Venue: RAF Church Fenton. Contact: D. Smith. Tel: 0904 34281.

June 3 — **THREE KINGS C/L SPORTS AND VINTAGE DAY**
Venue: Old Croydon Aerodrome. Contact: Derek Bird. Tel: 01-874 6394. Fly for fun: special prize for best vintage (pre-1955). Silencers and insurance compulsory.

June 3 — **WALSALL MAC FREE FLIGHT SCALE DAY INCLUDING: VINTAGE F/F, RUBBER, POWER CO,**
Venue: Walsall Airport, 'Greenacres Entrance.' Contact: Geoff Spencer. Tel: 021-556 3576. No pre-entry, everybody welcome.

June 9, 10 — **RAFMAA/SMAE THURSTON TROPHY COMPETITION. F1A, F1B, F1C. Mini events on 10th.**
Venue: RAF Barkston Heath. Contact: Brian Baines, 2 Church Walk, Metheringham, Lincs. LN4 3HP. Camping on airfield Sat. night: pre-entry £1.50 per event with SAE.

June 9, 10 — **KING'S CUP AIR RACE FOR ALL TYPES OF STAND OFF SCALE**
Venue: Birchwood Park, Warrington. Contact: Arthur Searl. Tel: Parbold 2000. Simple rules — fly for fun competition.

June 10 — **SMAE 4TH AREA MEETING — F/F, O/G (Team + Plugge); F1C (Astral Trophy) Cd'H**
Venue: Local area venues. Contact: Area Comp. Secs. *or* SMAE 0533 58500.

June 10 — **THREE SISTERS '500' GY only**
Venue: Three Sisters. Contact: Tom Miller. Tel: 0204 56890.

June 10 — **WEST MALLING MODEL AIRCRAFT SHOW**
Venue: West Malling, Kent. Contact: WMMAC. Tel: Tonbridge (0732) 350891. R/C and C/L aircraft, trade and club stands. Adults £1.50, others 50p.

June 10 — **SMAE SCALE CONTEST. R/C, C/L, CO_2, F/F**
Venue: Amesbury. Contact: Vic Willson. Tel: 0734 471946.

June 10 — **NORTH LONDON RADIO CONTROL MFC — SCALE DAY**
Venue: North London MFC — Baldock. Contact: R. Barley. Tel: 04427 4737. Snacks available, prizes, entry fee £1.00.

June 16 — **DONISTHORPE MODELLING AND HOBBIES OPEN DAY**
Venue: Donisthorpe Miners Welfare Club, Nr. Burton-on-Trent. Contact: Mr. G. Popejoy. Tel: Measham 71789. Models of all types, trade stands, craft exhibits. Adults, 40p. Child, 20p. Family tickets £1.00.

June 16, 17 — **AEROMODELLER SCALE DAYS**
Venue: Old Warden. Contact: Aeromodeller. Tel: 0442 41221.

June 17 — **INDOOR — 'FLYROD' 2g EZB NOVICE/EXPERT**
Venue: Cardington. Contact: Laurie Barr. Tel: (0628) 25595.

June 17 — **OXFORD NFC RALLY: A1, Cd'H, HLG, VINTAGE RUBBER. All flown in rounds**
Venue: Port Meadow. Contact: Andy Crisp, 30 Portland Road, Summertown, Oxford.

June 17 — **WAKEFIELD 500 GOODYEAR MARATHON**
Venue: RAF Dishforth. Contact: Brian Temporal. Tel: 0924 270890.

June 22 — **FRIDAY EVENING FAI T/R**
Venue: Three Sisters. Contact: Jim Woodside. Tel: 051-724 1442.

June 24 — **WHARFEDALE OPEN MINI GOODYEAR — SMAE RULES BUT NO AGE LIMIT AND OPEN MODELS**
Venue: Dewsbury, West Yorkshire. Contact: Jeff Smith. Tel: Leeds (0532) 663432.

June 24 — **½A COMBAT COMPETITION**
Venue: The Embankment, Peterborough. Contact: B. Waterland. Tel: 0778 343722.

June 24 — **BLACKBURN & DMAC SCALE/NEAR SCALE OR UNUSUAL MODEL RALLY**
Venue: Pleasington playing fields — Blackburn. Contact: Ray Stott, 18 Adelaide Street, Crawshaw Booth, Rossendale, Lancs. BB4 8PW.

June 30/July 1 — **THREE SISTERS INTERNATIONAL: FAI T/R, ½A, GY**
Venue: Three Sisters. Contact: Jim Woodside. Tel: 061-724 1442.

July 1 — **WALSALL MAC VINTAGE DAY. CLASS 1, 2, 3, TEXACO**
Venue: Walsall Airport, Greenacres Entrance. Contact: Jim Shelley. Tel: 0922 28553. Three trophies for each event, no pre-entry.

July 1 — **VINTAGE FLY-IN**
10am start. Venue: Montrose Airfield. Contact: Bruce Duncan, Burngrange Farm, Burrelton, Perthshire PH13 9PL. Write for map.

July 1 — **INDOOR — UNIVERSAL CONTESTS AND FUN FLYING PLUS SCALE CONTESTS AND PEANUT TO MIAMI RULES**
Venue: Cardington. Contact: C. Hadland. Tel: (0628) 72402.

July 6 — **FRIDAY EVENING GOODYEAR**
Venue: Three Sisters. Contact: Peter Jephcott. Tel: 0509 230262.

July 6-8 — **PFA INTERNATIONAL RALLY 1984**
Venue: Cranfield Aerodrome. Contact: Popular Flying Association. Tel: Shoreham-by-Sea 61616.

July 7-8 — **INTERNATIONAL AIR SHOW '84**
Venue: Army Air Corps Centre, Middle Wallop, Hants. SO20 8DY. Contact: Tel: Andover (0264) 62121.

July 7/8 — **YORKSHIRE SCALE MODELLING WEEKEND**
Electric Off-Road Car Competition, Model Boat Competitions, Plastic Modelling Competition, Model Helicopter Competition. Venue: Newby Hall, Ripon, N. Yorkshire. Contact: Mr. R. Thorn, 22 Chatsworth Place, Harrogate, North Yorkshire. Send large SAE for further details.

July 8 — **BLACKPOOL AND FYLDE RCMS VINTAGE R/C ASSIST FLY-IN**
Venue: behind Blackpool Zoo. Contact: Chris Bromley. Tel: 0253 25080.

July 8 — **CROOKHAM F/F GALA: O/R, O/G, O/P. All in FAI**
Venue: Beaulieu Old Airfield. Contact: David Cox. Tel: Ashford (Middx) 51696.

OBITUARY

HOWARD BOYS

AN APPRECIATION BY ALEX IMRIE

When I started to read *Aeromodeller* some 45 years ago, one of the regular contributors was Howard Boys who was then writing about flying scale models. I devoured every word that he wrote! My earliest impression of his talent for flying scale design was that fine 50in. span rubber-driven *Westland* 'Lysander' kitted by *Super Scale Kits* — quite out of my financial reach. Often at that time as I built kits for flying scale models I would find that the designs themselves and/or the building instructions were by Howard Boys. Small wonder then, that this name became firmly embedded in my model aeronautical vocabulary.

Later, almost every time that I chanced to open *Aeromodeller* I was reminded of Howard. There he was, still at it; in the late 1940s with flying scale, rocket and tailless models, in the 1950s his Radio Control Notes had an eight year run, to be followed by accounts of his numerous visits abroad to attend model meetings in Austria, Belgium, Czechoslovakia, France, Germany, Holland and Switzerland, undertaken on motorbikes of doubtful pedigree complete with home-made tent and sleeping bag!

Then, at an Old Warden meeting some 10 years ago, I heard someone mention a rubber-driven 'Lysander'. I looked at the raincoated white haired man peeling an orange . . . could it be? Incredibly, it was, the same Howard Boys.

Howard was born at Flore in Northamptonshire on 19th January 1906, mechanically-minded, he attributed his aviation interest to a kite-flying grandfather and at an early age was drawing aeroplanes and launching card gliders from his bedroom window. Developing an interest in wireless, he never forgave *Percival Marshall* for retaining the 10*d*. that he sent as an eleven-year-old for a booklet on the subject, to be told that this could '. . . only be delivered after the war since the contents might prove useful to the enemy.' Leaving school at 14 he was apprenticed to a local engineering firm thus beginning an erratic working life that would be punctuated by frequent bouts of unemployment. Howard was an avid reader of *Junior Mechanics* magazine making many items from its pages. Crystal sets and early valve receivers formed the basis for the radio knowledge that would later blossom in home-made R/C for his models. Howard's home-made camera was used in a junior reporter role when he took photographs of interest for the local newspaper. He had made his own enlarger and of course, did his own developing and printing. He even made his own fireworks and liked to think that these early gunpowder experiments led to his interest in rocket power.

By the late 1920s he was working as a draughtsman and made a few models based on the little *Pelly-Fry* seaplane that was described in *Model Engineer*. He joined the *SMAE* at this time and was allocated membership number 234. Keen to form a club at Northampton, he organised an inaugural meeting on Sywell aerodrome on June 5th 1932, made his first all-balsa model for this event and won the competition with a fine flight of 3 minutes 12 seconds as has already been detailed in these pages (Vintage Corner, December 1982). The economics of having a car taxed and insured as a motorcycle appealed to Howard, he bought a 1½hp *Francis-Barnett* motorcycle engine and gearbox for ten shillings and sixpence (52½p) and completed his three-wheeler for a total outlay of one shilling and fourpence before he had even learned how to drive! This vehicle came to an untimely end, when it was completely demolished by a motor coach, fortunately Howard was not on board, having vacated the cockpit two minutes earlier! He immediately made another car with various improvements that was to last for many years, before being replaced by the 'Boys-Austin' in 1945. Howard was one of the 46 competitors in the Eliminating Trials for the 1934 Wakefield at Warwick but his model had become waterlogged en route in the three-wheeler and refused to perform. However, he was able, with his home-made camera, to take a photograph of the winner, J. B. Allman and this was published in *Model Engineer*. He married in 1936 but bringing up a family did not prevent Howard from being a regular attender at model meetings, where he could often be seen armed with tailless models. The RAF Expansion Scheme was now under way, offering more steady employment and Howard entered the drawing office of *Armstrong Whitworth* at Coventry. He became a contributor to *Aeromodeller* and held forth in aerodynamic discussions in the 'Letters to the Editor' column, won prizes in the Competition for Gadgets and Ideas and ran a series of constructional articles for beginners. He described his tailless model in the November 1938 issue, this machine having put up a flight of 2 minutes 7.75 seconds when hand launched at a Northampton Club meeting. The *SMAE* Council Meeting on June 5th officially recognised this flight as a British record and also accepted Howard's suggestions that in future 'Pterodactyl' and 'Autogyro' classes of model should be named *tailless* and *rotorplane* respectively.

Howard made a tailless model to the required fuselage cross section for the 1939 Wakefield event. While no place was earned in the Eliminating Trials at *Fairey*'s aerodrome, it put up a flight of 1 minute 24.5 seconds at the Northern Heights Gala. This time was officially recognised by the *SMAE* on July 5th as the British tailless ROG record. The only known photograph of this machine was a ¾ front view from above, taken by Ian Lucas and it showed Howard clad in his customary shorts. This same photo was to be used by C. Rupert Moore to paint Howard for the front cover of early editions of the book 'Scale Model Aircraft That Fly'.

Howard was portrayed again by Rupert when he was shown as a sporting retriever clad typically in shorts and worn tennis shoes on the front cover of the July 1941 issue. It was undeniably intended to be Howard; but he was smoking a cigarette! Such artistic licence always irked Howard, who was a strict non-smoker/vegetarian — and Rupert would never admit to the liberty, except with a smile!

Improving tailless models meant for Howard a return to rocket power, which he had tried as early as 1933. He designed and built his famous trio 'Flaming Ptero', 'Fire Engine 1' and 'Fire Engine II'. The first model was flown soon after the end of the war and also flew at Eaton Bray on its opening day, 15th September 1945, being graphically recorded in the photograph used as the Frontispiece in September 1945 *Aeromodeller*. The 'Fire Engine' designs were made for the *Handley Page* Tailless Contest in 1945, and to maintain flying scale interest Howard also produced a model of the *DH* 108 'Swallow'. In May 1946 he took the *Fire Engines* to Lyon when he was invited to the first post-war International Tailless contest by the *Aero-Club du Rhône*, but had trouble with his rocket units, however, he put on a real aerobatic display by using borrowed Swiss rockets. During this meeting he was able to buy a 0.5cc diesel from M. Maraget and on his return home this was fitted to a modified *Fire Engine* with an enlarged centre section, the engine being located directly over the centre of gravity. Later, this model, powered by a 1.2cc *Foursome* diesel, won the 1948 Tailless ROG power duration event, giving Howard his third record title.

Howard was by now working for *Auster Aircraft Ltd* at Leicester and in a revival of scale interest he designed a 40½in. span rubber-driven 'Mosquito' that was kitted by *Super Scale* as a follow up to the 'Lysander'. He also built an *Auster* and a *Fairey* 'Junior' for diesel power and when in the Spring of 1949 his thoughts turned to radio control, he fitted differential ailerons to a 4ft. 6in. span 2.8cc *Allbon* diesel powered version of his *Auster*. However, he was continually plagued with escapement problems and began to experiment with his 'Rudder Waggler', an oscillating rudder system which gave proportional control. Around 1950 Howard was asked to modify and complete D. A. Russell's 10ft. span 'Lysander' for radio control and was also given a large high wing monoplane for radio experiments, this last named was probably 'Helios', however, although Howard spent much time and money on what was called the 'Aeromodeller Investigation into Radio Control', work on these models ceased when Eaton Bray was closed and eventually the models were disposed of.

Howard was proud of the overseas contacts that he made as a result of his touring on the continent and following his 1976 visit to Switzerland, an article in the *Aero-Revue* contained this excerpt:

"Howard Boys won friends everywhere through his open and friendly disposition, they all invited him to visit them, so his tours became longer and longer. His is a good example of the realisation of an active and fulfilled retirement on modest means. During his long life he invented many things but never became rich financially because of them, it was sufficient reward for Howard Boys to enjoy the deep satisfaction of having achieved what he set out to do."

This was a most fitting vivatury and one which might equally have been written in Czech or German, for he was regarded as a patron of the R/C arts by his many friends in Europe. His habits may have been frugal but his welcome was rich in its blessings. There was a certain ethereal atmosphere surrounding his presence, almost akin to being associated with eternal youth. He was the youngest 78 year old we are ever likely to know.

Howard was specially pleased and honoured to have been elected as a Life member of *SAM 35* and he followed its progress keenly. He became a real part of the vintage scene, hardly ever missing a meeting, he was usually there with an experimental model to fly but he was just as keen to talk about models and what is probably more important, he was always ready to listen to what we lesser mortals had to say.

Our vintage meetings will be the poorer for his passing.

Two portraits that typify Howard - the Compleat Modeller - Boys. Above: in 1983 with his very first all-balsa model, as flown at the inaugural meeting of Northampton MAC at Sywell in 1932 and, below right: with his all-carrying model box which formed a ground based Tx - a regular sight in those glorious '50's and early '60's.

AIRCRAFT DESCRIBED

No. 260
The Embraer EMB-312 (T-27) propjet trainer described by Charles W. Cain and drawn by A. A. P. Lloyd

TUCANO

Heading 'Tucano' the first trainer to be designed for a turbo-jet, made a fine impression at Farnborough in 1982 and Paris 1983. Right: rear cockpit detail and far right, front cockpit complete with two mirrors!

WITH ITS extra-long beak and bright feathers, the Tucano (Toucan) is at home in the tropical forests of Brazil. And from that largest country in Latin America comes the new, all-metal 'Tucano,' brightly orange and white but with far more modest a beak housing the popular (about 20,000 built to date) Canadian PT6 free-turbine turboprop.

Among the ritzy debutantes of the jet-plane set at any showplaces like Farnborough '82 and Paris '83, virtually last in the pecking order is the hard-working but least glamorous category, the trainer. So you might be forgiven for having forgotten that the 'Tucano' made its European debut at Farnborough in September 1982 and was at the Paris Show last year.

For Brazil, the 'Tucano' came about because of the 1970s' preoccupation with finding ways and means of countering the worst effects of unsettled world oil supplies. Pure-jets are gas-gobblers but propjets are as provident as sharp accountants. The name-of-the-game now is 'cost effectiveness' in the face of the undeniable fact that pure-jets are more 'thrust-effective' in the V_{NE} (Speed, never-exceed) performance bracket.

Suddenly, all this usually unglamorous trainer image has changed. While the 'Tucano' may have lost out in being European Deb. of the Year '82/'83, now, thanks to something called AST412, the 'Tucano' has at least become a hot contender (among, originally, about 17 basic trainer hopefuls) for the RAF's coveted late-

1980s' prize of replacing the ageing *British Aerospace* 'Jet Provost' T3s and T5s. Even the Fleet Street dailies have got into the act and any eagerness to educate readers as to the possible 'Oscar nominees' must be tempered with the knowledge that here is a politically-loaded situation. To some, buying foreign is unthinkable!

In pundit language, frontrunners are the 'Tucano,' the Swiss *Pilatus* PC-9 and the only British hopeful, the *Firecracker Aircraft Ltd.* NDN-1T 'Turbo Firecracker.' The 'Tucano' has the distinct edge in being in full-scale production whereas the PC-9, an RAF-tailored prototype yet to be flight-tested, is a development of the current-production PC-7 'Turbo Trainer' which will have a *BAe* 'Hawk'-type blown canopy and ejection seats like the 'Tucano' and 'Turbo Firecracker.' In competition, all three have the same PT6A turboprop with the novelty of full reverse propeller pitch.

However, AST412 (Air Staff Target) is a 'think-about-it' paper tiger and the real 'Oscar nominee' test will be when the critical ASR (Air Staff Requirement) is made available. If the cheaper but less satisfactory £90M option of refurbishing the remaining 'Jet Provosts' is not grasped as a way out, then the 'unthinkable' foreign buy for an initial 155 new aircraft makes sense for the British big boys to get into the act. *British Aerospace* has now dropped its own paper project, the 'NBT' (New Basic Trainer) and has opted to licence-build the Swiss PC-9. With greater foresight, *Shorts* of Belfast has long since effected a parallel deal with *Embraer* for the 'Tucano.'

Embraer credentials 1969-84

A stylish Brazilian brochure dated February 1983 encapsulates the 'Tucano' thus: 'The *EMB*-312 is the first military trainer to be designed from the outset around a turboprop, with an airframe ideally matched to simulate a fast jet ... (it) can execute any aerobatic manoeuvre up to +6g (times gravity) and -3g ... and has a reinforced airframe and landing gear to withstand rough treatment by student pilots and (from working out of) unprepared airstrips.' These are the bare facts about a new military basic trainer which might conceivably wear RAF roundels and be called the 'Toucan' T1. But what of its antecedents and its pedigree, always assuming the 'Tucano' isn't the product of a cottage industry breakthrough?

In fact, *Embraer* is celebrating its 15th anniversary this year. On August 19th, 1969, *Embraer* was established with private shareholdings comprising 90 per cent of the subscribed capital but with the federal government retaining 51 per cent of the voting shares. Then on January 2nd, 1970, *Embraer* became operational with the declared objective of 'developing and expanding the national aircraft industry to meet home and export needs.'

Today, *Embraer* is no 'cottage industry,' occupying as it does a modern plant in the state of São Paulo which needs a workforce of 6,000 to keep the wheels turning. The plant, at São José dos Campos, covers an area of 130,000sq.m (1,400,000sq.ft.). And, in 1980, *Embraer* acquired as a wholly-owned subsidiary its previous working partner, *Neiva*, of Botucatu, São Paulo.

Since the first five aircraft rolled off the production line at São José dos Campos in 1971, the plant has turned out around 3,000 aircraft — of which one-third have been *Embraer* designs. In 1974, *Embraer* concluded a deal with *Piper Aircraft* whereby major components for a range of light and general aviation models would be assembled locally (*PA*-28s to *PA*-34s) and marketed with Brazilian popular names in some cases. At least 1,136 *Piper* singles and 630 *Piper* twins have been rolled out. Additionally, between 1972-81 *Embraer* licence-built 182 *Aermacchi* MB326GB tandem-seat light strike aircraft as the AT-26 'Xavante' (Brazilian Indian tribe). About half the AT-26 force has been, until the welcome addition of the T-27 'Tucano,' doubling in the flying training rôle. In passing, the 25 remaining *Cessna* T-37C turbojet trainers of the FAB (Fôrça Aérea Brasileira) were removed from the inventory in 1982 and now bear the military markings of South Korea.

Behind every 'Hurricane' and 'Spitfire' is a design engineer of considerable talent like a Camm and Mitchell. And behind the 'Tucano' is *Embraer's* remarkably versatile Hungarian-born (March 19th, 1926) Technical Director i/c Advanced Projects, Ing. Joseph Kovacs. Emigrating to Brazil in 1948, he spent a year with the airline *Real SA*, before joining IPT (the Instituto de Pesquisas Tecnológicas or Institute of Technical Research) in São Paulo, 1949-51. From 1951-61, he really came into his own when he became associated with the legendary Prof. Heinrich Focke (*Focke-Wulf* and *Focke-Achgelis*) and René Marie Vandaele at the Centro Técnico de Aeronáutica. Here at CTA, Ing. Kovacs designed several sailplanes and light aircraft. (Even by the close of 1974 he had some 4,000 flying hours to his credit).

From 1961-73, Joseph Kovacs was with *Neiva*, variously as Chief of Projects, Production Manager and General Manager. The *Neiva* T-25 Universal piston primary trainer (which the 'Tucano' will supersede) was one of his many projects. In 1973 he moved to *Embraer* as Technical Director i/c Advanced Projects, the newest of which is the *AMX* jet fighter, a joint venture with Italy's *Aeritalia* of Naples and *Aermacchi* of Varese. The first set of *Embraer* designed and built mainplanes left for assembly by *Aeritalia* in an FAB *Lockheed* C-130 'Hercules' on October 5th, 1983. Of the six prototypes, Nos. 4 and 6 will be built at the *Embraer* plant, with No. 4 to be test flown in 1985.

Up to the time of joining *Embraer*, Ing. Kovacs had been involved in the design of 37 powered and unpowered aircraft — 11 advanced to prototype stage and another five to series production.

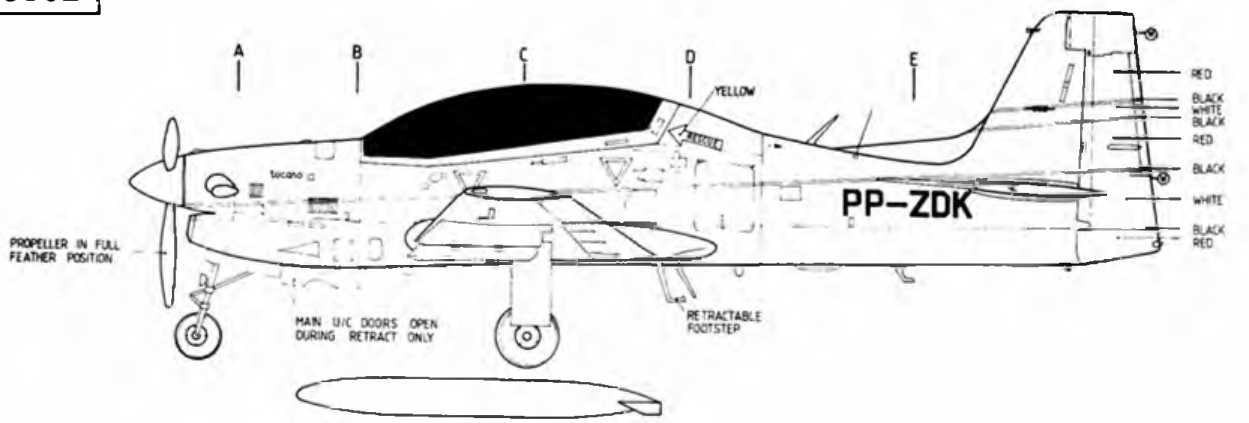
Excluding the 'Tucano,' four company-designed production series are currently on offer. The *EMB*-111 'Bandeirante' ('Pioneer') is a two-propjet commuter airliner seating 12-21 passengers and of which an impressive total of more than 430 have been built so far. The first production model took to the air on August 9th, 1972. Some 466 examples of the piston-powered, low-wing agricultural *EMB*-200/201 srs. 'Ipanema' (Rio beach and a farm attached to the Ministry of Agriculture's Air School) have been rolled-out since the first production flight in 1971. Newer *Embraer* designs are the *EMB*-121 'Xingu' (a 1,900km long Brazilian river), a nine-passenger light transport with two turboprops, and the biggest turboprop twin to date, the *EMB*-120 'Brasilia' (new capitol of the Federated Republic of Brazil), which seats 24-30 passengers. More than 90 'Xingu' I/IIs have been built since the first production flight took place on May 20th, 1977. For the 'Brasilia,' more than 100 orders are on the books; PT-ZBA, the first prototype was initially test-flown on July 27th, 1983, and the second, PT-ZBB, five months later on December 21st.

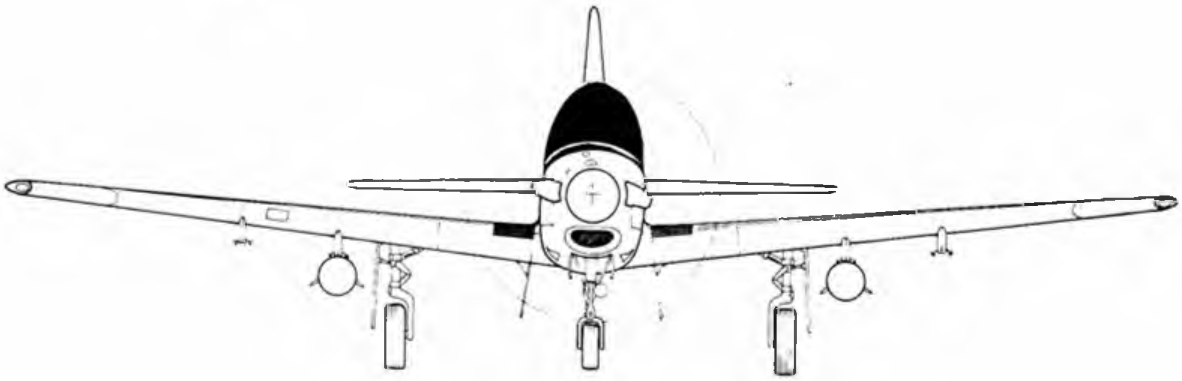
Below: the Tucano's armament configuration can include machine gun pods, rocket launchers, 250lb and 500lb bombs, or rockets (5in. SBAT-127 or HVAR).

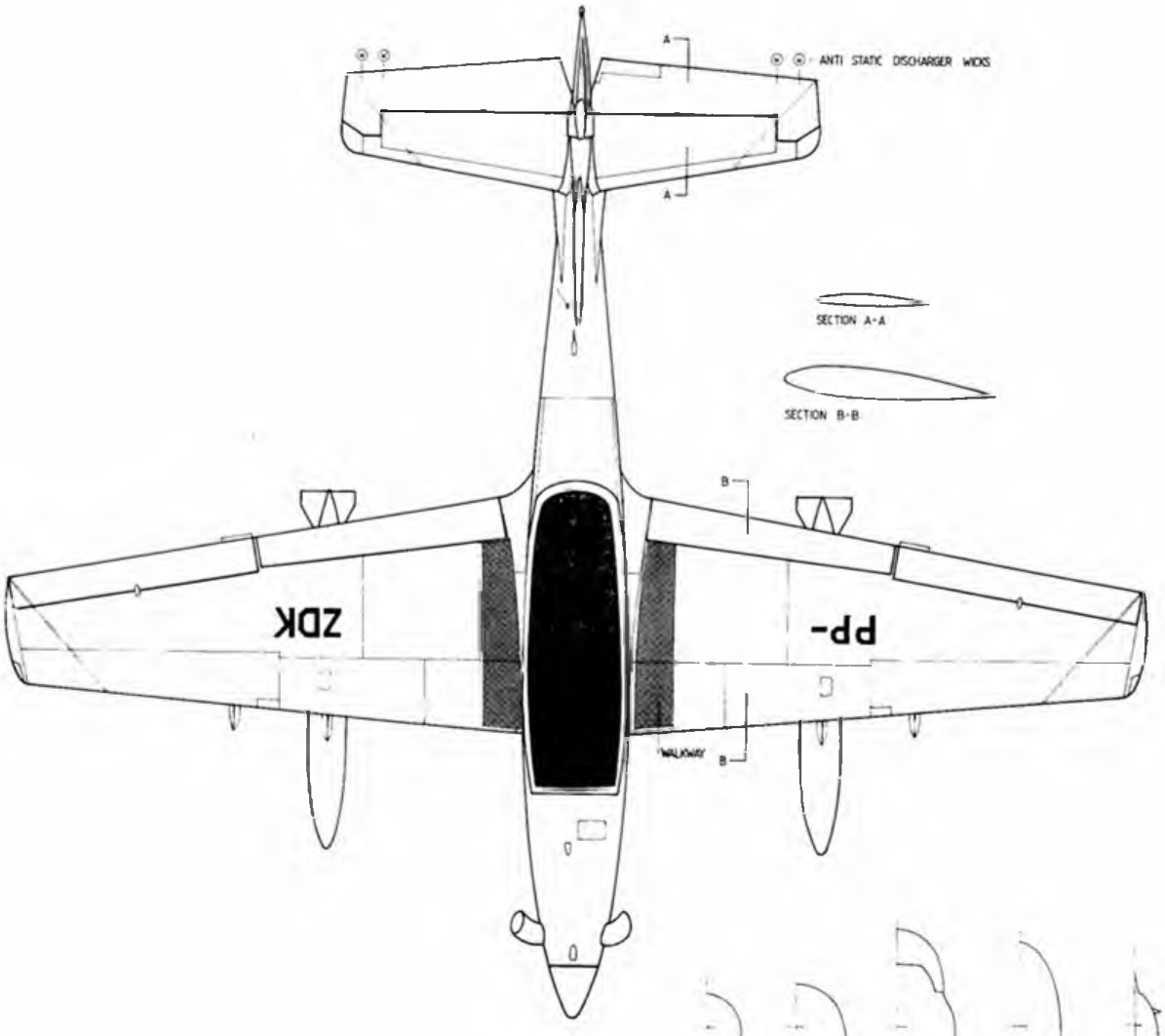
Tucano history

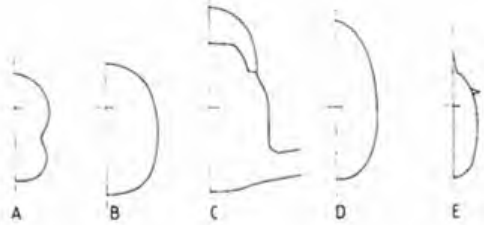
By now it is obvious that the 'Tucano' has a considerable wealth of background, both in technical 'know-how' and production

3062









EMBRAER EMB-312 (T-27 TUCANO)

1982 FARNBORO SHOW CONFIGURATION

SCALE FEET 0 1 2 3 4

skills. It has been said recently that as a company it is efficient and not very adventurous. Brazil has built up a reputation for exporting functional aircraft and all sales net hard currency. So more exports over and above the three to the British distributors, CSE of Kidlington, Oxford, and the 1983 Arab deal (Egypt and Iraq), hardly need a crystal ball to foretell the future.

While Joseph Kovacs was still at the *Nievo* plant, he was responsible for further developing his T-25 into the Model N622 'Universal' II (FAB:YT-25B). Therein lies the base of the 'Tucano' but only in respect of concept and overall lines. Both were considered by the Ministry of Aeronautics; the Requirement was issued in January 1978 and by December of that year an order for two YT-27s (FAB serials 1300 and 1301) and two static test airframes had been placed. No. 1300 made a first flight on August 16th, 1980; but No. 1301 had to be abandoned on August 9th, 1982, when an overstress condition occurred in final diving tests. Fortunately both of the *Martin-Baker* Mk8LC lightweight seats ejected faultlessly.

After the two static test airframes came the fifth 'Tucano' (regd. PP-ZDK for international ferrying to displays and demonstrations) as the first of two further flying prototypes. First flight was on August 16th, 1982; ten days later PP-ZDK was being flown across the South Atlantic to make its Farnborough debut in September. For Paris '83, the seventh 'Tucano' (PP-ZTC) was made available.

Production *EMB*-312s were first delivered on September 29th, 1983, two being allocated to the FAB's Academia de Fôrça Aérea at the Pirassununga, São Paulo, air base which is also the home of the newly-reformed aerobatic 'Smoke Flight' team (the Esquadrilha de Fumaça) — they have six T-27s smartly painted in wine red and white with cheat lines and the badge of the 'Smoke Flight' on the front fuselage. The Esquadrilha had been disbanded in the mid-1970s and its *Potez Air Fouga* CM170 'Magister' jet trainers were sold back to France.

By mid-1984, the production rate is seven-eight 'Tucanos' per month. Although the order for the FAB is currently for 118 T-27s (with extra 50 as options), after 50 'Tucanos' had been delivered, *Embraer* is now permitted to slip in export sales onto the production lines. This is handy in view of the deal signed in December 1983 by Egypt. The *AOI* (Arab Organisation for Industrialisation) is taking part in a programme to kit-assemble at least 120 'Tucanos.' In fact the first ten will be supplied by *Embraer* starting in the second half of 1984. *AOI* production at Helwan will not begin deliveries before April 1985 (and then on to 1988 at a steady rate of 2.5 'Tucanos' per month). Iraq is committed to take 80 aircraft to Egypt's 40 and thereafter the options are for another 40 to Egypt and 20 to Iraq. The average unit cost (early 1984) has been quoted at US$1,281,000 (£883,500 at $1.45 to £1.00 sterling).

In conclusion, those who have written about flying the 'Tucano' have been generous in their praise, the single-lever power and propeller-pitch control gives a 'jet-like response.' And that is what such a basic trainer should be all about. Happy landings!

Embraer EMB-312/T-27 'Tucano' ('Toucan'): design data.

Manufacturer: *Embraer* — Empresa Brasileira de Aeronáutica SA, Av. Brigadeiro Faria Lima 2170, PO Box 343, 12.200 — São José dos Campos, São Paulo, Brazil.

Current models: T-27 'Tucano' for Força Aérea Brasileira (FAB); *EMB*-312 'Tucano' for export, for kit-assembly and licence-production.

Categories: Military, tandem two-seat, turboprop-powered monoplane (1) Basic trainer; (2) Weapon systems trainer; (3) light strike tactical ground-support aircraft.

Design bureau director: Ing. Joseph Kovacs.

First flight and delivery dates: YT-27 (FAB serial 1300) August 16th, 1980; eight T-27s to FAB September 29th, 1983.

Powerplant: One *Pratt and Whitney Aircraft of Canada* PT6A-25C free-turbine turboprop delivering max. continuous power (ISA + 15.6°C) of 560kW (750shp); specific fuel consumption at take-off 100.6μg/J (0.595 lb/h/ehp) with max. 584ekW (783ehp).

Propeller: *Hartzell* 2,200 rev/min, RHT (right-hand turning), constant-speed, feathering and fully reversible, three-blade unit (with spinner); diameter 2.36m (7ft. 9in.); static ground clearance 0.33m (1ft. 1in.).

Fuel capacity: Two integral tanks each in left- and right-hand wing sections, total 694 l (183 US gal). For ferrying each inboard hard point can carry a fuel tank, total 660 l (174 US gal) weighing total 630kg (1,390 lb).

Dimensions: Span 11.14m (36ft. 6½in.); length 9.86m (32ft. 4½in.); height 3.40m (11ft. 2in.); wing area 19.40sq.m (209sq.ft.).

Above: rear and detail of PP-2DX, seen at Farnborough and Paris Air Shows, note mini trib-tabs(?).

Chords at wingroot 2.30m (7ft. 6½in.); at wingtip 1.07m (3ft. 6in.). Aerofoil sections, at wingroot *NACA* 63,A-415; at wingtip *NACA* 63A-212. Dihedral, at 30% chord 5°30'; incidence at mean aerodynamic chord 1°25'; sweepback, at 25% chord 0°43'26"; aspect ratio 6.4. Tailplane, span 4.66m (15ft. 3½in.), area (incl. elevators) 6.77sq.m (72.9sq.ft.); rin and rudder 3.67sq.m (39.5sq.ft.). Main wheel track 3.76m (12ft. 4in.) with *Parker-Hannifin* Type 40-130 wheels and 6.50X10 rib-tread 8-ply tyres; wheel base 3.16m (10ft. 4½in.) with *P.H* Type 7.555-02-L nose wheel and 5.00X5 rib-tread 6-ply tyre.

Weights: Empty 1,790kg (3,945 lb). Loaded (a) Basic Trainer, aerobatic with external stores on four hard points limited to max. total 740kg (1,630 lb), max take-off (t/o) 2,550kg (5,620 lb), max. landing weight as t/o; max power loading 3.40/shp (7.49 lb/shp); max. wing loading 131kg/sq.m (26.9 lb/sq.ft; load factors, max. from +6g to -3g. (b) Weapon Systems Trainer, with external stores on four hard points limited to max. total 1,000kg (2,200 lb) comprising 4 × 250kg) 'iron bombs,' max t/o 3,175kg (7,000 lb), max. landing wgt. 2,800kg (6,175 lb). Max load factors from +4.4g to -2.2g. (c) Ferrying condition, with two external 300 l tanks on inboard hard points, data as for Weapon Systems Trainer.

Performance: Basic Trainer, max. speed 458km/h (284mph/247kt) at 4,115m (13,500ft.), cruise 347km/h (215mph/187kt) at 3,050m (10,000ft.); initial climb rate 579m/min (1,900ft./min), service ceiling 8,750m (28,700ft.); range 1,915km (1,190st.m), with ferry tanks 3,555km (2,209st.m); stalling speeds with flaps 124km/h (77mph/67kt), without flaps 136km/h (84mph/73kt); landing roll 325m (1,065ft.), t/o run 470m (1,540ft.).

Acknowledgements

Most grateful thanks for *Embraer* assistance including supply of *EMB*-312 Type Specification and brochures. Cross-checking with 1983-84 *Jane's* 'All the World's Aircraft' has been invaluable. Special 'Mention in Despatches' must be awarded to John F. Brindley of Geneva, Switzerland and John M. Davis of Wichita, Kansas, for pointing the author back in the right direction on more than one occasion!

C.W.C.

Left: 1/24 scale dye-line print of this 1/72 drawing is available from Aeromodeller Plans Service, Wolsey House, Wolsey Road, Hemel Hempstead, Herts. HP2 4SS, price £1.65 plus 50p postage and packing. Please quote Plan No. 3026. Below: showing one of the possible armaments layouts . . .

Contest winning aerobatic control line model — explained in detail by designer Bill Draper 56in. span for 0.35-0.45 cu.in. motors

Superhawk

THE 'SUPERHAWK' is a development of my earlier 'Kittyhawk' designs with which I had a fair amount of success in the early seventies. The weight increase due to repairs after an unfortunate prang before the Nats in '75 took the edge off the performance of my No. 1 'Kittyhawk' and so a modified version with tapered wing planform, modified section and increased rear fuselage side area was hurriedly built for the team trials, coloured in 'civvy' colours for speed of finishing and renamed the 'Hawk'. The plane was very sweet to handle straight off the board and produced many contest successes, powered by an *Enya* 35.

Following the fashion for larger models, a 6% larger version was drawn up to suit a newly acquired *Enya* 40. For purely practical transport reasons the wing was made detachable and this, together with the heavier engine unit, contributed to making the larger model some 6ozs. heavier than the 'Hawk', although the wing loading and power loading were still similar. Re-named the 'Superhawk' the larger model made its debut in 1977. Two further versions of the same model have been built with only minor changes and the three models have been my main contest stable since then with great success. The first two models weighed 55ozs. less fuel and were *Enya* 40 powered, whilst the last one, due to poorer wood selection, weighed in at 57ozs. Some improvement was felt with the heaviest one by using an *Enya* 45 and this is now standard for this latest model.

A saving of some 2-2½ozs. would be achieved by using a one-piece model, provided that transport is no problem. The three-wing mounts would then be dispensed with.

Construction is very straightforward and robust, the models having all given stirling service with no structural problems. However they cannot ever claim to be lightweights and wood selection becomes very important to avoid going over the top. I believe that covered, carefully selected soft sheet is simpler, very much tougher and comparable in weight to a built-up structure which would require harder wood.

The wing section has been developed for use with flaps and is capable of reaching high angles of attack and lift before reaching a stall condition. It will also allow the Centre of Gravity to be moved well back whilst still remaining stable, thus making turns easier at high angles.

Detachable wing mounts of the traditional type with fixings only at front and rear are subjected to both severe aerodynamic loads in turns and to considerable twisting forces due to centrifugal effects, particularly in wind. Consequently I have adopted an additional fixing bolt through the centre of the bellcrank pivot to transfer the line loads of the motor and fuselage direct to the bellcrank. The bellcrank is therefore pivoted on a tube which is just clearance bore for the 4BA through bolt.

Wing construction

The wing ribs are equiangular and one template can be used for marking and cutting all the wing ribs. The curvature is designed such that the wing section is maintained with the high point at the same relative position and thickness and with the same trailing edge angle to meet the flap when using a common template.

If required the ribs can be individually traced or carboned from the drawing. *Number the ribs.*

Use full length main spars and trailing edge. If this is not available splice and glue the joints to make up the length with the glued joints staggered down the wing. Mark the rib positions on the spars and trailing edges.

On a flat building board, pin down the bottom main spar with 1/16in. packing at the centre section and 7/32in. at the tip positions, plus intermediate pieces. Make six balsa templates to support the trailing edge bottom at its correct angle and height parallel to the building board. Glue the ribs in position along the main spar and trailing edge, ensuring that they are square both

Control linkage detail. Above: view showing elevator push-rod and sideways location in slotted former also illustrates rear wing mounting. Right: elevator horn with adjustable soldered brass pushrod bush.

vertically and fore and aft. Fit the top main spar and trailing edge and both leading edges.

Cut to shape the first layer of the top centre section 1/16in. sheet forward of the main spar in one piece. Dampen the top surface by wiping with a wet cloth to assist curvature and glue and pin in position. Use a slower setting glue than cement to allow for positioning and accuracy, e.g. *Bordon* Carpenters wood glue. When the first layer has dried, fit the full top leading edge sheeting as before, dampening the wood on the outside of the curvature.

When dry, remove from building board. Face off the rear of the trailing edge and fit the rear cap strip.

Cut and drill the ply mounts to take the tubular bellcrank pivot and glue in position.

Cut the ply undercarriage (u/c) support plates to be a close fit between W1 and W2. Mark and drill for the support stitching for the u/c. Carefully blend the u/c legs to shape, not forgetting to fit the torsion bar pivot tube. Set the inboard wheel *only* for 2° inset. The outboard wheel should be straight. Stitch and epoxy, the u/c torsion bar pivot tube and wire to the bottom side of the support plate using nylon or terylene thread. Glue u/c support ribs W18, W19, W20 in position, plus the vertical grained support spacer.

Cut the bellcrank pivot tube, allowing for the length below the wing. Attach the leadout flexible wires to the bellcrank. Use tinned flexible 'heavyweight,' soldered to a solid wire loop through the bellcrank. Thread the leadouts through the wing and fit the bellcrank in position on its pivot tube. Centralise the bellcrank using thick neoprene tubular spacers and washers. Epoxy the brass tube in position.

Fit the u/c mounts in position. Complete the sheeting of the leading edge underside.

Build up the wing tips. Fit the leadout guides, epoxied in with additional 1/8in. support sheet. Fit the down lead tube *above* the tip sheet and the uplead tube *below* it.

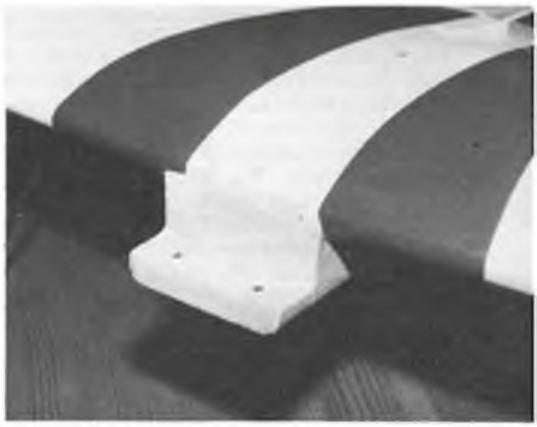
Attach the flaps using terylene cord and 'W' stitching. Fit small 1/16in. spacers either side of the stitched hinges to hold the flap clear of the trailing edge. These are left in position until after doping and are then removed. Fit the flap horn and push-rod. Pre-tin the flap horn and tubular push-rod bushes. Solder the bushes in position, ensuring they are 'square'. Make a template to measure deflection, and fit balsa stops to limit the bellcrank movement to provide 28° to 30° flap movement each way.

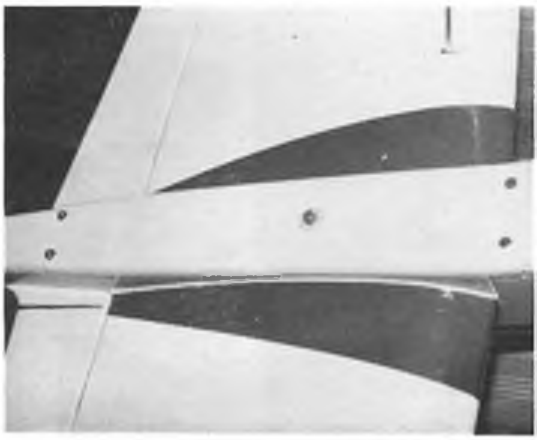
Sheet the rear centre section of the wing and complete carving and sanding.

Fuselage and tail

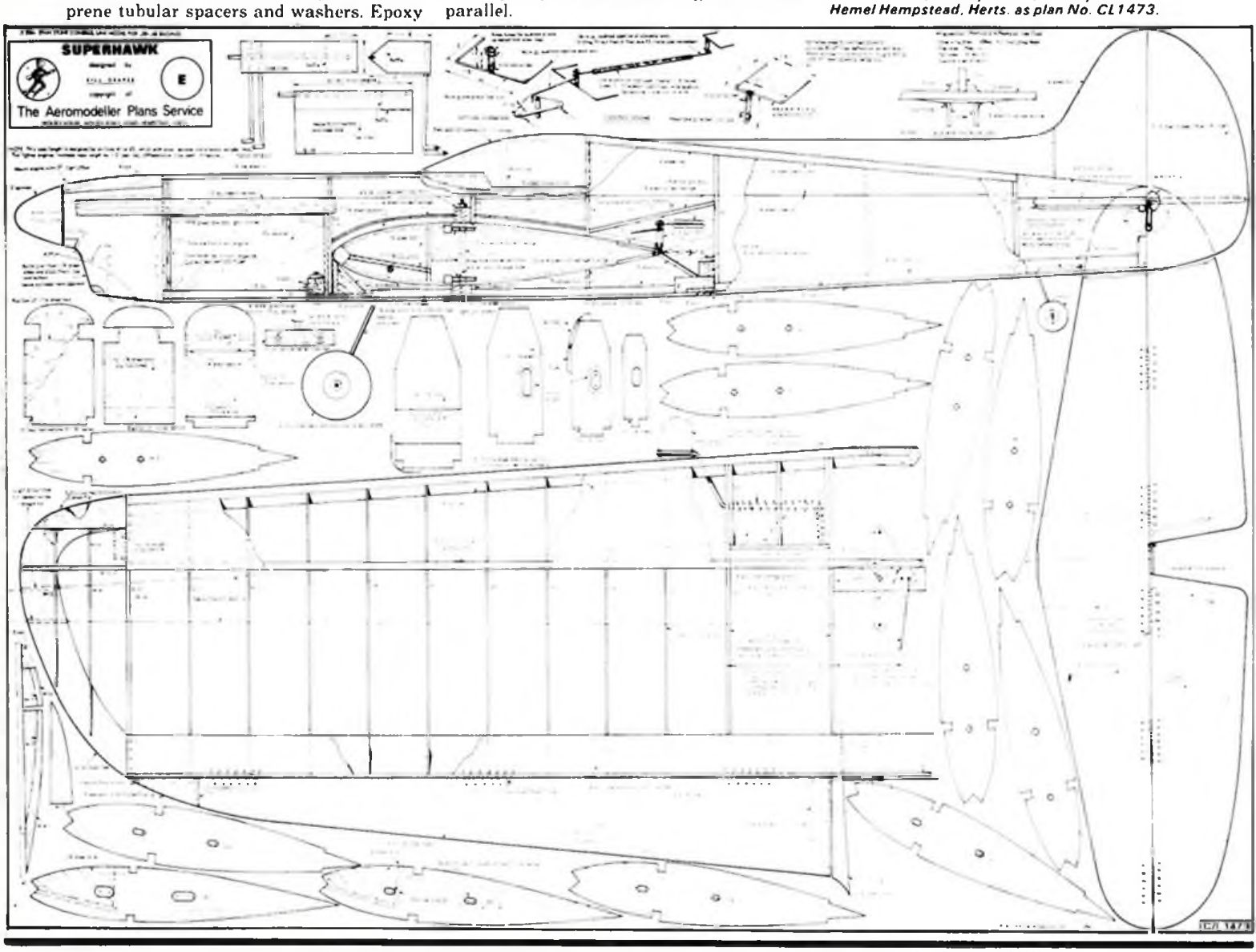
Mark and cut fuselage side outlines. Mark former positions on outside faces. Mark and cutaway for wing centre section and section of fuselage below the wing. Cut out 1mm ply doublers and glue to the inside faces of the fuselage sides. Use contact adhesive but with a line of PVA around the outer edges. Cut out remaining formers and components. Laminate the former F1. Each lamination should have the grain running at 90° to the next.

Mark the engine bearer positions and glue the bearers to the insides of the fuselage sides. Join the sides together using F1, F2 and F3, ensuring that they are square and the top edges of the fuselage sides are parallel.





Above: wing mounting detail from above and below, note five bolt fixing. Below: full-size copies of this 1/5 scale plan are available, cost £2.75 plus 50p post and packing from Aeromodeller Plans Service, Wolsey House, Wolsey Road, Hemel Hempstead, Herts. as plan No. CL1473.



Shape the 1/16in. tail post slightly to allow for the taper of the rear fuselage. Fit and glue the remaining formers and join the sides to the tail post. Epoxy the 1/8in. ply former to the front of F2. Fit the 1/8in. thick balsa strip doublers to the wing seating surface. Epoxy the three 1/2in. square hardwood wing mounting blocks in position. Drill and fit a single 1/16in. dowel through the ply former and F2 into the front mounting block, horizontally and centrally. Glue the dowel in position. Drill and fit 1/8in. dowels through the fuselage sides into the ends of the three blocks.

Fit the wing into position and mark through the bellcrank pivot tube for the central mounting bolt in the centre mount. Remove the wing and drill a 4BA clearance hole square through the mount and epoxy in the 4BA nut plate. Refit the wing in position held by the central bolt with a temporary block packing piece below the wing to make up the full depth. Assemble the fuselage section below the wing including the mounting blocks and ply mounting supports at front and rear. Drill for two side by side 4BA fixing bolts at the front, straight through the hardwood mount and similarly at the rear for two 6BA bolts. Epoxy nut plates in position. Fit the front and rear fixing bolts to support the wing and remove the centre bolt. Complete the centre bolt mounting block and sheeting.

Cut and sand the tailplane and elevators. Temporarily fit the tailplane in position to ensure the alignment with the wing with no twist. Remove and attach the elevators with W stitching using 1/16in. packing pieces on either side of the hinges similar to the flaps. Make up and fit the elevator horn.

Make up the push-rod from 14swg wire with the aluminium stiffening tube epoxied over spacers. Leave the final bend for the elevator horn.

Remove the wing, slide in the push-rod, engage the flap horn and refit the wing. Pin the tail in position and with flaps and elevators central, mark with a dab of paint *(Tipp-Ex)* the bending point of the push-rod for the elevator horn. Dismantle, cut and bend the push-rod. Re-assemble and with the wing in position, glue the tailplane in position ensuring that flaps and elevators are neutral.

Complete the 1/16in. box across the fuselage between F2, F3 and F4 and the 1/8in. box between F4 and F5. Ensure correct operation of controls without fouling and with correct deflections. Complete the tank box, top and bottom sheeting, lower longerons, cockpit deck, etc. Fit rear wheel mount, dorsel and main fin, rudder, etc.

Trim the engine bearers and drill for 2° offset. Temporarily mount the engine and fit the top block. Build up the cowl. Complete all remaining items, sanding, wingtip weight, etc.

Cover the wing centre section with nylon or glass cloth. I covered the wing structure with lightweight tissue, lightly doped, and then *Solarfilmed*. If using this technique, ensure that a hole is made in every rib, including tips to allow the air under the *Solarfilm* to dispel. Pin-prick every panel with 5 or 6 holes for the same reason.

The flaps and elevators were lightweight tissue covered, the tailplane heavyweight tissued and the fuselage nylon or glass cloth covered. The two earlier models were painted with household paint but the latest unit was cellulose sprayed and finished with twin pack fuel-proofer.

When assembling the wing and fuselage do not use excessive force on the bolts. Over-tightening of the centre bolt will simply crush the centre of the wing. I use a large diameter (3/4in.) nylon washer to spread the load of the centre bolt and merely tighten until the washer is gripped.

Superhawk's super contest record

Nationals records	1977 —	10th
(Gold Trophy)	1978 —	3rd
	1979 —	4th
	1980 —	3rd
	1981 —	1st
	1982 —	3rd
	1983 —	1st
Clapa League	1978 —	1st
	1979 —	1st
	1980 —	2nd
	1981 —	1st
	1982 —	1st
	1983 —	1st
Clapa championships	1982 —	1st
	1983 —	1st
Team Trials for W/Cs	1983 —	1st

Above: tank and hatch cover fittings, tank is retained by single bicycle spoke across the fuselage and through brass tube soldered to tank. Note wing mount bolt and large nylon washer. Right: flap control linkage on upper surface of wing.

Flying

Provided that the balance point (C.G.) is within 1/16in. of the nominal position, try flying the plane before adding weight. Even with the balance point in the same position, two aircraft with different weight distributions will handle differently. Also, different people have different reactions, wrist movements, etc. and so it is better to trim the model to suit your own 'feel'. Correct any differences in line tension between inside and outside turns by flap twist or, as I prefer, by using the fixed outer portion of the outboard flap as a trim tab.

If the plane feels slow on square turns, add weight to the tail rather than changing flaps or elevator deflections. The flap deflection has been chosen for best lift/drag performance, whilst excessive elevator movements result in high drag, stalled, less effective, elevators. Add weights 1/2oz. at a time until the desired response is achieved and then no more. I found it necessary on one of my models to do this and added 1/2oz. in the form of a lead 'Penny' bolted to the fin under the elevators.

If the plane is too quick on the turn and 'jumpy' reduce the elevator deflection 5° at a time. If the desired response has not been achieved with maximum deflections of 30° up or 25° down, then nose weight must be added.

Fly on 0.015sq.in. seven strand or 'light Laystrate' three strand. 'Laystrate' lines require more maintenance, etc. to avoid kinks, but are lighter than the seven strand stainless lines and equally strong in straight tensile strength. I fly on 63-64ft. actual line length, discounting the model.

Good luck with your 'Superhawk'. Avoid the *nasty one* and it will provide years of service.

Going Solo

Part 3

Auto-Rudder and tow hook construction for Solo I.

A practical series for the beginner

by Trevor Faulkner

Auto rudder and tow hook

So far the series has dealt with model-gliders launched by hand and at their normal gliding speed. Given what is known as 'stable air', (no rising or descending patches of 'lift' or 'sink'), even the most superb glider will eventually descend to the ground. Defining this 'normal gliding speed' a little more, we could describe it as the speed at which the model settles into a well-trimmed glide.

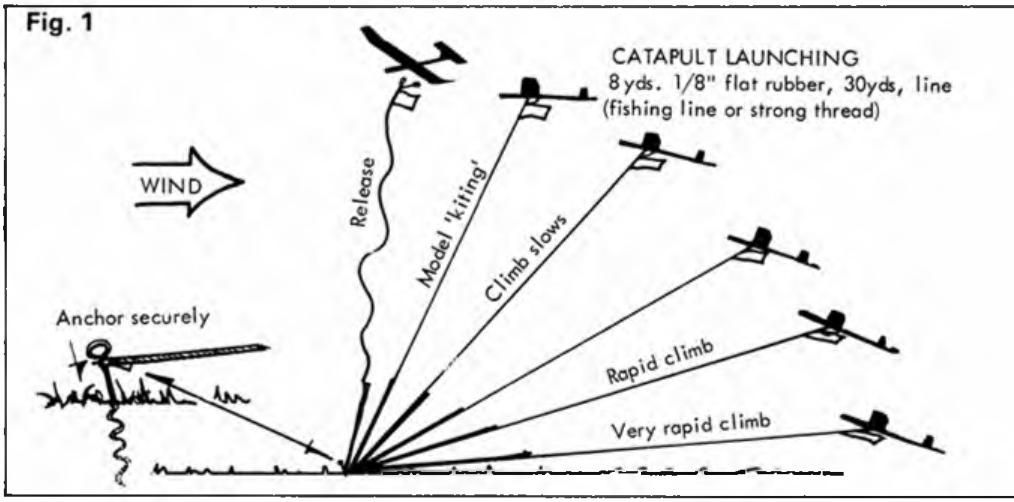
When an aircraft is in either level flight or climbing, this 'normal' mode of flight has been disturbed by an extra ingredient . . . power. This power could come from within, in the form of fuel which is being burned, or energy, stored in some device (for example, rubber strip) which is released under control and turns the airscrew.

In addition, the power could come from an external source; air movements could disturb the flight path and assist in changing the normal glide path in both direction and speed. (Watch a model entering a thermal current; it accelerates rapidly. A patch of sink, or 'downdraught' slows it down). Our external source of power for a glider, usually comes from human energy applied directly, such as when a model is thrown (the 'chuck-glider' exemplifies this), or indirectly via a tow-line or a catapult (fig 1).

The application of this extra surge of energy results in increased flying speed, which produces extra lift (and extra 'drag' due to the increased resistance of the air to the model's passage through it). These forces all assist in making the trim of the model a bit more critical at times when its speed builds up, so that while the model is inclined to climb in response to the energy available, any assymmetry in its construction will become more apparent than at normal flying speed.

To summarise, if we want to get any model 'up' we need to apply energy (to increase its speed and the lift its wing generates). At the same time we need to be able to control this energy. This is how we go about it.

Fig. 1

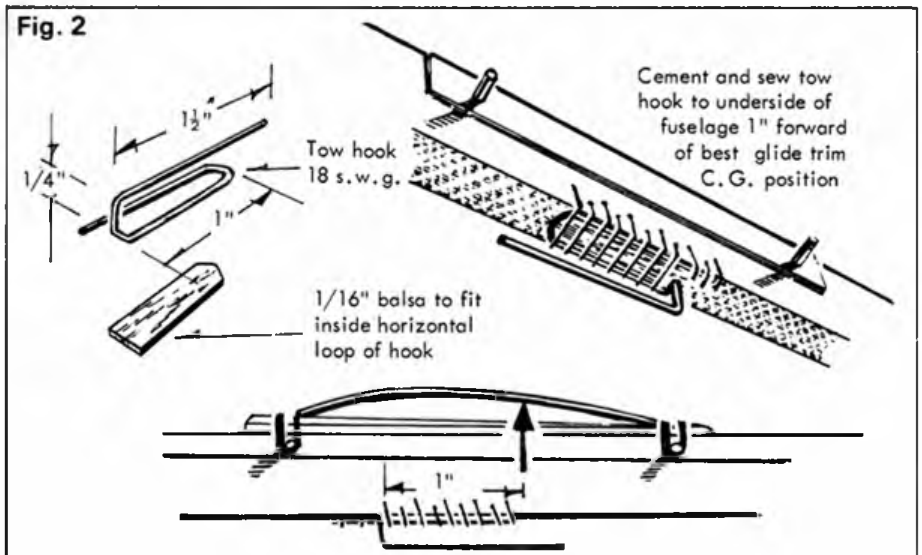


The model we built last month — Solo I, is not designed to be thrown hard to gain altitude, and so we need to use tow-or catapult-launching techniques. Both require a hook secured to the fuselage and to which the tow-line or catapult can be attached *and* from which the model can free itself automatically.

The *tow hook* is bent to the pattern shown in fig 2. It's worth getting a piece of 18swg wire, but if you have some of the 20 gauge stock left over, this can serve at a pinch. The diagrams explain that it should be exactly fuselage width across the loop part. Use strong thread to sew the hook in place after cementing as shown, *stagger* the stitching to avoid splits and rub some cement into the threads after sewing, to waterproof and secure them.

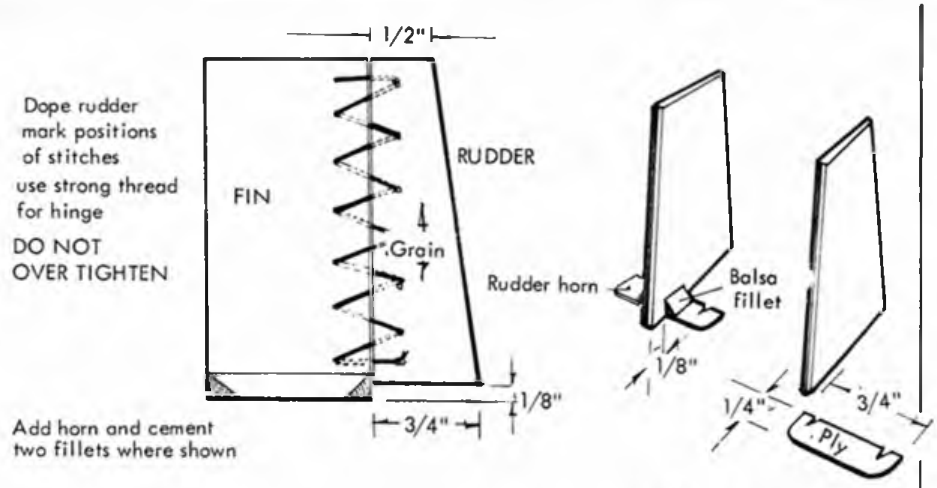
That's all that's required to link the model to its 'power supply'. The next job is controlling the model when under power. *Auto-rudder* (fig 3) is the term usually applied to any movable rudder surface which has two or more pre-set positions which the rudder takes up in response to a simple activating mechanism. This sounds a bit fanciful but all that is involved is a simple hinged flap pulled to one side by a thin nylon line and then pulled back in the other direction by a small rubber band.

Fig. 2



Although this isn't complex, it will introduce a few more very useful modelling techniques which are applicable in many kinds of models. First the *rudder* itself. Cut a piece of ⅛in. sheet as shown. The ⅛in. clearance at the bottom isn't critical, but don't make it less than advised. Dope the rudder with a couple of coats of your castor-oil treated mix as described last month. Pierce holes in both fin and rudder (staggered) as shown. With some strong thread sew — starting at the bottom, *over* the rudder, through the gap, under the fin, *up* through the fin, back over fin, through the gap, etc. If you get mixed up, cut off the wasted thread and start again!

When you get to the top, check that the rudder hinges easily without binding or slopping about. Round off the job with a neat knot at the top. Rub a little cement into the holes and carefully dope the thread where it overlaps the wood. Try *not* to get dope on the thread *between* the fin and the rudder, as this will stiffen the movement. Cut four strips of ply, ¾in. x ¼in. Add one to the rudder as shown, another to the fuselage with all the surplus of this part projecting from the *right of the fuselage*. Scraps of balsa glued to this ply strip will act as 'stops' for the rudder. They are adjusted by adding or cutting away *small* amounts of wood until the correct result is achieved. With a ⅛in. drill angled as shown in fig 4 and 'twirled in the fingers make a hole about 2in. aft of the rear wing dowel on the rudder-side of the fuselage.



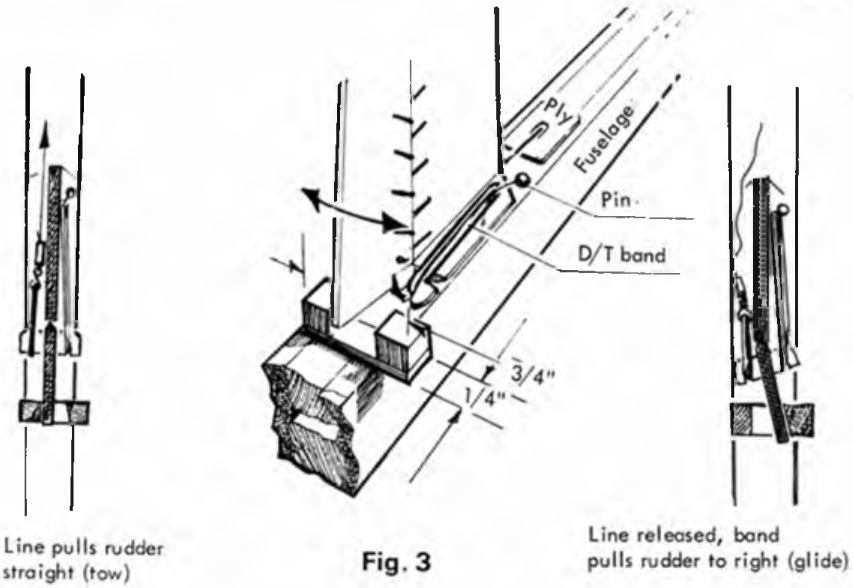


Fig. 3

Now . . . 1in. in front of the fin (top of fuselage) drill a ⅛in. hole and enlarge this carefully until you can see and lift out a *thin* piece of electrical flex passed along the fuselage from the front hole.

With both ends of the flex sticking out, tie a length of nylon fishing line (10 to 20lb. breaking strain is ideal) to one end of the flex and pull this through, with the nylon now taking up the position vacated by the flex. Slide the ply reinforcing plates (drilled with a 1/16in. hole) over the nylon, and glue in place.

Make up a small hook from a small paper clip and try the tube-crimping technique to attach it to the line (fig 5). Now push a pin down and through the fuselage from above, ⅛in. to the rear of the rear wing dowel. (see fig 3).

Put one D/T band over the right-hand rudder horn and secure this by a pin so that the stretched band is tensioned enough to pull the rudder over against the balsa stop on the right-hand side. Link the wire hook to the left-hand horn via a small rubber band and pull the forward end of the line until the rudder moves up against the left-hand stop, that is in the straight-ahead position. Add the washer and crimping tube in such a place that when the washer locates on the pin, the rudder is pulled straight.

Now check that the system works by referring to the diagrams. Washer on pin, rudder straight. Washer released, rudder to right.

This is the sequence that will occur automatically when the model is launched by line. You are advised to use the catapult system as it has the dual advantage for a beginner of being safely handled by one person and also eliminates the need to learn towing skills at this stage.

Let's start at the model end. The line terminates in a ring, (tow ring) which can be bent from a paper clip, be a small split-ring or anything which will slip easily from the tow-hook without fouling. A second short line connects a smaller ring to the tow-ring. This second ring is slipped onto the pin below the fuselage *before* the washer will be pulled off the pin and as we saw earlier, the rudder will go over to the right. Moving down the line we note that a pennant is fixed about 6in. from the tow-ring. Make this of light material such as nylon. (If you can find a segment from a discarded umbrella, this will make an excellent pennant as the material doesn't get soggy in damp conditions.) The rest of the line (about 30 metres is ideal) is fastened to yet another smooth ring and from this ring a strip of rubber ⅛in. flat by 8 yards long extends to a peg or other ground 'anchor'. Don't be tempted to use more or thicker rubber. The model will travel too fast, come off 'stalled' and probably not recover properly before meeting the ground. Hook the two ring onto the model's tow-hook. Then put the release ring onto the pin, finally, pull the washer forward and pop it over the pin. Check that the rudder is now in its 'straight' position. Walk back about ten yeards, hold the model's nose up at about 30° and release.

The model should climb into wind and may even stay on top of the line 'kiting' for a little while. They the drag of the pennant will pull the tow ring free, off comes the release ring (and washer) and circling flight begins.

The extra height this gains allows you to see how good your initial glide-trims were. It will probably be necessary to make small adjustments to the stab. packing, (about 1/32in. at a time) to get the best results.

Always try to give the same amount of catapult extension extension once you have discovered the best degree of 'pull' to suit your model. Rather like a cricketer marks out his bowling run, mark your launch point.

Check the model after each landing and before each launch. If you can arrange you can arrange to fly over uncut grass, so much the batter but if the ground is hard, be particularly careful to examine all the flying surfaces for damage before trusting to luck. (Luck tends to be on the side of those who don't trust to it!)

A simple addition to the wing dihedral joint is shown which has toughened up the prototypes structure after a lot of flying in blustery conditions over frosty ground had broken the joint at that point.

Once you get things going nicely, the D/T (de-thermaliser) ought to be used on warm days when cumulus clouds are around. Although the model is no 'floater', it responds to thermals, the system was illustrated in last month's instalment.

Work out a way of winding up your catapult after one, (a reel of some sort is what you need) and take cement, some pins, sellotape and spare rubber bands to cope with emergency repairs. When in doubt, refer back to what you learned on the 'Trim Trainer' and try to apply the same principles here.

Next time we'll start to deal with built up construction, till then, good flying.

Aeromodeller

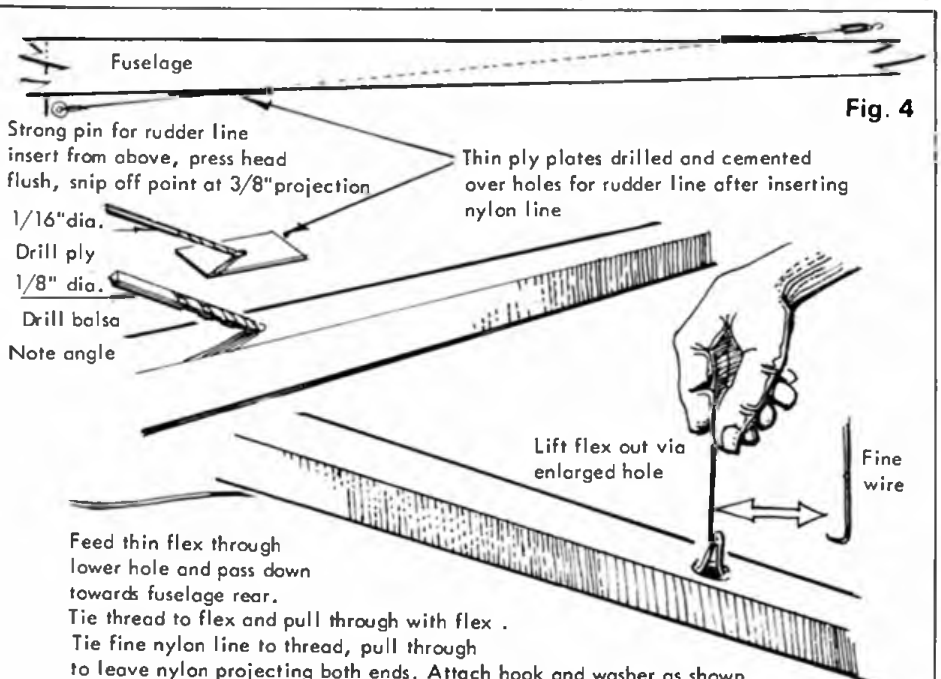


Fig. 4

Fig. 5

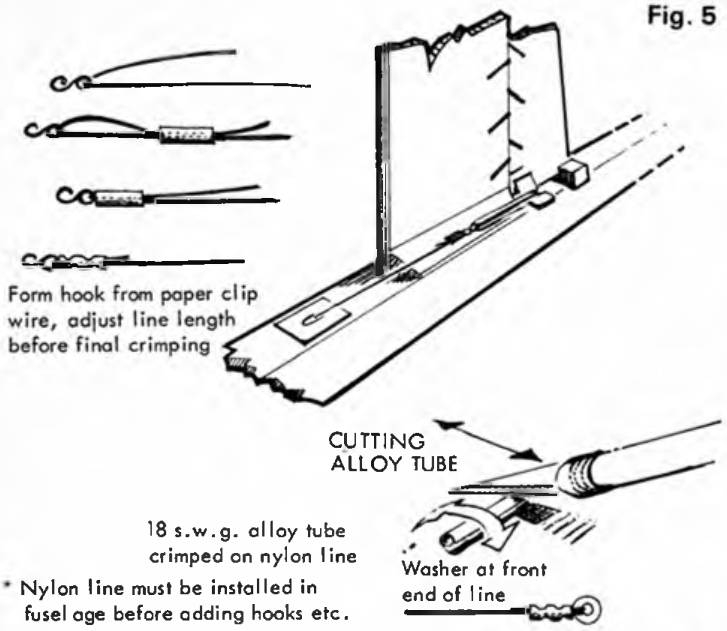


Fig. 6

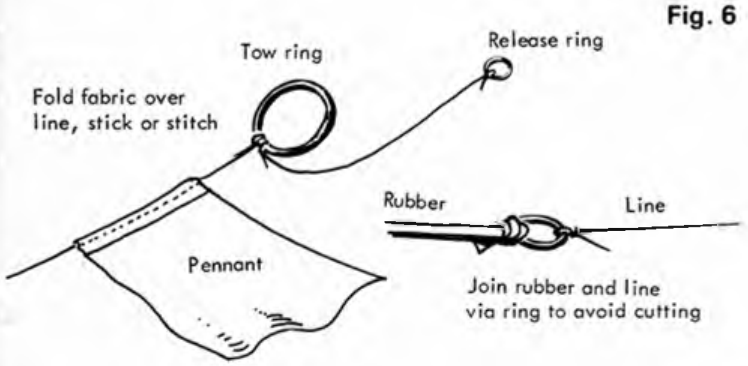


Fig. 7

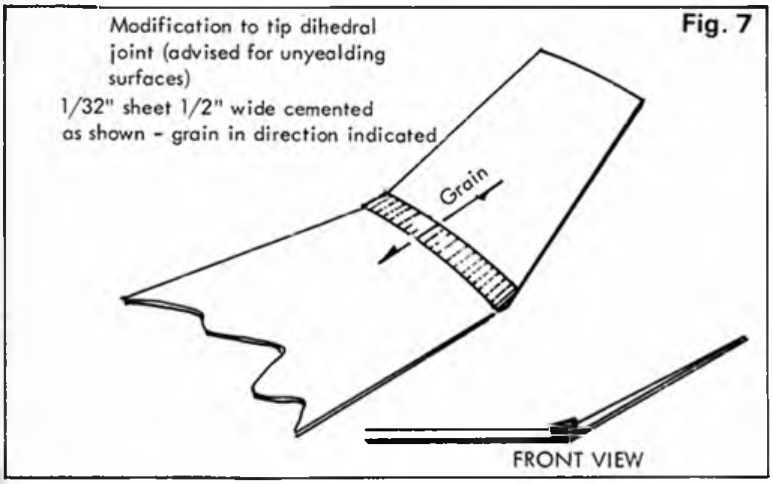


Fig. 8

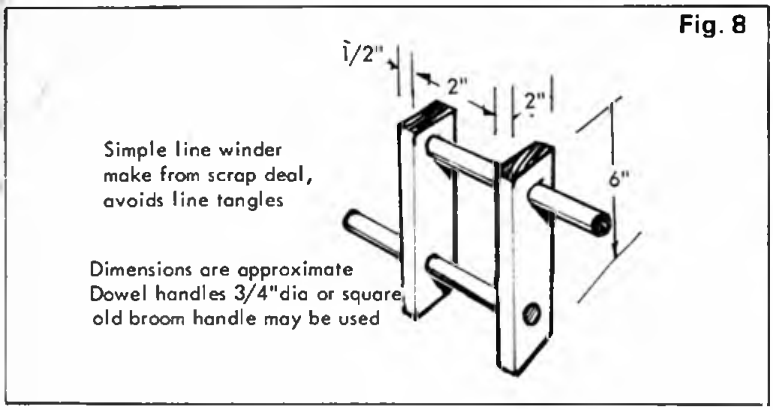


PHOTO-PRIZE ~ MODEL NEWS
with Fliar Phil

With the flying season in 'full-flight' spare a thought for our 'feathered friends'! Flying around looking for a bit of 'free lift', they may well be confronted with a fearsome-looking R/C job, or a thermal-riding free-fighter, invading their 'air-space'! Happily Fliar Phil has no reports of any 'confrontations', *but* continues to receive reports, and photos, of your masterpieces. Herewith this month's offerings.

1

2

3

Photo 1
A beautifully constructed model of a little known aircraft, a *PoliKaspov* P.O.5 it comes from Geoff Spencer of W. Midlands. Plan is by Alan Shanztle from the U.S.A. Rubber-powered, weight just over ½oz. Span 18in. An attractive and unusual model Geoff.

Photo 2
Those early flying machines certainly had a fascination that todays aircraft seem to lack. An example is this *Bleriot* XI. Span 415mm. *Brown* 'Campus' CO_2 powered. Weight 28 grams. Built and realistically photographed, by Mr. Siddall of Lincoln. Wheels are home-made, with fully working suspension.

Photo 3
When you get as close as this to a scale model the detail just *has* to be better than good! This photograph of his *JU*87B in the markings of the Luftwaffe in the Battle of Britain period, comes from Martin West of Dartford, Kent. Spans 60in., engine is a *Super Tigre* 60, and 4 channel radio. Impressive Martin!

Photo 4
Dedication — (and perspiration!) are evident in every strut and rigging wire of this 1903 *Wright* biplane, built by Paul Street (Sunderland D.M.C.A.). Ian Gardner of Tyne and Wear, who submitted the photo, informs Fliar Phil; the scale is ¼in. to 1ft., materials balsa, bamboo and tissue.

4

Photo 5 — Winner

An impressive photo, *and* constructed in very unusual material — *silver*, by Mr. P. Howell of Wiltshire. It is of a 'Spitfire' L.F. IX.C. (1/72nd scale). Fliar Phil must add that there is a piece of aeronautical history behind it. The model was made and presented to Flt. Lt. J.D. Lindsay, R.C.A.F., who, flying the original 'Spitfire' ML411, shot down three *ME*109's in *one* sortie in July 1944. A fine photo *and* information, wins Mr. Howell this month's camera.

Photo 6

Fliar Phil receives a number of fine photographs of 'Tiger Moths'. An outstanding example is this 'Tiggy' from Peter Bull of Kilkenny, Ireland. Span is 57in, power a *Merco* 61, with *Fleet* 4 channel R/C. An interesting note. It was originally fitted with floats. Peter says, "it flies well and is quite aerobatic" adding, "the leading edge slots really do work"! Fliar Phil recalls that the leading edge slots on the full-size 'Gypsy I Moth' he used to fly, also worked! He *won't* say how long ago that was!

Photo 7

'Realism plus' is certainly the keynote in this photograph from Mr. Reeves of March, Cambs. His superb 'Spitfire' Mk IX, spans 74in. Weight 13lbs. Engine *HP*61. Working undercarriage and flaps. The photograph was taken by Mr. Reeves at Reno, in Nevada, U.S.A. The mountains in the background form a fine backcloth. Thanks Mr. Reeves.

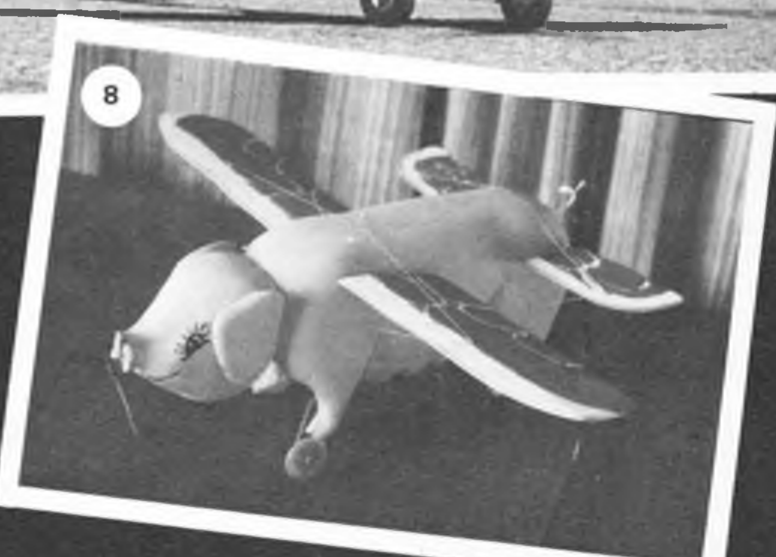
Photo 8

Thankfully, there are imaginative aeromodellers, who between their more serious modelling, are inspired to produce a flying 'model' that is fantastic, or humourous, or both! Our hobby would be the poorer without them. Tony Hicks of Bristol, sent F.P. this 'portrait' of 'Posie', the electric R.T.P. flying porker! Constructed from dense expanded polystyrene, with balsa 'rashers of bacon' for wings and tail. Took a great part in the South Bristol M.A.C.'s electric R.T.P. display at the Model Engineer Exhibition at Wembley.

Well friends get up there among the thermals! Fliar Phil will be seeing you.

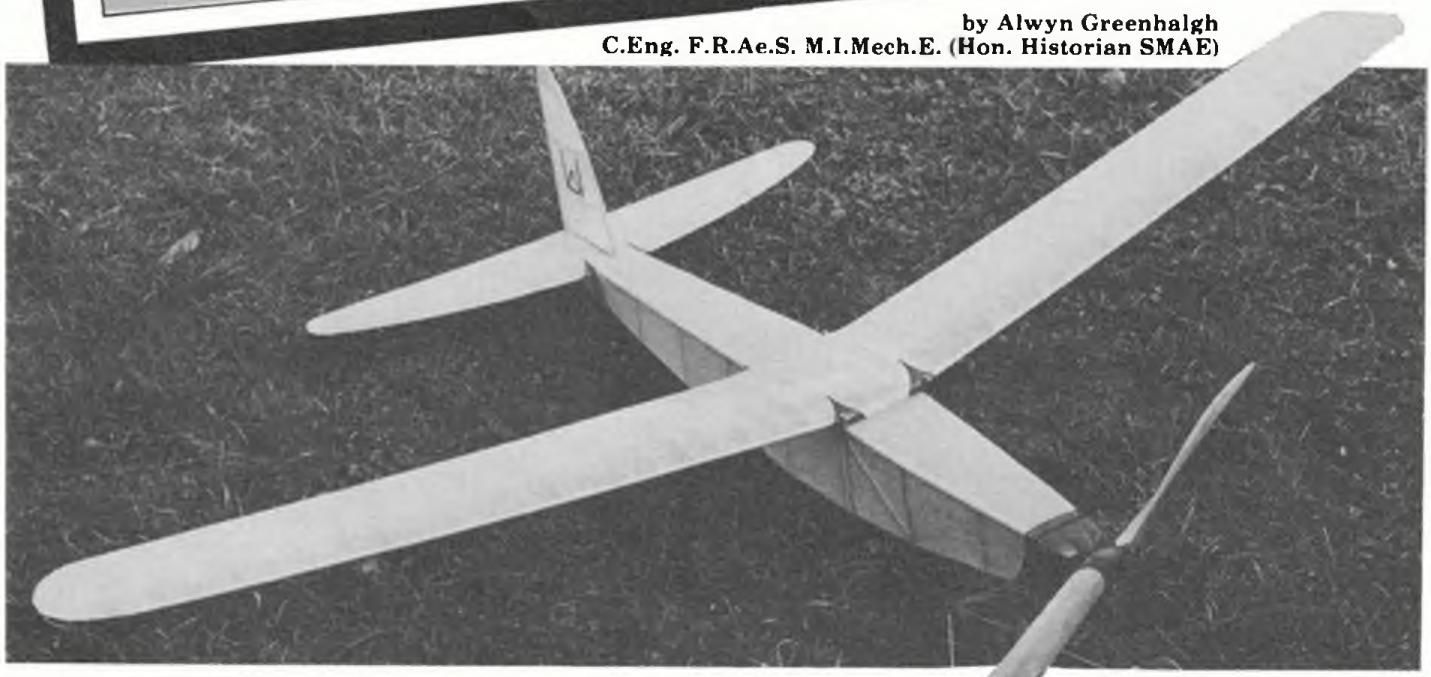
Win a Cosina SLR Camera

All entries should be good quality black and white or colour prints. Your name and address should be on the back of the print. Details if possible should be given about the model and its construction. Send all entries to: Aeromodeller, Photo prize Feature, PO Box 35, Wolsey Road Hemel Hempstead, Herts. HP2 4SS. Photos will be returned after publication.



THE 1934 WAKEFIELD CONTEST

by Alwyn Greenhalgh
C.Eng. F.R.Ae.S. M.I.Mech.E. (Hon. Historian SMAE)



J. B. Allman's winning model 'Grasshopper,' sadly not totally original but the reconstructed version by Alwyn Greenhalgh.

THE WAKEFIELD CONTEST of 1933 had been won by Joe Kenworthy with his model 'Conqueror' and resulting from this the 1934 contest was held in Britain. The venue chosen was Warwick Racecourse and was not ideal because of the presence of a great deal of fencing and of some very large buildings. The contest was held on Sunday, 24th June and was arranged by the Warwick and Leamington Model Aero Club.

1934 was the first year in which proper rules had been drawn up, formulated by the *SMAE* from experience gained since the first contest in 1929. The wing area of competing models was to be 200 sq. in., plus or minus 10sq.in., the minimum weight 4 ozs. and the minimum area of fuselage cross-section to be derived from the formula 1/100 x (length overall)^2. Models were required to rise off the ground unaided and the average of three flights to count as the score.

Teams had been entered by Australia, France, USA and Great Britain; it was unfortunate that the Australian models did not arrive in time for the contest but it was arranged that the models were flown later and their flight times recorded.

The French Team consisted of M. Desnoes, M. Genay and M. Guillemard. M. Denoes and M. Genay came over for the contest and M. Guillemard's model was flown proxy by J. T. Howdale.

The U.S.A. fielded a full team of six and their models were flown by proxy, that of L. M. Adams was flown by J. W. Kenworthy, A. H. DuFlon's by H. York, W. Getsla's by R. O. G. Booth, A. Howell's by D. Fairlie and M. G. Lucani, G. Light's by C. S. Rushbrooke and F. Zaic's by R. N. Bullock.

The eliminating trial for determining the British team was held in the early afternoon of 24th June and from 47 entrants, the Team members chosen by contest were J. B. Allman, W. Fillingham, R. T. Howse, T. H. Ives, A. H. Liggitt and R. A. White.

The weather on the day was far from ideal, it was drizzling and there was a gusting wind. Despite these adverse conditions, some surprisingly long flights were achieved.

The contest proper was started at about 4 p.m. and the results are shown in the table.

The contest was concluded with a speech by Dr. A. P. Thurston the Vice President of the *S.M.A.E.*, after which he presented the Trophy to Justin Allman . . .

Justin Allman's model proved a worthy winner. He had diligently developed an ingenious combination of a well-designed airframe with a step-up twin skein gearbox which resulted in a very long motor run. The model has been restored by the author and has flown again.

Another notable entry was that of Walter Getsla, a member of the USA Team. It had mid-wings and a cruciformed tail unit, all mounted on an octagonal fuselage. It was powered by a twin skein motor. On the first

Country	Team Members	Club	Flights 1.	2.	3.	Average	Position
U.S.A.	L. M. Adams	Peru, Indiana	34.5	6.5	32.0	24.3	12
	A. H. Duflon	Ridgefield, New Jersey	65.4	48.0	7.0	40.1	9
	W. Getsla	Chicago, Illinois	116.0	—	—	38.7	10
	A. Howell	Worcester, Massachusetts	46.5	60.0	54.0	53.5	8
	G. Light	Lebanon, Pennsylvania	—	—	—	—	Model Crashed
	F. Zaic	New York City	63.0	65.0	127.5	85.2	3
France	Desnoes	Club Aeronautique	7.0	6.0	—	4.3	13
	Genay	Francais Des Modeles	25.5	20.0	50.0	31.8	11
	Guillemard	Reduits	—	—	—	—	Scratched
Great Britain	J. B. Allman	Warwick & Leamington	8.5	163.0	164.0	111.8	1
	W. Fillingham	Nottingham	68.0	71.5	71.0	70.2	5
	R. T. Howse	Bristol	123.0	124.5	23.5	90.3	2
	T. H. Ives	S.M.A.E.	90.2	66.5	8.0	54.9	7
	A. H. Liggitt	T.M.A.C.	88.2	66.5	76.0	76.9	4
	R. A. White	T.M.A.C.	51.6	66.5	65.9	61.3	6

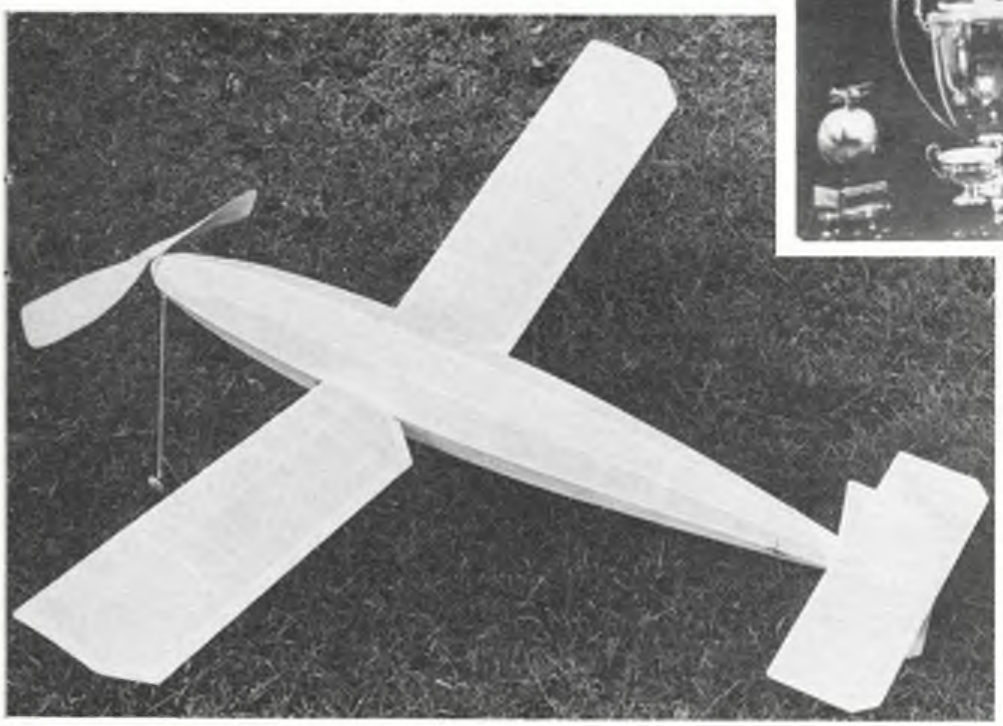
flight a time of 116 seconds was recorded but misfortune intervened when winding for the second flight; the attachment of the lower skein at the gearbox failed and the rubber and metal-work damaged the very complex fuselage structure quite beyond repair. After doing so well on its first flight, this was a great disappointment, not least to its proxy flier, R. O. G. Booth (who had the proper initials for a model aviator of those days!). Very fortunately it has been possible to regenerate a definitive drawing of this aircraft from which the author has built a replica.

Another interesting model was that of Frank Zaic. It was one of the earliest streamlined models and although it weighed eight ounces (foreboding the future), it put up a very good performance.

The British team won six of the first seven places and demonstrated their capability of being 'all weather' fliers.

Returning to J. B. Allman's winning model — 'Grasshopper', a future article will provide comprehensive details of its construction.

Right: J. B. Allman with the original 'Grasshopper' gazing pensively at the nine trophies that they both won. Below: alternative view of Alwyn Greenhalgh's 'Grasshopper' plans of which will appear in Aeromodeller shortly.



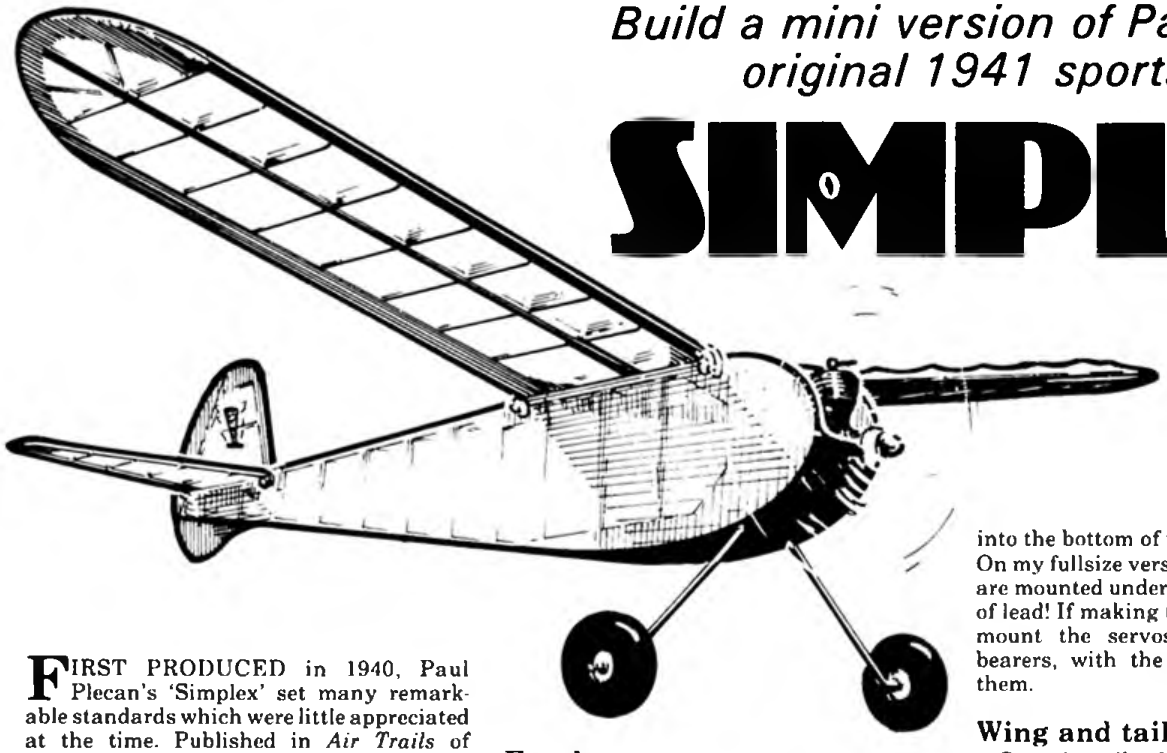
The Wakefield International Trophy remains the most coveted prize in model aviation contests. The models have developed into extremely efficient flying machines which, although still mainly conforming to the dimensions of wing area, the weight requirement has been increased and the amount of rubber for the motor limited. No longer is there a minimum area of fuselage cross-section stipulated and the rise off ground start has been replaced by hand-launch.

In order to win any major contest today, the model aviator requires considerably more technical expertise than did his predecessors in 1934, but a great deal of skill was needed to fly a four-ounce balsa model off the ground in the usual high wind of a competition day in Britain.

Build a mini version of Paul Plecan's original 1941 sports flier

SIMPLEX

40in. version for Mills .75 redrawn and built by Douglas Tennant



FIRST PRODUCED in 1940, Paul Plecan's 'Simplex' set many remarkable standards which were little appreciated at the time. Published in *Air Trails* of September '41, the original 5ft. model appeared to British eyes as a skimpy, unrealistic typically American lightweight box car; but it was far from being that. For a start, Paul built the original for an equivalent cost in materials of 50p or $2.50 — in those good old days when the pound was the equivalent of five dollars — add a seven dollar engine and $1.25 timer and you had a complete 'gas job' ready to fly for an investment of just over £2!

Paul used a 'Sky Chief' on his prototype, added the pull out battery tray arrangement with knock off motor mount bulkhead and by his eleventh flight he had the first out of sight of 33 mins. from a 15 sec. engine run.

In times of stringency, when Brits were banned from flying power models and more used to bulkier, heavier cabin designs, 'Simplex' came as a breath of fresh air and there must have been hundreds of expatriate aeromodellers from the old country displaced through the Commonwealth Air Training Scheme to Canada, Rhodesia, South Africa and the USA who cut their teeth on 'Bantam' and *O&R* powered 'Simplexii.' They all found that Paul's model was just the job to tuck under the barrack room bed between sessions of air training. So it is no wonder that 'Simplex' should re-emerge in fond reminiscence among the membership of *SAM*. Douglas Tennant has a clutch of them including this 40in. version for the *Mills* .75 diesel and at only 11oz all up it is naturally a spritely performer. Over to Douglas for his description.

Simplex 40

My son Angus built a *real* 'Simplex,' 60in. span, for two channel radio, powered by an *ED* 'Competition Special'. Nylon covered, at 2½lb. it proved an excellent, leisurely trainer. It is now fitted with three channels and an *Enya* 19 and has gained some ½lb in weight.

Construction, as the name implies, is very straightforward and with its nylon covering it will bounce off most things.

Very little needs to be said about construction but the following points may be useful.

Fuselage

The engine is mounted on a ⅛in. paxolin plate (aluminium would do just as well). This permits easy engine and thrust line changes. Alternatively the engine bearers may be fitted to suit the width of the chosen engine. The undercarriage is fastened to the ply firewall with home made J bolts, those very useful and no longer obtaintable devices. These are made very easily by bending 8BA bolts with round nosed pliers, then cutting off the bolt heads. When tightened, the sharp cut off will press firmly into the ply. Do not overtighten, or they will straighten themselves again!

The balance (centre of gravity) position is important. Use heavy wheels or epoxy lead into the bottom of the engine compartment. On my fullsize version, the receiver Ni-Cads are mounted under the engine as well as 2oz of lead! If making the radio control version, mount the servos well forward on the bearers, with the lighter receiver behind them.

Wing and tailplane

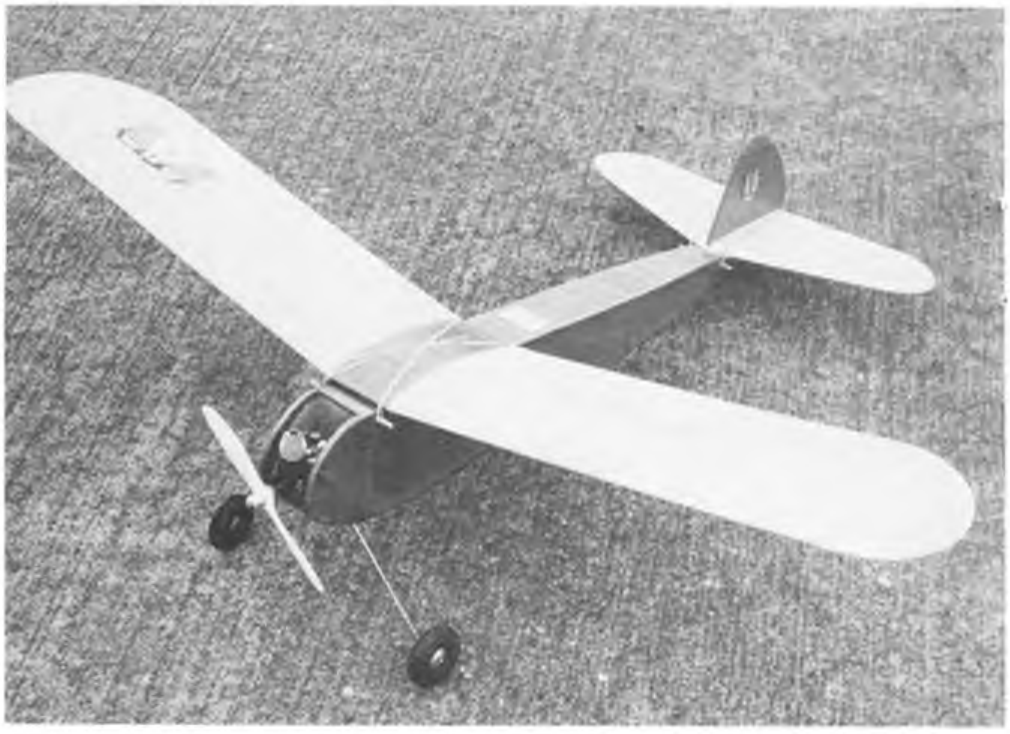
Cut wing ribs from hard sheet and slot them 1/16in. into the trailing edge. Keep tailplane assembly as light as possible. It is a little warp prone, but warps are easily removed over an electric ring or a steaming kettle.

Covering and flying

Mine is nylon covered and fairly indestructable. Modern plastic film may be used. If using tissue, it would probably be wise to fill the first bay in the fuselage with 3/32in. sheet balsa.

Free flight trim is left/left. The trim tab is very sensitive, particularly if the balance point is too far back. The looks of the model are much improved by a *SAM* sticker.

Displaying all the simplicity of the original, Douglas Tennant's 40in. Simplex, adorned as suggested with it's SAM sticker! (also we're pleased to see . . . the emblem of the SMAE!)



Unimat 1

Bill Burkinshaw tries out a new mini machine tool

HOW MANY TIMES have you wished that you were able to quickly produce a nose bushing for a new rubber model, special wheel for a control-line model or parts for a circle tow precisely and in the right metal for the job? All that prevented you want absence of lathe, a milling machine or even a simple drilling machine. Up until now, even the simplest of machine tools have cost a lot of money, but this new aluminium alloy and injection moulded plastic machine powered by a low voltage motor changes all that.

The *Unimat 1* costs well under £100 and for this price a modular package enables turning, milling (both vertical and horizontal) and drilling to be carried out on non-ferrous metals, plastics and wood. This package is complete right down to cutting tools and small samples of materials to try out the various machine functions on. Power for the low voltage motor can either be from re-chargeable batteries or dry batteries housed in the bed of the machine which doubles as a battery box, or from a mains electricity operated transformer available as an extra.

Chucks for drills, a 3 jaw self centring chuck, small machine vice and necessary assembly and adjusting tools complete the outfit.

Putting it all together

A simple pictorial leaflet explained fairly clearly how the machine may be assembled in its various guises and within a very few minutes the little machine was humming round. During assembly it became apparent that great care was needed to ensure that all parts were both assembled true and square to one another and that the various 'H' section clamping pieces were solidly in place. I used a large engineers square to check alignment and pressed all parts firmly down onto a hard flat surface whilst finally tightening up the clamping sections.

As soon as I started trying to work with the machine I realised that the wooden base recommended by *Unimat* really was needed so quickly fabricated this from $\frac{3}{4}$in. chipboard and scraps of 2 × 1in. softwood.

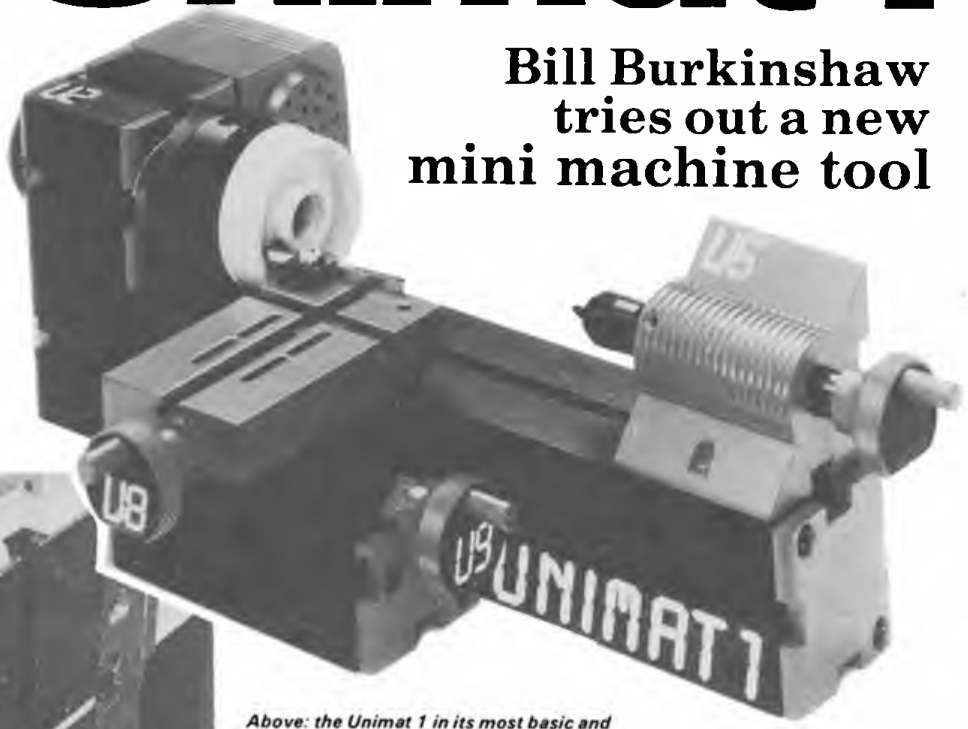
Once firmly mounted and set up on the lower of the two available speeds, I tried turning and drilling in wood, aluminium, brass and nylon and found that the results were quite acceptable. Such items as bushes, collets, propeller spinner nuts should be easily made.

Milling proved a joy, the 6mm end mill supplied can be used for such jobs as milling engine mounts, tow hook parts or accurately profiling hardwood and ply parts for precision fit during more conventional model building.

It is a simple matter to convert the machine from vertical mill to pillar drill, the collets supplied will hold drills up to 6mm diameter. Some ingenuity will be required when holding larger pieces of work for milling and drilling as the mini-vice supplied will only accommodate work up to 20mm across. Screwing and clamping onto the slide is of course possible.

Conclusions

A fascinating little machine with immense possibilities. Do not allow yourself to be put off by the light alloy and plastic construction, this machine will allow you to expand your aeromodelling horizons enormously and build better models to boot. A very worthwhile investment, but do consider the extra cost of a transformer power supply.



Above: the Unimat 1 in its most basic and probably most used format, the lathe. Left: vertical milling is just one of the many possible alternatives available.

Martyn Cowley describes

F1B GLIDER TECHNICALITIES

Incredible performance by Germany's Lothar Doring in tough conditions, to defend his title and become history's only winner of 3 consecutive World F1B Championships.

Double Champion

The highly competitive sport of model flying at World Championship level, makes consecutive winners a rare breed. Since the Wakefield Cup was initiated in 1928, only two individuals had previously held that honour. America's Joe Ehrhardt was World Champion in 1930 and 1931 and Finland's Arne Ellila was Champion in 1949 and 1950. Only in F1A glider, started in 1946 was there another consecutive winner — Rudi Lindner from Germany in 1954 and 1955. No one has managed the feat in F1C.

All the more remarkable then, that Germany's Lothar Doring should join this select group at the recent World F/F Championships at Goulburn. Lothar's performance was truly outstanding for many reasons. With many more nations now competing at International level than in the early days, the field is considerably tougher. The rules having been refined over the years to limit performance, the task is more technologically challenging. Add to that the adverse weather conditions experienced both in Spain in 1981 and in Australia in 1983, and you'll realise Lothar's performance was all the more exceptional.

Lothar attended the Goulburn Championships as the defending champion. As such he was allowed a pole and the full hour round to himself compared to the three team flyers on most other poles. That may sound like an advantage . . . but if you consider the fact that Lothar then had to work alone, preparing models, spotting thermals *and* retrieving himself, you can imagine that was no small task. As conditions turned out very windy, with lots of rain, Lothar faced a major task defending his title.

Probably no one could have been better suited to such a challenge. Flying skills aside Lothar is an individualist. His competition style revolves around thorough preparation of models and equipment before the event, allowing him to single-mindedly concentrate on his two twin thermister and wind recording machines. One unit is placed 50 yards upwind, the other comparative unit at the pole. This year's win makes it three times in a row for such equipment to be used by the Champion. Itzhak Ben-Itzhak flew with a similar device to win at Taft in 1979.

The recent December CIAM meeting tabled a proposal to ban such equipment at future events. I wonder how Lothar would have voted? Such a change would certainly alter the emphasis of Wakefield flying, which is inarguably developing into a highly sophisticated meteorological event. One more thought on the subject of future Championships — as the top places are so closely fought and often only seconds separate the gold, silver and bronze medalists, wouldn't it be a good idea in future to invite all three back to the next Championships to defend their titles and to keep the individual winner company on his lonely pole?

Lothar's models are already well publicised, a three-view plan first appeared in *Aeromodeller* February 1981, with further details appearing in March, 1983. His design 'Espada 80/1' was selected by America's *National Free-Flight Society* in their *Ten Best Models Award* in 1982 and more details appear on p.134 of their annual Symposium report.

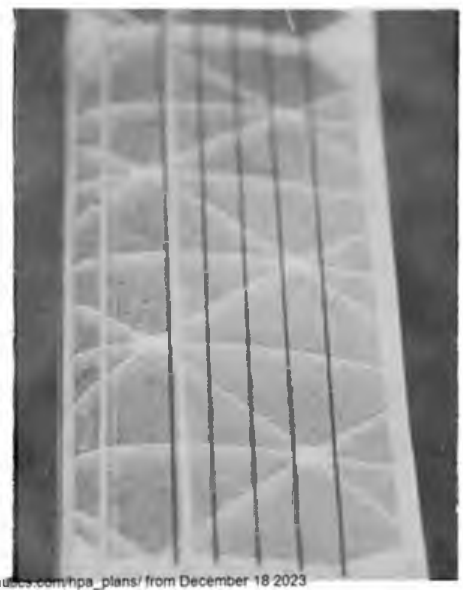
Once again admiration and congratulations from the World of Free Flight go to Wakefield Champion 1981 and 1983 — Lothar Doring.

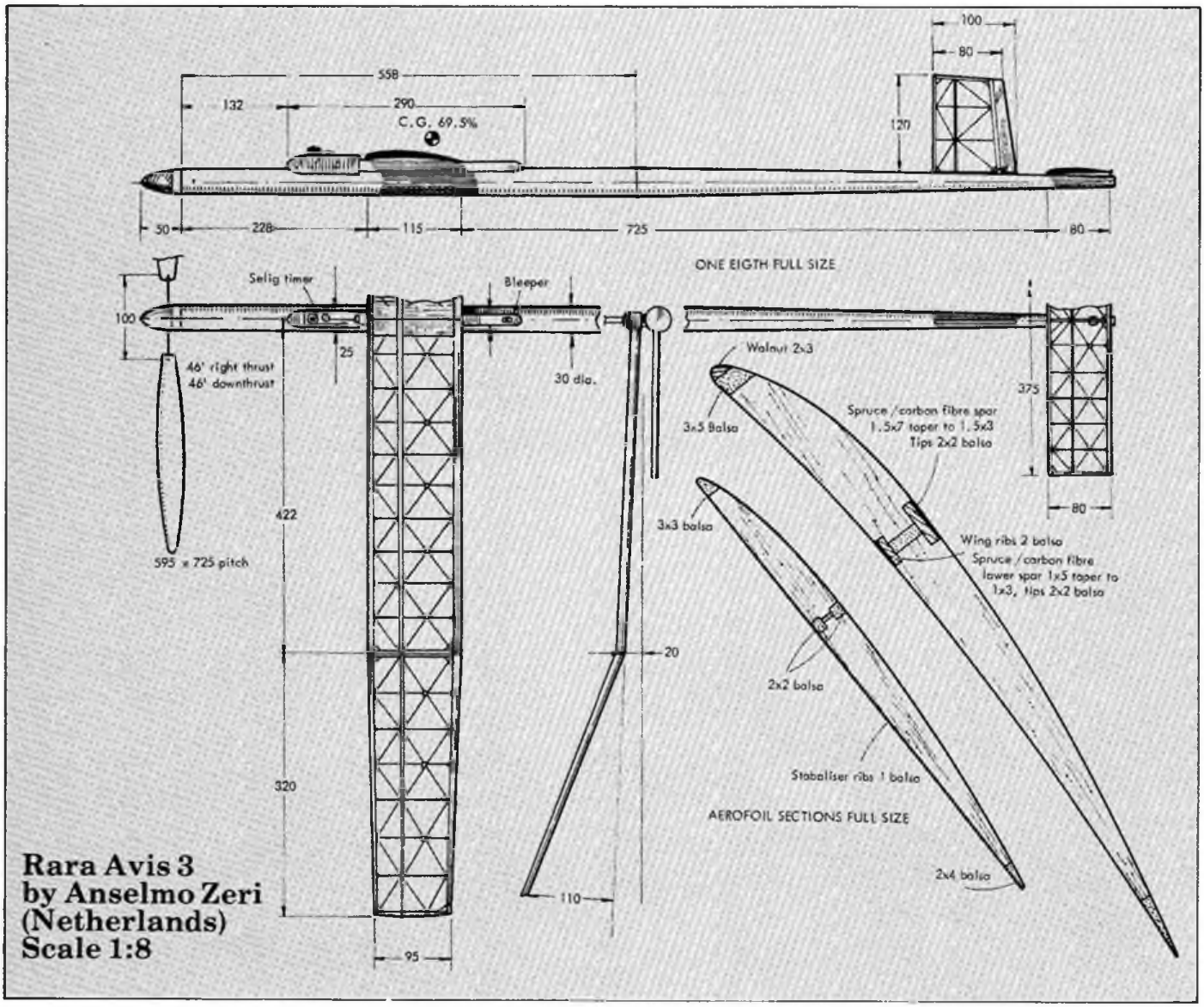
Anselmo Zeri

The scramble for the remaining places at Goulburn produced an exciting finish with half a dozen flyers in contention right up to the last flight. Good consistent maxing by Holland's Anselmo Zeri, after a second round 2:47 seconds, proved the rewards of keeping one's head after an early mistake.

Anselmo describes the conditions thus: "the kind of weather we found for the F1B contest was not unlike that which we are used to in Northern Europe. I don't mean it was easy . . . just not frightening!" This confident mental approach is vital to success, certainly many others *were* psycho-

Below: invigorators, small turbulators towards the rear of upper surface helped many in the rough conditions - including Anselmo Zeri 2nd place.





logically 'frightened' by the high wind and consequent damage that could be expected to their models! If you are to compete effectively at International level, you need to be prepared mentally to be able to concentrate on winning even under adverse conditions.

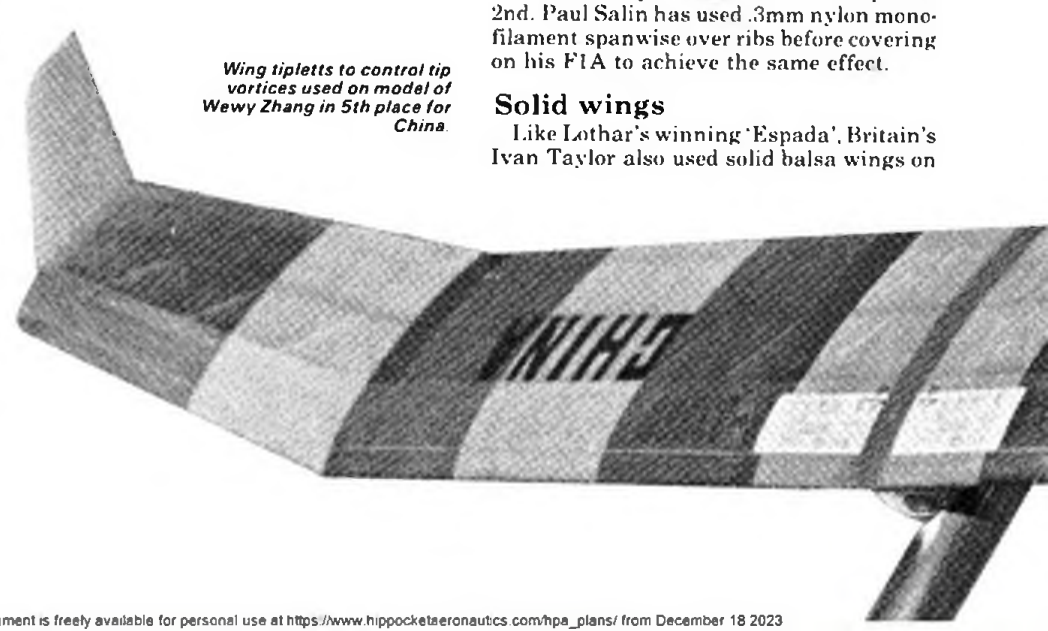
The model he used for the opening flights uses a *Benedek* B6356b airfoil with a thickened upper surface and relatively little warps. An auto-rudder comes in at three seconds with VIT one second later. Anselmo's models also feature an electric retrieval buzzer — unusual for a Wakefield, but a lesson he has learned in Holland, his unit weighs 9 grams and runs for 15 hours!

His best model was damaged upon landing in the very windy 4th round and he chose to use an older reliable model for the last flights. "As usual for me, I didn't look at the scoreboard towards the end — I only knew I had to max. I planned to take no risks and so changed wound motors every 15 minutes waiting for my final flight. Peter De Boer who was assisting me prevented me launching until we were certain. As the rain started again, I put in my 3rd motor and waited. Most flyers had now finished, I stood alone on the line, no streamers were left, nor much time. In the last minutes liberation came in the form of a good thermal. Then I was told the news, after the three-minute flight, the scoreboard proclaimed me second place!"

More new ideas

Many teams were experimenting with invigorators at this year's Championships. Invigorators are a series of turbulators positioned towards the rear of the upper surface of the wing — in addition to a conventional turbulator near the leading edge (L.E.). The subject was introduced to modellers by Martyn Pressnell, in his article in the NFFS Symposium Report 1982. It is believed such invigorators help control the vortex bubble which forms near the upper surface L.E. and can help produce higher section lift coefficients before stall. In practice flyers are finding little benefit in still air times, but a considerable improvement in stability and stall recovery, leading to better performance in rough conditions.

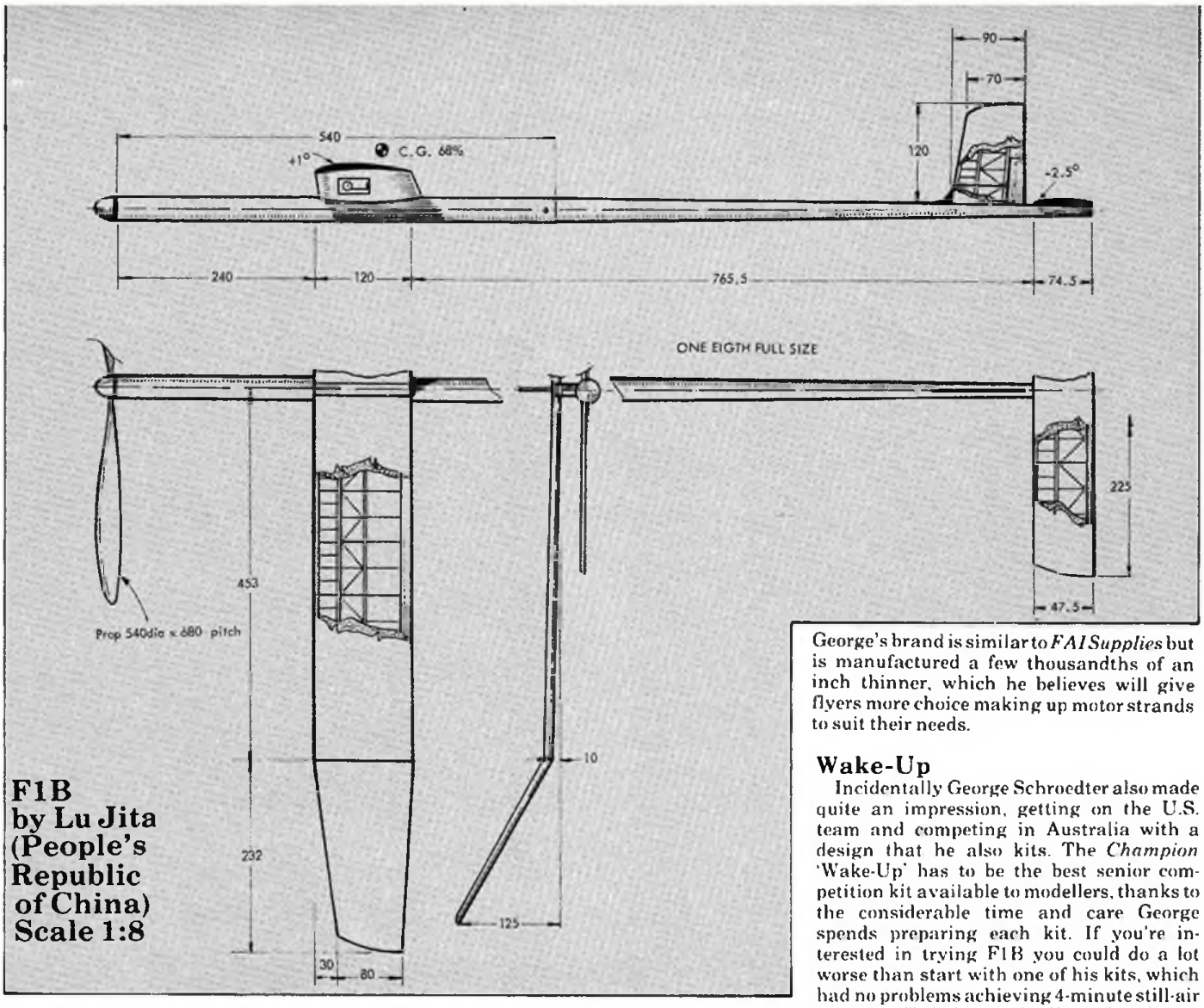
Most competitors chose to use thin graphic art tape as recommended by Martyn typically .006in. thick x .030in. wide positioned at 5% as a turbulator and 40, 50, 60, 70 and 80% as invigorators. These were used primarily by the Dutch F1A and F1B teams, notably Anselmo Zeri who placed 2nd. Paul Salin has used .3mm nylon monofilament spanwise over ribs before covering on his F1A to achieve the same effect.



Wing tipletts to control tip vortices used on model of Wewy Zhang in 5th place for China.

Solid wings

Like Lothar's winning 'Espada', Britain's Ivan Taylor also used solid balsa wings on



F1B by Lu Jita (People's Republic of China) Scale 1:8

Full size sections for Lu Jita's F1B

his high aspect ratio 'Thin Liz'. Ivan, who so narrowly missed a top placing, finished 11th. But his model proved it could easily cope with the rough weather despite its apparent extreme layout.

I'm sure many are apprehensive about constructing solid balsa wings — especially with undercamber but Ivan explains how it's done. "These wings are not at all difficult to build, but they do need good light wood. Planks are cut as shown in Fig. 1 and glued together so that very little wood need be removed from the underside. To get the shape, use fairly coarse wet and dry sandpaper glued to a shaped sanding block and finish with finer grades. Lightweight glass cloth ½oz./yd² is used on centre panels, using 'Tufkote', a two-part polyurethane varnish as an adhesive."

Ivan certainly appeared to have no problems with his models getting wet, unlike many traditional tissue covered models. Furthermore the inevitable damage, broken wings etc., were quickly repaired with cyano glue with no apparent change in trim, giving Ivan a distinct advantage over other models that remained damaged and unflyable.

New rubber

Once again the most popular rubber for Wakefield flying, *Pirelli*, has gone out of production, this time it is rumoured for good. The Japanese team managed to turn up an apparently good new supply manufactured in Japan by *Dunlop* used for golf balls. What types of rubber might the other *Dunlop* plants around the world come up with?

However, for now, Ed. Dolby's *FAI Supplies* rubber, which has gained popularity over the years as quality has improved, would appear to be the favourite choice for the future. But U.S. team member George Schroedter *(Champion Model Products)*, 880 Carmen Court, La Verne, CA91750) is now also marketing contest grade rubber. George's brand is similar to *FAI Supplies* but is manufactured a few thousandths of an inch thinner, which he believes will give flyers more choice making up motor strands to suit their needs.

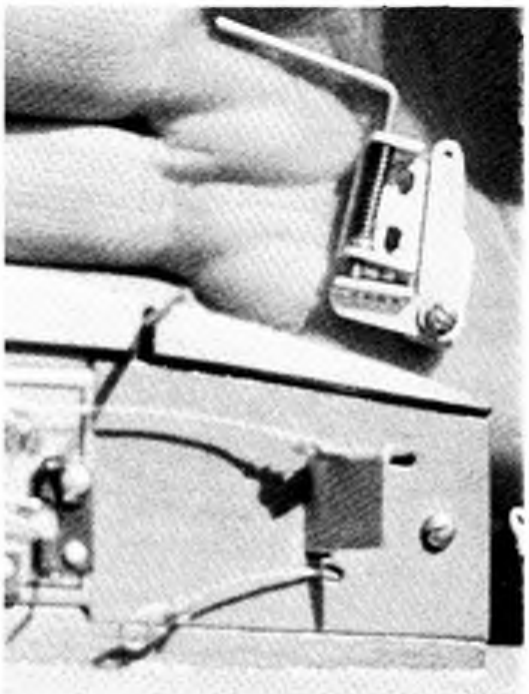
Wake-Up

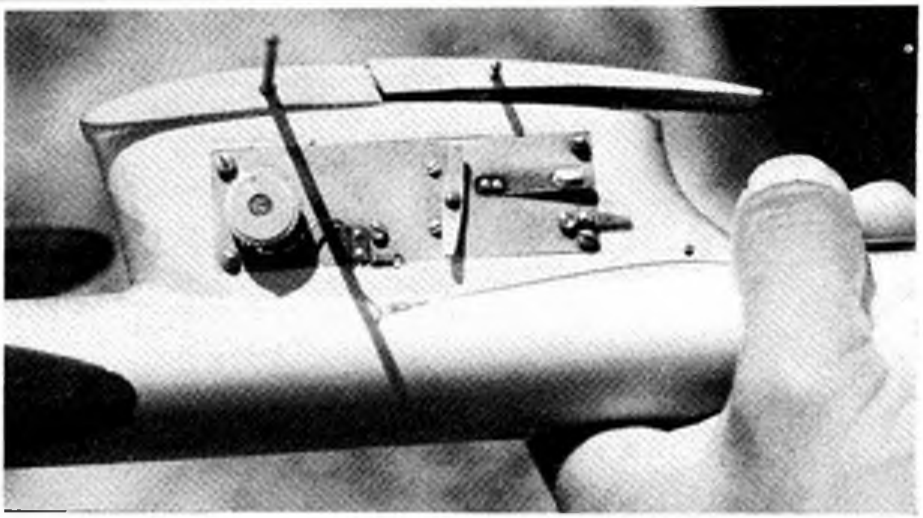
Incidentally George Schroedter also made quite an impression, getting on the U.S. team and competing in Australia with a design that he also kits. The *Champion* 'Wake-Up' has to be the best senior competition kit available to modellers, thanks to the considerable time and care George spends preparing each kit. If you're interested in trying F1B you could do a lot worse than start with one of his kits, which had no problems achieving 4-minute still-air maxes at Taft during the Team Finals.

Positive prop stop

One problem facing all Wakefield flyers is how to transition from the end of the power run into the glide. The real issue concerns the warps and rudder used to control the climb and the need for an auto-rudder controlling the glide to actuate at props-fold. Using a timer is reliable in itself but the

Below: Hans Zachhalmel's wing wiggler device, holds left wing TE high to give wash out for initial 6 seconds of power burst climb.





Above: Chinese timer cam operated variable incidence wing, raises TE of whole wing during initial climb. Progressively drops to increase incidence until wing mount is fully faired with front wire acting as pivot. Adjuster screw rocks rear wire to alter relative left, right indicence.

actual length of prop run will vary from motor to motor.

The best method would seem to be an auto rudder tripped by the action of the universally adopted 'Montreal Stop' pin, which positively locates the position of the blades at the instant of folding. The only problem here is that the spring activated pin, tends to creep as the motor torque, which holds it in place during the run, finally falls off. This progressive creeping movement of the pin tends to allow it to knock the auto rudder device several times and can trip the rudder prematurely. This results in extra turn for the model while still under power, which can cause the model to tighten up and lose altitude, obviously not the smooth transition anticipated.

Australian John Lewis solved this problem quite neatly with a development of an idea from Paul Lagan. John's hub uses a notched pivoting arm to activate the auto rudder. Once the arm begins to be tripped it starts to pivot, thereby further blocking the path of the rotating pin until it is securely held in a notch, which is the final resting place for the Montreal pin. By filing the arm so that the first point of contact is the lowest, any movement presents the pin with an increasing obstruction, guaranteeing a first time stop.

Wakefield shuttle

Paul Van Leuven placed 2nd in 1979 at Taft, this time flying on home ground in Australia he was less fortunate, dropping the first and last rounds but maxing through the really wet and windy ones. Like

Fig. 1

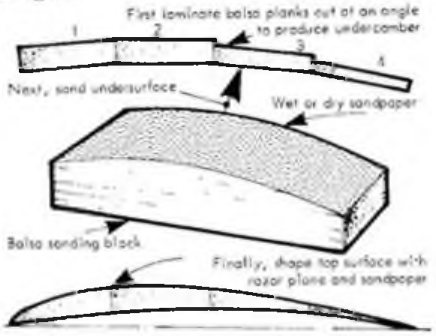
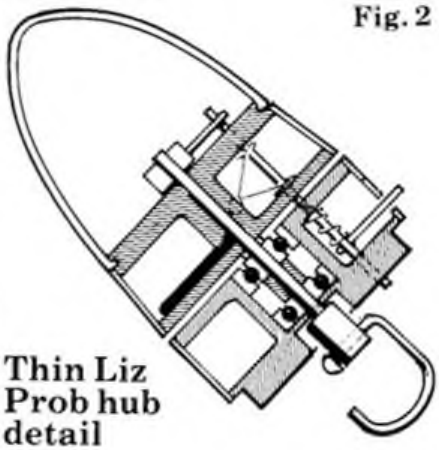
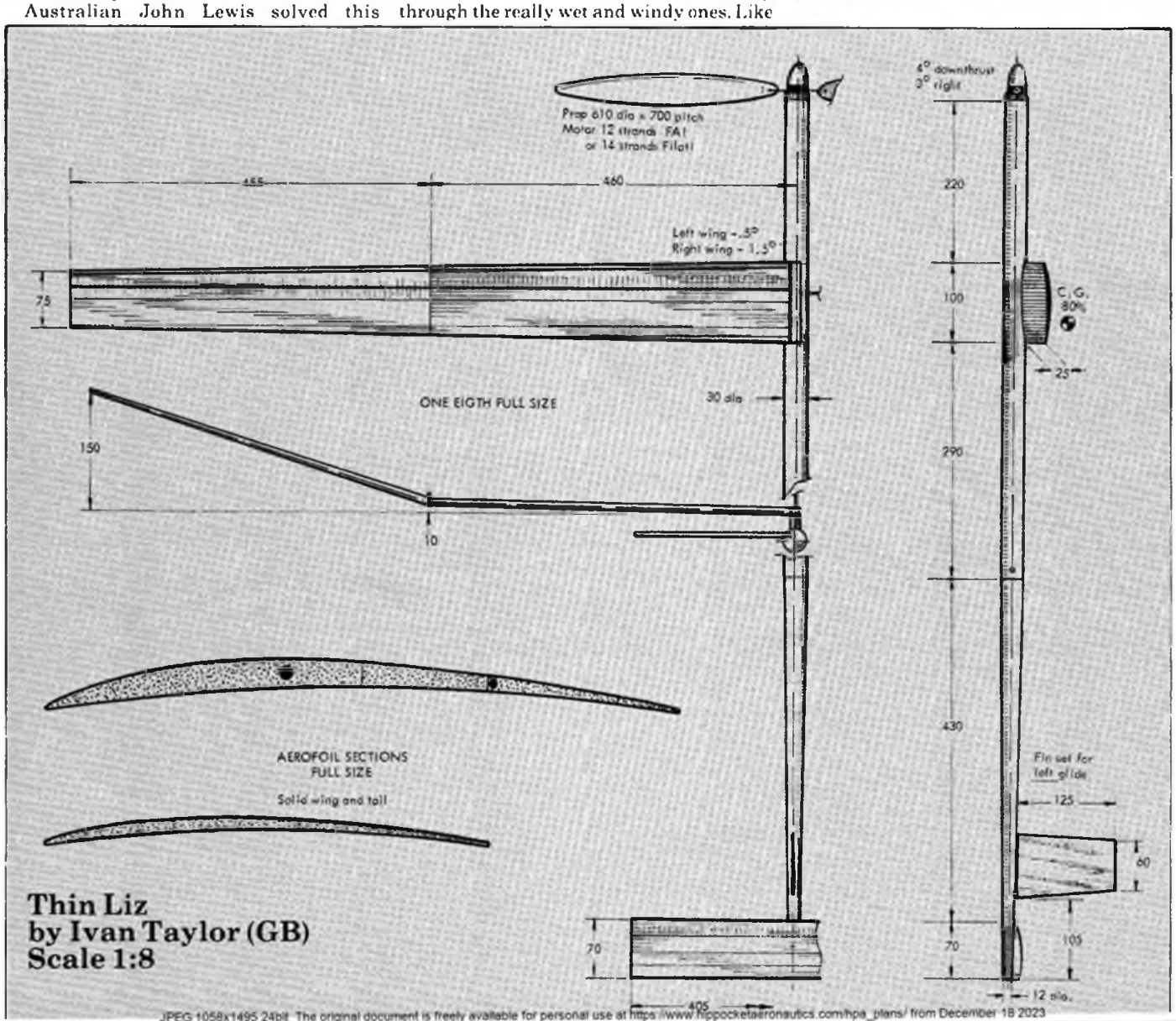


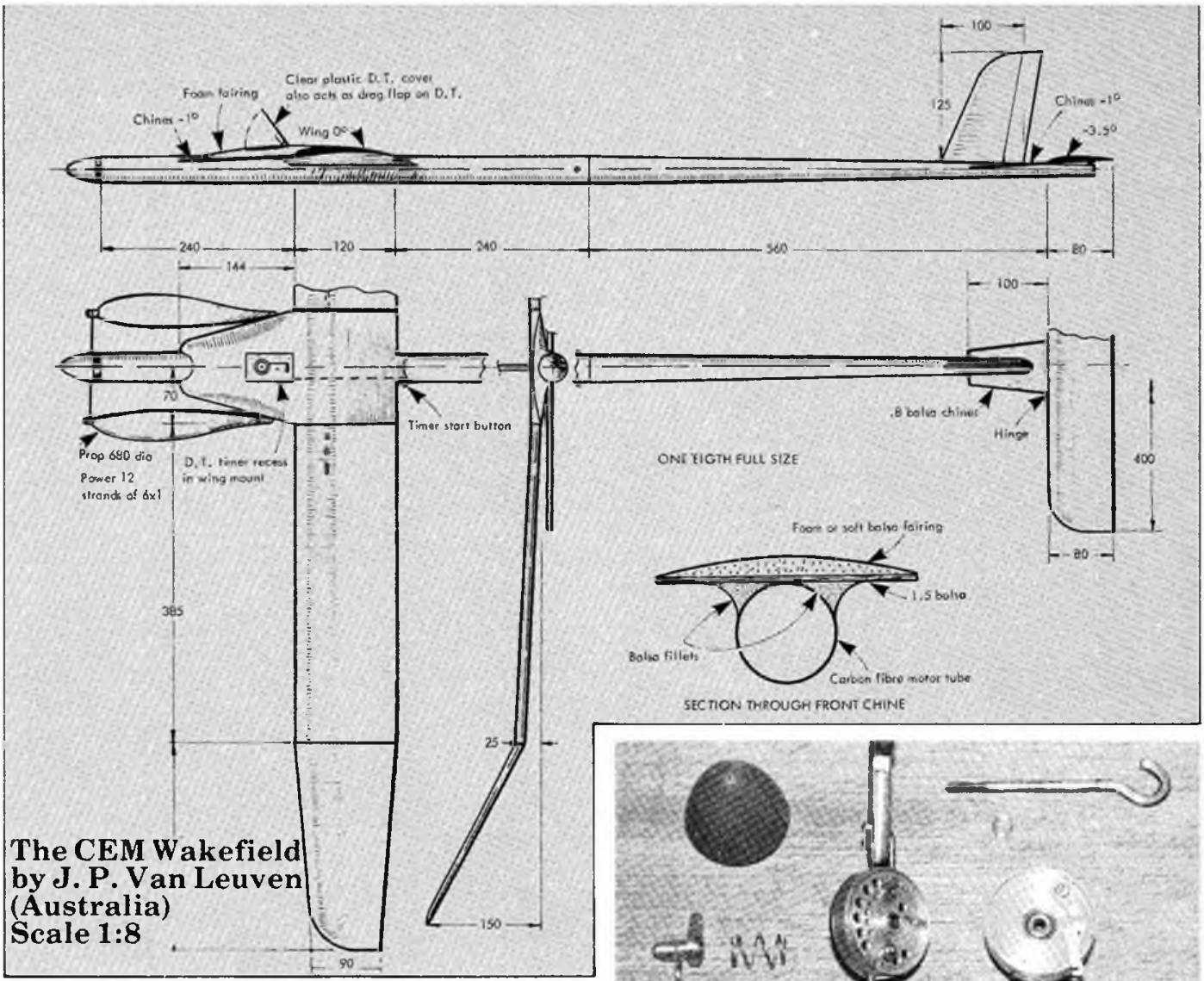
Fig. 2



Thin Liz Prob hub detail

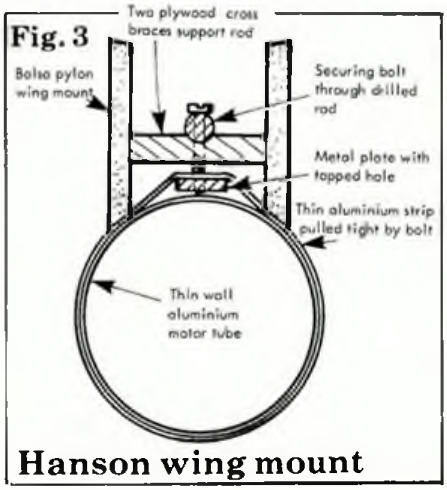


Thin Liz
by Ivan Taylor (GB)
Scale 1:8



The CEM Wakefield by J. P. Van Leuven (Australia) Scale 1:8

Above: clever positive prop stop device by Australian John Lewis. Whole prop hub assembly is pushed back by spring as motor torque drops, to have fixed pin engage in pivoting notched arm in noseblock to activate auto rudder. Small sprung pin on left used to hold wound motor before launch.

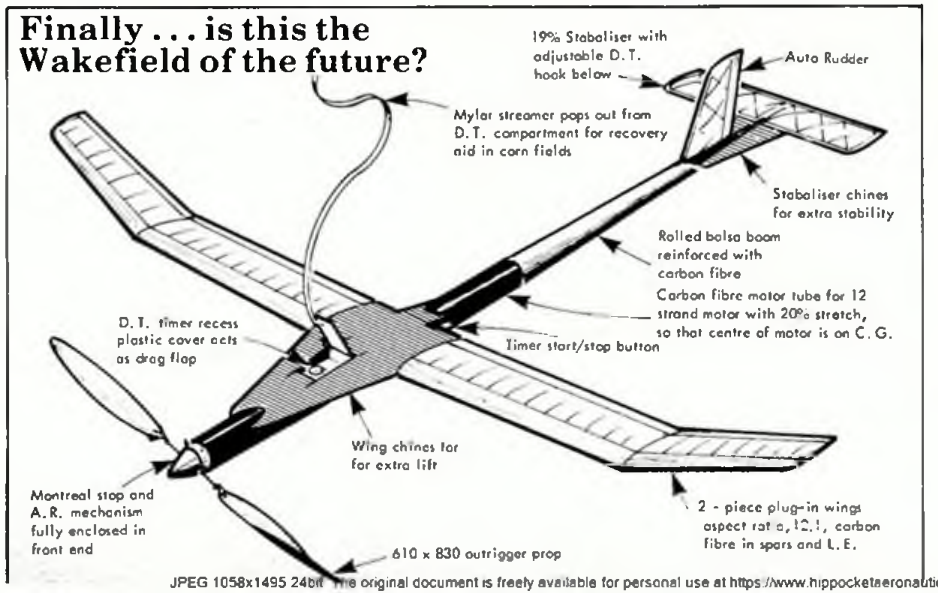


Hanson wing mount

many fellow Aussies he exhibits a truly individualistic style in his models and his approach. Paul's latest concept is wing chines, a streamlining device to reduce fuselage turbulence over the flying surfaces, which look like a piggybacking space shuttle on the model!

Paul explains: "Wool tufts glued to the model showed the airflow over the wing near the fuselage was very unstable and established that the wing over the fuselage produces less lift. By applying the chines the airflow was much improved and the model suddenly behaves better on the glide." Paul whose ideas were presented at the Technical Symposium says: "It was found that Wing Chines should have no more than 1° negative in relation to the wing incidence." He claims a further bonus as under FAI rules the wing area is calculated by extending the line of the LE and TE, which does not include the area of his Chines. As it turned out Paul did not fly a CEM (Chine Equipped Model) at the Championships but he plans to develop the idea.

Finally . . . is this the Wakefield of the future?



Reports

The Goulburn F/F Symposium Report, a 29-page document including New Wind Tunnel Tests from Stuttgart by Martin Simons, Power Model Trim by Stan Hines and Lost Wax Engine Casting by Dave Sugden, is available from the New South Wales F/F Society. If they still have any left, the F/F Championship Planbook, 162 pages of competitors biographical, technical and philosophical details together with 3-view plans is also an excellent purchase at $10.00A plus postage from NSW F/F Sec. Committee, 50 Brown Street, St. Peters, NSW2044, Australia.

SHOP TALK

NEW MODEL HOBBY PRODUCTS REVIEWED

Above: whole new page of low voltage power tools launched simultaneously from 'Minicraft' and distributed by Flair Products. Right: one of the new Micro Mold 'Series 84' wheels. Nice scale tread pattern.

Miniature Power Tools

The latest in a long line of power tools from *Black and Decker* is a range of tools aimed specifically at the modeller and home craft market — the *Minicraft* Miniature Power Tools. They include various drills, saw table, disc sander, jigsaw, orbital sander and even a chainsaw sharpener(!). All run off a 12v dc power source — either a car battery or one of the transformer units in the *Minicraft* range. The smallest drill in the range — the MB 0120 'Prince' is claimed to have a power output of 40 watts (about 3½A drawn at 12v) and the MB 0520 'Buffalo' has a claimed 100 watts ... quite a powerful beast altogether. The 'Buffalo' drill can be used with the lathe and router attachments also marketed in the *Minicraft* range. The accessories available are extensive including flexible drives, a machine vice and all the expected grinding points, twist drills, cutters, routers, collets etc. that you would expect from such a comprehensive system. Drills cost *from* £12.50 and a saw table will cost you £32.95. The *Minicraft* range of power tools is available from *Flair Products*, Holdcroft Works, off High Street, Blunsdown, Wilts and a stamped addressed envelope will get you the *Minicraft* catalogue and a price list.

Scale '84

No not another fly-for-fun scale rally but a new series of scale type wheels from *Micro-Mold* — 'Series '84' wheels use a plastic air filled tyre with a spoked silver-grey hub of realistic appearance. Two sizes, 2in. and 2¼in. are available at present but the series will be extended shortly to include 2½in. and 2¾in. Available from *Micro-Mold* stockists and cost 2in. — 91p; 2¼in. — £1.06; 2½in. £1.19 and 2¾in. — £1.52.

Extra shrink, heat shrink

'Polytex' is the latest of the new heat shrink coverings to appear on the market. Distributed by *Powermax,* it is claimed to shrink to a greater degree than other similar products. This extra shrinkage makes 'Polytex' a good choice to cover multiple compound curves! The range of colours at present are: black, white, red, blue, yellow, orange, kingfisher blue, vintage red and natural. These match with a corresponding range of 'Polycote' paints, available in cans and aerosols.

Polytex comes in 2, 5 and 10 metre rolls, 730mm wide with prices £4.30, £10.75 and £21.50 respectively for the colours and £3.96 and £9.90 for natural.

Tacky tools

Definitely not! *Litesold* soldering irons have been with us for many years and are extensively used by the electronics world, not to mention the number that find their way into many a modeller's workshop. The latest offering from *Light Soldering Developments Ltd.* are two 'Tacking Irons.' These electrically heated tools have a number of applications in hobby and industrial processes. These include attaching and shrinking heat-sensitive covering materials for model aircraft, use with photographic dry-mounting tissue, curing PVC repair materials and activating heat-shrinkable sleeving. Two versions of the 'Tacking Iron' are available. Both tools are fitted with detachable flat polished chromium-plated brass tips, with pure copper shanks, in either 1in. circular or sector shapes.

The 25 watt Tacking Iron is suitable for light-duty applications, such as photographic dry mounting, or small PVC repairs, where heat demand is small. Operating temperature is approximately 160°C and is available in all normal mains or low voltage ratings (field repairs!).

For more critical applications and intensive use, such as with model covering materials, the EC50 Electronically Controlled 'Tacking Iron' should be used. This features an advanced, electronic control circuit and a thermister sensor located in the tip mount. The iron is set on test to 160°C but is adjustable, between approximately 150 and 200°C. Voltage ratings available are 115, 220 and 240 volt (AC only).

Cost: 25 watt — £8.91; EC50 — £26.41.

Further details and order forms from: *Light Soldering Developments Ltd.,* 97-99 Gloucester Road, Croydon, Surrey, CR0 2DN. Telephone: 01-689-0574.

Above: tidy tacking irons from Litesold just the ticket for fixing heat shrink films into sharp corners. Nice range of shaped bits as well. Below: remember the Mercury control-line handle? Ron Moulton our Editorial Director maintains the original was shaped exactly to his own hand.

Old soldiers never die ...

Just fade away ... for a while. Older aeromodellers may fondly remember the original *Mercury* 'Adjustaline' control-line handle. As can be seen from the photograph the 'up' line (or 'down' if you're Australian) can be adjusted to suit either your flying style or dare we say it ... a slight error in making up the lines! These handles disappeared from the shops some time ago but a boxful recently re-appeared at Henry J. Nicholls Ltd., 308 Holloway Road, London N7 6NP. Cost £1.50 plus 50p post and packing.

VINTAGE CORNER

Left: Alan Holmes of Dunham Engineering (left) presents Tom Wilmshurst with a brand new 'Valkyrie' diesel engine in recognition of his outstanding own design and construction of the engine fitted to Tom's 'Hornet.' Dunham have very kindly donated a similar award to SAM 35 for presentation this year.

Warwick Wakefield Jubilee

Colin Watts, Competition Secretary of *SAM 35* is organising the Wakefield competitions to be held on Warwick Racecourse on 24th June 1984 to commemorate the 1934 Wakefield Competition held on the same site and date fifty years ago. These will be divided into two events, both having three place prizes, one for 4oz models to the 1936 Rules and one for 8oz models complying with the 1951 Rules. Both classes of model will be eligible for the Concours d'Elegance and second and third places in this event will also be honoured.

The Mayor of Warwick has kindly accepted the invitation to present the prizes and Air Training Corps cadets will perform retrieval duties, one cadet being allocated to each competitor. The advantage of having local cadets performing this duty can easily be imagined where local knowledge may mean the difference between a 'lost' or 'found' model. Additionally the ATC cadets will hold a barbecue type food stand and *SAM 35* has agreed to allow all profits made in this area to be retained by the local ATC squadron. Entry forms will shortly be available from Colin Watts, 29 Marchmount Road, Wylde Green, Sutton Goldfield, West Midlands, on receipt of an SAE. In keeping with the nostalgia being generated for this event the entrance fee has been defined as 18/6!

Once it became known that the vintage Wakefield event would take place, other *SAM 35* personalities came forward with ideas for additional flying events. Peter Martin will run a competition for compressed air models and will award a suitable trophy. Peter Michel, *SAM 35* Membership Secretary, sees the occasion as ripe for a contest of British pre-war (1939) spark ignition powered models, while Derek Ridley intends to hold a single model glider event, the model chosen being Vic Smeed's 'Tiresias', a 48in. span lightweight glider of simple construction that somehow evaded being published at the time! (What about ". . . kitted or plans published before 1st Jan . . ." aw, forget it!) Plans are available from Dave Baker and a silver trophy has been donated for the winner. Derek is also holding an Open Vintage Glider event, that, it is hoped, will become an annual competition, a fine silver cup is to hand for the winner and while at time of writing final details are not available, three flights will be made with maximum times and towline lengths being decided on the day to suit the weather conditions.

Above: rubber-driven Airspeed 'Envoy' built by Mike Cook (see text). His model nicely styled in the red, white and blue of the Household Brigade represents the machine of the original King's Flight, which was one of only two 'Envoys' to survive WWII. 'EXX was sold to Sweden in 1946.

Finally, the area of the flying site is sufficient for the usual Fly for Fun activity, so all are welcome to come and fly, however, please note that IC engines used in Radio Control and Control Line models must be fitted with silencers. Visitors who might like to dwell on the field will have to be caravaners and use the *Trax* site, unfortunately, no tenting is allowed. Flyers in period dress will be appreciated, so look out those old flannel bags and 'plus-fours'!

Australian R/C IGO glider

The sight of G.W.W. Harris' 'Igo' glider in the January issue has prompted Martin Simons of Stepney, South Australia to tell us about his R/C version. He had coincidentally just completed this model a few days before the magazine arrived after its three month transit journey by surface transport and he gives details of the necessary modifications to the *MAP* plan G/222X. Martin goes on. "The radio used is a *Century Systems* mini with two servos and the very small battery supplied by *CS*. This battery just fits inside the nose block of the 'Igo' if it is drilled out to the correct diameter. Radio and servos, plus battery, weighs about 3 ounces, and I found no additional trimming ballast was needed, especially since the rubber band wing mounting allows one to move the wings back slightly to achieve balance. The wing loading comes out only a little heavier than the original free-flight model. I have flown the model on an ordinary radio control type bungey (Hi-Start) and have hand launched it on a slope, in very gentle breezes of course. It flies well, and is quite manoeuvrable. The main difficulty is that after a climb in a thermal, if there is any wind aloft at all, the penetration is so poor that it is a struggle to get back to base. The same is true on the slope. A wind that gives enough lift to soar, also tends to blow the 'Igo' backwards. This is not unexpected, of course and it is certainly fun to try such a sailplane. It looks very pretty in the air."

Vintage hydro

Recent letters from George Bushell of Enfield have revealed that there are at least twenty different float kits available worldwide and that John Pond has a similar number of vintage float plane drawings from which to choose. There are also hydro examples in the *MAP* X List and other plan ranges. Many readers will, of course, remember George's 'Powerhouse' flying at Old Warden last year and he gives the following details of it's float landing gear: "The 'Powerhouse', if built fairly light, is really great on floats, in fact on grass it handles better on floats than on wheels! It flies marginally slower as a result and handles thermals even better and doesn't stall on the glide, just develops a mushy

Radio-controlled Igo glider by Martin Simons of Stepney, South Australia (see text).

Left: Tom Wilshurst of the Chobham DMFC with his fine yellow and red Taibi 'Hornet' which was described in Model Airplane News July 1940 and in the currently available Air Age Gas Models. Model seen here at Old Warden last October, is powered by self-made 15cc glow plug engine.

Above: R. H. W. Annenberg at the 1950 West Sussex Power Competitions with his 27in. span vertical climbing duration model 'Scalded Kitten' which was described in the 1949 Aeromodeller Annual.

sink. The floats that I use are the larger size made by *Sureflite* in USA, *Micro-Mold* imported a quantity of these some years ago and there must still be a few hiding about the storerooms of some model shops. Nine were assembled as per the instructions. The injection moulded expanded polystyrene has a channel in the 'deck' to take the plywood strips supplied. These look a bit floppy with the outside grain going the wrong way but they impart just enough rigidity to prevent the foam from cracking. Remember to pre-drill the undercarriage saddle mounting woodscrews to prevent the ply from splitting. The method that I used to finish the floats is as that recommended by Ron St. Jean in his 'Structureless Foam Composites' article published elsewhere. Heavyweight tissue is applied with 50/50 water/PVA mix and 'doped' using a similar mix with the addition of a small quantity of food colouring to ensure an even coverage. Finally a coat of enamel is applied. Any dents or nicks are repaired after every flying session using a mix of epoxy and micro balloons.

If the 'Powerhouse' undercarriage attachment channels are used as on the original design, the floats and wheels are readily interchangeable. The angle of incidence on the floats is not critical, it is generally recommended to have slight positive incidence (1 to 2 degrees). Mine was so set initially but has now developed a negative set as a result of extensive flying, this does not appear to make any difference to the handling on water, on grass or in the air.

The shape of the *Sureflite* float is the same as the *Taibi* float and foam seems to be a more practical choice, hazards like punctured floats caused by collisions with driftwood etc. might actually appeal to the purists who decide to use built-up floats!

Note that no water rudder is required and remember to solder up the undercarriage chassis before fitting to the floats to avoid melting the foam! It is a good idea to mark out the location of the saddle clamps on the bench and screw them down, in order to build up the chassis from a rigid basis.

With a healthy .40 two-stroke the Powerhouse' has a good rate of climb coupled with a slow glide. It is possible to fly out of quite small stretches of water surrounded by obstacles. I fly from a local gravel pit but have flown off the Lea River locally, which is narrow; with access to both sides of this non-tidal river, no recovery boat is necessary. The most notable places I have used are the London Docks where the water was very dirty and West of Windsor, when we hired a boat in the town (shades of that November 1950 *Aeromodeller* front cover which depicted 'Tomboy' in a similar environment) and found it was quiet worthwhile. Readers wanting *Sureflite* floats and unable to find them in UK are advised to try any of the larger American mail order houses, quoting credit card number and expiry dates.

Rubber-driven Airspeed Envoy

This classic model is very much a vintage flying scale machine, it was designed by H. J. Towner, the doyen of the flying scale designers and was described in the November 1939 *Aeromodeller*. A number of readers' 'Envoys' were illustrated over the next 12 months proving that the design was popular. The original 54in. span model weighed 9½oz and 35 seconds motor runs were said to assure satisfactory performances where flights of from 200 to 300 yards were obtained. Being a purist, I personally would be loath to change anything structurally from the original, but there are other modellers who are prepared to devote a great deal of time and effort in making modifications to improve flying performance. Mike Cook of Cranfield is one of those and he has submitted an interesting account of his experiences with this model.

Mike draws attention to the fact that some parts on the plan are undersized and emphasises that great care is necessary in building in order to ensure that dihedral angle, thrust lines and the rigging angles of the flying surfaces are exactly correct. He also suggests that provision be made for trimming by means of an adjustable rudder and elevator and that thrust lines should be made adjustable in order that at least 5 degrees of downthrust can be achieved if necessary. Mike did not like the shear pin attachment of the outer wing panels to the centre section and felt that a 'tongue and box' arrangement would be better, also he found that the longitudinal flying properties were improved by replacing the tailplane with a unit having a cambered *Clark Y* section. He also modified the outline of the engine cowlings to make them nearer to scale and used modern high performance plastic propellers running in small thrust races fitted with free wheel mechanisms housed within the hollow moulded *Isopon* spinners.

Mike makes the following comments, "on flying the model:

1. A reasonable glide was obtained after adding an ounce or so of ballast to the nose of the model.
2. The recommended motors, six strands of ¼in. flat rubber, were found to be grossly excessive and resulted in a splendid power stall followed by the inevitable! An extended glide can easily be obtained with two strands of ¼in. rubber per motor. It is

Below: Pat Fillingham, retired after a lifetime of test flying has exchanged his full-size 'Mosquito' for this 10cc OK 60 ignition powered example of Megow's 'Flying Quaker.' In this close-up note the varnished and bound undercarriage legs and that rivetted aluminium to cowling!

Right: another twin rubber-powered flying scale model. Derek Camps with his Martin B-10, 35in. span machine made in 1939 from an Ideal kit. The two apertures on the top wing surfaces aft of the engine nacelles are for the motor sticks, necessary to provide length of rubber when the model is used in the flying scale category.

Above right: John Kemp with his Frog 1.75cc petrol powered 'Little Vagabound' at Old Warden during last year's South Midlands Vintage Meeting. The model was designed by G. W. W. Harris, plans available from MAP as PET/136 price £2.10 plus 50p postage. Above: John Meaney with his George Harrison designed 'Pegasus' a 34in. span canard. Plan still available from MAP as U/396X price £2.10 plus 50p postage.

Above right: Peter Bull of Kilkenny, Eire is another vintage hydro enthusiast and following mention of his activities and photo of his float equipped 'Buccaneer Standard' in the February issue, sends along this action shot of the same machine taken last year. Below: remember Eaton Bray? Wouldn't it be nice to have our own model aerodrome nowadays? This group was probably taken at the 1951 Summer Camp, since three 'Ro-Darts' can be seen in the centre of the group two of them held by Messrs A. Baker (fifth from left) and D. Neale (seventh from left). One wonders where all these modellers are now?

expected that a reasonable flight performance will probably be achieved with four strands of 3/16in. rubber per motor.

3. Even with approximately the correct power the model has a pronounced power stalling tendency. This has been alleviated to a great extent with lots of downthrust; in excess of 5 degrees. The situation was further improved by replacing the symmetric section tailplane with a tailplane having a cambered section.
4. Surprisingly, asymmetric thrust does not seem to be a problem provided the motors are reasonably well matched.
5. By far the greatest problem, the solution of which still continues to puzzle me, is the lack of lateral stability. The layout of the model is such that it is spirally unstable and is therefore difficult to cure with a fixed geometry. The result of this is that the model drops a wing and spirals into ground, this it will do quite happily every time, either to left or to right and has often led to a repair job. This effect is not sensitive to power, consequently thrust line adjustment does not help very much; the thrust lines should be accurately aligned forward only! It is for this reason that I have been reluctant to use anything other than minimum power to date (after the initial disaster), a powered glide reduces the damage on impact. I have tried everything I know, to cure the problem but without success and have reluctantly concluded that the only cure will be provided by a pendulum operating on ailerons. Starting from scratch again I would be very tempted to include a degree of two more of dihedral which would undoubtedly help."

Mike concludes his detailed account by stating that he is quite convinced that the model is capable of a reasonable flying performance and the effort expended to get this will be well worth while, should any reader have any advice to offer, Mike would be delighted to have it, write to him direct at 6 Hotch Croft, Cranfield, Bedford, MK43 0BN.

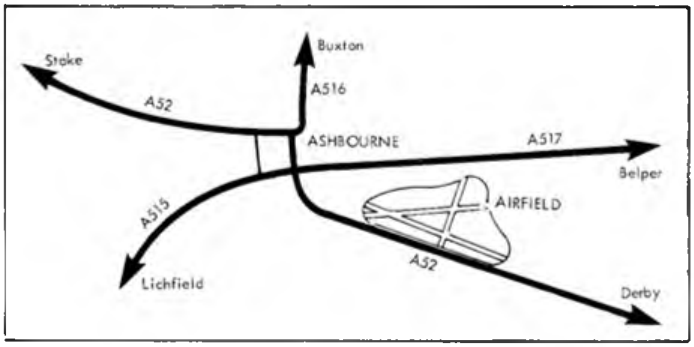
Above: D. A. Pavely was this country's leading exponent on compressed-air models and he entered this fine looking machine in the 1948 Bowden International Trophy Contest at Fairlop. Hopefully the Warwick event will be well represented and bring out models like this. Right: a study in contours! Bill Brazier shows off the classic lines of his Ted Evans' design 'Jaguar' and himself at the Irish Nationals in 1948 at Dublin's Baldonnel Airport.

FROM THE HANDLE

CONTROL LINE NEWS

RACING with Jim Woodside

Right: no juggling with a school protractor here! Beautifully produced and very accurate pitch gauge from Jurgen Lengen. Below: proving myths arise from fact - airfield in the heart of England at Ashbourne.



How Central is a Centralised C.L. Meeting — Part 2

In the February column I published a piece on the location of Control Line meetings along with John Horton's comments on 'Control-Line England' with its centrally located site near Derby. Would you believe that there is a disused airfield within one mile of Ashbourne. Does anyone have any idea about its condition and availability?

Product Information Nelson Combat Special R.V.

Fresh out of the factory in time for this autumn's World Championships is the R.V. Combat Special. Based on the teamrace diesel crankcase, power output is equal to the F.I. engines, but the engine's weight is slightly less — an important consideration when building ultra tight turning airframes. A less obvious advantage is that the R.V. configuration does not 'swallow the sod' (to quote Henry) during a crash and so is essentially more usable in a tough bout.

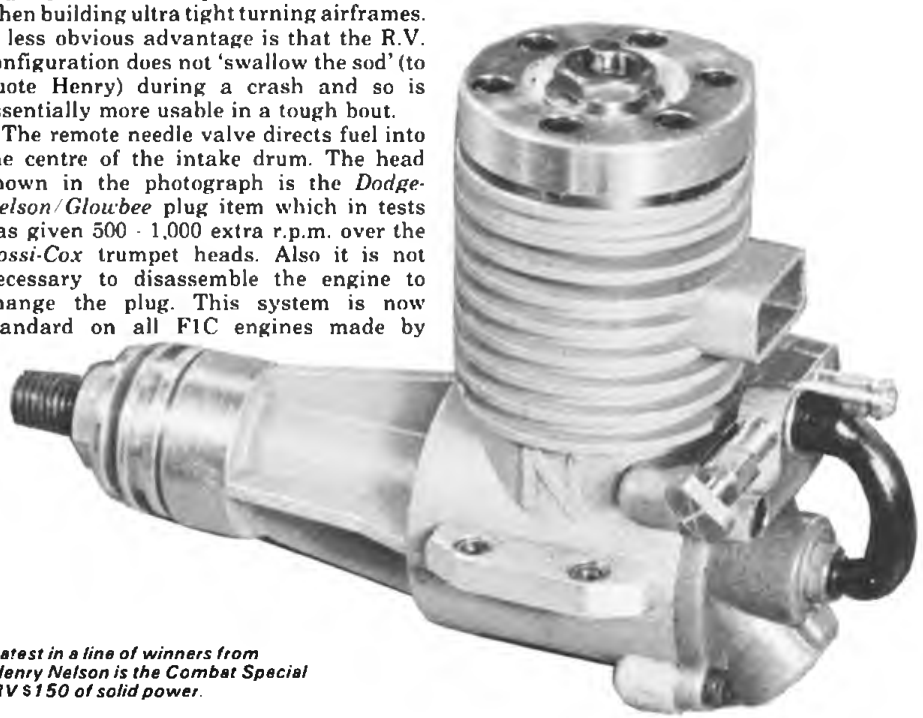
The remote needle valve directs fuel into the centre of the intake drum. The head shown in the photograph is the *Dodge-Nelson/Glowbee* plug item which in tests has given 500 - 1,000 extra r.p.m. over the *Rossi-Cox* trumpet heads. Also it is not necessary to disassemble the engine to change the plug. This system is now standard on all F1C engines made by *Nelson Competition Engines* for free-flight use.

Referring to recently published remarks by this and other writers that the team-race diesel could perhaps use a face-lift, Henry wryly remarks that it is 'interesting' how his 'obsolete' case with a glow liner can outrun most other open exhaust glows! Fair comment.

Prices in US dollars:

ABC liner, solid crank	150.00
ABC liner, lightened crank	160.00
AAC liner, lightened crank	175.00

Orders to: Nelson Competition Engines, 729 Valemont Drive, Verona, PA15147, U.S.A.



Latest in a line of winners from Henry Nelson is the Combat Special RV $150 of solid power.

Jurgen Lenzen Super-Precise Pitch Gauge

In the June 1983 edition of this column I showed how to make a rudimentary angle reading pitch gauge at a cost of about 50p. Here is the grandaddy version costing somewhat more. The accompanying photograph shows the *Lenzen* gauge to be a superbly built item capable of reading to an accuracy of 1/5 of a degree. The prop is mounted on a pillar and the blade assembly moved from station to station, which can be specified at either 5 or 10mm spacings.

A conversion table is supplied which will convert angles into either inches or millimetres of pitch up to a maximum of 10 ins./250mm.

There are four different models of pitch gauges with ranges suitable for different sizes of propeller.

1. For a blade radius between 20mm - 80mm in steps of 5mm ± 0.02mm accuracy.
2. For a blade radius between 20mm - 70mm in steps of 10mm ± 0.02mm accuracy. And from 70mm - 80mm in steps of 5mm ± 0.02mm accuracy.
3. For a blade radius between 20mm - 170mm in steps of 5mm ± 0.02mm accuracy.
4. For a blade radius between 20mm - 170mm in steps of 10mm ± 0.02 accuracy.

A very impressive piece of tackle, of interest to committed speed and team-race competitors at an equally impressive price — 220 - 240Dm (£60 - £70) according to whether 5mm or 10mm divisions are chosen. Postage *is* extra.

Orders and enquiries to: Jurgen Lenzen, Alfred Dobbert Str. 57, 5600 Wuppertal 1, West Germany.

Mike Broadbent Teamrace Products

First illustrated in these pages in March 1982, the range of pressure re-fuel reservoirs and pilot's handles has now been withdrawn from production. No further orders should be placed. Those needing a pressure re-fueller can obtain a good item from *Shadow Racing*.

This includes a gauge, pump and is priced at US$25 + $5 postage: Shadow Racing, 3421 S.E. 28 Court, Ocala, Florida 32671, U.S.A.

**Please note the new address for Shadow Racing, effective immediately.*

FREE FLIGHT SCENE

Dave Hipperson reports

Above: is this the biggest Open Rubber model in the world? Mark Croome demonstrated this 'collosus' at the 1st SMAE Area meeting at Barkston Heath . . . complete three minute prop run.

SMAE 1st Area event . . . 11.3.84

Early March can be an unkind time of the year for aeromodellers. This year was rather better than usual and for the 1st Area event parts of the day were quite flyable virtually nationwide. The North East Area using Brunton had the worst and wettest of it, but the remainder of the country reported very variable wind speeds alternating with either heavy showers or at least dark threatening clouds and rather better mornings than afternoons. Probably the most stable conditions prevailed at the central and best attended site — Barkston Heath. Some 65 flew here — a record for this Area for many years — mainly because on this occasion it was host to not only the Midland Area, but also East Anglia and a large part of London too.

It was here that the three Open Power men, arguably the most effective, and certainly the most impressive in the country, flew off for the Frog Senior. There were others in it of course, but the tremendous climbs of Hopper, Smith and Screen really eclipsed all else. Hopper's model developed a stall but still bettered six minutes whilst Screen and Smith (Jeff not Tom) both glided away into the distance to record remarkable scores, given the generally dead conditions. With drift no more than 8mph — although it had been double this only a few minutes before — all models were recovered a field or so out of the 'drome.

Howick and Lee must have found a similar patch at Ashdown with their rubber models. The weather there had been more changeable with an encouraging morning of light winds deteriorating into much colder, windier and wetter weather by afternoon. Their break came at fly-off time when one of the post downpour lulls coincided nicely and Mike's swept wing Nats winner from last year took top honours comfortably with Nigel Lee coming home 3rd behind Morley who had been patient enough to wait for a warmer patch at Barkston.

If the standard of the top few in these two classes had been high then the overall standard in the heavily entered glider event was perhaps even higher. No less than 15 returned full scores nearly half of these coming surprisingly from Beaulieu as they had quite a wet afternoon. Top here was Mike Fantham, but he had to be content with third nationally, as Tony Le Vey posted a fine 4-minute fly-off all on his own at Driffield and Phil Owens, also flying late on in the period at Barkston, took second with a 3:51.

Most encouraging to see such a healthy entry on a day when the weather could have so easily been much nastier and indeed the weather men held little hope. Nevertheless defeat at the hands of someone else flying miles away in much better conditions comes as a hard pill to swallow but against this deficiency in the system, it has to be said that Area events bring major *SMAE* contests closer to your doorstep. (Notice the way I avoided saying near!) For this reason they attract large entries and help to maintain interest right across the Country. Those licking the wounds of defeat should be reminded of the same Area event back in the late '60s, when the whole country was ravaged by gales and flying anything was an achievement. Tony Young for instance thought he had it wrapped up with a very useful and exhausting total of something around 11 minutes from five flights in glider at Chobham and a number of rubber fliers were congratulating themselves on having actually made three flights of any length at all.

Up in the North East the gales and rain were so bad they actually got as far as thunder and lightening storms. Here Tony Cordes had the idea that if a storm was involved then there was just a chance that as it passed there might be a blank spot for a few minutes. Calm enough for a few flights maybe? With only this thousand to one chance he and Ron Pollard waited it out on Newcastle Town Moor in the most appalling conditions. Low-and-behold the break came mid-afternoon and a flat calm patch lasted long enough for Ron to rattle off three maxes in Rubber and Tony to complete his five flights in glider, a number of which were actually taken in the same thermal! The wind returned as suddenly as it had ceased and Ron's fly-off of 3:50 was sucked away quickly and never found. The reward for their patient effort was that Ron topped Rubber and Tony won the KMAA Trophy. Now that is what I call tactical flying!

Results:

F1A (A2) Glider for KMAA Trophy — 90 flew

1	T. Le Vey	NYFFG	15:00 + 4:00
2	P. Owens	Liverpool	15:00 + 3:51
3	M. Fantham	Richmond	15:00 + 3:46
4	B. Lavis	Biggles	15:00 + 3:28
5	A. Cordes	Birmingham	15:00 + 3:22

Open Rubber (no trophy) — 47 flew

1	M. Howick	East Grinstead	9:00 + 8:03
2	D. Morley	C.M	9:00 + 7:05
3	N. Lee	East Grinstead	9:00 + 6:45
4	D. Hipperson	Grantham	9:00 + 6:25
5	L. Aukland	NYFFG	9:00 + 6:11

Open Power for Frog Senior Trophy — 25 flew

1	J. K. Smith	BAC	9:00 + 8:31
2	S. Screen	Birmingham	9:00 + 7:31
3	J. Hopper	Freebird	9:00 + 6:08
4	D. Cash	East Grinstead	9:00 + 5:28
5	R. Peers	Falcons	9:00 + 3:57

Understanding rubber motors Part 2...

Rubber bunching *(cont.)*

Rubber bunching also explains why you often see contest models stalling down on the glide in flyoffs after they have given no trim problems during the day. Their owners have been caught by those last few turns they reserve for flyoffs!

There are ways around this problem. One is to actually ballast the rear of the model with sufficient weight to compensate for the forward CG at low turns and remove it when full turns are approached. This of course presupposes you know the design well enough to be able to estimate the correct amount of ballast. The other way is to always use, or at least wind on, full turns. The suggestion is not as dangerous as at first it might seem. I find it safer when trimming a new model to always wind on more turns than I am going

Below: Anthony Ball beat Dad Phil at the 1st SMAE Area meeting, dropping just a few seconds short of a change at the Open Rubber fly-off.

Left: Pete Watson used this model to good effect in the February Slow Open Power, placing third. It has almost standard Dixelander surfaces and is PAW 19 powered.

to use letting say half off before releasing. This has the effect of eliminating the first burst and there is a burst no matter how few turns are applied, hence lessening the chances of a stall or spin close to the ground. It follows from this, that the most reliable way of trimming, would be to wind on full turns every time and let fewer and fewer unwind on the ground as trim is achieved. This gives the motor much more of a hammering and the last thing one requires is strands breaking all over the place whom concentrating on trimming, so the best path is a compromise. Set the model up on hand glides positively under-elevated — that's safer than stalling anyway — then only wind on full turns after rough trimming to ¼ turns is complete. Let off less and less on the ground as you approach perfect trim. Remember never risk a model on absolute maximum turns on an important flight if it has not been checked to these turns before, it is more likely to upset the glide than the power!

Arrangement of motor lengths

The more rubber weight you use the more energy you can store in the model. However, torque and length of run are variable and depend on the aspect ratio (length over cross-section) of the motor. Length is easy to measure — cross-section more difficult. Obviously the ideal way to measure the cross-section is to measure the section of one strand and multiply by the number of strands. That of course pre-supposes that all the strands are equal, which is unlikely and anyway the initial measurement is on a scale so small as to be impractical and this is an article about short cuts, not making it more complicated. The effective cross section of a motor is often referred to as the number of strands. Now, strand thickness and width varies so much that this is misleading and fraught with confusion. Forget numbers of strands. Look at cross-section simply as a product of weight of rubber used against length of the made up motor. This way, once we have decided on how much rubber the model requires we only have to consider the length of the motor and is simple to measure. What is more, rubber of varying widths can be utilised without too many problems.

Consider for example an Open Rubber model requiring 100 grams of rubber. A reasonable length for a motor of this weight in an Open Rubber model and in its natural state would appear best arranged in a length of about 44in. This motor will take about 1,000 turns and run off through a 22in. × 28in. pitch prop in about 90 secs. The 100 gram quantity is weighed out and made into a single enormous loop by tying the ends together. This loop is then made up into a motor by wrapping it around two nails knocked into a plank (building board) 44in. apart (Fig. 8). Low and behold it doesn't work out to an exact number of loops (Fig. 9). At this point you can decide whether to make up into a slightly different length motor or use an odd number of strands to get nearer the final made up 44in. you require. If this first try finished up with the end of the loop half way between the nails then one strand less — an odd number — will very probably fit perfectly (Fig. 10). If on the other hand the even number comes out very nearly the required length then best you alter the nail positions slightly — maybe you finish up with a 43in. or 45in. motor . . . close enough. You will begin to see now that it may actually be beneficial to use rubber of a rather smaller cross-section than the ⅛in. × $^{1}/_{32}$in. nominal that seems so popular. With half that width it stands to reason there would be twice as many strands and more strands means more flexibility when making up to length. In fact the smaller the cross section strip the greater flexibility it has to offer. Certainly strand to strand friction becomes a factor if we take this too far but it is unlikely to be a problem until we get down to using $^{1}/_{64}$in. square!

Returning to the odd number of strands situation. Just how do you have an odd number of strands? Well you simply tie a loop in each end of the strip and lay it up around the nails as a single strand rather than a double piece as you did with the large loop. Once again you adjust the distance between the nails slightly to obtain the loops coincident with the nails. Actually when you have done this a few times with either odd or even strand configurations you will probably find it quicker to use your hands rather than bother with nails in a plank. (He's known now as octopus Hipperson ... Ed.) Just lay out a tape measure along the building board as a guide from which to start.

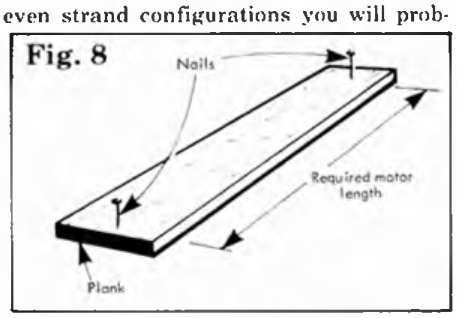
Incidentally tying a loop in the end of a strip of rubber is very simple. You tie what is known as a bowline (Fig. 11). A simple thumb knot in the end of the rubber before the loop is tied, will help resist its pulling through when the motor is lubricated. I have found that this knot actually holds rather better in lubricated rubber than the reef knot used to tie strip together. Odd numbers of strands in no way inhibits pretensioning. One simply splits the motor into as near half as possible and wind on equal turns to both skeins as one would with an even stranded motor. You will see that making up by weight and length allows one to bother much less about the actual size of the strip one is using. You are more likely to be able to use up all the strip you have no matter what size.

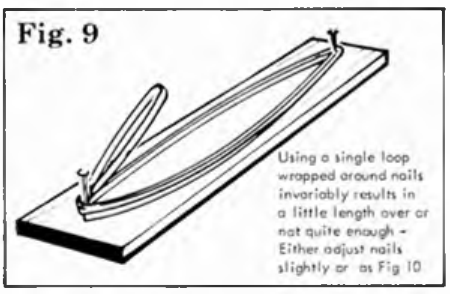
FAI versus Pirelli

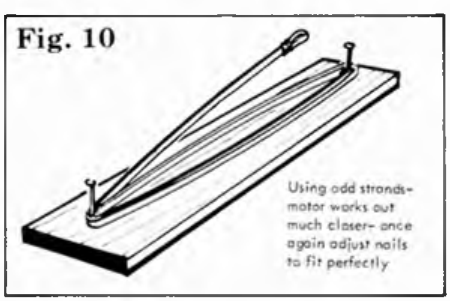
As touched on earlier, *FAI Supplies* tends to behave differently to *Pirelli* therefore you should be careful if switching from one type to another. Motors may have to be made up into different lengths to fit the trim of the model — i.e. reproduce the same initial torque and length of run. Initial torque is particularly important as this above all else can endanger the model. As a simplification *FAI* develops more initial torque and hence delivers more of its power early on in the run than the equivalent motor made from *Pirelli*. Therefore motors in *FAI* should be made up *longer* than motors for the same model in *Pirelli*. For instance a 44in. *Pirelli* motor of 100 grams would probably be comparable to a similar weight *FAI Supplies* motor of 52in. and so on.

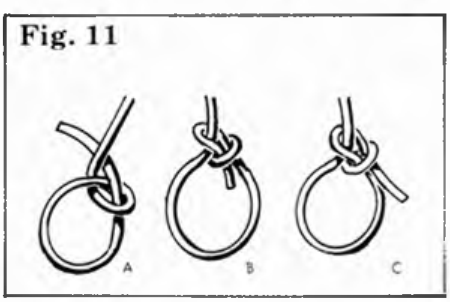
Running in and the effects of stretch

It is debatable whether rubber actually requires running-in but it certainly does take a slight permanent stretch after some use, so it is good that this is taken up before contest turns are applied for a variety of reasons. First, if the motor is going to stretch slightly then it follows that any length increase will









allow slightly more maximum turns and we should know this when calculating them. Second, and perhaps more important, if any prop assembly apart from the simple screw stop mechanism is to be utilised then an unexpected stretch, even quite slight, could easily allow the motor in the model to go slack (despite pretensioning) with disastrous consequences — the prop falls off! This incidentally is one of the prime advantages of the simple wood screw stop. You can hopelessly miscalculate everything and often still get away with it. Thankfully most vintage models are so equipped.

Running-in procedures vary almost as widely as winding techniques. My favourite is not to run in at all but retain new motors for initial trimming flights and work up quickly and quite brutally to full turns. Others stretch their motors linearly to quite remarkable lengths, up to six times stretch in some cases. Terrifying when conducted indoors but at least it doesn't fray the rubber. When I try this it usually pulls pieces of my house down instead! A sensible compromise is to apply winds in the normal fashion in increments from $\frac{1}{4}$ max turns to $\frac{1}{2}$ and finally $\frac{3}{4}$. Flights could then be made with such a motor but it is sensible to check its length again after a little use and if necessary make it up one strand more if it has crept above your top limit for length.

Don't be afraid to alter the 'strandings' of motors if they have stretched. If all your motors of the same weight are within fairly tight limits of length then you can be assured they will behave similarly.

Holding fully wound

It is generally believed that the longer a motor is held in the fully wound condition then the greater the drop in torque and hence performance when it is released. This is only partially true when using good quality rubber. Certainly initial torque does drop but most of this occurs very quickly, probably by the time you have removed the winding tube, attached the prop, fiddled about with the DT and walked out to where you are going to launch. After that time the drop-off, although measurable, is insignificant particularly if the reason for your delay is that you are waiting for better air in which to fly the model. Believe me, launching at the right moment, even if its just a lull in the wind rather than actual lift, easily compensates for a motor held for 5 or 10 minutes! Don't be in too much of a rush to get the model away as soon as its wound. Another fear that can add to the pre-launch panic is the chance of the motor blowing after you have removed the winding tube. It has happened but so infrequently as to be an irrelevant statistic. I am going to take a huge risk here. It has *never happened to me* in the 20 years I have been flying Open Rubber. I have done it to a CdH — twice but only because I was cranking on extra turns with my hand while I waited for lift. This is a habit that tends to increase confidence rather than have any real effect on performance. Waiting 'wound up' for long periods is *not* particularly detrimental to the power available at launch it does *feel* re-assuring to know that while the time is passing more turns even if only a handful are being applied. However, it's a dangerous habit and best avoided and definitely out with frail vintage and open constructions.

Right: Dave Hipperson's own design to the 1950 Wakefield rules complete with 17 square inch cross-section fuselage - ouch! (I wonder if it has got turbulators . . . Ed).

Continual use of a motor

You will often hear of people extolling the virtues of changing the motor after every flight. This too, is almost always unnecessary. On anything like a breezy day you will probably have been half and hour or more chasing and retrieving which is ample time for the rubber to recover. In some tests I carried out in July 77 and April 79 *Aeromodeller* I tried repeat windups. By repeat I mean immediate rather than leaving any recovery time at all. Certainly there was a drop-off in power but still only quite slight. If you have reasonable quality rubber and the motor hasn't shed any strands — bash on. As a warning here however there has been rumour in the past that some batches of *FAI Supplies* don't take kindly to this treatment. As I have never had any of these samples to test I only have other people's word for the symptom but perhaps a little caution on this, when using *FAI* particularly in cold weather. In general the better the rubber the less it will be effected by holding wound or by repeated use.

Conclusions

There is a great deal more to be learnt about rubber motors but it is hoped that the foregoing, although really no more than a précis of a very complex subject, will be of help particularly to those who are about to embark on their first contest rubber model or having done so have come up against snags. Happy winding!

Turbulators

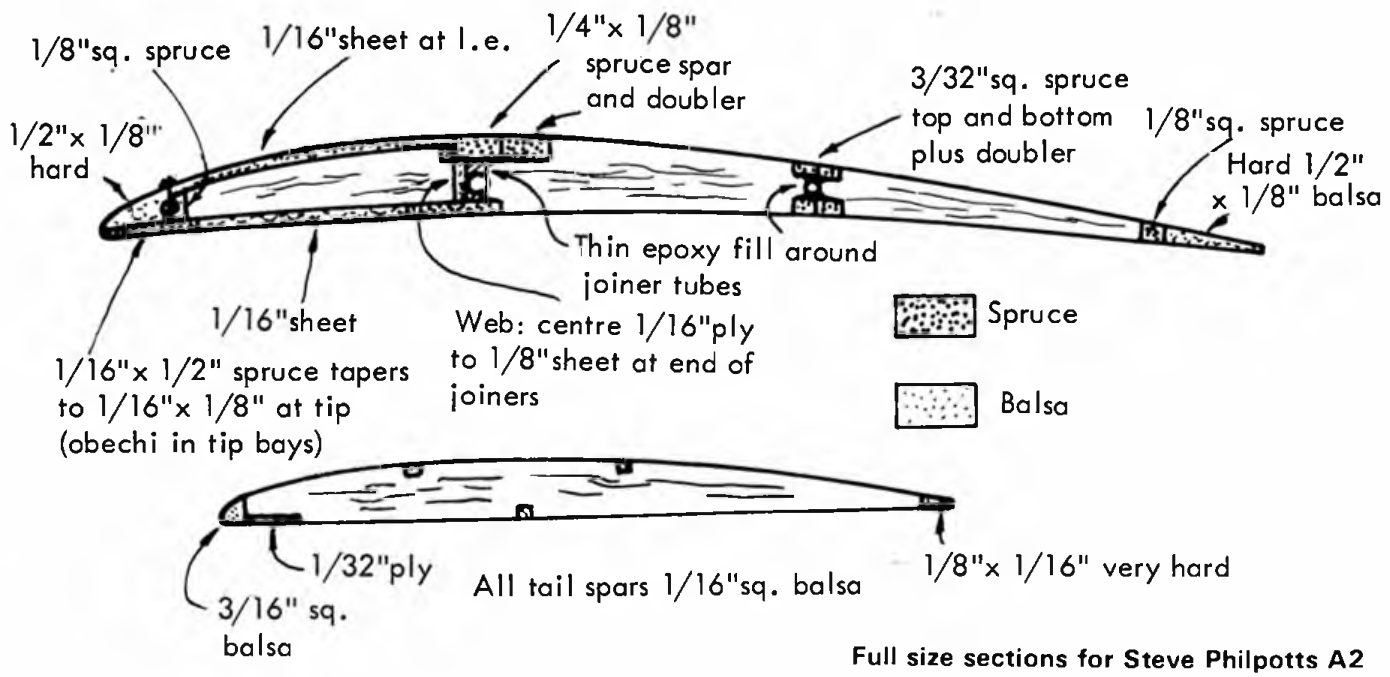
The subject of Vintage model authenticity for *SMAE* events has raised its head again. With three Vintage events on the *SMAE* callendar this year it was expected that there would be more interest in the class. It follows therefore that some people were going to encounter glide consistency problems and wonder about the validity of turbulators. The last skirmish around this subject was really outside the *SMAE* sphere of influence but it remains the only documented test case. It surrounded an argument John O'Donnell had with the Northern Area in '73 when they would not allow his 'Scram' with a thread turbulator to compete in a Northern Area domestic event. The grounds being that: 'It represented an aerodynamic modification, aerofoil characteristics being drastically altered'. This was rather unsatisfactorily resolved when the designer of said model, Laurie Barr, stepped in to say that many of his versions required and were fitted with turbulators. They were never shown on the plan however!

Since then there has never been a test case and numerous current competitions now openly use turbulating threads on vintage models. Foreseeing trouble the FFTC discussed the matter last month and have ruled that, in their view, turbulators on vintage models are *acceptable* and this would be their advice to the *SMAE* Council if ever a case or protest were brought before it.

Actually the improvement effects of turbulators might have become rather exaggerated and it is probably this that leads some vintage enthusiasts to want to outlaw them. It is no longer a case of hanging some fancy device on outriggers at a critical distance in front of and above the wing section after extensive testing in a smoke tunnel! It's much more approximate than that and there is probably less 'secret' involved than to altering decalage and shifting the C.G. These latter adjustments would take considerably more skill and judgement to be beneficial particularly on unusual aerofoils.

More often than not the leading edge radius and position is such that the boundary layer over your wing is turbulated automatically. Multi spar surfaces usually do the trick, but the sections that most often benefit are those with smooth upper surfaces, often no spar protruding at all and all too common in designs of the 50s. If the model glides at all then you are probably not going to find that extra turbulation does much. The symptoms that require attention are either a non-existant glide altogether — a 45 degree dive no matter how much packing goes under the trailing edge of the tail (very unusual, but it is what O'Donnell claims beset his 'Scram') — or more likely a glide that stalls and then goes into a prolonged and shallow dive to stall again erratically. This is often accompanied by a reluctance to hold a consistent glide turn.

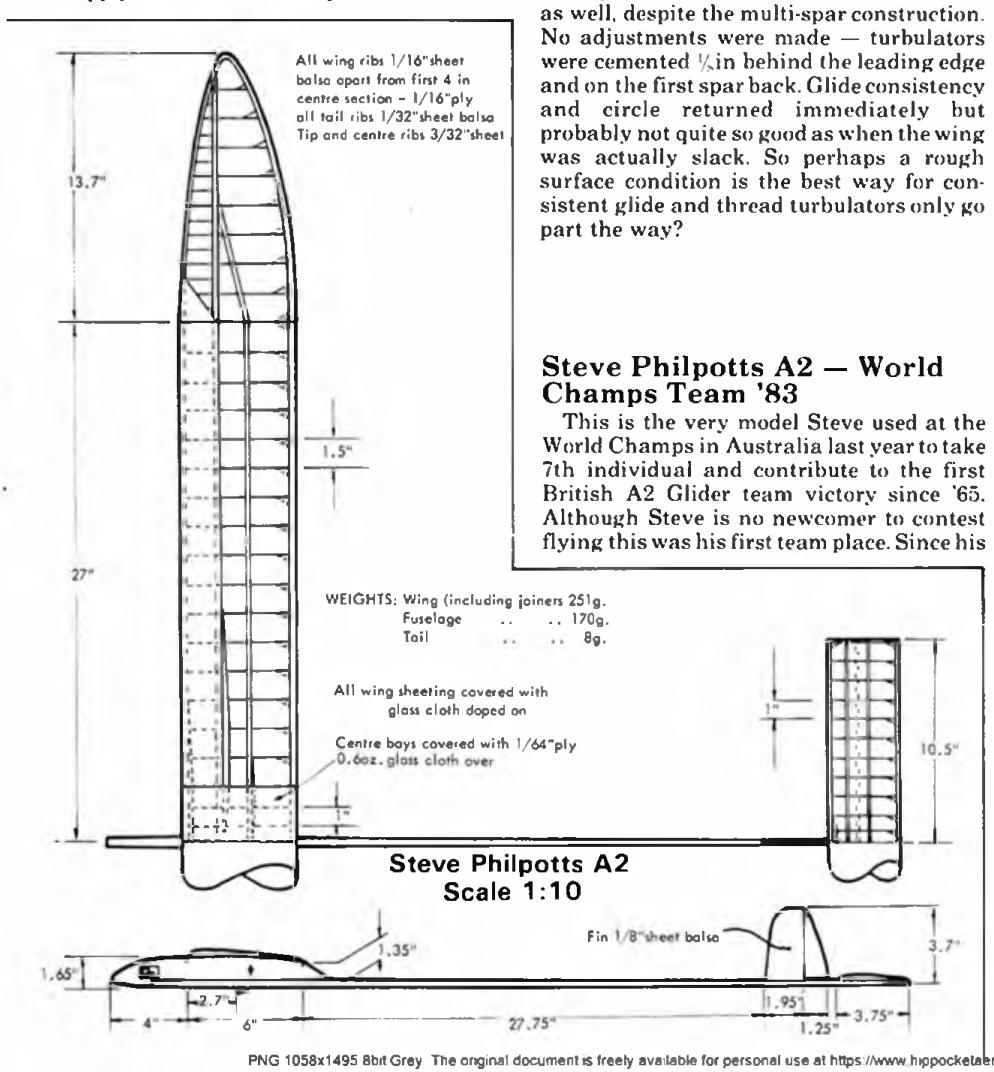
Airflow breakaway from the top surface produces the stall, then its reluctance to reattach gives rise to the prolonged dive. Quite probably just a rough top surface (e.g. Philpotts' comments elsewhere) would cure the problem in many cases, but unless it had been expected at the building stage it would go rather against the grain to roughen the top surface and on a tissue covered wing it might actually prove impossible without resorting to a very nasty appearance. The tidiest solution has been found by cementing or even doping quite small diameter threads along the top surface to 'spoil' the flow. At the rear of the leading edge member and about 20% back seem popular places to start. Recently some have discovered



Full size sections for Steve Philpotts A2

improvements by continuing them right across the entire chord at such intervals. I have not done that yet, but as a matter of course I turbulate my Coupes as one of them did exhibit stall and dive characteristics once, but it might as easily been because I had it too closely rigged, with too aft a CG! On Coupes with the B7406f section I turbulate at the high point which roughly coincides with the main spar. However the same section used on Wakefields with slightly deeper chord has never needed one.

I experienced a dramatic example of surface turbulation recently whilst trimming a 'Lanzo Stick'. First test hops were conducted on a very calm, damp, January afternoon before I had time to apply the final coat of dope. The wing tissue had gone slightly slack, but of course the structure of the 'Lanzo' is so rigid that test flights could continue as neither strength nor warps had been affected. The model glided far better than an earlier version and so encouraged, the model was finished properly with another coat of dope on the wing and brought out the next week. Power trim was still perfect, but the glide had deteriorated out of all recognition and the glide turn was erratic. The only difference in the model between the two outings being that it now possessed a tight and smoother wing covering compared to the slack surface on the initial flights. It was therefore presumed that the slack surface had turbulated to good effect, whereas the tight waterproof covering did not, or at least not as well, despite the multi-spar construction. No adjustments were made — turbulators were cemented ⅛in behind the leading edge and on the first spar back. Glide consistency and circle returned immediately but probably not quite so good as when the wing was actually slack. So perhaps a rough surface condition is the best way for consistent glide and thread turbulators only go part the way?



Steve Philpotts A2 — World Champs Team '83

This is the very model Steve used at the World Champs in Australia last year to take 7th individual and contribute to the first British A2 Glider team victory since '65. Although Steve is no newcomer to contest flying this was his first team place. Since his return home the model has served him even more impressively by winning him another team place. This time to the European Champs in August. At the Trials last November it was clear that the model was climbing very high from the top of the line — when he got the launch just right. Thirty feet would certainly not have been an overestimate. Steve puts this down to the thin wing section and there are even plans to experiment with a flat bottom model in the near future. He admits that the glide is a little faster than the norm but the sink rate is comparable with slower flying models and therefore the height gain pays off. Certainly at the Trials in neutral November conditions the model looked capable of exceeding 3 minutes from a good zoom. The very rigid leading edge 'D' box construction is vital in preventing momentary wash-in during the very short period of extreme G-forces exerted at launch.

The correct warps are important too. Port tip has ⅛in. washout, port centre panel is flat. The starboard tip is washed in $\frac{1}{32}$in. and the starboard centre panel also has $\frac{1}{32}$in. wash-in. No surprise ... Steve is a chuck glider flier!

The turbulator ridge is formed by cementing on a length of 30lb *Dacron* thread and then peeling it off again after the glue has dried. The ragged double cement line serves ideally but Steve also tends to leave the top surfaces as rough as possible for further turbulation. For instance the 0.6oz glass cloth covering on the top of the 'D' box is *not* rubbed smooth.

The fuselage is constructed from two laminations of ⅛in. soft balsa sheet locally reinforced for wing mounting, dowels and hook attachment. The rear tube is the conventional *Ronytube* unit well glued to the pod and wraped around with *K & B* 'Hobby Poxy' to resist its peeling off the pod. Steve admits now, that cellulose enamel might be better for this operation as it produces a harder finish.

The hook is only partially recessed, which apart from making on the field servicing easier, also helps the model around the bottom of the circle rather like a straightforward off-set hook. This unit is preformed by Tom Richards of Birmingham and is a similar style to the *Isenko* unit. (Complete hooks are available from Tom for around £5).

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JUNE 1984 95p

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Superhawk by Bill Draper
Aerobatic CL model
https://outerzone.co.uk/plan_details.asp?ID=9818 ...
Page: 12

Simplex by Paul Plecan
Sport flier - mini version of the original 1941
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Page: 22