APRIL 1984

95p

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MAP
MODEL PUBLICATION

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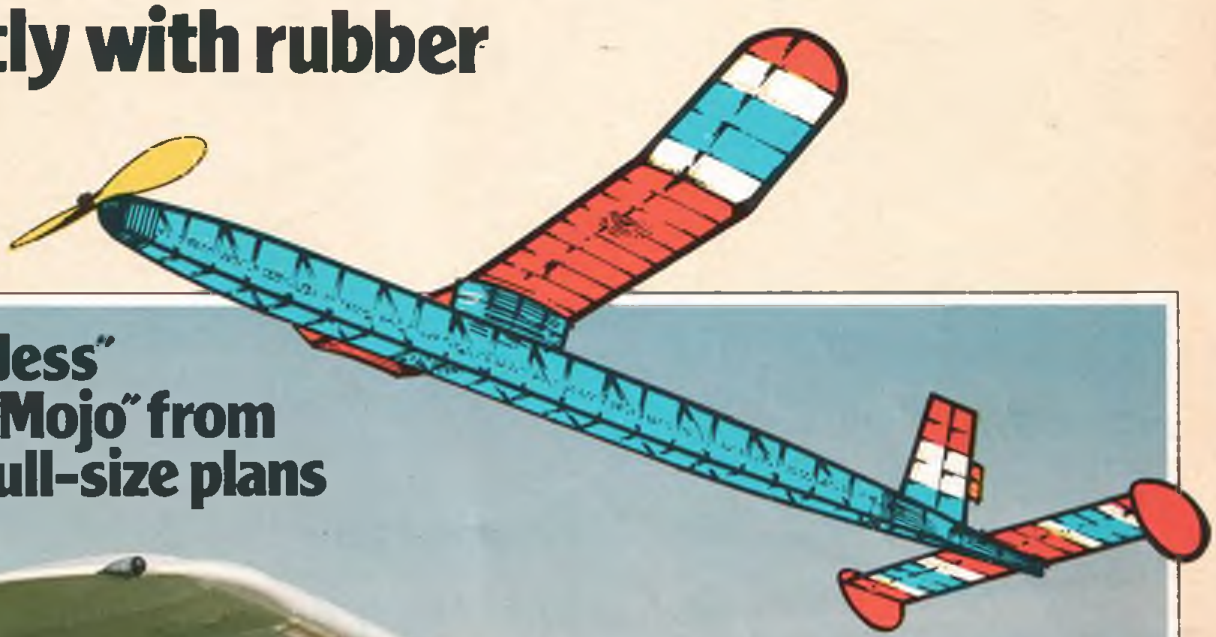

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AERO MODELLER

APRIL 1984

Cover

Ever popular, everlasting, the perpetual Piper 'Cub' returns in the PA-18-150 version on pages 164-167 this issue. This immaculate Swiss example, has mudguards á la Bucker 'Jungmeister.' Free-Flight rubber model 'Bo-Jess' is our full size pull out plan - should see some of these in the top three this year.

Subscriptions:

Annual UK subscriptions, £11.40. Overseas £13.00 or $26.00. Send remittance to Model & Allied Publications, Subscription Department, P.O. Box 35, Wolsey House, Wolsey Road, Hemel Hempstead, HP2 4SS. (subscription enquiries Tel 0442 (51740). Change of address: US Postmaster send address changes to Model & Allied Publications, PO Box 35, Wolsey House, Wolsey Road, Hemel Hempstead, Herts., HP2 4SS, United Kingdom. U.S.A. subscription agent: Joseph J. Dailedu, 4314 West 238th Street, Torrence, CA90505.

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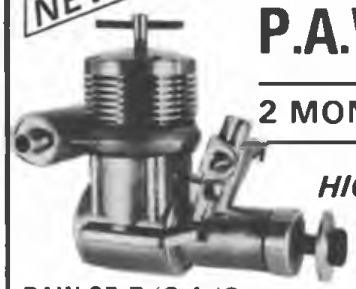

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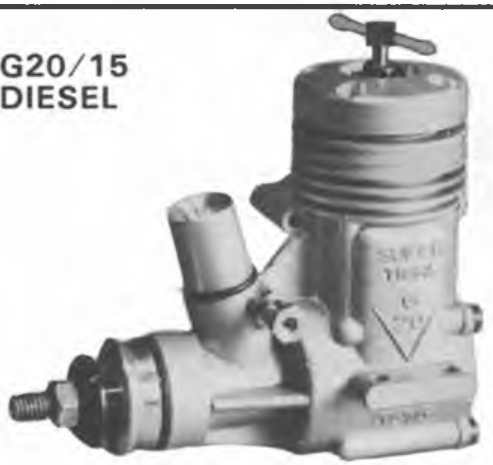

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Mick Wilshere February '84

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HEARD AT THE HANGAR DOORS

Indoor '84

New style Indoor events are being organised for the 1984 season in the magnificent Hangar at Cardington arguably the best flying site in the World. Everyone is welcome to come and fly in the new competitions or just fly for fun or simply spectate.

The EZB event is a combined 'Flyrod', 'Novice', and 'Open' affair, to take advantage of the explosion of interest following *AGM* Pairs etc. and Laurie Barr's 'Flyrod' article and competition last year. There are modelling goods as prizes for each class, with the overall winner calculated using the American index method (flier who achieves highest percentage of the shed record for his class is the winner).

Peanut duration (13in. span) is a new class which has really taken off in the low ceiling winter events. This is a class with a specification which gives models which fly for about two minutes under low ceilings and probably four minutes at Cardington. A magnificent range of designs have emerged and must surely be the easiest introduction to Indoor.

1984 Cardington Program: All flying up to approximately 17th June will take place in Hangar No. 1, and thereafter Hangar No. 2 between the hours of 11.00am to 6.30pm.

Only 19th/20th May, 1st and 2nd September *require* the S.M.A.E. Universal Contest Licence (£10 p.a.) but all *competitors* must be S.M.A.E. members (£5 p.a. including insurance). Membership and contest licence from: *S.M.A.E., Kimberley House, Vaughan Way, Leicester.*

The *AGM* Novice & Expert 'Pairs' trophy can be flown for at any of the meetings (except 19th/20th May) up to and including the Nationals on Saturday the 1st September.

Due to the delay in announcing *any* program changes in print, will all fliers *please* send s.a.e. to L.G. Barr, 4 Hasting Close, Bray, Berkshire for rapid up-dates.

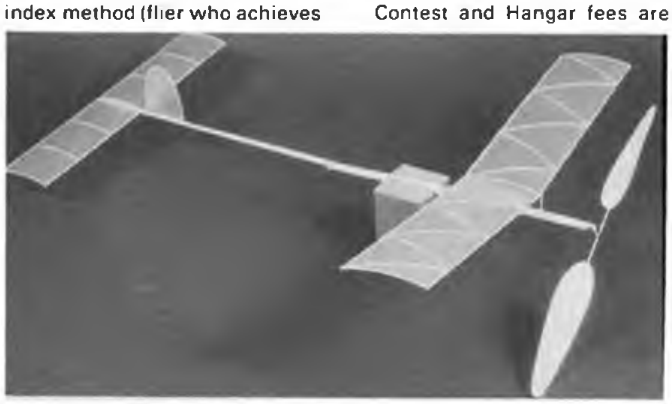
'Flyrod' Contest

This years event on the 17th June 1984, will be as previously published drawings in July 1983 *Aeromodeller*, except fliers may use any amount of their own (or someone else's!) rubber.

Note! The prop assembly jig as published has the pitch setting triangles drawn for *clockwise* rotation, and they should be reversed through 180° for *anti-clockwise* rotation.

The contest will be run with prizes of £100 1st, £30 2nd, £20 3rd, *for both* Novices & Experts. A Novice is anyone who has not placed in the first 3 places in *any* Indoor Duration Contest at 17th June 1984.

Contest and Hangar fees are £3 on the day, but pre-entry is essential by 1st June, send an sae to *Laurie Barr, 4 Hasting Close, Bray, Berkshire. Please* do this *as soon as you can,* to give L.G.B. a chance to know the number of fliers to be catered for!



Laurie Barr's 'Fly-Rod' - build one for June 17.

Scale World Championships Team Trials

The Eighth World Scale Championships are to be held July 2-8, 1984 at Le Bourget, near Paris and events for FAI class F4C (R/C) and F4B (C/L) will be held.

The teams to represent Great Britain in both these events will be selected at a trials to be held on May 5 and 6 at RAF Elvington near York. Both the team trials and the World Championships will be held to the current FAI rules for these scale classes.

The static judging will take place on Saturday 5 followed by the flying competition on Sunday 6.

Only pre-entries will be accepted and these should be sent to: *Eric Coates, Arosa, Liberty Road, Newtown, Fareham, Hants.*

Each entry must be accompanied by the entry fee of £8 (which is non-returnable). The entrant's name, address, telephone number, SMAE number, class of model and subject modelled should also be submitted with the entry.

What's On . . .

March 17, 18 — **SAMUEL WHITBREAD, PSA HOBBY AND MODEL SHOW**
Wide range of models, wargames, handicrafts and trade stands. Venue Samuel Whitbread School, Clifton Road, Shefford, Beds. Contact Jim Bassett Tel 0462 811406

March 17, 18 — **HOBBIES FOR ALL — MODEL SHOW '84**
Venue Belper Sports Centre. Contact Christopher D C Thorpe Tel: Ashbourne (0335) 70600.

March 25 — **SHEFFIELD CLAMS CONTROL-LINE GALA — FAI T/R, FAI COMBAT, GOODYEAR**
Venue RAF Church Fenton. Contact John James Tel 0709 588476

March 25 * — **WHARFEDALE A COMBAT**
Venue Church Fenton, West Yorkshire. Contact Jeff Smith Tel Leeds (0532) 663432

March 25 — **SMAE 2ND AREA MEETING — F/F F1C (HALIFAX & PLUGGE), O/P (GAMAGE), O/G**
Venue Local area venues. Contact Area Comp Secs OR SMAE 0533 58500

March 25 — **F3B LEAGUE EVENT**
Venue Church Fenton. Contact Mike Proctor, 8 Church Rise, Holtby, Yorkshire Tel 0904 489386

April 1 — **1ST ROUND CLASS A BRITISH DIESEL COMBAT CHAMPIONSHIPS**
Venue The Embankment, Peterborough. Contact B Waterland. Tel 0778 343722

April 1 — **SMAE INDOOR SCALE NATIONAL CHAMPIONSHIPS**
Venue Alumwell Centre, Primley Avenue, Walsall, Staffordshire. 9am-5pm — Peanut, Open Rubber, CO2. Pre-entry in all classes by March 1. Registration fee £1.50 per event £2.00, spectators £1.00. Details and entry forms from Doug Sheppard, 13 Luckington Road, Monks Park, Bristol, Avon. Tel Bristol (0272) 697595

April 7 — **"AERO JUMBLE"**
Venue Fleet Air Arm Museum. Contact F R Veal, Publicity Consultant, Fleet Air Arm Museum, Yeovilton, Somerset. Tel Ilchester (0935) 840868

April 7-8 — **READING MODEL EXHIBITION**
Venue The Hexagon, Reading. Contact A B Milne Esq. (Exhibition Manager) 39 Springhill Road, Goring on Thames, Reading. Tel Goring on Thames 872949. (Solely models — there are no trade stands)

April 8 — **SMAE CONTROL LINE MEETING — F2B, F2C, F2D, GOODYEAR, A COMBAT**
Venue Three Sisters. Contact Bob Horwood Tel: 0272 48769

April 8 — **SMAE HANDICAP SPEED**
Venue Bicester. Contact R McGladdery Tel 01 994 6320

April 8 — **CONTROL-LINE SCALE OPEN DAY-FLY-IN**
Venue Broomwade SSC, High Wycombe. Contact Ron Trueleve Tel Penn (0494811) 5300 evenings

April 8 — **CONTROL LINE AEROBATIC F2B AND NOVICE**
Venue Broomwade SSC, High Wycombe. Contact Glen Alison Tel Rickmansworth 772675

April 15 — **FIREBIRDS MC (SMAE) SPRING R/C FLY IN**
Venue Fairthorne Manor, Botley, Hants. Contact Lee Fryer Tel Southampton 550307

April 16 — **ODIHAM SPRING GALA — F/F FAI G/R/P, Cd'H, CO2, HLG, SCALE**
Venue Odiham. Contact Bob Taylor, 1 Erigalee Cottages, Copthorne Bank, Sussex

April 21, 22 — **SMAE F/F EASTER MEETING OPEN AND FAI G/R/P**
Venue Barkston Heath. Contact Trevor Faulkner, 4 Birchitt Close, Bradway, Sheffield S17 4QT

April 22 — **F3B LEAGUE EVENT (EUROPEAN CHAMPIONSHIPS TEAM TRIAL)**
Venue Southern venue. Contact Geoff Dallimer, 36 Farthing Drive, Letchworth, Herts Tel 04626 78745

May 5 — **F3B LEAGUE EVENT (EUROPEAN CHAMPIONSHIPS TEAM TRIAL)**
Venue Cranwell. Contact Norman Mitchell, 159 Windsor Drive, Wigginton, York. Tel 0904 760991

May 6 — **SMAE MINI-VINTAGE F/F MEETING A1, Cd'H, A, HLG, CO2, SOP, VINTAGE**
Venue North Luffenham. Contact Trevor Faulkner, 4 Birchitt Close, Bradway, Sheffield S17 4QT

May 6 — **SMAE CONTROL LINE MEETING — F2B, F2C, SPEED, A T/R, B T/R, A COMBAT, CARRIER, GOODYEAR, NOVICE AEROBATICS**
Venue Barkston Heath. Contact Bob Horwood Tel 0272 48769

May 6 * — **2ND ROUND CLASS A' BRITISH DIESEL COMBAT CHAMPIONSHIPS**
Venue Barkstone Heath. Contact B Waterland Tel 0778 343772

May 6 — **TONBRIDGE OPEN THERMAL SOARING EVENT (BARCS LEAGUE)**
Venue Leigh Park Farm, Nr Tonbridge, Kent. Contact K Miller, 18 Bounds Oak Way, Southborough, Tunbridge Wells, Kent. £2 Pre-entry, frequency and alternate plus SAE

May 12, 13 — **BRISTOL AND WOODBURY WEEK END**
Sat Champagne Event for OR, OP, OG Vintage Rubber. Sun OR, OG, OP, All-in FAI, Vintage Precision. Venue Woodbury Common. Contact Elton Drew, 2 Downsfield Close, Alveston, Bristol BS12 2NJ. Tel Thornbury 416092

May 12, 13 — **SANDOWN PARK MODEL SYMPOSIUM EXHIBITION & DISPLAY**
Venue Sandown Park Racecourse, Esher, Surrey

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

June 2, 3 — **ROTHWELL AERO MODEL SOCIETY VINTAGE SCALE AND SPORTS FLY-IN**
Venue Nostell Priory, Nr Wakefield. Contact J Whittaker, 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, A & A COMBAT, A T/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 (04841) 862353

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) 25695

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

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

*Please note change in published programme.

†RON WARRING 1920-1984

To so many just the name on the spine of a book, to devotees of the Wakefield class a legend and to everyone in aeromodelling a man whose influence reached every aspect of the hobby, Ron Warring died suddenly on January 24th.

He was associated with AEROMODELLER through all his working life as a freelance journalist and author, contributing his Round-the-Pole design to the December 1940 issue while in the Royal Corps of Signals. Invalided from the Army after a serious bout of double pneumonia, Ron turned to a skill which he perfected as a brilliant communicator of technicalities, opening with the first ever description of how Rubber was produced for model motors in the April '41 issue, soon followed by a description of his then record (26:45) holding Wakefield of 1940. It was this feature which set a standard for many to follow, giving the genealogy of his design approach from 1937 in such detail that it inspired a whole generation to emulate the features, and the performance. Such ability was quickly recognised and Ron was recruited to that exclusive band who produced AERO MODELLER and a host of Harborough books from the Wilmary House address in Hampstead. It was the only time he ever worked as an employee, and that brief but hectic experience was undoubtedly to be a strong influence on his later career.

D. A. Russell's entrepreneurial skills poured out books to an aeronautically hungry market in those war years. Ron revised Cruikshank's 'Airfoil Sections', produced airfoil section sheets, and with a monumental series of nine designs originated a complete course on 'Model Gliders', a title we still regard as a classic of forethought, particularly for 1941 when it was written.

All the while, this shy, even retiring aeromodeller from the West Sussex MAS was building a reputation as a contest flyer. Deserting the streamlined fuselage, he became the protagonist for 'slabsiders' and proved his point in the contests. Rubber was his forte and his link with Caton and personal research gave him an enviable insight. Colleague Vic Smeed, one of his close contemporaries, summed it up perfectly when he said,

"If I was asked to say one thing about R.H.W. it would be that he was the first of the 'second generation' flyers to make theoretical considerations credible. The first generation were basically 'seat of the pants' designers; there were aerodynamic speculators, but Ron expounded the theories *and achieved results on the field,* and in so doing influenced model thinking probably more than any other person."

There was a strong association, albeit as adversaries from North/South of the Thames, with Bob Copland, who epitomised aerodynamic perfection in form and when these two produced the 'Model Aeronautical Digest' in 1944 it was as though a whole new stimulative force had been applied at club level. The designs in those pages were built in profusion and captured the imagination. It wasn't Ron's only freelance book — just the beginning. They ranged from the Modelcraft Planbook 'Making Miniature Aircraft' — a book on 'solids' to the then emerging Petrol Engine. He had a big hand in the Majesco, in kits, instruction leaflets, in contributions to the SMAE 'Model Aircraft' and in launching (with Bill Dean, his deskmate in the days of 'D.A.R.') the series of 'Model Aviation' and 'Model Aeronautics' funded generously by Ian Allan. With Don Brockman, Bill Dean, Cyril Shaw and the Geddies brothers he started a Beckenham-based club known as the *Zombies* and it was in his time in the company of that small group that he was most successful on the flying field and creative in the establishment of the SMAE Control Line Sub-Committee despite being the originator of the phrase 'Brick on a String'.

1948 gave him elation at winning the Astral Trophy with a *Banshee*, and greatest disappointment in losing his chance to place on the Wakefield team for America when he lost his Zombie in the trials.

But he made up by representing the country three times, in 1949, 1950 and 1952. He placed 10th in '49 at Cranfield, and 10th again in Finland in '50. In those days the trials attracted huge entries and qualification alone was a triumph (417 competitors in 1950 for six places!) After coming 12th in the Swedish finals in '52, Ron was at last impressed by gears through the skills of Ellila, who he regarded as a perfectionist among the anti-streamliners and he joined the twin skein brigade.

Already his trophy list was long and with a venture into monthly publishing in Hutchinson's 'Marine and Aero Models' his name became synonymous with the hobby. Features in series like 'Design for . . .' and 'Construction for Aeromodellers' were collated in book form while his analyses of everything from kits to engines were eagerly digested.

Sadly, a family tragedy eclipsed his enthusiasm for contests. His son Mike collapsed and died on a cricket field to terminate the prospects of a bright career at only 19. Ron withdrew and wrote at an even faster pace. Many's the time his 'A. M. Colbridge' pseudonym had to be used to avoid an impression of a takeover! He undertook the Engine Tests, had a dynamometer built to his specs, contributed untold volumes of material to those late lamented Aero Modeller Annuals . . . and took to boats.

A move from that huge, welcoming flat at Hayne Road, Beckenham to the quiet backwater of Bosham took him absolutely to water. It wasn't long before he had his own trim Volvo Bertram 25 'Grey Phantom' with racing number 301, and his second son, Chris, was helping in Offshore Powerboat Racing.

Though no longer active, his modelling interests were still as vibrant as ever. Solarbo advertising gave away his secret of being their advertising agent by use of his characteristic sketch style. He produced Ripmax and KeilKraft Handbooks at the same time, a tribute to his discretion, his abilities and the trust in which he was held with highest esteem. As his writings expanded, with directories on subjects ranging from Transducers to Hydraulics, he became more sedate in his boating and swapped the Bertram for a Fairey Spearfish, the 'Sport'. His great thrills were to be among those round the Island (Isle of Wight) racers as they thundered off — and to meet them coming back the other way!

All this time through 45 years of marriage, Alice supported and nurtured his genius. To see his splendid office, self-designed and organised, of course; to view the shelves of countless titles he has produced; and to be witness to that influence he so quietly extended through all those works is something we can personally treasure, and would wish to share with all our readers. Ron Warring's work will become his own memorial and, though he has gone to that great runway in the sky, his creations live on.

Just three phases from the great days of R.H.W. Below right: setting the 24 inch prop on his 1952 Wakefield, made after seeing Bilgri's performance. Below left: receiving the Queen's Cup from Lady Tedder at NH Gala Day '49 and right, with his Astral Trophy winning Banshee in 1948. We quote from one who knew him well, "He has left a legacy of his skill." — D. J. 'Dickie' Laidlaw-Dickson.

Piper Super Cub

Drawn by A. A. P. Lloyd
Described by Charles W. Cain

Super Cub lineage

Since "people-make-planes-'make'-people", the 'Super Cub' starting point is logically with those American pioneers of the 1920-30s whose good ideas have now kept a production-line in being for more than five decades. In the beginning, the originality, the engineering and the sales commitment were those of the Rochester, N.Y.-based Taylor brothers. And not long after the launch of their first sportsplane, the 'Chummy', another name was added to the enterprise — that of oil businessman, William T. Piper, of Bradford, PA.

The 90-hp, 2-seat, parasol monoplane 'Chummy' of 1928-30 would have been conventionally priced and might have prospered but for the untimely death in 1928 of the sales' driving-force, brother Gordon and the hideously spectacular and disastrous collapse of the Wall Street stock market in 1929. Fate redressed the imbalance in that same year by the introduction of W. T. Piper, who with his partner, Ralph Lloyd, injected new finance into the embryo aircraft company. After his brother's death, Gilbert Taylor settled in Bradford, PA, and the link with William Piper was made absolute with the latter becoming a member of the board.

Newcomer Piper provided the right impetus so that Taylor and himself should ride out the storm of the Great Depression of the 1930s. The reasoning was sound. The conventionally-priced 'Chummy' would find only a limited market after the Wall Street crash; but, slash the selling price by 50-60% and still provide a safe-looking, cabin-type, two-seater and the demand should secure the company's economic future. It did, but not immediately and not without changes in the company's structure. The new product was the 'Model E2', the 'Cub', of 1930.

No doubt it was unpleasant for C. Gilbert Taylor, but by early 1931, the original company was made bankrupt and W. T. Piper was able to buy the assets, including the prototype 'Model E2', for a modest US$600.00 (about £2,300 in today's £Sterling). By March 1931, a new company was in being as the *Taylor Aircraft Company, Inc.*, with Taylor as President and Chief Engineer and Piper as Secretary and Treasurer. Between 1936-37, the Treasurer first bought out his partner (and assumed two more titles, President and Board Chairman) and then, in 1937, reconstituted the company as the *Piper Aircraft Corporation* with Walter Jamouneau retaining the title of Chief Engineer that he had latterly held in the old company.

Meanwhile, first at Pittsburgh-Butler, PA, and later at Alliance, OH, C. G. Taylor opted for the side-by-side seating for his first independent product, the *Taylorcraft* 'Model A'. As early as November, 1938, the British connection was established and the eventually many-branched *Auster* family-tree was planted in the name of *Taylorcraft Aeroplanes (England) Ltd.*

But back in Pennsylvania, 1937 was also the year when the Bradford, PA, plant was seriously damaged by fire. And, rather than risk losing potential customers by further delay, the 200-strong work-force was re-located some 80 miles south-east to Lock Haven, PA. Soon the former silk factory was employing twice the number of people and was neatly dubbed 'Cub Haven'; even today, the adjoining municipal airport is known by this name.

Super Cub forebears

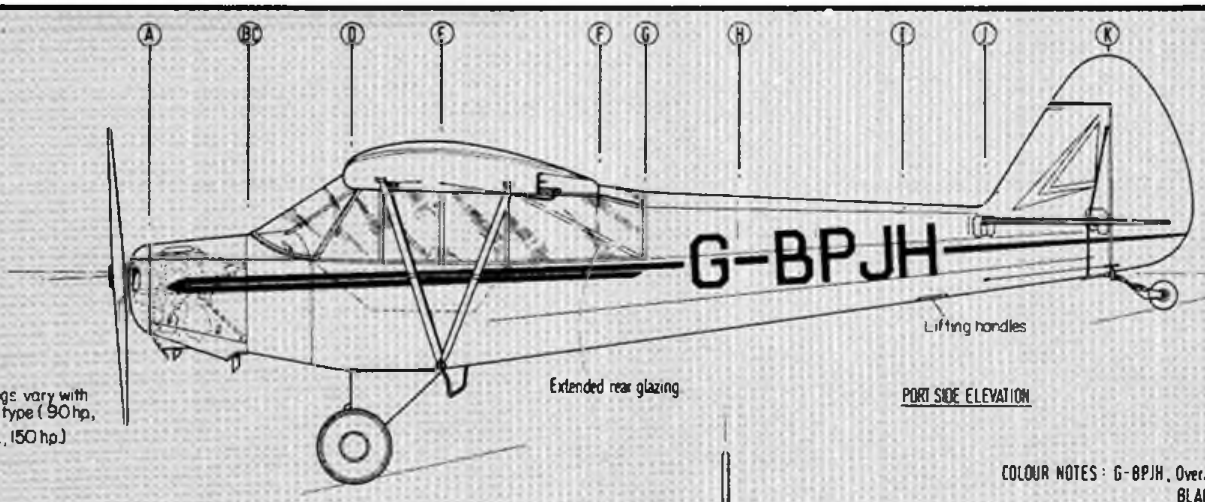
In broad terms, the *Dacron*-covered, aluminium and welded steel construction 1980s' *PA*-18-150 'Super Cub' should be the ultimate model in over 50 years of development and production of the *Piper* high-wing cabin monoplane family on the *tandem-seat* theme. That emphasis is necessary because there are other branches of the *Piper* high-wing lightplane clan. For example, there are the 2-seat side-by-siders like the 1938 J4A 'Cub Coupe' and on the 1961 *PA*-22-108 'Colt'. And there are 3- and 4-seaters from the 1940 J5A 'Cruiser' 3-seater to the 1950s' *PA*-22-125/160 'Tri-Pacer' 4-seaters. Broadly-speaking then, with so many variations and anomalies on offer to confound the chronicler, if it has got tandem-seating then it is most probably a 'Model 2' (like E2, F2, H2 or J2 'Cub'), or a 'Model 3' (like J3, J3C-65, F-65 or L-65 'Cub'), or the L-4 'Grasshopper', or a *PA*-11 'Cub Special', or (at last!) a *PA*-18 'Super Cub' — of which, more anon, as they say.

The earlier birds — The beginning is with the *Taylor/Piper* 'Model 2' on the 1931 production line. The breakthrough came with the American advance in developing the air-cooled 'flat four' piston engine of 37-40 brake horsepower and to make the power unit available at a price lightplane manufacturers could exploit to create really economical small aircraft. *Continental* was first with its 'Model A-40' producing a maximum output of 38-hp at 2,800 rev/min. The 'A-40' went into the *Taylor/Piper* E2 'Cub'. But, just to be awkward, the F2 and the H2 both had air-cooled, inverted-Y, 3-cylinder engines; the F2 had the 40-hp *Aeromarine* AR-3-40, and the H2 had the similar power output *Szekely* SR-3 motor.

Next came the 'Model 3' with the J3 'Cub' (sometimes called 'New Cub') for the 1938 production line. By 1940, the trim Cub was being offered with a primary training option which was reflected in the new sales name of J3C-65 'Cub Trainer'. The J3's new suffix is a useful aid since the 1940 model was on offer with the choice of three 65-hp 'flat fours'. The most popular was the *Continental* A-65 (thus, J3C-65). Then there was the J3F-65 for the *Franklin* 4-AC-150 and J3L-65 for the *Lycoming* 0-145-B engine. The 1940 J3 had yet another marketing name — 'Cub Sport.'

A 1/24 scale dye-line print of this drawing is available from Aeromodeller Plans Service, PO Box 35, Wolsey House, Wolsey Road, Hemel Hempstead, Herts. HP2 4SS, price £1.65 plus 50p postage and packing. Please quote Plan No. 3061 when ordering.

3061



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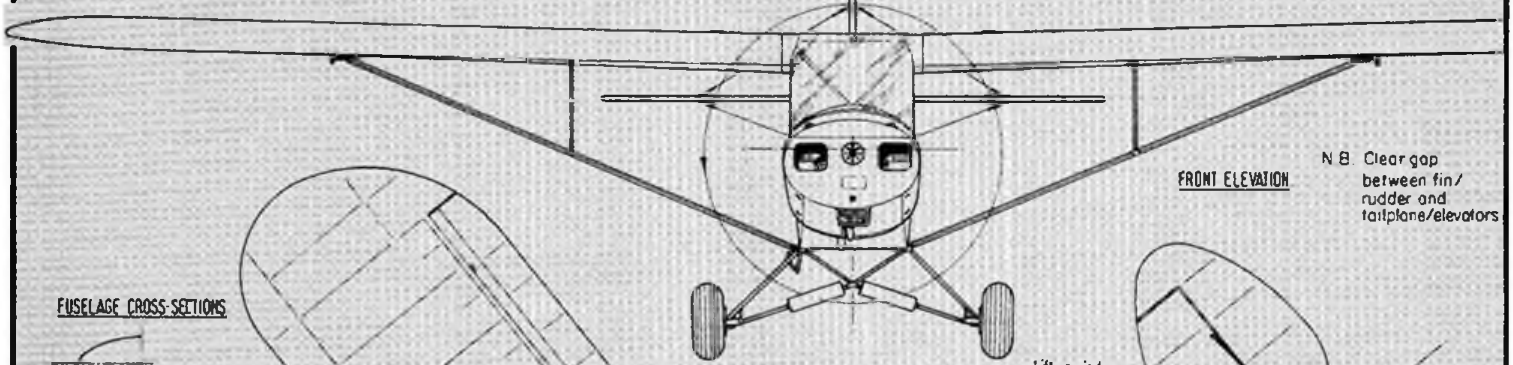

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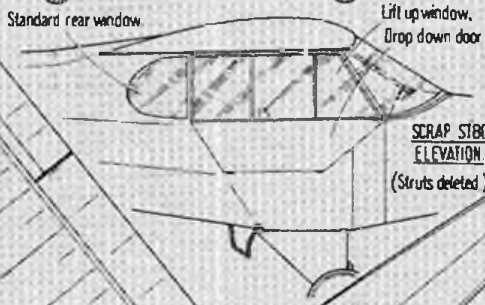


Drawn & Traced by: A.A.P.LLOYD.

PIPER PA-18, L-18, L-21A Super Cub.

Grasshopper era — December 7, 1941 changed the course of World War 2 when the Japanese bombed Pearl Harbor, Hawaii. For *Piper Aircraft*, by that time the company was claiming to have built its first 10,000 'Cubs'. The American fighting services were going to need a lot of 'Cubs' from then on. But the summer manoeuvres for elements of the U.S. Army Ground Forces proved once and for all that light observation two-seaters (like the 'on-loan' *Piper* 'Cubs' and some of their competitors) just had to be part of Army Ground Forces battle front inventory. The U.S. Army Air Forces was responsible for placing such orders for both services and, starting with observation O-59, the militarised 'Model 3' advanced to the better-known liaison L-4 'Grasshopper' designation. The L-4 (out of the lookalike other 'Grasshoppers', the *Taylorcraft* L-2s and *Aeronca* L-3s) was chosen as the front-line 'Plane Friday' in every Theatre of Operation from Europe to the Far East. An enlarged version, the L-14 of 1945 was a victim of production cancellation after VJ-Day. Only five Service Test YL-14s were delivered, the further 845 L-14s were not built.

PA-185-150 on Edo floats first registered as N5405Y in 1945 but for some years on the Italian register as I-OLMO and seen frequently at Como.

PA-18A 5B-CAE Cyprus registered agricultural variant with belly tank. Below: French ski equipped version retains the wheels and steerable tailwheel.

A BIPE? Yes - N4351Z has a lower wing added and a heavy duty tailwheel unit. Origin of this oddity among PA-18-150's would be interesting. (Photo: A. Heape).

Post-WW2 tandem-seaters — Despite the well over 100,000 trained pilots as potential additional 'Cub' owners, the post-war dream did not quite live up to expectation. Nevertheless, the *Piper* people hurried back into production with the 1940 J3C-65, but gave it the sales name of 'Cub Special'. By 1947, the 'Cub Special' had become the first production model to be fitted into the new nomenclature of *PA* for *Piper Aircraft* - the *PA*-11 with a 65-hp *Continental* A-65-8 'flat four'. From the *PA*-11, the next step was a military requirement for America's Nato allies, the *PA*-18 'Super Cub', which in military guise was to become the L-18 and the L-21.

The Military Super Cub — Under the terms of Nato's M.D.A.P. (Mutual Defense Assistance Pact), the United States agreed to supply arms including aircraft. Various Nato armies, as well as the U.S. Army Ground (later Field) Forces were to be recipients. The first was the Turkish army which was allocated 105 L-18Bs. These were standard *PA*-18-95s (90-hp *Continental* C-90 'flat four') which had been certificated by F.A.A. in November 1949. The L-18s were not equipped with the flaps that graced the 1951 military *PA*-18-125, the L-21 (the L-21A had the 125-hp *Lycoming* 0-290-D1 and the L-21B had the 135-hp 0-290-D2), and the L-18 variants did not have the landing light in the port wing's leading-edge as did the L-21 variants.

After the 105 L-18Bs came the following L-18C orders: Fiscal Year 1951 total of 382; FY1952 (164); FY1953 (184) and FY1954 (40).

In 1951, tests were conducted with tandem main wheels with two YL-21s and some of the L-21Bs were thus adapted for unprepared field operating. In FY1951, a total of 150 L-21As were ordered and of the slightly more powerful L-21B variant, in FY1952, 75 were ordered, in FY1953, three blocks of 47, 29 and 62 were ordered (and up to here it is known that in 1962 the designation U-7A was accorded in reclassification; U-for-Utility). In 1954, two blocks were ordered, 355 and an additional 10 for M.D.A.P. By 1955, the order was down to a mere four plus one commercial production *PA*-18 (USAF s/n. 55-4749).

The exact numbers of L-18/21s allocated for Nato use and other foreign countries — some strayed from the commercial production lines — is not a completely filled-in picture. Military 'Super Cubs' went to: Belgium, Denmark, France, Greece, Italy, the Netherlands, Norway, Turkey and West Germany. Also civil/military 'Super Cubs' served in Portugal and Switzerland, as well as with the Argentine army (U-7As), Austria, Ghana, Iran, Israel, Japan, Sweden and Thailand. Today, ex-service Belgian, French and Italian L-18/21s are being refurbished for civil ownership; and some idea of the variety of 'Super Cubs' the

F.A.A. recognises for civilian use now follows.

Super variety Super Cubs — The U.S. Federal Aviation Agency civil register 'Super Cub' coding (71018xx and 71019xx) recognises some 32 variations from 7101802 as *PA*-18 with *Continental* C-90 engine to 7101906 as *PA*-19S, a *Lycoming*-powered seaplane variant. Some work still needs to be done on sorting out the 71019xx four entries as 7101902 is listed as a *PA*-19, '1903 as an L-18, '1904 as an L-18C and '1906 as above. Of note, too, is the block of 7101808 to '1811 which are all *PA*-18-105s. Two are listed as 'Specials' ('08 and '10) and two as *PA*-18S-105s (seaplanes, '1810 already noted as a Special, and '1811). The *PA*-18-105 was an allocation to the American Civil Air Patrol and more than 240 were in C.A.P. use from 1952-53 onwards. A curiosity is the suffix 'AS' as in 7101824 *PA*-18AS-150. Since 'A' is normally applicable to the Agricultural version (either spray gear or hopper) it would seem that at least a spray gear seaplane 'Super Cub' may exist somewhere in the U.S.A.

As our photographs show, there are 'Super Cubs' at least in all shapes if not sizes but to Switzerland goes the award for the most attractive-looking glider tug conversion in the 1960s *Dätwyler* 1038 MDC-'Trailer' (regn. HB-RAL). Powered by a 165-hp *Franklin* 6A4-165-B3, the *Max Dätwyler & Co.* modifications have made this single-seater capable of towing either one or two sailplanes at a time (one of 1,200lb. or two totalling 1,550lb.). Swiss certification was approved in December, 1962.

Finally, as *Piper Aircraft* specialist, Colin M. Smith has observed: "This is only the merest tip of the iceberg!" but since a lot of 'Super Cubs' are bound to be around for many years to come . . . you have been warned.

(WTA) Piper PA-18-150 Super Cub: Design Data

Manufacturer: *Piper Aircraft Corporation*, Lock Haven, PA17745, U.S.A.

Selling Agency: *WTA Incorporated*, Lubbock Int'l. Airport, TX79401, U.S.A.

1983 models: *PA*-18-150 (landplane) & *PA*-18S-150 (seaplane) in three price brackets: Deluxe, Standard instruments and Advanced instruments. Also Agricultural *PA*-18A-150 (landplane) and *PA*-18AS-150 (seaplane).

Chief Designer: Walter Jamouneau (1949 prototype *PA*-18-95).

Category: two-seat (tandem), one-door, cabin lightplane suitable for private-owners, flying clubs, agricultural and service industries' purposes; also military light aviation rôles including liaison/observation/training.

Powerplant: one *Avco Lycoming* 0-320 four-cylinder, horizontally-opposed piston engine delivering max. output of 150-hp at 2,700 rev/min. (direct-drive) at sea-level. Min. fuel grade 80/87 octane. Two wing tanks, each of 18 US gal. (68.0 1), max. usable total 35.8 US gal. (135.5 1). Propeller by *Sensenich*, RHT (right-hand turning) 6ft. 2in. (1.88m) diameter, fixed-pitch, two-blade, metal unit with spinner provided.

Dimensions: span 35ft. 3½in. (10.76m); length 22ft. 6in. (6.76m); height 6ft. 8½in. (2.04m); wing area 178.5sq.ft. (16.6sq.m); constant wing chord 5ft. 3in. (1.60m); dihedral 1°; incidence at mean aerodynamic chord 0°; total washout 3° 18'; aspect ratio 7.0. Tailplane span 10ft. 6in. (3.20m). Main wheel track 6ft. 0½in. (1.84m) using standard 6.00X6 four-ply, rib-tread, tyres.

Weights: empty 984lb. (446kg); max. loaded 1.750lb. (794kg); useful load 766lb. (348kg) inclusive of baggage 50lb. (22.7kg) in 18cu.ft. (0.51cu.m) compartment.

Loadings: max. power 11.6lb/hp. (5.3kg/hp); max. wing 10.0lb./sq.ft. (48.8kg/sq.m).

Performance: max. speed at sea-level 130mph (210km/h); cruise at 75% power 115mph. (185km/h) at 5,000ft. (1.525m); initial climb rate 960ft./min. (293m/min); service ceiling 19,000ft. (5.790m); range 460 miles (740km) at 75% power using 9 US gal./hr. (34.0 1/h); stalling speed (flaps) 43mph (69km/h); landing roll (flaps) 350ft. (107m); take-off run (flaps) 200ft. (61m).

Acknowledgements — Most sincere thanks to Colin M. Smith of Sawbridgeworth, Herts. *(Air-Britain Specialist on Piper aircraft)* and Messrs. M. J. ('Mike') Hooks of Croydon, Surrey, and K.G. ('Ken') Wakefield of Barry, S. Glamorgan, all of whom unstintingly opened their files and shared their enthusiasms — not least being K.G.W. who has gone the whole way and now proudly possesses a genuine L-4 'Grasshopper'!

One of several newcomers to the British register, 'BKRF is a 'straight' L-18, ex Italy, and overhauled in the UK. Battery access panel behind glazing on St'bd side is a British modification.

Long nose, sunray wing decor, and roadrunner markings ahead of N49875 reg'n give the clue that this is one of the re-worked aerobatic versions in the USA. (Photo: Erwin J. Bulban, Dallas).

Two Swiss examples 'RAL (see text) has a Franklin engine and locally made wheel spats. 'OOV (below) in typical surroundings is on skis for the mountain rescue service which the 'Cubs' maintained for years until arrival of helicopters.

PHOTO-PRIZE MODEL NEWS with Fliar Phil

IT has been said that "in spring a young man's fancy turns to thoughts of love" — and no doubt aeromodellers are no exception! But the aeromodeller's fancy *also* turns to thoughts of hot days, thermal-laden skies and the first flight of that new model. To see it successfully riding the invisible air — which is its natural, and appointed realm.

Photo 1

We 'take-off' this month with a photo of Mike Hetheringtons 'Interceptor'. A superbly designed model *and* would you believe, constructed almost entirely from *paper*, including the propeller! Fliar Phil is much indebted to Bill Dennis of Okehampton (himself a contributor to *Aeromodeller*) for this photo. The plans for the 'Interceptor' were featured on an S.M.A.E. Newsletter. Bill says it flies extremely well, even in a wind.

Photo 2

Almost a 'guess what' photo! Fliar Phil can do no better than quote from the letter of Paul Jefferies of Lewes, East Sussex. "My latest aerobatic model, taken whilst flying in close formation with my camera-equipped model — *or was it?*"

Readers must work Paul's explanation out for themselves! Briefly, the model in the photo is 72in span, weighs 10lbs, and was developed for the new turnaround aerobatic schedule.

Photo 3

The German *Fieseler* 'Storch' demands skilful modelling with all those struts, flaps and complicated undercarriage. However, John Watters of Manchester has succeeded in creating a very fine free flight model. From an *A.P.S.* plan, power comes from that well-beloved engine, the *Mills* 0.75cc. John has modified his model to follow as closely as possible full-size construction, including full cockpit detail. Covered with lightweight nylon. When John says, 'it flies quite well', Fliar Phil feels John is being unduly modest!

5

6

Photo 6

And now for a scale model type that possibly deserves more attention than it has seemed to receive — an *Armstrong Whitworth* 'Siskin IIIA'. It was sent to Fliar Phil by George Mathieson of Honiton, Devon. George very kindly provided Fliar Phil with some interesting information. The 'Siskin IIIA' is to his own design, spans 17in. (scale ½in. to 1ft.) is CO_2 powered, wing section is Clark Y, with 1/16in. sheet fin and tailplane.

Photo 7

Fliar Phil's arm muscles are not what they used to be when it comes to launching chuck gliders! Obviously this is not the case with Duncan McRae seen launching his *indoor* glider. An original design for low ceilings (18 feet) in this case). Flight duration 30 seconds. F.P.'s thanks to David Erbach of Manitoba, Canada, for this 'action pic.'

That's it! See you next month.

Photo 4

Probably the finest long-range fighter of WW2 the *North American* P.51 'Mustang' is always popular with scale fans. This one is a control-line model spanning 37in. Power is a *Frog* 500. It comes from Bob Polson of Walsall, who informs Fliar Phil that the silver areas are covered with foil from *cigarette packets!* Smart idea Bob!

Photo 5 — Winner

The beauty and deadly efficiency of the immoral 'Spitfire' are revealed in this photo from Brian Hubbard of Chatham, Kent. Brian built and flies this 'Spitfire 1A' (seen taking-off from West Malling Aerodrome), which was designed by Brian Taylor. Data: span 63in. 4 channel *Skyleader* radio, flies superbly. Fliar Phil must mention the fine photography by George Elsegood. Congratulations to Brian, George and designer Brian Taylor. Obviously a great combination. Result: this month's winner.

7

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.

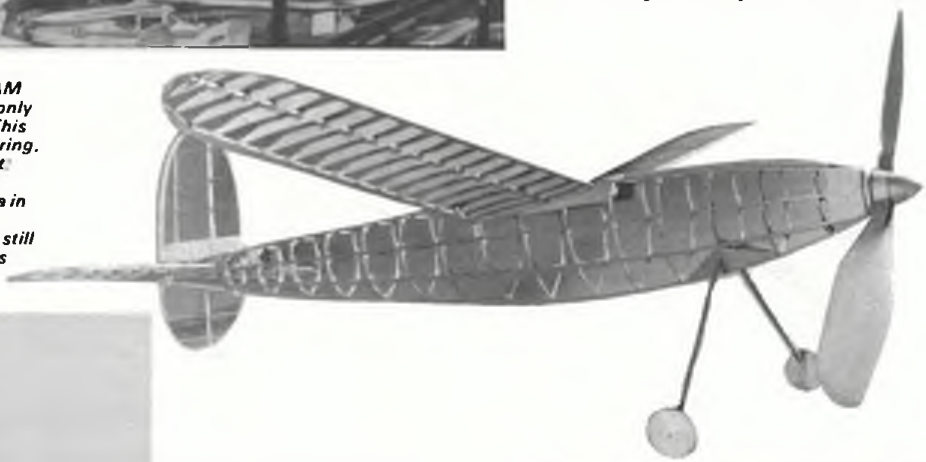
Alex Imrie's VINTAGE CORNER

Model Engineer Exhibition 1984

Situated right in the centre between the two stairways connecting the concourse to the foyer, *SAM 35* could not have wished for a better location for their stand in the Wembley Conference Centre. Twice the area of last year's stand, the complete space was taken up by a very fine display of vintage models, here to see, were many old friends encountered on the flying fields over the last few years and a few new 'old faces' not seen before, but immediately recognisable from the old magazine illustrations. Once again the *SAM 35* membership had answered the call and pulled out all stops to exhibit. Apart from the usual model types I was especially taken with the replica *Appleby* 'SE5a' by Stan Ford, this model with its card construction, rubber-tyred wheels, perforated brass propeller washers and brass wire 'engine control lever' (a wire operated from the cockpit, which fouled the wound propeller and only allowed it to revolve when pulled aft) had been faithfully reproduced to represent one of the most attractive models from this late 1920s series. I doubt whether such models ever flew very well at the time but with our present 'know how' it would not surprise me to see good flights from *Appleby* card models, after all, they do have the ingredients and *Rigby* card models were good performers. The 13½in. span 'SE' looks like it wants to fly, maybe some vintage peanut buff will show us how!

Some skeletons were seen, an original P. T. Capon 'Krusader' fuselage, the one and one half times 'Tubby', an E. J. Weathers design being built by Phil Cox and D. A. Russell's 'Cyclonic', that 'Baby Cyclone' powered high wing model that eventually gave way to 'Vulcan' from the same drawing board. Also on show was the Eddie Riding 'Westland Widgeon' recently described in *Aeromodeller*, and exhibited near to it were two original Rupert Moore water colours that became *Aeromodeller* front covers when Eddie Riding models of the subjects shown, were described inside — the *Westland* 'Widgeon' and the *Bristol* 'Bullet Scout'. There were over 100 vintage models of all types, flying scale rubber, flying scale power, free-flight power, free-flight rubber, control-line, Wakefield, glider and twin-pusher all assembled on the *SAM* stand, as concentrated a batch of vintage models as has ever been seen anywhere. It is impossible to name all the models on show but mention should be made of the attractive 60in. span Don Donahue power design that was described in the 1937 *Zaic Yearbook*, and the original A. C. Minion designed glider that flew in the 1939 King Peter Cup, after having started its life as a streamline Wakefield model.

The many models on the *SAM* stand were in direct contrast to the sprinkling of vintage models entered in the Competition Class AA (non-scale flying models of all types). It seems that the comments that I made last year following the previous Model Engineer Exhibition still apply. Are vintage builders shy of competition? If there were



Above: no prizes for counting – 'cos nobody knows how many vintage models filled the SAM 35 grid at Wembley. Suffice to say there was only one duplicate – and that for a special reason. This display was a dazzler, both colourful and inspiring, with every model to exhibition standard. Right: John Meaney also built this 'Merlu' design by Edgardo Sadorin of Italy (second place to Ellila in the 1949 Wakefield). Model described in December 1949 Aeromodeller and the plan is still available from MAP as D/344X for £2.10 plus 50p postage.

Left: Jim Fullarton, writer of Australia's vintage column 'For Old Timers' Sake' in Airborne magazine, with his DC 'Dart' powered canard model on Shaw Cup Vintage Day in Victoria last September. Right: also seen at the Shaw Cup Vintage meeting 'down under,' Darian Cassidy launches his DC 'Dart' powered Gossamer, a 32in. span 1947 design by K. L. Stothers that was the British Class A Record Holder in 1948. Model described in July 1949 Aeromodeller. Plans still available from MAP as PET/327X for £2.10 plus 50p postage.

classes for vintage type models would we see more entries in Class AA? Because of space problems, do the M.E. Exhibition organisers really want any more bulky model aeroplanes than they already have in Class AA? All this is, I suppose food for thought, next year it is rumoured, that, the *SAM 35* stand will be larger than this year, so even more models can be exhibited but will there be any more entered in the competition?

Out of the 13 entries in Class AA this year, were 4-stroke powered R/C versions of 'Scram' and the 'Comet II', *Mills* 1.3 diesel powered *Kiel Kraft* 'Rover,' our old friend 'Co-axial' which won the Aeromodeller Cup, and 'Gypsy', a relatively unknown 1936 Wakefield cabin model (is this the 44in. span Earl Stahl design from *Flying Aces*?) easy to confuse with Bill Dean's 'Gipsy' Wakefield of later days, an example of which was on the *SAM 35* stand.

News from Abroad . . .

Australia

Chris Joy, President of the Victoria Free Flight Society gives the following details of a vintage class competition that is currently proving very popular in Victoria. Chris writes: "Basically the class is open to any vintage model that was designed before 1955. Similarly the engine must be pre-1955. Models are to be as original, with the exception of modifications to fuel cut-off and DT in the aims of safety and longevity. Also engine mounts may be modified for the same reasons. The models are flown to a 15 seconds engine run with a 3 minute maximum flight time. Two points are awarded for each year that the design predates 1955, these are added to the flight score up to a maximum of 180 seconds. As an example 'Hi-Ball' (1947) with a flight score of 120 seconds would have a total score of 120+ (2 × 7) = 134 seconds. Note that if a 3 minute flight is obtained there is no additional increment for year of design. The competition is over three rounds and as can be seen, the scoring system allows for a potential fly-off."

"Currently proving popular in Victoria are such models as, 'Alert', 'Playboy', 'Swiss Miss', 'Sandy Hogan', 'Stomper', 'Eliminator', 'Y-Bar', 'Hi-Ball', etc., with engines like *Frog 150, 250, Oliver Tigre, Webra, OS Max 29*, etc., (all pre-1955). The above provides for a 'competitive vintage event'. Also proves popular with newcomers to the hobby as the models are generally more docile and a little easier to trim than their modern counterparts. The same point scoring system is used with Classes for Vintage Glider and Vintage Rubber — *no*, the rubber does not have to be pre-1955!!"

Above: J. B. Allman with 'Grasshopper,' his winning 1934 model with the nine trophies it gained, including the Wakefield Cup. This model is still in existence, and has been restored to flying condition by Alwyn Greenhalgh, so we hope to see it performing at Warwick on June 24! Left: twin gear 1949 Wakefield design by Aarne Ellila of Finland, beautifully built by John Meaney of Horsham who enthuses over the fine stable flights turned in by this thoroughbred.

Left: J. B. Allman with his 1933 model named 'Flamingo,' the boy at left is Horace Claymore, who as Allman's 'assistant' became thoroughly air-minded and later was to serve as a pilot in the Royal Air Force during WWII, and is still an avid modeller today. Right: Peter Michel, SAM 35 Membership Secretary with P. T. Capon's original 'Coer De Lion' Mk20 No. 2.' This model with its 22in. diameter propeller was the last of the unlimited rubber weight Wakefields, the last year of competition to this rule was 1953 and it would seem that this could be a suitable terminating date for vintage Wakefield.

Sweden

Sten Persson of Palslyckegatan 26, S-302 30 Halmstad, Sweden is an active vintage enthusiast, who, in a recent letter, says that he enjoys *Aeromodeller* and is a keen follower of this column, he has kindly sent a copy of *Oldtimer* a magazine full of interest, from which the Phu-Ling sailplane drawing is reproduced. Sten goes on: "In Sweden our Oldtimer organisation is growing slowly but steadily and our meetings draw an ever increasing number of modellers and models. Our main means of communication, the *Oldtimer* magazine, was published for ten years by internationally well-known free-flighter and indoor contest flyer Sven-Olov Linden, but the responsibility of publishing it is now shared by all members. Needless to say, it is a very unpretentious photo-copied publication, but it is vital for the existence of our organisation and the communication between our slightly more than 100 members who are scattered throughout our sparsely populated country. The main feature of this issue is a report from our annual *OT* championships and the rest is made up from old articles, plans and pictures, photocopied from magazines and books in my vast model aviation library. A number of foreign designs are always seen at our contests but the majority of models are Swedish designs. Our models are built and flown according to our 1938 rules and designs from later than 1945 are not permitted except in the newly-established 'vintage' class for Wakefield models, constructed 1942-1952." Sten ends by offering more news and photographs of the Swedish Oldtimer scene, we are grateful for this input and look forward to further news from Sweden.

Definition for Vintage

It is rapidly becoming apparent that no real date exists for this purpose. Here in UK the *SMAE* ruling is accepted if we wish to

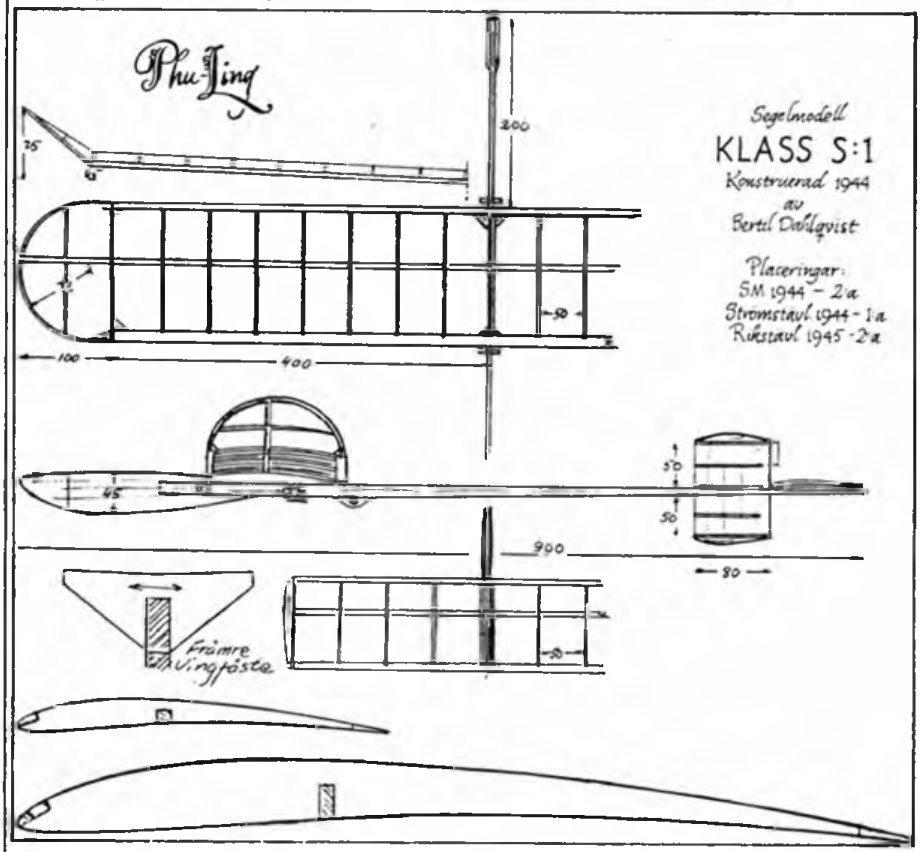
VINTAGE CORNER

enter *SMAE* competitions, this is given as a design that was published prior to 1st January 1951. The *Society of Antique Modelers (SAM)* in USA consider models that were designed, kitted or had their plans published before 31 December 1942 as Old Timer, or the same criterion using 31 December 1938 as the cut-off date for the Antique category, note that there is no mention of Vintage at all in the SAM ruling! Elsewhere in this column there are references of Swedish Oldtimer (end of 1945), vintage Wakefield (end of 1952) while the Victoria Free Flight Society use pre-1955 as the latest design date for their 'competitive vintage event'. How confusing all this must be for beginners, who doubtless think that 30 years is long enough to look back, so we might very well end up with a floating cut-off date and this will eventually allow all those fine designs from the 1950s to become true vintage types! In the new R/C model magazine which contains a seven page 'Vintage View', we read that Old Timer is now taken to mean a 'Vintage Free-Flight Power Model that has been fitted with Radio Control' and this is in keeping with American practice where limited engine run and fuel allotment factors have been used for some time in Radio Control Assist Old Timer Rules for maximum duration in competitions. The old free-flight power model seems to decrease in number with the passage of each year, yet we are fortunate in this country that our movement has a number of stalwarts who support the type. Most modellers have their favourite period and mine remains pre-Pearl Harbor, since I feel that 'something happened' to the hobby once America entered the war.

Readers' Letters

Following my request for information on the designer of 'Hells Angel' in the February issue, Tony Beckett of Oakham, Rutland writes that the 5/8th full-size model shown was almost certainly from an *Alan Moorhouse* kit and that he understood Ron Warring to have been the designer of the full-size 'Hells Angel'. However, if this is so, I find it odd that in the data lists given in the book 'Power Duration Models' by Ron Warring published by *Percival Marshall* in 1951 no name is given against this model as the designer. Can any reader enlighten me further?

Right: this is the collision referred to in the Vintage Day report in the November issue and shows Mr. Brownson's 'Cruiser Pup' after it had glided into (and stopped) the 'Mechanair' propeller on Brian Ferrett's Coovert 1938 'Berryloid Winner.' Below: Jack Law with his Spearhead 'Senior,' made from an Eagle kit this 54in. span model is powered with a 'Mills 1.3' (Indian) diesel. Seen at Old Warden at the South Midland Area SMAE Vintage Meeting on October 23 last year. Bottom: plan for one metre span sailplane designed in 1944 by Bertil Dahlqvist and reproduced from the Swedish vintage magazine 'Oldtimer.'



Both Trevor Lambert of West Yorks and Paul Wiburg from Birmingham provided the answer to the *NGA* motto problem that was mentioned in this column in the January issue. Paul writes: "The difference between 'volas' and 'vola' in Latin is the same as that between 'du fliegst' and 'flieg!' in modern German, or 'thou fliest' and 'fly thou!' in Shakespearian English. In plain modern English 'Volas cum cura' means 'You fly with care' — a feeble statement which could be untrue; but 'Vola cum cura' means 'Fly with care' — good, snappy advice! I imagine 'Fly with care' was the message that *NGA* had in mind all along, but that they got the Latin wrong at first and then corrected it later."

Derek Welch of Caddington tells of a Vintage R/C Rally that has been omitted from the fixture sheets. It will be held at the airstrip and car park on Newbury Racecourse on Sunday May 6th 10.00 am to dusk. Further details available via SAE from Reg Bees, 6 Coxeter Road, Newbury, Berks.

Readers interested in further details of the vintage meeting being held on Warwick Race-course on June 24th to mark the 50th Anniversary of the 1934 Wakefield Cup meeting can obtain this by sending an SAE to Colin Watts, 29 Marchmount Road, Wylde Green, Sutton Coldfield, West Midlands. It is planned to hold competitions for Vintage Wakefield (1951 rules), Vintage Glider, and an event for compressed-air driven models. General flying will also be allowed, but internal combustion engines powering R/C and C/L models need to be silenced. Especially welcome will be flyers wearing period (1934) costume!

A BEGINNERS GUIDE TO FREE FLIGHT SCALE

BY BILL DENNIS

PART IV

COMPARED TO the length of time it has taken to get to this stage, covering your model is a quick process but it must be done with care, or all your efforts will be ruined. The first thing to do is to check that the structure really is finished and that all hard points for horns, bracing struts, etc. are in place. Gently twist the wings and fuselage, listening for tell-tale clicks that indicate a dry joint.

Fill large gaps with scraps of soft balsa and small ones with *Polyfilla*, which is soft and easily sanded. If you use something harder, like *Plastic Padding*, you will find that the filler survives relatively unscathed while you sand away the surrounding balsa.

Now is the time to set to work with your selection of sanding blocks, going over the entire model until you are totally satisfied that there are no lumps or dents. Pay particular attention to the shape and thickness of edges and check that ribs contour smoothly into the leading and trailing edges. Above all, avoid using loose bits of sandpaper in your fingers as this is a sure way to round off corners that should be square.

Before going ahead with covering the model give some thought to the cockpit detail you wish to incorporate. Even if you are going to ignore this area, it is worth painting the interior structure, as bare balsa looks very stark indeed. Don't be tempted just to paint the untreated wood but prepare it properly with sanding sealer. If the model is an early type, the structure may be natural wood, which should be stained before sealing.

All this is quite simple in an open structure but if the fuselage is fully sheeted, like the 'Fox Moth', you will have to deal with the cockpit at a very early stage. For example all the sheeting will have to be prepared and painted before it is attached.

We now must decide with what we are going to cover the model, to some extent this depends on the kind of flying you intend to do with your model. If you have built a small, lightly loaded model and are going to fly it only on calm evenings in the proverbial hayfield, then heavyweight tissue may be used. It is certainly by far the cheapest.

However, it is inevitable that you will get punctures and tears and the model can soon look like a patchwork quilt. Have you ever noticed how the covering always rips where the roundels or insignia are? The other problem with repeated patching is that the colour on the model fades with time, making a repair with fresh paint very obvious.

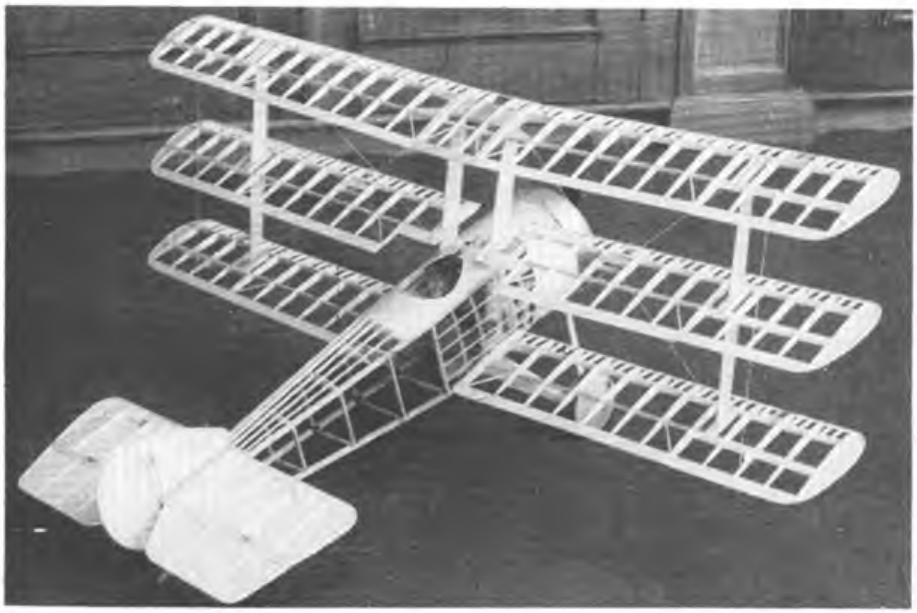
These days most of us have to fly where we can, which in my case means Chobham or Dartmoor, neither of which resemble a hayfield in any way! Also, most of the airfields on which we fly are quite closely mown, so it is a good bet that our model is going to bounce on landing. Having designed the structure to flex on impact, there is no point in covering it with something as brittle and inflexible as tissue. The only two options open to us are nylon and silk over tissue.

I used lightweight nylon on the wings of my *APS* 'Puss Moth'. This is a large all balsa model which can easily absorb the extra weight of nylon and the thick section of the wing gives it sufficient rigidity to withstand warping.

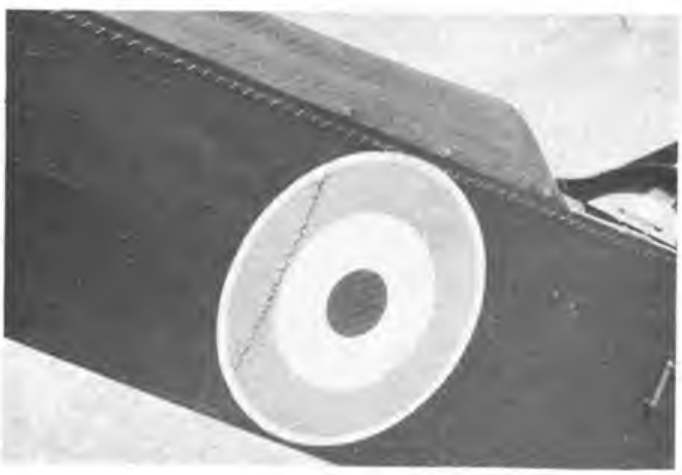
Certainly nylon is an extremely strong covering material and is to be recommended for the fast flying, P. E. Norman type of model, although whether these are environmentally and socially acceptable in the '80s is debatable!

I use the silk on tissue method for most of my models, including small ones. The weight penalty over tissue alone is negligible and is more than compensated for by added durability and realism. The only drawbacks are its availability and cost — about £4.80 for two square yards. You will have to try the few model shops that still sell things for 'aeromodellers', such as Michaels' Models of North Finchley, London.

The first step is to cover the aeroplane with tissue in the usual way. Where you do not want the covering to adhere to the structure just below the surface, e.g. spacers, spars, etc., rub the relevant parts with a candle. In fact there is much to be said for using Jap tissue, as it is not permeable to dope and so should not stick like the *Modelspan* type does. Give one coat of thinned dope, trying to get the tissue just taut without being overtight. It will shrink further when the silk is applied, so beware of



Above: John Coker's Sopwith 'Triplane' is worth another look before the covering goes on. Below: silk is doped onto the wing lower surface. Silk is tricky to keep in one place - note the initial spanwise stripe of dope. Right: the side of the author's 'FK8' shows the realistic fabric lacing effect obtained using a sewing machine as explained in the text.



warps. I prefer to use *Titanine* clear dope as its shrinking action is less severe than other brands.

Before the silk can be applied it must be rinsed in warm water to remove the starch and then carefully ironed. Any wrinkles or creases will not disappear in the doping! When ironing, ensure that the silk is pulled into its correct shape with the weave as straight as possible. There is a definite grain in one direction and it is important to have this running spanwise on the wings and tail, otherwise there will be unsightly sagging between the ribs and some loss of strength.

Starting with a wing panel, arrange the dry silk in place as smoothly as possible, with the weave straight. Ignore protruding strut hooks for the time being and brush on a stripe of dope along the wing at mid-chord. This fixes the silk in place and keeps it under control. Then carefully work chordwise from the centre, keeping an eye out for any wrinkles or air bubbles developing, the latter can be punctured with a pin and brushed down smooth again if necessary. When you come up against a hook, just make a small cut and dope the silk down around it.

Some wings have a section which gives rise to excessive double curvature and sagging at the front, between riblets, which can make it difficult to get the silk to lie flat. In this case I usually cut the silk back along each rib for an inch or so, allowing it to be doped down smoothly to the tissue. The gap will be disguised and strength restored when the rib tapes are applied.

When the dope has dried, trim the silk to leave a ¼in. overlap, snick it with scissors around the curves and dope it down. Lightly sand the hairy edges and repeat the process on the other side.

When the job is finished you may find, in the cold light of day, that there are a few blemishes. Small wrinkles can be lightly sanded out, larger ones need cutting out with a sharp knife, preferably to a rib and a patch of tissue applied, followed by a silk one, cut a bit larger so that it blends in.

So far, the silk has received one coat of dope. At this stage various tapes need to be applied, stripped from heavyweight tissue and stuck down with dope. Rib tapes are the obvious ones but fuselages will usually have tapes applied over sharp corners, even on ply covered types. Close scrutiny of good photographs is necessary here. Fabric lacing is represented easily by sewing a zig-zag pattern on to a sheet of tissue by sewing machine, cutting out the strip and doping in place.

One final overall coat of clear dope should suffice but the edges may need sanding and sealing with dope again.

At this point we have a model with a uniform fabric finish with, perhaps, some smooth sheeted areas. You could go ahead and decorate it now but you will end up with an equally uniformly painted model, typified by the sport-scale R/C model covered with *Solarfilm*. Real aeroplanes show a range of surface texture which must be simulated for realistic effect. In its simplest form, this can mean the degree of sheen on the fabric. For example, a first World War aircraft could have a smooth, high gloss finish on a factory fresh machine, quickly becoming dull and wrinkled in the field. A true matt finish was rare.

My *DH*34 showed some interesting contrasts in finish, so I will describe them in detail. There are abundant photographs of the prototype G-EBBQ and they clearly show three separate areas on the fuselage, which is all ply-covered. The curved top decking is smooth and glossy and I reproduced this with 1/64in. ply over soft 1/32in. balsa, covered with tissue and given several

Above top: a hardwood former for beating an aluminium cowling. The bolt and large washer ensures the job is replaced in the same position after each annealing. Above: John Coker's 'Kittyhawk.' Covering shouldn't take long with this one! Below left: this close-up of John's Spartan 'Arrow' reveals excellent metalwork, using material from beer cans! Note neatly formed louvres. Below right: the Sopwith 'Pup' that has been the subject of this series of articles - getting nearer to the moment of truth!

coats of sanding sealer. The rear fuselage sides are slightly less glossy, so these were covered with heavyweight tissue and given two coats of dope to leave some texture.

The front fuselage sides, in common with many ply covered *DH* types, show a great many bumps and undulations. Those of you who are *SMAE* members will have read Mike Hetherington's articles in *Model Flyer* on how he constructs his extremely realistic rubber models from doped notepaper over a minimal balsa framework and I adapted this idea for the *DH*34. Some fairly stout paper was taped down and given two lightly sanded coats of sanding sealer. I then cut out two accurately shaped pieces to fit over the soft balsa sheet fuselage sides, complete with window cut-outs and applied random blobs of balsa cement to the rear surface of the paper. The well known shrinking action of the cement caused the paper to distort and buckle in quite realistic manner! When dry, it was stuck in place with evo-stick around the edges only. Doped paper is also useful for representing small brackets, fishplates, etc., since it is easier to cut out than metal and is much lighter. The only drawback is that you cannot scratch the surface to simulate wear, as you can with metal.

The next subject we have to look at is that of making metal panels and cowlings. Most aircraft feature some metalwork, especially around the nose and there is no satisfactory alternative to representing metal with metal. A good job of tin bashing really sets a model apart from the rest. In this respect the models of Terry Marley and John Coker are outstanding and worth a close look if you get the chance. I must admit that this is not one of my strong points and for that reason, much of the following comes via John.

The easiest proposition is the engine cowling panel that is flat, or curved in one direction only, such as found on many light-planes like the 'Puss Moth'. Beer cans will yield thin aluminium with a natural curve for top cowlings, although I tend to use old litho plates from printers. When cutting shapes out, I find it easiest to almost but not quite, cut through with a sharp *Stanley* knife, finally bending the parts to free them.

Where aluminium has to be formed into anything but a gentle curve, it will have to be annealed to make it workable. To do this, rub some soap on one side and heat over a gas ring. The soap does not have any magical properties, but turns brown when the metal is hot enough, at which point it is immediately quenched in cold water. It will now be quite malleable but repeated tapping and shaping will make it hard again, whereupon the annealing process must be repeated. Finally, if the aluminium is heated and left to cool slowly its original hardness will be restored.

Above: by a stroke of luck, an aluminium teapot yields quite a good cowling and fits perfectly. Note the engine installation, the 'Mills' carburettor passes through a hole in the bulkhead.

Panels which are permanently attached are best glued with 24-hour *Araldite*, after the underlying structure has been well doped against fuel seepage. Not only is *Araldite* stronger than the 5-minute stuff but its viscosity means that it will not be squeezed out from under the edges — a hallmark of my models!

Take care to thoroughly de-grease the metal and get a thin layer of glue right up to the edge. If a corner is not well stuck down you will soon find it with your cleaning rag! Where a cowling has to be routinely removable, for tank filling etc., press studs are the best solution. Use large ones and don't try to glue them directly to the structure but solder them to a square of tin and glue this instead — the greater glued area means that they will not come adrift.

Where the engine controls are inaccessible, replace the compression lever with an allen screw and adjust it through a small hole in the bottom cowl, rather than put in an extra cowling break where there should not be one.

Other cowlings can be more permanently attached but still need to be removed for engine changes, these are best fixed with screws, or nuts and bolts. One example of this type is the radial cowling on the *Sopwith* 'Pup'.

Complex shapes like this will normally have to be beaten from aluminium over a hardwood former. The grade of aluminium is important — John specifies BS1470 SIC. which is apparently used by builders for flashing around chimneys and is 22 or 24 s.w.g.

The car-type radiator surround seen on *BE*12b's is very easy to do — just a flat strip wrapped around the former and the edge lightly tapped over. For more sophisticated shapes, repeated annealing will be necessary, so it will be important to retain the aluminium in the same place and a long bolt is the best solution.

The process of beating aluminium to shape has been covered before and to be frank, I think the beginner is best advised to avoid complex cowlings to begin with. I had intended to make the round cowl for the *Sopwith* 'Pup' in the traditional way but my eyes fell on our aluminium teapot which we used when camping. Although the profile was a little too rounded, the diameter looked about right, so out came the hacksaw. To my amazement, it fitted exactly. The handle retaining rivets were easily filed down, so the only problem was the hole left by the spout, overcome by careful patching, backed by a strip of aluminium.

The hole in the front was marked and numerous holes made with a 1/8in. drill, allowing the centre to be snipped out. After filing it smooth, a few light taps with the hammer against a hard surface flattened the over-rounded front edge. A 1/8in. ply circular former was cut to fit inside the cowl and over the engine, then *Araldited* in place.

These teapots are widely available in different sizes but be prepared for odd looks in the shop when you get your calipers out! They should be suitable, for example, for most WW1 fighters of 1/8th scale, with a little adjustment.

Next month will be the final article, dealing with decorating and trimming for flight. I haven't flown the *Sopwith* 'Pup' yet, so it remains to be seen whether I finish up with a red face!

When this is published, it should be just a few weeks until the first outdoor scale competition — the Odiham Spring Gala.

The weather at this event seems to go in two year cycles and ths year we are due for sun and flat calm so, if you are a *SMAE* member, come along and make the event a success.

A few metalworking 'hints and tips' from John Coker. Below left: one method of simulating rivets in aluminium, note that step A calls for a working surface of hard balsa whilst step B needs a much harder surface that will not 'dent.' Below right: hinges on panels and doors are represented by carefully painting segments on thin wire, 'cyano'd' in place. Right: louvres can be reproduced with care but the metal must be annealed.

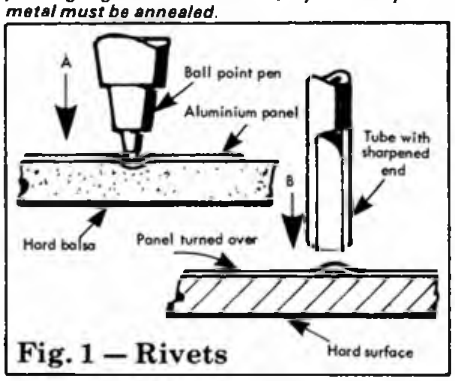


Fig. 1 — Rivets

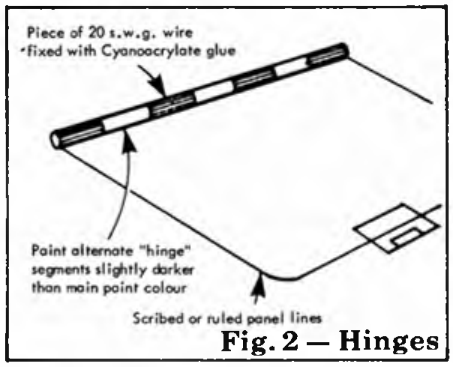


Fig. 2 — Hinges

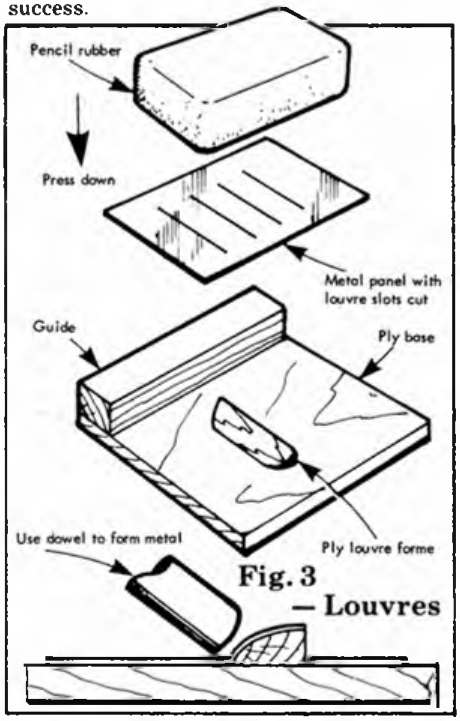


Fig. 3 — Louvres

BOSS

A very competitive 41in. Open Rubber model specially designed by Bob Wells for the newcomer to competition flying

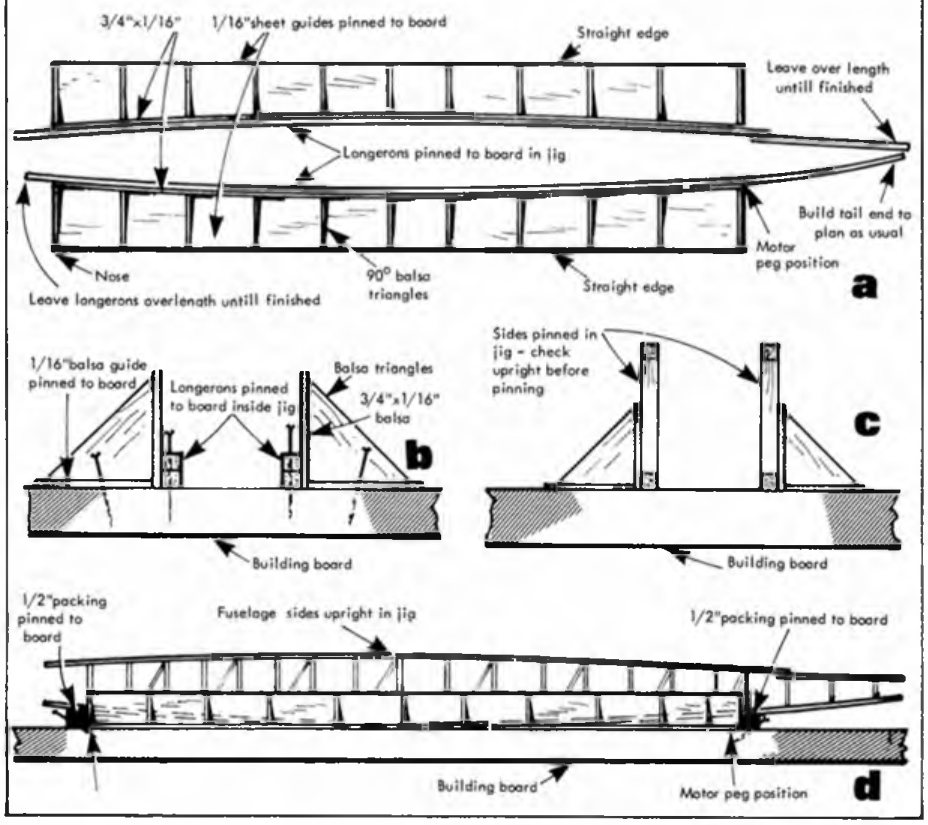
Introduction

This model was designed specifically for Jessica Nash to build as a 'larger' contest model after a lot of flying and some success with John O'Donnell's 'Delinquent' (APS D/923). With this she won the Women's Cup three times but never made three 'maximums.' Not because the model was not capable of high scores but Jessica, as a beginner, was not quite capable of getting the best out of the model. It was decided that a model was required which when flown a little below its best would make the required flight times. The size of a rubber model is only limited by the size of the motor that can be wound comfortably. Jessica found that she could handle a motor of 14 strands of 6mm × 1mm rubber and this fitted nicely with a model of 'Wakefield' area.

The general shape and proportions of the 'Delinquent' were retained together with the freewheeling propeller which is easier to make than a folder, is lighter and makes trimming easier. The model was built, flown in the Women's Cup in 1983, made three three-minute maximums fairly easily and a good fly-off flight of 4:06 to win.

The model had a motor of 95 grams, 14 strands of 6mm × 1mm *Pirelli* about 43in. long and wound to 800 turns. This motor was used for ease of handling. The model will take a similar motor of 120 grams, about 56in. long which requires more careful

Fig. 1 *although not covered in the text, using a simple jig will simplify the building of the fuselage.* (a) *basic jig,* (b) *first stage, building two sides one above the other,* (c) *and* (d) *second stage using the jig whilst positioning top and bottom spacers.*



handling and will take over 1,000 turns and give flights in excess of five minutes.

The model is about as simple as a rubber model can be. It is therefore quite suitable for anyone to build as say a second contest model, or for the more confident, even their first contest model.

Construction notes follow, not because they are necessary for this model but more to provide tips which may be useful to anyone not too familiar with construction of this type.

The general principle is to cut oversize and trim down to fit where it has to.

Materials selection

Don't imagine that the model will be a failure if the balsa chosen is not perfect. Providing the model is not unduly warped, it will almost certainly fly.

Generally, all the wood chosen should be light in colour, not white but tending towards a pale fawn. It should be cleanly sanded with no saw marks and with an even grain pattern.

For everything except wing ribs, the grain must be long and straight. All the wood should feel stiff and when pressed between finger and thumb (*do not* use thumb nail) should feel hard and unyielding. For wing-ribs, the wood should be particularly stiff and with the 'speckly' grain pattern commonly referred to as 'quarter grain.' Although stiff, quarter grain *should not* be used for longerons, wing leading and trailing edges or spars as it tends to snap straight across, rather than bend when subject to shocks.

Do not however, choose wood purely for its weight. The model must be fairly strong but do not think that heavy wood necessarily has strength, the two do not always come together!

Some modellers prefer to cut their own strip from sheet but unless you have done this before it would be better to buy ready cut strip. This allows the final weight, accuracy of cross section, straightness and grain pattern to be better assessed. Any wood with a natural curve to it should not be used as it will almost certainly cause the model to warp.

Fuselage

The fuselage is longer than the standard 36in. Get 48in. strip if you can, otherwise join two pieces together. Select four lengths of 1/8in.sq. for the longerons making sure they are identical in grain pattern and weight. Splice join, by cutting diagonally across the extreme ends of the main longerons and cutting the ends of the make-up lengths to match. It may take several goes before you get the joint to fit, therefore

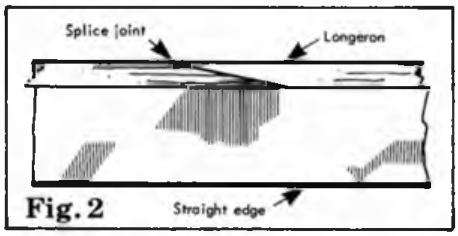


Fig. 2

cut the make-up pieces well over length. Test the fit of the two pieces against a straight edge **Fig. 2**. When satisfied, glue together by double gluing. Apply balsa cement to both pieces, allow to dry, then apply more glue and join together, keeping straight and preferably under pressure until dry.

The fuselage sides can now be built by the usual method of building one on top of the other, over the plan *(note, on the plan provided you must build the wings first as the plan has to be cut to provide a full fuselage profile ... or trace the missing front end! ... Ed.)*. An alternative method using a simple jig is shown in **Fig. 1**.

When cutting out the spacers for the sides, use them as a measure and cut out an extra pair of slightly overlength spacers for the top and bottom (noting where they are to fit!). This will save time later. Do not try to put in the nose and motor peg sheeting while the sides are pinned down, it is much easier with the fuselage off the board. Leave longerons overlength until later.

When all spacers are glued in position and dry, remove the sides from the board.

Lightly sand and then separate the two sides. The curve on the top and bottom of the fuselage should be the same but if the longerons were wildly dissimilar in grain or density, there is a chance that the top and bottom will have a different curve! One advantage of a 'square section' fuselage over a 'diamond' is that this sort of distortion can be 'lived with' ... if not too bad!

Now the sides can be pinned vertically to the board over the plan but only at the wing mount position where they touch the board.

Approximately 1/2in. packing pieces can be placed under the nose and motor peg position, the packing pinned to the board and the fuselage sides to the packing. The previously cut spacers can now be trimmed to exact length required. Put in only the bottom spacers at this stage. When in place and dry, turn it over and the top spacers can be cut and fitted.

When complete, the tail ends can be joined together by pinning one piece of scrap balsa about 3/16in. thick between the two ends, adjusting until the fuselage is straight, then cutting the two 1/8in. spacers.

Now all the remaining diagonal spacers can be cut and fitted but leave out those pieces in the top around the fin.

Cut pieces of 1/16in. sheet to fill the first bay at the nose and glue in place.

Make the pieces to take the motor peg. These are 1mm ply on the inside and 1/16in. balsa on the outside. Cut the balsa so that it fits in place, then use as a template to cut the

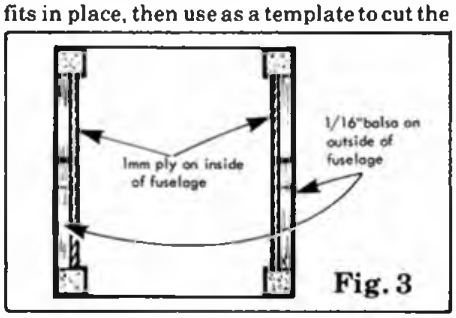


Fig. 3

ply. Make the hole in the ply for the motor peg, glue to the 1/16 balsa then glue the two in place **Fig. 3**.

Before the fuselage is finished, build the fin. This can then be used as a guide for the parts in the fuselage that fit round it.

There is nothing complicated about the fin. The leading edge, trailing edge and top piece with gussets should be glued together pinned to the board, I prefer to build the rest of the fin off the board.

While the outline is drying on the board, cut out the ribs. These are easiest if rectangles 3/8in. wide are cut to length then cut to the shape of a rib. Make a template of

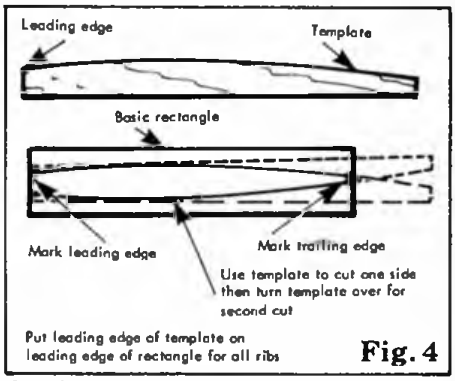


Fig. 4

the rib curve. Mark the leading and trailing edge thicknesses in the rectangles and cut out the ribs using the template **Fig. 4**. Glue in the bottom rib first, making sure the fin is not twisted. When dry, glue in the other ribs. Cut the notches for the spars using the spar itself as a guide, pinned onto the fin in the correct place.

When complete, sand the leading edge, top and trailing edge to shape but leave the parts that extend inside the fuselage square.

Pin the fin in position in the fuselage, cut and glue the lengths of 1/8in. × 1/16in. that fit round it and the short spacers. When dry, remove the fin.

Lightly sand the fuselage all over just enough to make it all flush and smooth. Now you find the spacers that were not properly glued! One or two will probably get knocked out, don't curse, look on it as a blessing that

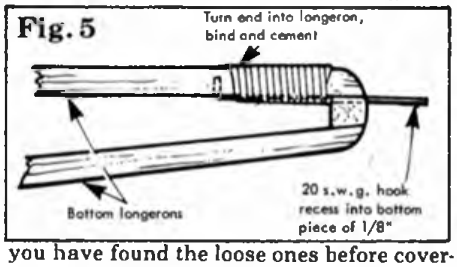


Fig. 5

you have found the loose ones before covering! Cut off the surplus lengths of longeron, sand the tail end round and fit the DT hook **Fig. 5**. The fuselage and fin are now ready for covering. The wing mount is left until the wing is built.

Wing

Some people have trouble with laminated tips but these are really very easy to make *providing* you first have a decent template.

A very suitable template can be made from scraps of 1/4in. balsa. Join enough pieces together to cover the curve of the tip with about an inch to spare each end, place under the plan, mark the inside of the curve

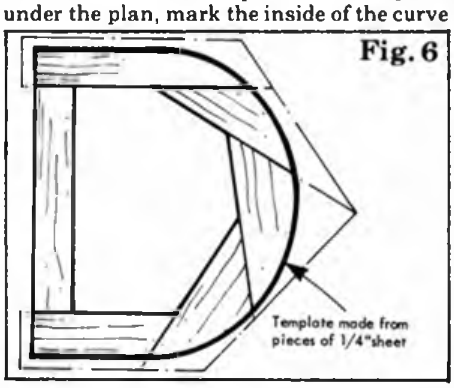


Fig. 6

by pin pricking through the plan and then cut out the template following the pin pricks **Fig. 6**. Get the edges of the template as square as you can. Thoroughly grease the edges with a candle to stop the glue sticking

to the template! Cut out ten strips of 1/4in. × 1/32in. approximately 12in. long (five for each tip). Using a white PVA, glue five strips together using plenty of glue to make sure

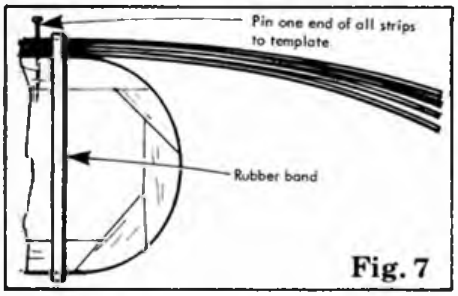


Fig. 7

the wood is well soaked. Making sure they are nicely in line, pin one end of the strips to the template and put a rubber band round it **Fig. 7**. Bend the stack of strips round the

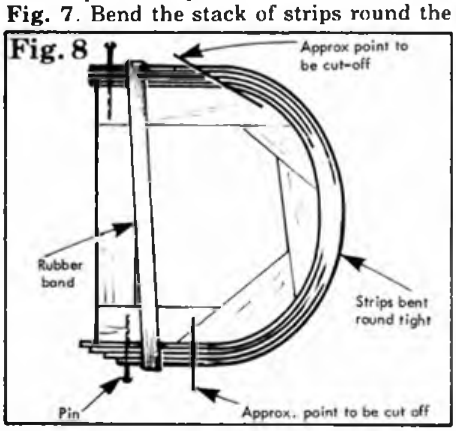


Fig. 8

template, pulling them as much as you can to ensure that they are tight against each other and the template. Pin them to the template at the other end, slip the rubber band over the whole lot and leave to dry for at least 24 hours **Fig. 8**.

Make a thin plywood template for the ribs and cut them out. Cut the notches for the spar at this point but leave those for the doubler until the wing is built. Cut ribs a bit overlength at the trailing edge so they can be trimmed to fit. Use pre-formed trailing edge if you can get it, otherwise cut from 1/8in. sheet. Trailing edge section is not easy to shape. Sandpaper smooth, sanding must be done *across* the grain or in small circles. *Do not* press hard or sand along the length, or the wood will curl upwards!

I find it easier to work with short lengths of wood and therefore cut the strip into lengths for each panel but leaving a generous overlap. The lengths of trailing edge can now be laid on the plan, the rib positions marked and notches cut to take the ribs. These notches should only be 1/32in.

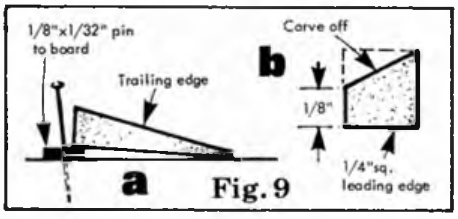


Fig. 9

deep. Now cut the trailing edge to length but leave overlength at the tips, pin to the board, not forgetting to pack up the front, 1/32in. This is best done with a strip of 1/8in. × 1/32in. under the front of the TE **Fig. 9a**. If by now the laminated tip is dry, take it off the template and make the other tip ... Roughly shape the leading edge **Fig. 9b**. At this stage, join the tip to the leading edge. Cut off where it has to join the leading edge and cut

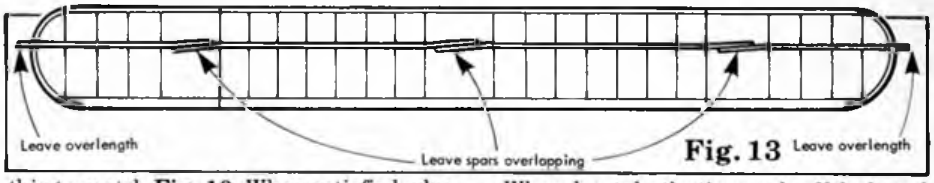


Fig. 13

this to match **Fig. 10**. When satisfied, glue the tip to the leading edge, again double gluing and make sure they fit together when laid flat on the board.

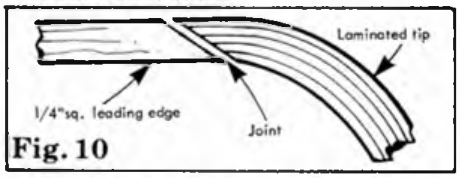


Fig. 10

When the joint is dry, pin down the leading edge with the tip laid over the trailing edge. Cut off the rear end of the tip and cut the trailing edge using the tip as a pattern **Fig. 11**. Double glue to the trailing edge and pin down. When the tip, trailing edge and leading edge are all nicely pinned in place trim off the leading edge to length.

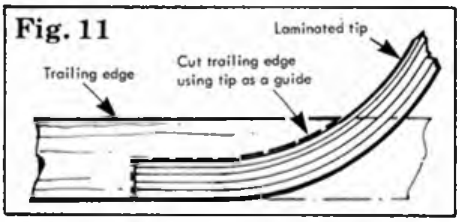


Fig. 11

Treat the other tip and outer panel similarly then cut the centre panel leading edges to exact length and pin in place. You then have the complete wing outline pinned down and can check that the chord of the various panels is the same throughout.

For best flying trim, the left hand wing must be slightly 'washed-out' (less incidence) relative to the right hand wing. The warps can be steamed in when the wing is finished but it is better if built in. The left tip should have 1/16in. wash-out and although it is logical to raise the end of the trailing edge

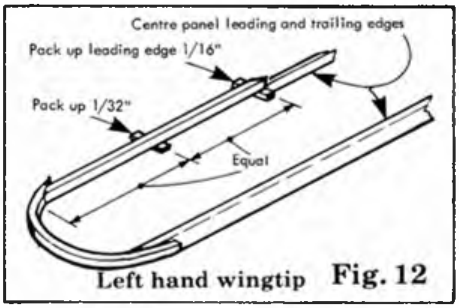


Fig. 12

to obtain the warp, it is easier to raise the inner end of the leading edge; this avoids the fiddly business of keeping the trailing edge packed up at the correct angle. Pack up the inner end of the leading edge 1/16in. and leave the tip pinned to the board **Fig. 12**. All the ribs except those at the dihedral joints can now be glued in position. Trim off the trailing edges of the ribs until they fit; double glue the ribs at the leading edge.

With all ribs in position, cut the spar 1/4in. × 1/16in. into four lengths, each a couple of inches longer than its panel. The spar is then glued into the ribs using PVA glue to give more working time. Get the spar flush with the top of the ribs so that further sanding is not necessary. Leave the ends of the spars overlapping each other and leave a bit overlength at the tips **Fig. 13**.

When dry, take the tip panels off the board but leave the centre panels pinned down and make the outer dihedral joints.

Use a piece of packing to support the tip to the height required, offer up the tip to the

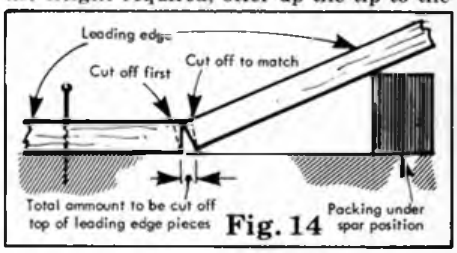


Fig. 14

centre panel and you will see where the trailing and leading edges need to be cut. Cut about half the amount required off the pieces pinned to the board, then cut the corresponding tip pieces until they match **Fig. 14**.

When the leading and trailing edges fit

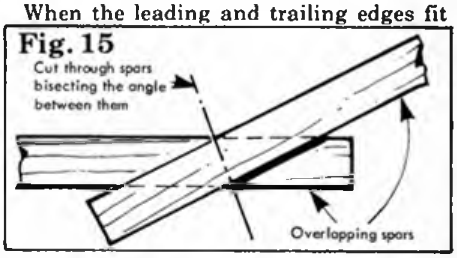


Fig. 15

each other nicely, glue together, again double gluing and leaving the spar overlapping. *Do not* pin the outer panel in any way, as you may by pinning the leading and trailing edges at slightly different angles and cause a warp.

When the two panels are firmly glued

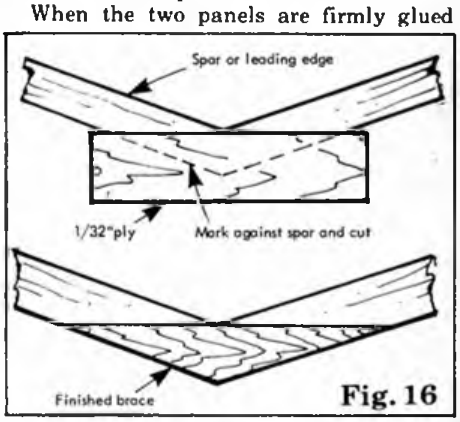


Fig. 16

together, the overlapping spars can be cut straight through together and then glued **Fig. 15**. This needs a nice fine cut and I still prefer the old-fashioned double edge razor blade. When dry, take the assembled inner

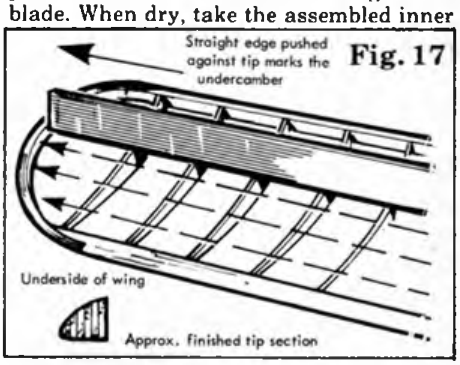


Fig. 17

and outer panels off the board and cut and fit the plywood braces **Fig. 16**.

Then cut the 1/16in. rib to length (not notched into TE) enlarge the spar notch to accommodate the ply brace, glue into position and add the trailing edge gussets.

Treat the other outer panel similarly and then shape the laminated tips **Fig. 17** before joining the centre panels. Join the centre panels together, add the ply braces but leave out the rib at this stage. Cut out the spar doublers, notch the ribs to take them and glue in position, note that they fit on top of the ply brace which then becomes hidden from the top. Cut out the 3/16in. × 3/32in. wing rest, notch the bottom ribs to take it and glue in position, then add the 1/8in. infill between the spar and the wing rest **Fig. 18**.

Finish off the tip spar by gluing a piece of 1/16in. sheet to join the spar to the tip and

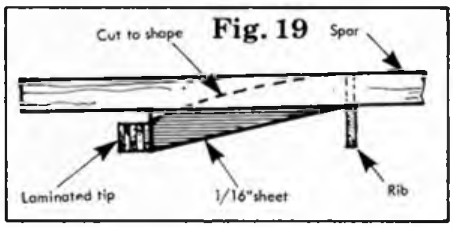


Fig. 19

cutting the whole to shape **Fig. 19**.

Finally cut the 1/16in. rib in half, trim to fit and glue in position. The wing structure is now complete and requires only light sanding to finish.

Avoid sanding the ribs as far as possible or they will easily lose shape. Don't forget to sand the trailing edge across the grain. Sanding with the grain will still tend to make it curl.

Tailplane

This is as simple as can be and needs no comment; just follow the general principles of the wing. Cover both the tailplane and tip fins *before* gluing the fins in position. Fit the DT hook to the tailplane before covering.

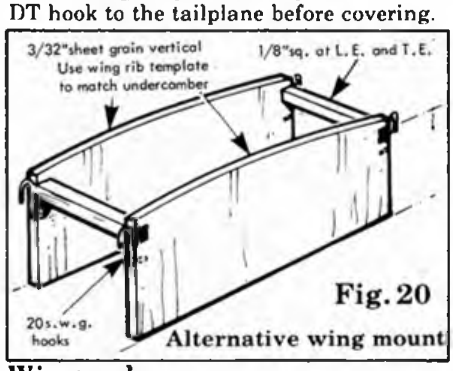


Fig. 20 Alternative wing mount

Wing pylon

You may think this is unnecessarily complicated and if so it can be replaced with a simple 3/32in. sheet mount **Fig. 20**.

However, the pylon shown is attractive in appearance, interesting to build as well as being lighter.

Start by making the central frame pinned to the board. The frame is then taken off the board and built on a piece of balsa sheet 1/4in. thick or so. Pin the frame upright with the bottom cross strip in position **Fig. 21**. Then

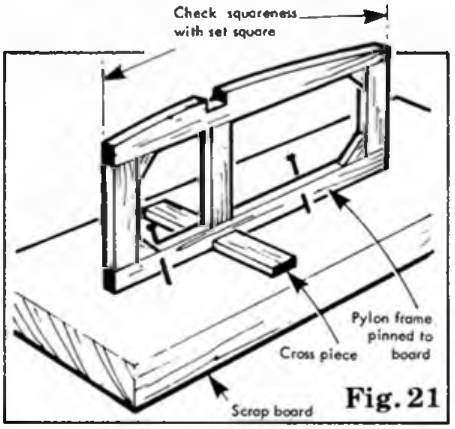


Fig. 21

add the wing rest and two main side uprights. Try the wing in position on these and adjust heights and angles until wing sits square without wobbling.

The basic pylon is now complete **Fig. 22** and the rest is more streamlining than anything, although it does make the whole structure more rigid. However, even if you make a mistake, it will not affect the basic wing mounting.

Cut out one curved rib for the front and one for the back, use these as templates to make six of each. Cut a little overlength where they meet the central upright and do not cut the notches for the 1/16in. square uprights. Trim the lengths and adjust angles at ends if necessary and glue all the ribs in position. Note that the top ones follow the dihedral angle.

At this stage push a couple of pins into the leading and trailing edge where the hooks will go and lightly rubber band the wing in position. It will be seen that the top pylon ribs can now be pushed upwards gently to meet the undercamber of the wing ribs (it is easier if the wing is covered when doing this). Take the wing off and cut the notches in the pylon ribs to take the 1/16in. square uprights.

With the wing back in position, cu. uprights to a length that will force the top pylon ribs against the wing undercamber. Now cut and fit pieces of 1/32in. sheet between the uprights and under the top rib to hold it in position. The pylon structure is now finished and can be sanded smooth. Bend and fix the rubber band hooks and it is ready for covering. Cover the pylon before fixing to the fuselage, but *do not* shrink the tissue until it is fixed.

Covering

The whole model must be covered in a lightweight tissue. By lightweight of course is meant the finished weight including dope and not just the tissue! The most common lightweight tissue available is 'Modelspan' or similar. This is actually lighter than 'Japanese' tissue but absorbs more dope, thus being heavier when finished. Japanese tissue is readily available from some model shops and private individuals who often advertise in Aeromodeller.

Having chosen the tissue, you now need something with which to stick it to the airframe. Although some people have their favourite variety of paste, the real choice is between clear dope and specially made 'tissue paste' — the white runny variety like watered down PVA.

There is no doubt that dope gives the neatest and lightest job but not everyone finds it easy to use. Tissue paste is much easier to use, it can be spread over the whole surface to be covered and the tissue applied fairly leisurely. Furthermore if you make a bad mistake, it allows the whole panel of tissue to be lifted off which dope will not.

Therefore, if you are good at it, or would like to try, use dope. If you are like most of us and often make a mess of covering, you will get a better job with tissue paste.

With the 1/32in. ribs, make sure the tissue is stuck well to both edges. The top surface of the rounded tips from the last rib outwards can only be satisfactorily covered by using a separate piece of tissue.

The bottom of the fuselage from the motor peg to the tail should be left uncovered until the fin is fixed in position. The top of the fuselage is covered first, then the fin covered

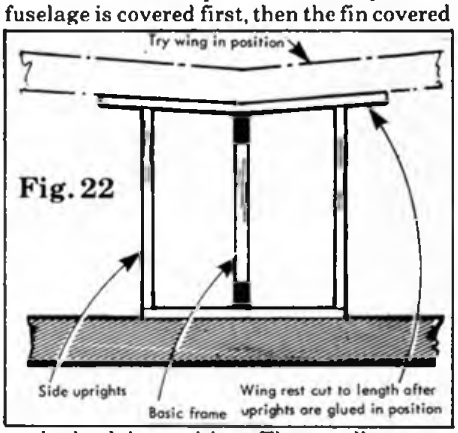


Fig. 22

and glued in position. The small gussets that secure the fin to the bottom of the fuselage can then be added followed by the covering. The wing pylon (un-doped) should be glued in position *after* the fuselage has been doped.

Water shrink by brushing on water till damp and then leave to dry. Do not pin down surfaces while water or dope is drying. If they are going to warp it is better to find out at this stage. Dope with very thin dope. 30 per cent dope/70 per cent thinners, if it is too thin, you can always apply more coats but just try getting it off! Two coats should be sufficient for everything except the fuselage which can have an extra coat as protection against the rubber lubricant. Bear in mind that the purpose of the dope is to render the tissue airtight, the fact that it helps to make it water resistant is only a happy side effect. You should never put so much dope on that you end up with a glossy finish. If you find that the tissue slackens off far too much in damp conditions then give it another coat of dope. However, having the tissue slacken is preferable to having the model warp in hot, dry conditions which will almost certainly happen if too much dope is used. Providing the tissue is not being used to hold the structure true, the trim of the model will not be affected by the tissue slackening. This is why it is extremely bad to stretch the tissue into place when covering and cause unequal stresses in the structure.

The finished weights of Jessica's model are:

Fuselage, fin and pylon	27 grams
Propeller and assembly	22 grams
Wing	26 grams
Tailplane and tip fins	12 grams

The propeller assembly and trimming will be covered next month.

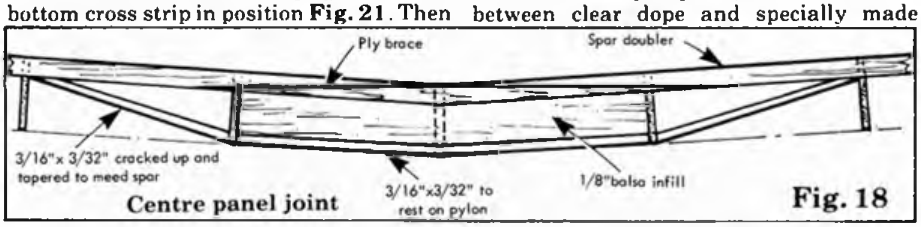


Fig. 18

From THE HANDLE

RACING with Jim Woodside

The Wharfedale/Rufforth 1000

When this event is run at the end of the 1984 season it will mark the silver anniversary of this famous long distance event, making it one of the oldest events in the competition calendar. I might add that some individuals who took part in the 1983 event actually participated in the 1960 inaugural meeting. In the interest of diplomacy I will refrain from naming names! Actually the first race was won by a couple of likely lads called John Horton and Don Haworth with help from Mr. Moulding. The winning engine was a *Frog* 500 which although quite slow had excellent range.

The first fifteen contests were run using 60ft. lines, metrication took place in 1975. The record on 60ft. stood at 49:41.2 and was established by FAI World Champions Place/Haworth using not a 5cc glow but an overstroked ETA 2.6cc diesel.

With the loss of Rufforth airfield the name changed from the *Rufforth 1000* to the *Wharfedale 1000* in 1977. The later events have been totally dominated by 5cc glow engines, particularly the very powerful *OPS* 29 R.V. Teamrace. This engine with its ABC liner has provided power, range and excellent restarts. The penalty has been that the airspeed allied to greater weight means strain on all but strongest armed pilots. Over the years the '1000' has been nearly one hundred per cent a north of England benefit: Wharfedale, 13; Tynemouth, 6; Feltham, 1.

Those six Tynemouth wins have all belonged to Dick Wilson and Ian Gardner, which makes them the 'winningest' team. Congratulations to them.

Some good prizes will be on offer to tempt you budding, past and present buffs. You cannot say you haven't had good notice. I think it would be a splendid idea if the day's flying was rounded off with a celebration dinner. Details can be had from Wharfedale's P.R.O., who would welcome suggestions, donations and help: Jeff Smith, 45 Denton Avenue, Leeds LS8 1LE.

The following information and sketch plan will help those who fancy building a model for the '1000' and the other 'B' events on the calendar such as the Nationals.

Let's look first of all at the available engines. The obvious thing to do is to look for a snorting 29 such as the previously mentioned *OPS*. It is worth mentioning that the most competitive of these have been fitted with an open exhaust timed liner in the rear intake speed motor case. *OPS Distributors* or their agents may be able to supply examples. However in recent years there has been tremendous advancement in the 20/21 class, stoked by the competitive car racers. These motors will concede little to their larger capacity brothers. In this group are engines such as the *Picco, H.P., K&B, Enya, HB*, etc. An added advantage is that a little more range can be found from the 30cc tank.

Fuel The basic fuel is the old favourite:
Castor 20%
Methanol .....60 — 55%
Nitro-methane .....20 — 25%

However the substitution/addition of other substances will help give range should this prove problematical. The first line of attack is to substitute iso-propyl alcohol instead of methanol.

A real range additive is zylene although I found it gave cool/undercompressed runs. This underlines the need to tailor the compression ratio to the fuel by removal or addition of gaskets.

So a more sophisticated formula would be:
Castor 20%
I.P.A. 40%
Zylene 20%
Nitro 20%

In the early 1960's Ron A. Lucas was the maestro of long range fuels. His fuel, as published in the June 1963 *Model Aircraft* was:
Nitro methane 12½%
Nitro benzene 2½%
I.P.A. 20%
Iso-Propyl benzene 40%
Castor 25%

Props: Try those in the range 7½in.-8in. diameter and 7½in-8in. pitch.

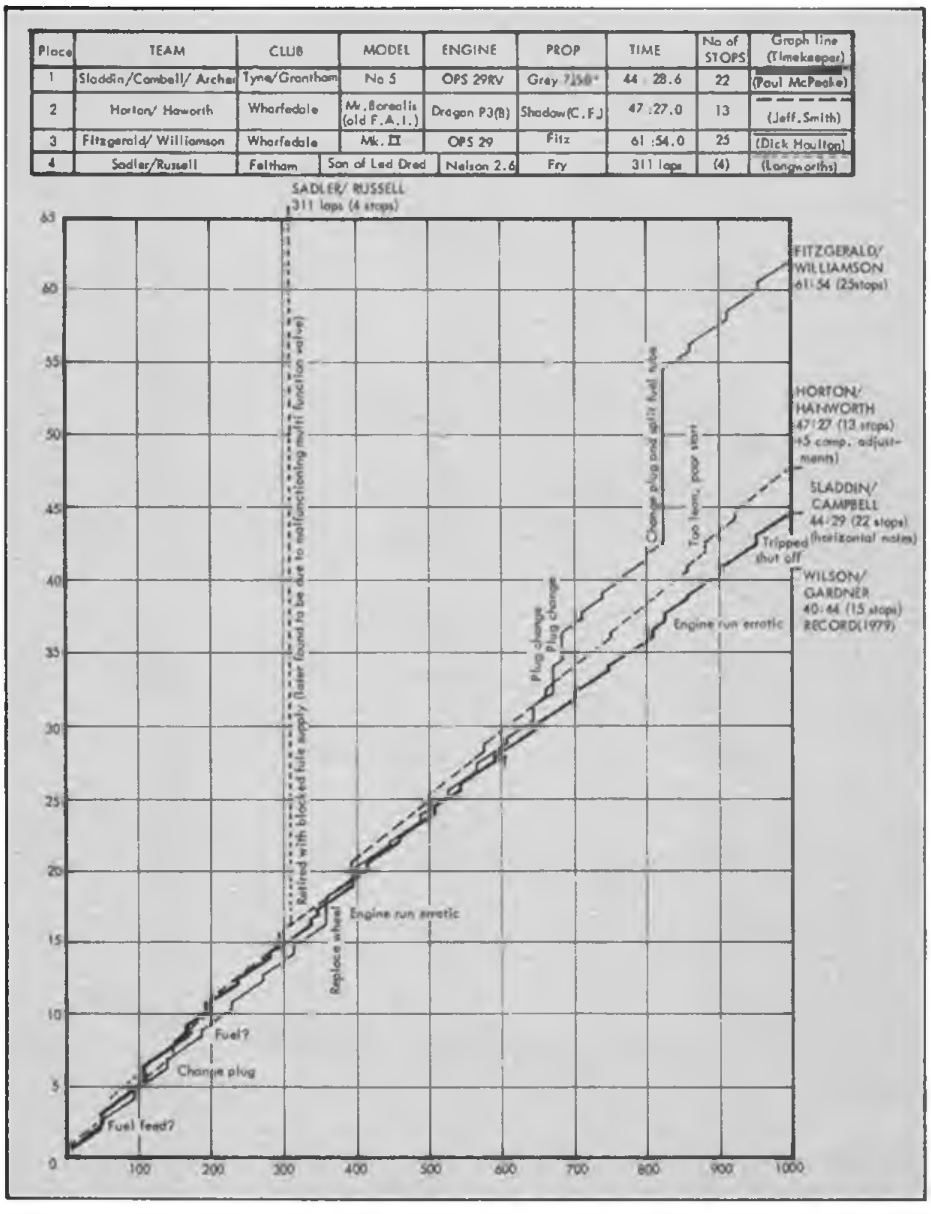
Dave Campbell's Model

This model won the 1983 event, being flown by Martin Sladdin. It is typical of a present day 'B' T/R model, using some of the techniques used in the FAI class. Some extra notes may be of help.

1. The engine pan is hand made from ⅛in. dural plate.
2. Current to the glow plug is provided through a neat combined electrics/fuel filling system. The tank filler is electrically isolated in the fuselage and connected to the tank by silicone tubing. A lead from

1983 Wharfedale 1,000 (24th Rufforth 1000) 23.10.83. Dishforth, C/L Class 'B' Racing run by Wharfedale with help from Tynemouth. Weather bright and sunny with cold light wind, cloudy later . . .

Place	TEAM	CLUB	MODEL	ENGINE	PROP	TIME	No of STOPS	Graph line (Timekeeper)
1	Sladdin/Cambell/ Archer	Tyne/Grantham	No 5	OPS 29RV	Grey 7½x8"	44 : 28.6	22	(Paul McPeake)
2	Horton/ Haworth	Wharfedale	Mr. Borealis (old F.A.I.)	Dragon P3(B)	Shadow(C.F.)	47 :27.0	13	(Jeff. Smith)
3	Fitzgerald/ Williamson	Wharfedale	Mk. II	OPS 29	Fitz	61 :54.0	25	(Dick Houlton)
4	Sadler/Russell	Feltham	Son of Led Dred	Nelson 2.6	Fry	311 laps	(4)	(Longworths)



the valve body runs to the plug. One lead from the battery is connected to the finger valve. The other lead goes to the pit-man's thumb where a metal contact provides the earth to the pan. Hence fuel and glow in one!

3. An easier method of providing 'sparks' is by the 'hot fin'. Use some double sided copper circuit board for the fin and run separate wires to earth and the plug. Naturally you will need a battery man to make contact during a race.
4. Dave will make fuselage shells for bone-fide builders. Contact him at contests.
5. Full copies of current S.M.A.E. rules are available from: Secretary SMAE, Kimberley House, Vaughan Way, Leicester.
6. *Wharfedale 1000* Rules: these are the same as SMAE class except:
   a. heats are 200 laps
      final is 1000 laps
   b. there is no minimum engine size
   c. models with engines less than 3cc capacity may be flown on 0.3mm diameter lines.

I hope all this has whetted your appetite to give this famous event *your* support in the anniversary year.

Class 'B' Team-racer — building notes

1. Wing from ⅛in. Balsa — Symmetrical section — High Point at 35% chord.
2. 30mm dia. bellcrank — leadouts exit from wing together.
3. C.G. at 6.25% root chord (¼in. behind point of L.E.) — *This is critical!*
4. Bellcrank pushrod throw = 7/16in. Horn centres = ½in.
5. Wheel to be at least ¾in. in front of C.G. (more if possible).
6. Inboard U/C plus tip-weight required for safe take off.
7. Nose length and moment arm not important — adjust wing position to obtain C.G.
8. Wing and tail at zero/zero degree incidence — *very important.*

Hugh Lorimer Teamrace Fuselages

Scots enthusiast Hugh is producing some nicely made fuselage kits designed around a Nelson pan and a flying wing model. There is sufficient fuselage length to accommodate wings of chords equal to the Smith Wing/CB14.

The kit consists of the following:

1. Ready formed balsa cooling duct
2. Acetate canopy
3. Top and bottom of fuselage formed in plastic card. I have used one of these kits to rebuild a crashed model (actually Derek Heaton did most of the work!). While it may not be very much quicker than employing conventional techniques it does produce a neat and reasonably light model. Hugh usually has a supply of the kits at U.K. domestic contests, although it is possible to post these abroad.

Cost: about £6 per set.

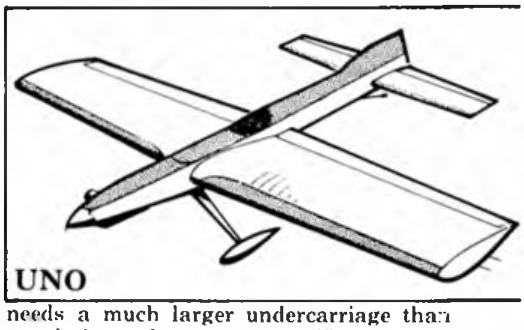
Address: Hugh Lorimer, 'Alpbach', Stair by Mauchline, Ayreshire, Scotland.

Aerobatics with Glen Alison

UNO stunt model by Stanislav Cech.

This is a smart modern styled stunter by a flier who is not well known in Western Europe. In winning the European championships in Utrecht last summer he showed that he could handle the turbulent conditions better than most.

What can be learnt from looking at the 'UNO' design? Firstly, most noticeable is the degree of symmetry shown throughout. The engine, wing and tail are all on the centreline, thus giving theoretically equal turning ability up and down, a feature favoured by the Italians. This of course



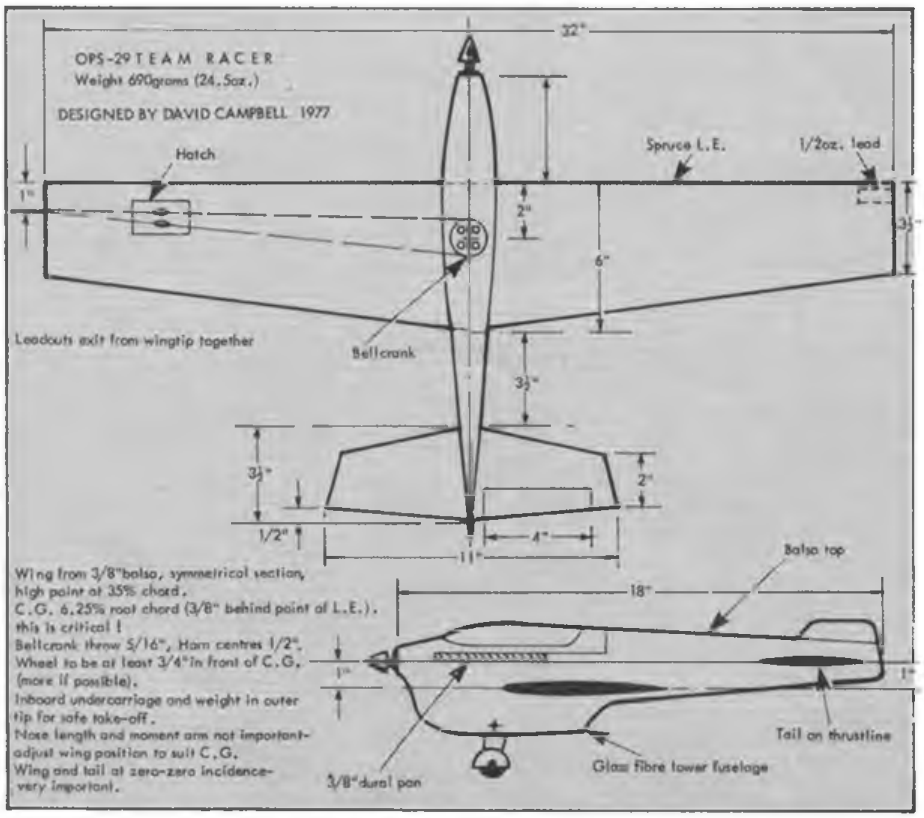
UNO

needs a much larger undercarriage than usual in order to get sufficient prop clearance. The undercarriage is fuselage mounted under the wing, which is detachable from the top and has a nominal 5mm differential longer inboard span. The engine, a *Super Tigre* 46 driving a 11×6 wide blade prop is side mounted, presumably to get even running characteristics in upright and inverted flight. This arrangement can lead to fuel feed problems as the spray bar is at least 15mm outside of the tank centre line leading to a gradual leaning out during the flight but this effect can be reduced by tank pressuration from the silencer.

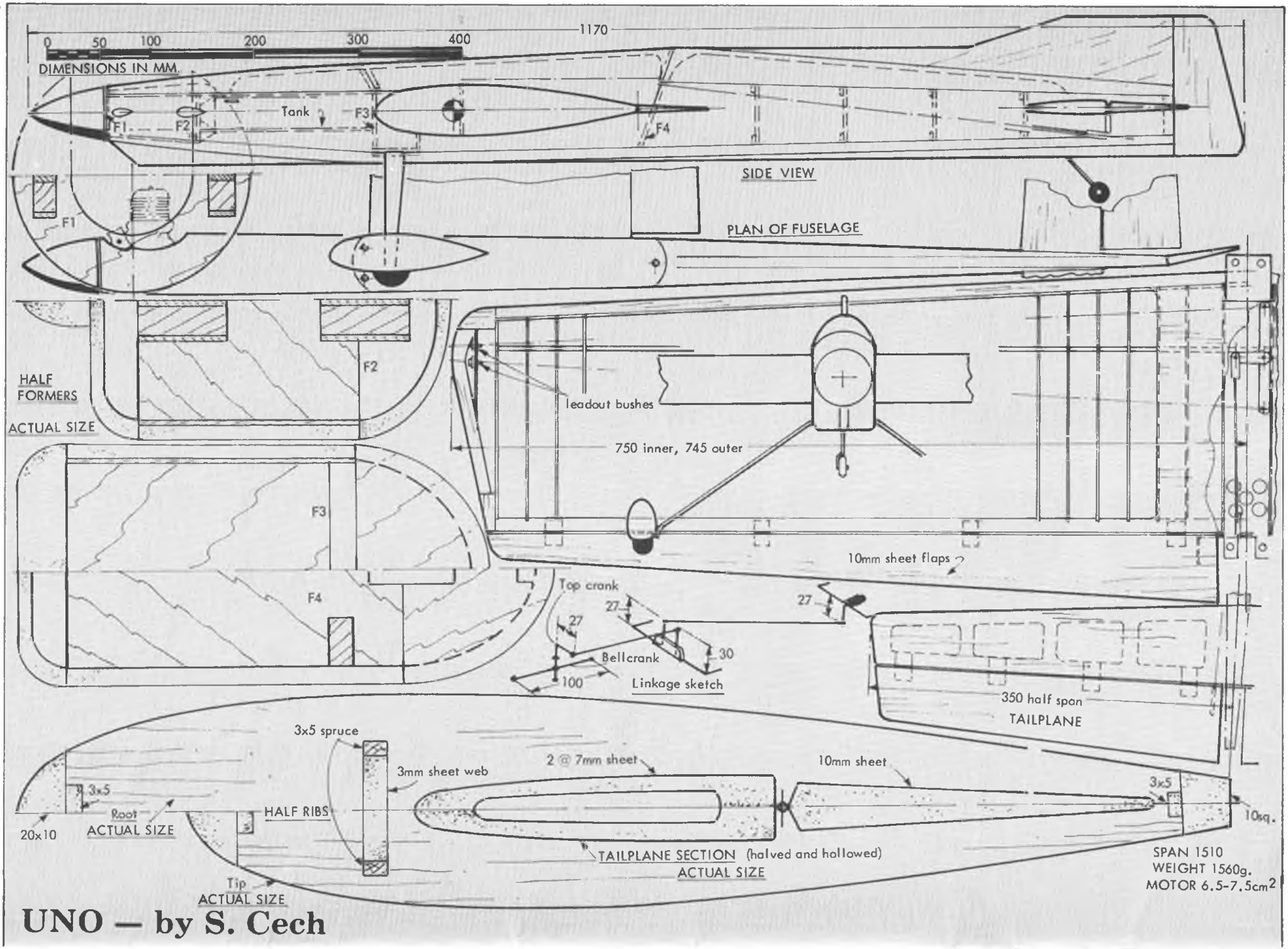
The general construction is orthodox. The wing is a mono spar 'Detroit' style which is capped with spruce for extra strength. The tailplane is slightly unusual in that it is constructed of two laminated sheets of balsa hollowed out to save weight.

Linked elevator/rudder

I had a letter recently from stunt enthusiast John Cutler of Leighton Buzzard who is building the *A.P.S.* 'Crescendo' design by Claus Maikis. This model features a linked elevator/rudder system as pioneered by the American Al Rabe with his series of 'Mustang' semi-scale stunters. John wants to know the theory and adjustment of this arrangement. The idea is that more rudder offset is automatically applied at critical points in the stunt schedule to improve the line tension when the model may be slow, such as at the outside corners in the square eight for example. Depending on the geometry of the horns and linkages, various ratios of movement can be achieved and it is essential to have all of these adjustable in order to help eliminate the undesirable characteristics of any particular model. I believe that on the 'Mustangs' and also on the 'Crescendo', the set up was to have just a little offset for level flight, a medium amount on up elevator, and quite a lot on down. This will certainly aid the top loop of the vertical eight and hourglass and the outside section of the horizontal eights . . . but how much do you use? Not enough movement will not do any harm but there again it will not do any good either! Too much will yaw the model severely and spoil the pattern. Do *not* forget that in windy weather it is quite easy to have *too much* line tension, say in consecutive down wind loops, for comfort or safety. So do not overdo it.



One fifth scale plans of Stanislav Cech's European Championship winner — UNO.



UNO — by S. Cech

SHOP TALK

NEW MODEL HOBBY PRODUCTS REVIEWED

Storage problem?

A new, ingenious cupboard, designed and produced specifically for modellers is now available from *Goodyear Design Products*. Sited on, or over the workbench it can save much of the time spent gathering and storing equipment and materials, keeping everything neat and visible. Stoutly made of good-quality birch ply, it provides 12ft of 3in wide shelving, plus a separate section for tools, within its overall dimensions of 18in × 12in × 12in (approx.).

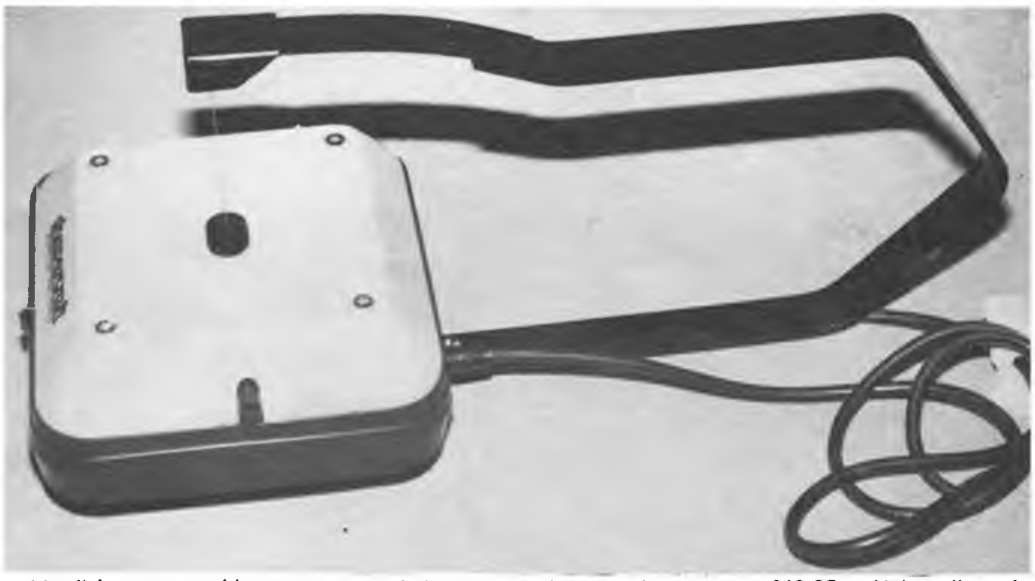
This amount of storage has been achieved by building the cupboard in three sections — a shelved back section drilled for secure fixing to the wall, an independently-hinged centre 'leaf' which incorporates tool storage on one side and shelving on the other and a shelved front section which also closes the cupboard.

All shelves are fitted with a gallery rail and the tool section features a tray base and hanging pegs. Stout strap hinges are securely bolted into place and magnetic closure catches fitted. The *Goodyear Easy-Store Cupboard* is supplied in sanded Swedish Ply, ready for finishing to personal choice.

Total price, including postage and packing, is £28.50, from: Goodyear Design Products, 11 Elmhurst Way, West Moors, Wimborne, Dorset BH22 0DN.

Useful Power Tool

The *Shapersaw* is a power driven fretsaw and would be a useful addition to any modeller's workshop. The blade is driven on the vibrator principle rather than direct motor linkage. This means that it is inherently safer than the latter types but would not be the ideal saw for cutting larger sections (¼in. steel or 1in. oak etc!). For the aeromodeller, these saws are a worthwhile investment and although you can manage without one, once bought, it will always be in use. Ply formers and templates can be tackled with ease and no longer become a chore. The low amplitude blade vibration means that you can cut intricate shapes without the fear that you may loose a finger at any moment!



The *Shapersaw* in common with all fretsaws enables you to change the direction of the 'cut' very easily and a little practise is needed to ensure long *straight* cuts!

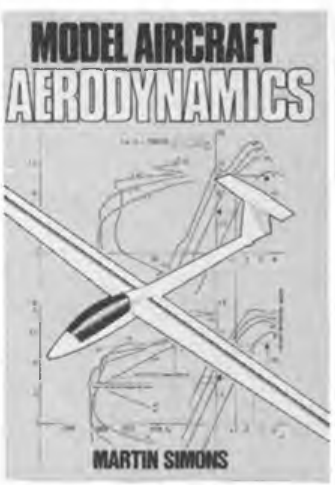
The *Shapersaw* will retail for about £49.95 and it is well worth asking for a demonstration . . . you'll like it.

Mini Balloons . . .

A fascinating little book for anyone with a present or future interest in this traditional means of flying. 1983 saw the bicentenary of the first manned balloon flight and interest in balloons although fluctuating over the years seems to be getting a new lease of life due to the use of more modern materials. 'Mini Ballooning' provides would be modellers with the necessary guidance to fly their creations effectively, safely and within the law. Also included is an extensive listing of mini balloons on the C.A.A.'s Register (up to 1983 C.A.A. registration was required of balloons over 2 metres wide or tall under 5kg!) Copies of 'Mini Ballooning' can be found in bookshops or direct from the publishers: Line One Publishing Ltd., Bayshill House, Bayshill Road, Cheltenham, Glos. GL50 3AA at £3.95 + 30p post and packing.

Now in Paperback

Since first published in 1978, Model Aircraft Aerodynamics by Martin Simons has been a classic for the Aeromodeller. Although covering a field that normally requires a fair degree of scientific understanding, Martin has managed to convey to the average reader the whys and wherefores of model flight in a remarkably readable manner. Books have become increasingly more expensive as the years go by and one way of 'beating the system' is to publish paperback versions. This latest reprint of Model Aircraft Aerodynamics is such a compromise, and at £6.50 can only be said to be excellent value. Even if only bought for occasional reference it is a book that you can return to again and again. Published by Argus Books Ltd., and should be readily available. Also available direct from Argus Books Ltd., Wolsey House, Wolsey Road, Hemel Hempstead, Herts. HP2 4SS, but include 65p for U.K. post and packing.



Going Solo

Part 1
a new practical series for the beginner

by Trevor Faulkner

Let me start by being controversial: I don't think that a complete beginner to aeromodelling is easily found in this day and age. Most people in the civilised world have grown up accepting model aircraft as part of the recreational and hobby scene. They accept from childhood that flying machines exist and that smaller versions of such machines are constructed and flown. Words such as 'balsa', 'diesel', 'fuel', 'remote control' are not unknown to almost everyone and the person *inclined* to become an aeromodeller will have picked up this vocabulary quite instinctively.

To summarise . . . if you think you are going to have to learn everything from scratch to become an aeromodeller, you're wrong. You already know much more than you think!

Of course, there are gaps in everybody's knowledge, alongside existing abilities. As the series progresses, I'll try to get good basic examples brought to your attention in a practical form. Using current jargon, 'hands-on' experience of adjusting a model for flight is probably the skill least likely to be possessed by the 'beginner'. For this reason, we'll show you how to produce a small model (**Fig 1**) which can be flown indoors and can be adjusted to demonstrate the effect of some of the variables common to the majority of conventional models. If finance is a problem, have no fear! Four models can be built from a single sheet of 1/32in. x 3in. x 36in. (**Fig 2**), and a couple of strips of 1/8in. square balsa. A few odds and ends are needed, as are simple tools. These we will mention as things proceed.

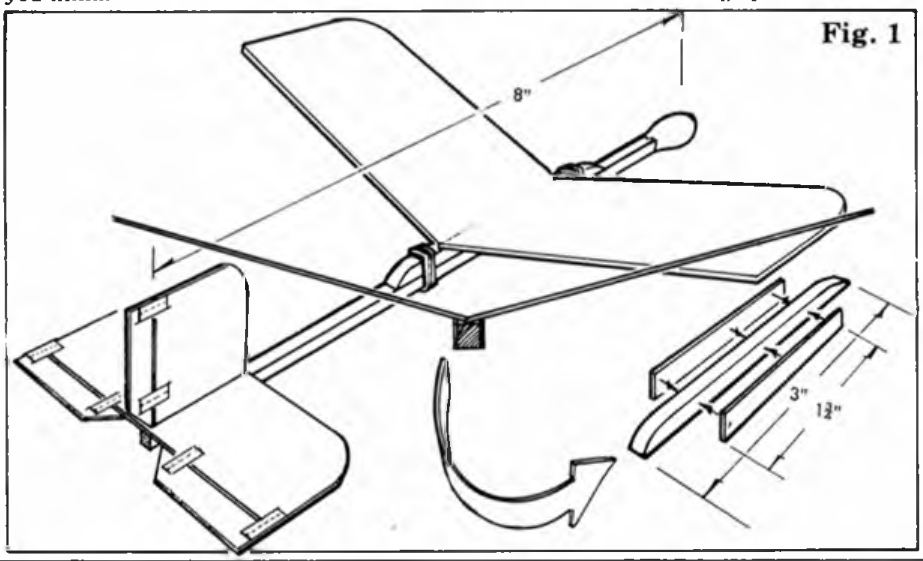


Fig. 1

Materials

Balsa sheet, strip and block all vary a great deal in three very important ways. These are *weight* (density), *cut* (affecting 'grain' or 'figure'), and *consistency* (uniformity of physical characteristics throughout the piece).

Anyone unfamiliar with the material will tend to regard all balsa as light in weight. Getting experience in wood selection can be a long job, but there are one or two short cuts. The easiest way is to get assistance from someone who regularly uses the lighter grades of balsa. Such a person will have developed the skill you're seeking. Avoid the person who specialises in Radio-Control or Control-Line flying at this stage. They will have considerable flair in finding the sort of stock ideal for their purposes but unless they're quite exceptional, will not have the facility to judge what you need.

If that sort of help is not available, don't be afraid to take a sensitive scale or balance along when you buy your wood. A good model shop proprietor will help you by selecting sheets of the cut you specify and give you a bit of time to find the lighter pieces. So, ask for some sheets of *quarter grain*, 1/32in. x 3in. and explain that you want to select a very light piece. Quarter grain has a distinctive mottled effect which once seen is not forgotten. If you have a suitable scale, weighing takes no time at all.

Check the scale at home first. A rough and ready test is to weigh something like a one penny piece. If this produces a reasonable response, the scale is sensitive enough. Remember, at this stage you'll be looking for a light piece by comparison with other available pieces. The exact weight is less important. A sketch of a very simple balance is shown (**Fig 3a**). This will help if you don't have a scale. Also in the sketches is the method of choosing the 1/8in. square strip for the fuselage (**Fig 3b**). Handle all wood with respect and make friends with your dealer. Try to go shopping at times when the shop is less crowded. You'll get better service and feel more comfortable.

The only adhesive you'll need at the moment is what is generally known as 'white glue'. Borden 'Wood Glue', Evo Stik

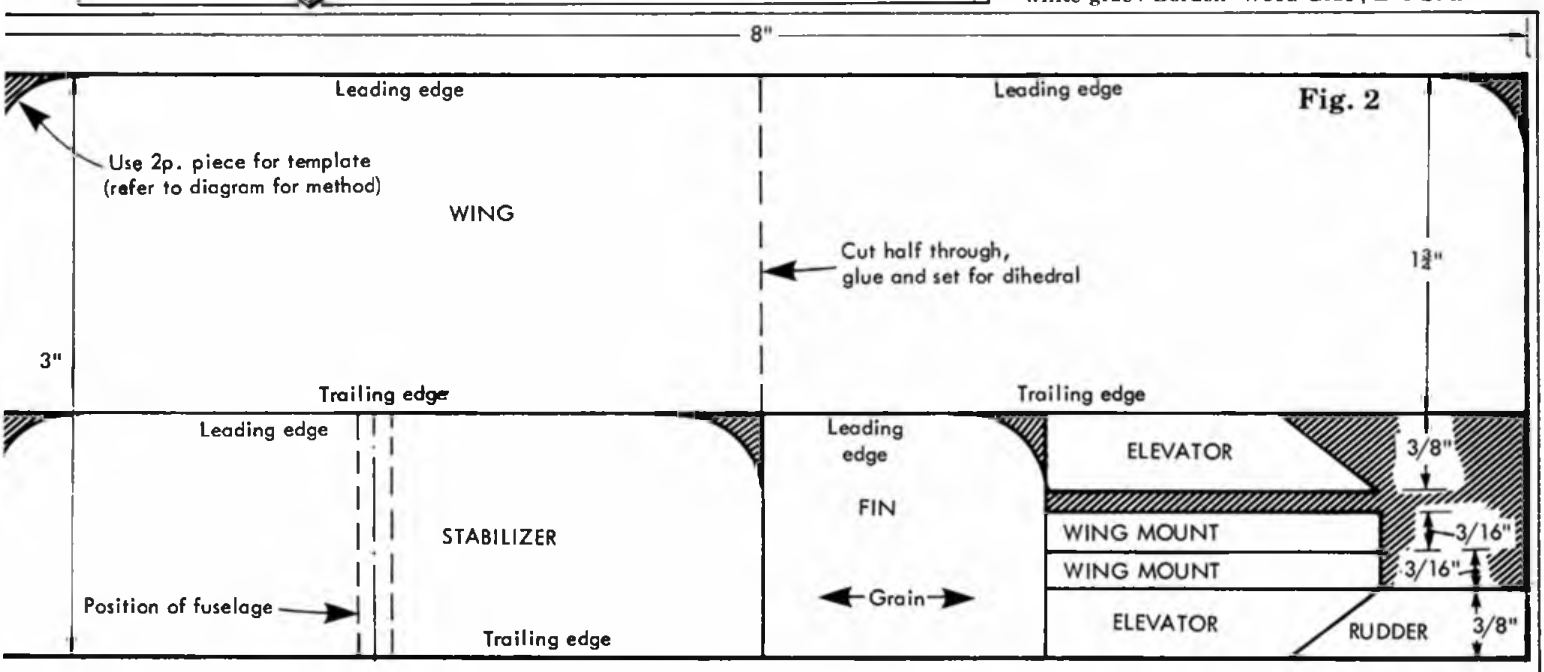


Fig. 2

1/32"sheet. Ideal weight approx. 0.25oz. for a 36"length

'Resin-W' and Supergloy 'Wood Glue' are typical examples. Buy a small quantity (it's very economical); you'll have no problems with 'shelf life', and it will cope with all the gluing jobs on the 'Trim Trainer' without warping the thin sheet or being difficult to remove from your fingers. *Please, do not use balsa cement for this model.* Balsa cement shrinks on drying and the essence of this Trainer is warp-free construction.

The remaining items come under the heading of 'miscellaneous'. Modellers are an inventive breed and are constantly looking for items worth scrounging, collecting or hoarding. You'll need to make some simple hinges, capable of being adjusted and of retaining that adjustment in flight. After trying several items (freezer-bag ties, plant-ties, strips from beer cans, etc.), I came up with the idea illustrated (**Fig 3c**).

The copper wire is stripped from plastic covered cable (flex) of about $\frac{3}{32}$in. thickness, containing six or seven thin strands. One strand is chosen and stretched as shown, using two pins. The pins are pushed through a piece of *thin* writing paper into a flat surface such as a length of deal, insulating board or drawing board. The wire is slid down the pins to contact the paper and a little white glue smoothed along to give a glued strip about $\frac{1}{4}$in. wide. A narrow strip of the same type of paper is placed as shown, sandwiching the copper wire and left to dry.

While you wait, mark out an 8in. length of your balsa sheet. Cut with a sharp blade (scalpel, modelling knife, stiff-backed razor blade or similar), guiding your blade with a metal straight edge. This need not be a special item as a section of alloy extrusion, a strip of steel or a steel rule will serve just so long as the edge is straight and will resist the blade. Try to cut the wing *(dihedral)* joint half-way through so that you can crack and glue it without it falling apart. If you go through completely, a strip of sellotape or masking tape will help to hold the wing until set. Be sure that both edges of the wing are in contact to avoid any sort of twist. Prop the wing as shown until dry (**Fig 4a**). Flat surfaces can be almost anything ... a small sheet of glass is ideal.

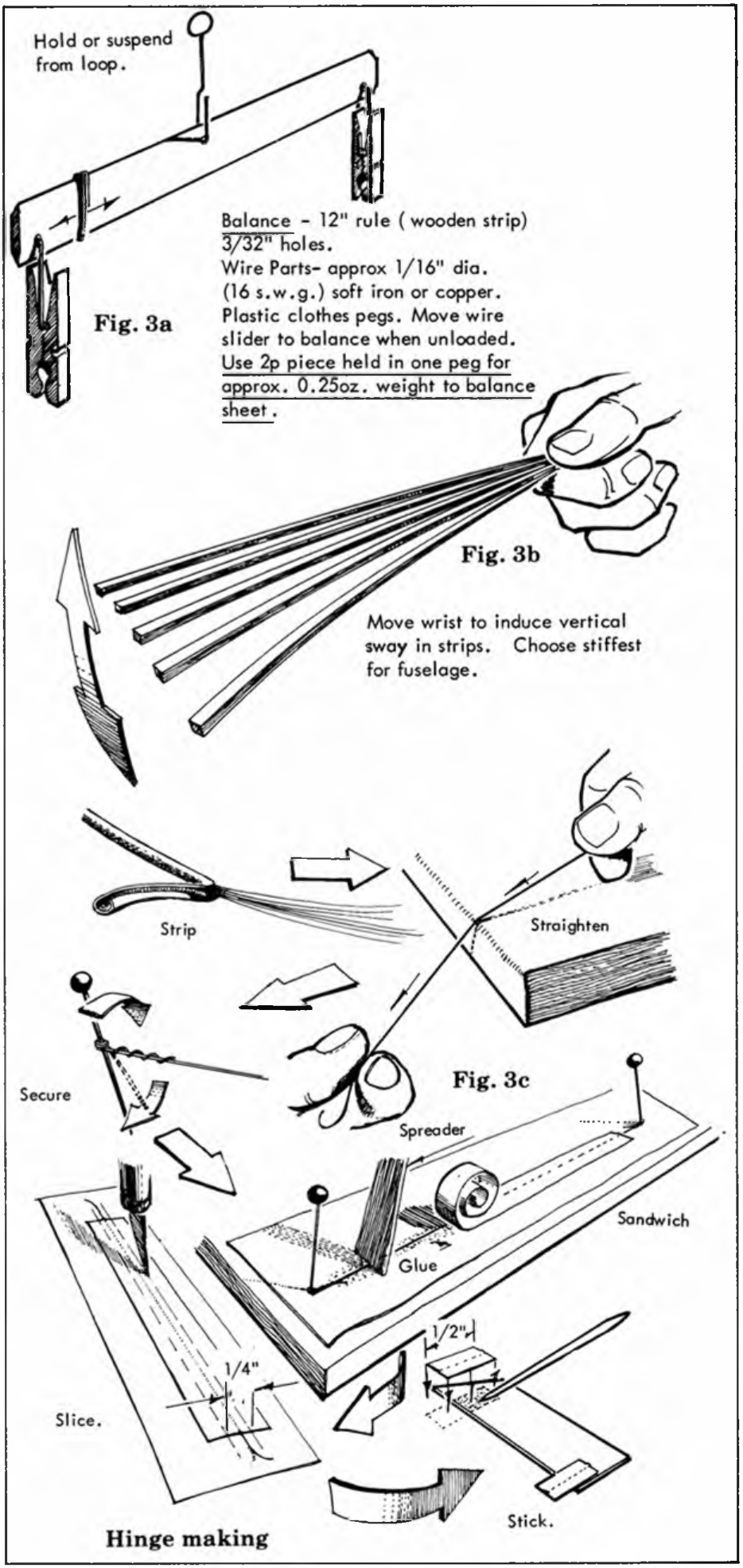
The fin is now glued to the stabiliser *(stab)* with the grain as shown and directly in line with the stab centre line *(C/L)*. Make sure that the angle between stab and fin is 90°. Use a set square, tri-square, or even the machine-cut corner of a postcard to check. *Get into the habit of measuring angles from the start.*

By now, your hinge strip will probably be dry. Take the paper sheet from the board and mark a line $\frac{1}{8}$in. either side of the wire's position.

Using your straight edge, cut along these lines, and then cut this strip into sections $\frac{1}{2}$in. long. Attach two hinge sections to each of the elevators and to the rudder. Use the minimum of glue.

A useful tip when you need to control the amount of glue being applied: squeeze a tiny amount of adhesive onto a scrap of waste material. Using a sliver of wood (a cocktail stick is ideal) apply the glue where needed.

We now need a wing mount ... a device to help attachment of wing to fuselage. The fuselage will be from $\frac{1}{8}$in. square stock, and our wing mount uses a piece of similar section. There is a $\frac{3}{8}$in. strip of our sheet remaining, which is cut into two $\frac{3}{16}$in. strips. Glue these neatly on either side of the $\frac{1}{8}$in. square mount strip, so that all the lower edges are flush.



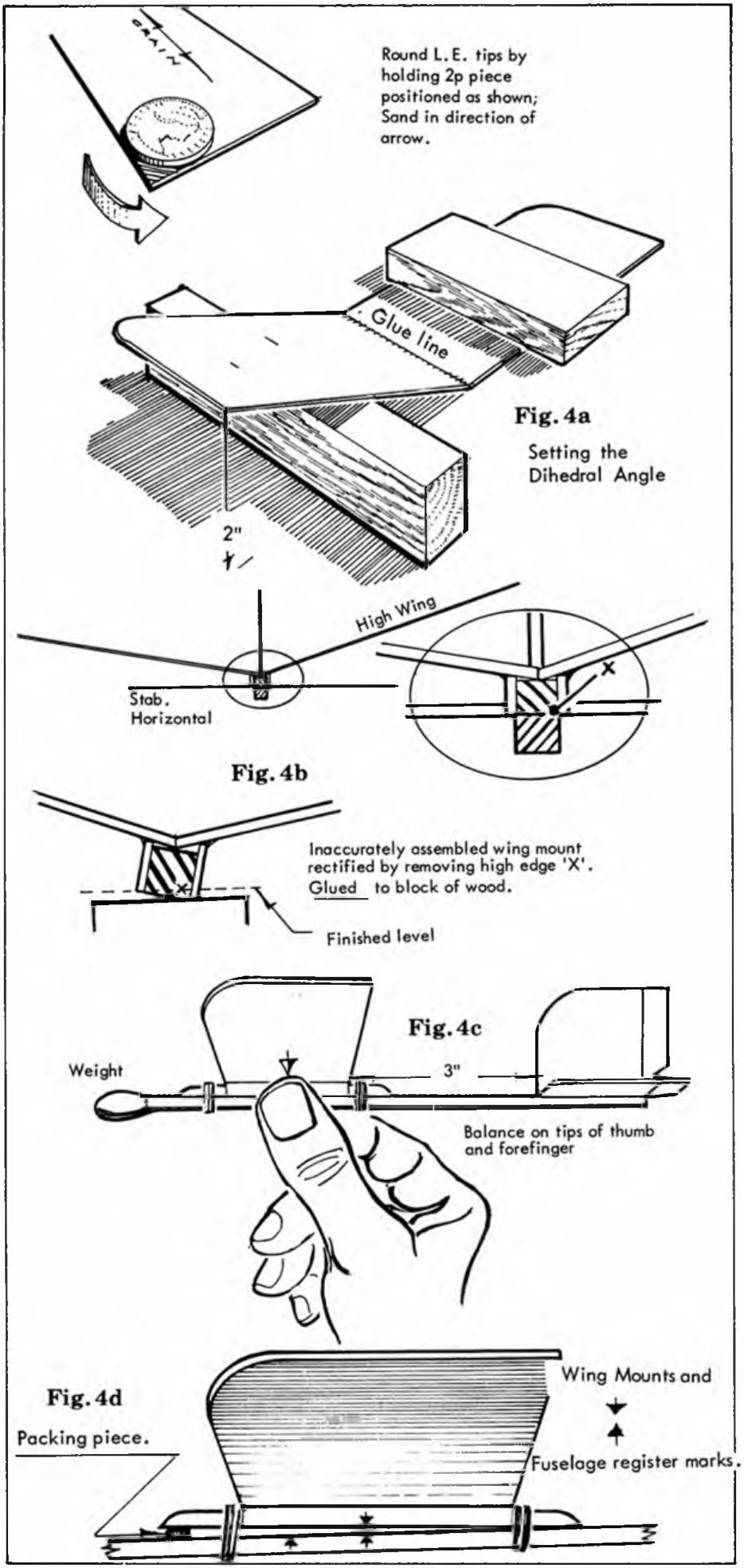


Fig. 4a Setting the Dihedral Angle

Fig. 4b

Fig. 4c

Fig. 4d

Turn now to the elevators and rudder. Make sure that the projecting sections of hinge are flat and glue them to stab and fin respectively. Leave a tiny gap ($\frac{1}{64}$in. or so) clearance to avoid the hinge binding. The final gluing jobs are securing the wing-mount to the wing and the stab/fin unit to the fuselage. Again, use the minimum of glue, checking for symmetry. (Dihedral line in centre of wing mount, fin in centre of fuselage, at both front (leading) and rear (trailing) edges). These joints must be thoroughly dry before proceeding, so allow at least one hour to set in a warm room (longer in a cool workshop).

Assembly and Trimming

Two $\frac{1}{2}$in. rubber bands, $\frac{1}{16}$in. wide are needed. These are known to modellers as 'D/T Bands' (explained later in the series). Loop each one twice round the fuselage, and roll one band back towards the stab. Place the wing in position, and roll both bands over the mount to hold the wing T.E. (trailing edge) 3in. from the L.E. (leading edge) of the stab.

Hold the model directly facing you and sight the dihedral against the horizontal line of the stab. There should be no tilt either way, but if there is, rectify by filing or sanding the high edge of the mount as shown (**Fig 4b**). (The mount must be flat, or it will rock, and trimming made impossible).

When all is square, add weight to the nose to make the model balance when supported half-way between L.E. and T.E. of the wing (**Fig. 4c**). This is known as a 50% C.G. position ... a loose but useful description of a model's balance point. Weight can be plasticene, fishing weights secured with strips of tissue and glue, masking tape or adhesive tape, in fact almost anything which comes to hand. As the model is mainly for indoor use, it is advisable to make sure that no hard or sharp weights project.

In this condition, the wing and stab surfaces lie parallel with the fuselage. This is known as a '0° -0° set-up' such as might be present in a missile. To produce flight as we understand and wish to produce it, *either* wing or stab must be angled.

Sliding a sliver of $\frac{1}{32}$in. scrap balsa between the L.E. of the mount and the fuselage (**Fig 4d**) tilts the wing up to produce 'positive incidence' (you may see this called 'angle of attack' by some writers).

Launch the glider, slightly nose down with a smooth deliberate action. With the packing in this forward position, the model will probably fly in a shallow dive. If it stalls (**Fig 5**) check that the elevators are level and in line with the stab. If the stall continues with elevators in line, re-check the C.G. If that is OK remove the packing and re-fly. Should the stall persist (*very* unlikely) add a little more nose weight until it is corrected. Mark the position of the wing.

If, as is more likely, a shallow dive has occurred, move the packing back towards

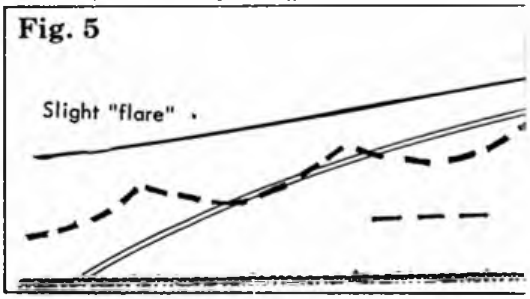


Fig. 5

the wing L.E. This should flatten the glide. What we are aiming for is a glide where a hint of stall is just beginning... and then we remove that by a slight decrease in packing.

To recap, we've been trimming by alterations to the angle of incidence (and although unlikely, the CG). Now we'll try *elevator effect.* Carefully bend the elevators upwards. (Hold each hinge in turn and aim to produce no more than 1/16in. deflection at the T.E.). Get one elevator right (no twist) then set the other to match. Test glide.

The model will stall. (If it doesn't, your trim for the flattest glide hadn't gone as far as it should, so go back to the start and increase the packing. There are three main ways of 'killing' the newly induced stall.

1. *Decrease* wing incidence (packing).
2. *Move* the wing *back* (i.e. the C.G. moves to a position further towards the wing's L.E.).
3. *Increase* nose weight.

Remember, each of these adjustments is independent of the other two, so if you have corrected the stall by *decreasing* incidence, then replace the packing to what it was before trying method 2 (wing movement).

For adjustment 3, the wing should be in its original position and with the packing in place.

Once you have a 'feel' for the model, its handling, adjustments and flying speed, move the wing 3¾in. from the stab. The C.G. will now be almost on the T.E. With the elevators set as for the last experiments, and packing in place, a stall will certainly result. This time, our adjustments may be:

1. Removal of the packing;
2. Bending the elevators *down* at their T.E. about 1/32in.

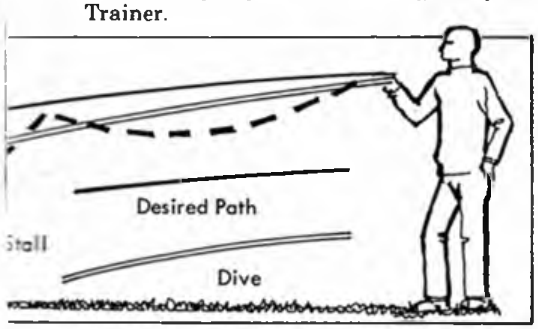
(Again these are independent adjustments). Trim 1. is our '0-0' set-up, and has no reserve of stability.

Indoor flying may not reveal this very dramatically but the model will tend to glide with a slight stall, a little 'stallier' than our very first glides. With the packing replaced and the second adjustment (down elevator) the glide will be much better. Excess 'down' will produce a dive.

The interaction of these adjustments will become clear as you proceed. One other variable remains to be added — rudder. You will expect the rudder to induce turn; to the *right* at its TE, model turns *right.* (All directions imply your facing in the direction of flight).

The rudder also produces an effect similar to *down elevator* as the glide will steepen as well as curve. Referring back, we know that either increased incidence or *up* elevator will improve the glide angle.

You can now experiment on your own, working systematically and patiently. This is the basis of glide trimming, and will prepare you to fly more specialised models, as most of them need to be adjusted for glide first, exactly as you've been doing with your Trainer.



Mini Mojo

Easy to build and fly, sports rubber model by R. Preston

MINI-MOJO was a logical development of the Mojo design *(Aeromodeller* December 1980); it was scaled down to suit a Sleak Streak plastic propeller or any other six-inch plastic prop. Its construction is very straight forward and should present no problems to a beginner. Wood selection is very important on a model of this size, so try to choose it carefully, i.e. try to keep the upper fuselage longerons stiffer than the lower longerons as this will help prevent the fuselage bending. Excessive weight is the biggest enemy to small models so try to keep the weight down by removing surplus cement from joints and choosing nice thin acetate sheet for the windows! PVA glue is recommended as it shrinks less than balsa cement and is less likely to cause any warps. The reward for this care is a much improved flight performance.

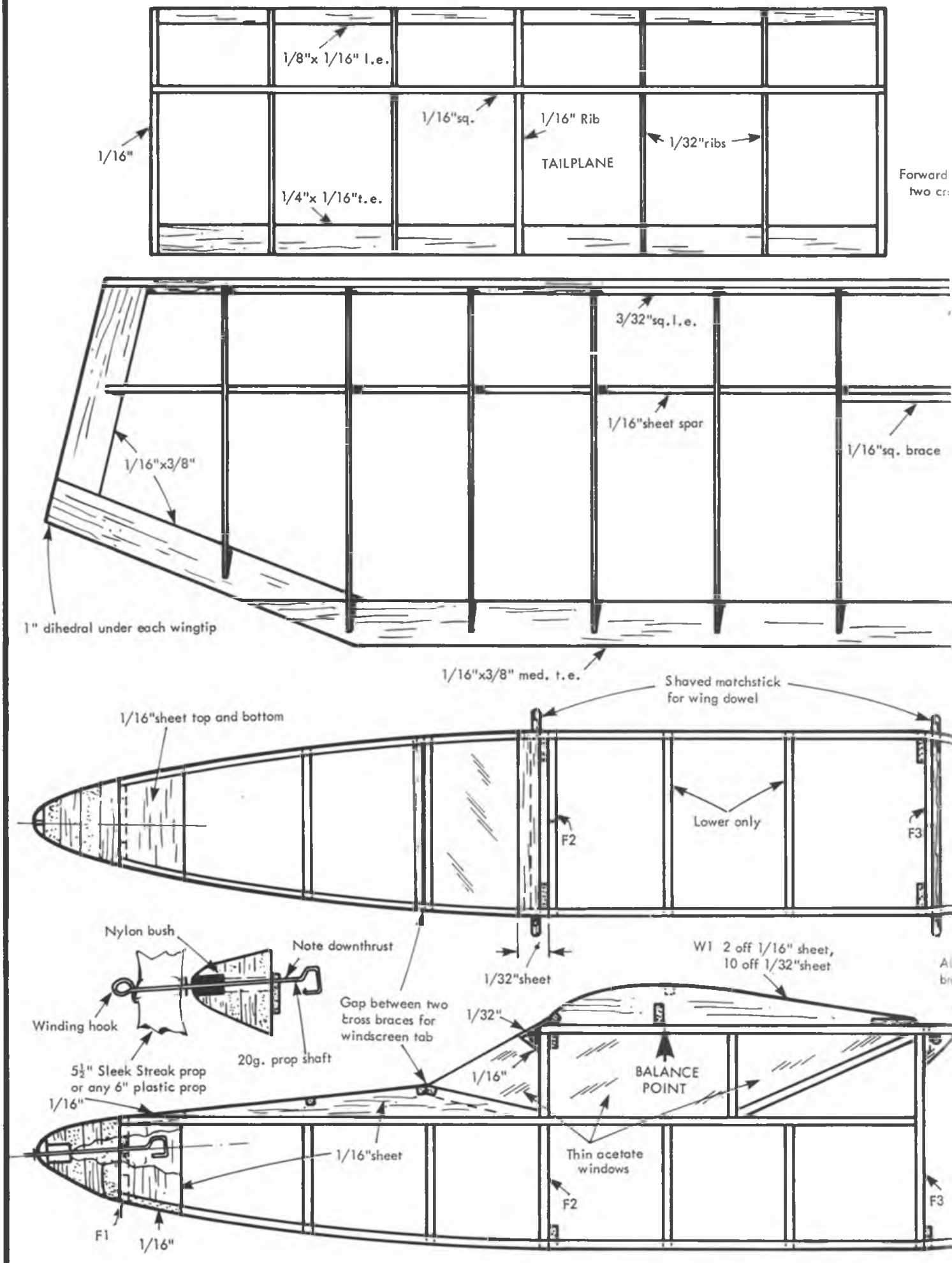
Let's start construction with the fuselage; lay out the upper and lower longerons onto the plan that has previously been greased with a candle or soap, cement into position all the vertical struts making sure that the rear motor dowel support is well cemented. The forward fuselage upper side panels can be added later when the fuselage is removed from the plan but before this is done the second side should be built directly on top of the first side. When these two sides are dry, they can be removed and carefully separated by a sharp blade. Cement F2 and F3 into position on one side of the fuselage, making sure they are at right angles to it; when dry, cement the other side of the fuselage to F2 and F3 as shown on the plan. Leave this to dry well and then add the forward fuselage upper side panels. Bring the tail-end together and cement; do the same with the nose and hold together with adhesive tape or elastic bands. Do *not* use pins as these tend to split the wood. All the cross braces can now be cemented into position but make sure that a gap is left between the two cross braces at the forward end of the windscreen to allow the tab on the acetate screen to fit between these braces. Add all the fillets but don't fit the wing dowels yet, this makes tissue covering so much easier.

The wings are very straightforward and are built directly over the plan as follows. Pin the main spars to the plan and then the trailing edges and tips; cement all the wing ribs into position ensuring that the 1/16th ribs are in the centre. Build the wings as two separate items, also making sure that the root end ribs are angled on the end of the spar, this gives the dihedral angle. Next add the leading edge, noting how it is shaped at the wing tip. When dry, remove the two wings from the plan and cement the two root end ribs together making sure that they are square to each other and that there is one inch dihedral under each wing tip. The 1/16in. square brace is now cemented into position across the centre section, this completes the wing.

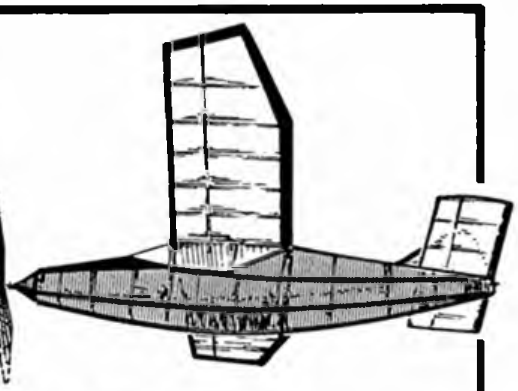
The fin and tailplane are also built directly over the plan; it is better to cut F4 and the tailplane centre rib from the same piece of balsa; this will ensure a good fit for the fin.

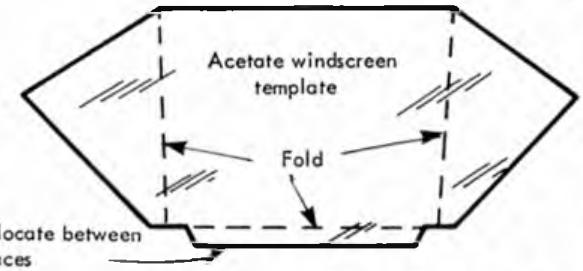
Cement the acetate windows into position after lightly sanding off any bumps from the fuselage. Cover the whole structure with lightweight tissue, preferably jap tissue, and then water shrink. Give the flying surfaces one coat of thinned dope (50/50) and the fuselage a coat of slightly stronger dope (70/30). Check for warps and remove any by holding in steam from a boiling kettle and gently twisting the structure in the opposite direction (take *care* when doing this). The wing dowels can now be fitted into position and the tailplane and fin assembly cemented onto the fuselage making sure they are all square. Make up the nose block assembly as shown on the plan making sure that the propeller freewheels freely. The model is completed by making up a well lubricated 9 inch loop rubber motor, which can now be installed. The balance point should be as shown on the plan, if not then plasticine can be added to the nose or tail to achieve this balance.

Test glide over grass once you have balanced the model, a small elevator trim tab can be made from the gummed part of an envelope and stuck onto the trailing edge of the tailplane. The prototype did not require any side thrust but if after launching under power, the model does turn too much to the left, then a small amount of packing can be added to the left hand side of the nose block to give some right thrust. Initial powered flights can be made with about 100 turns to observe powered flight trim, if everything is OK, then the turns can gradually be increased up to 500 using the stretch wind method. That's about it; have fun and let the Mini Mojo bring you luck.



MINI MOJO





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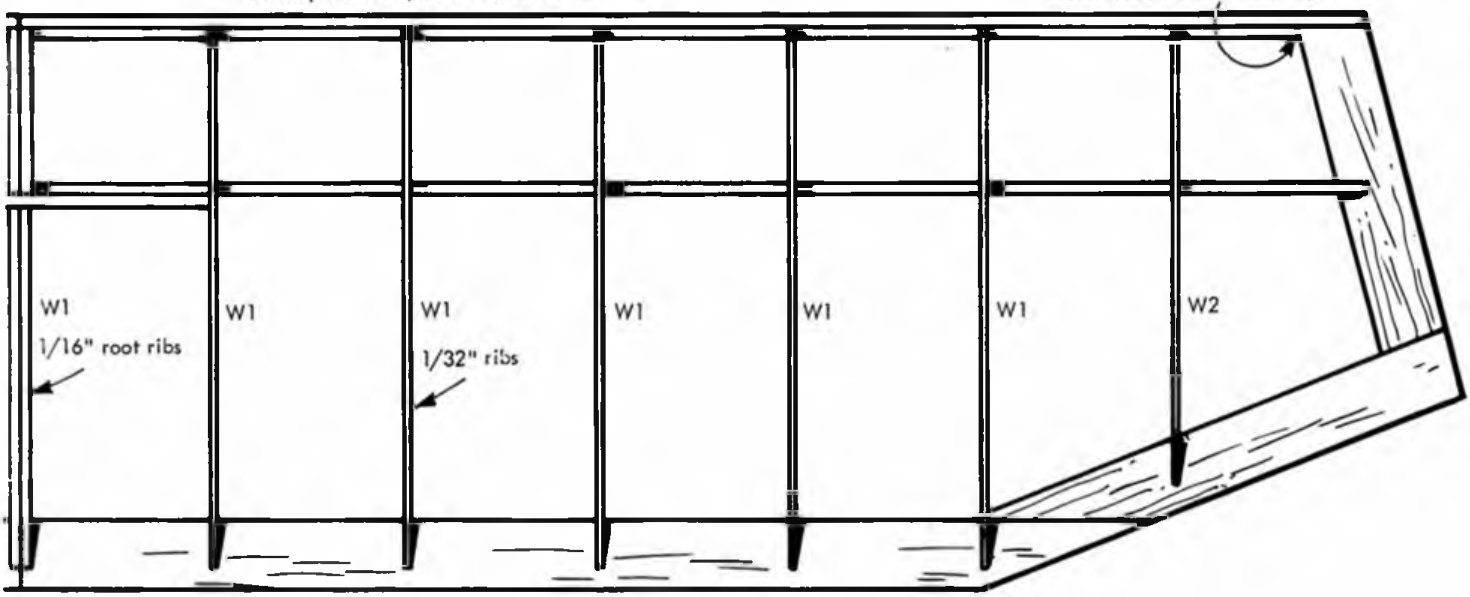
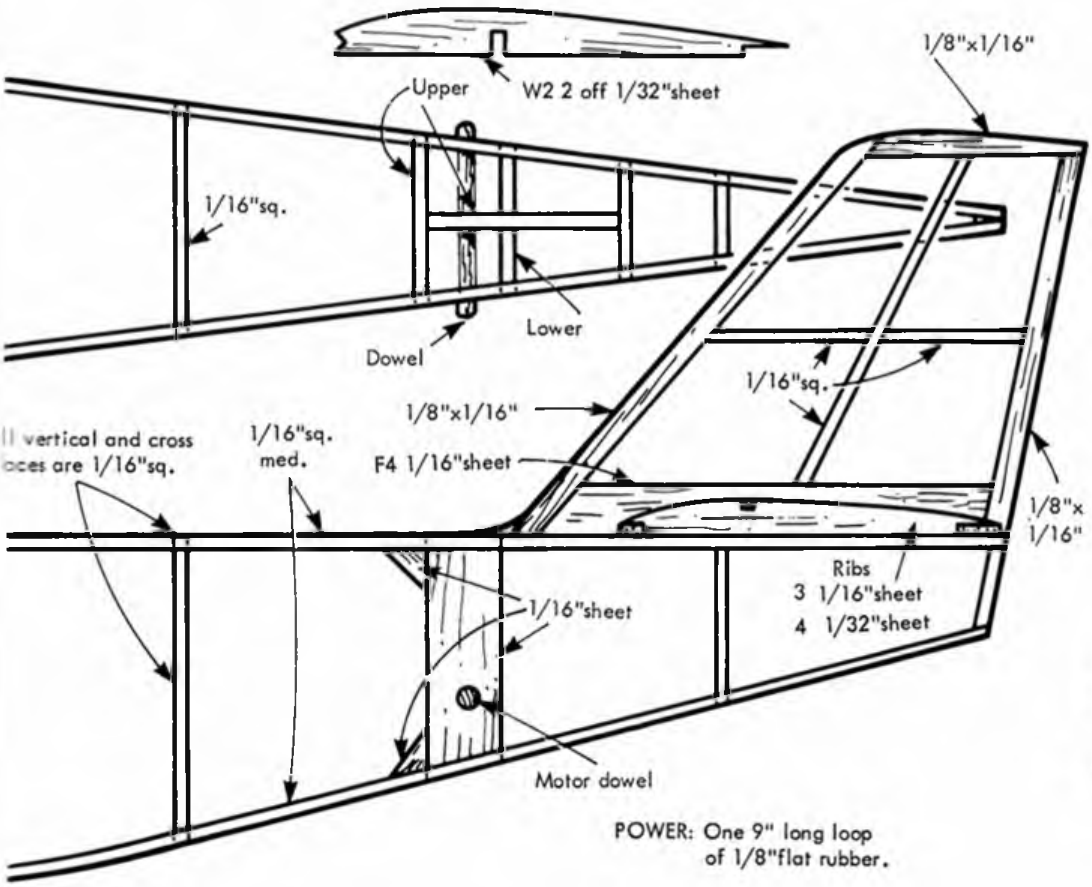
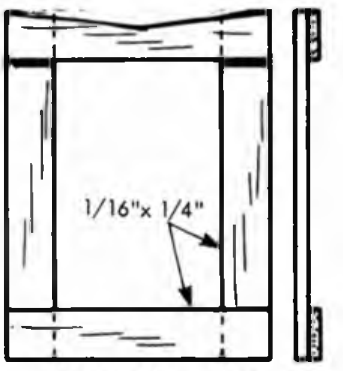
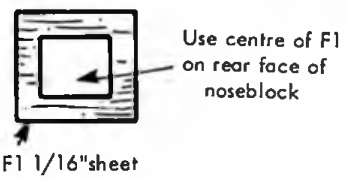


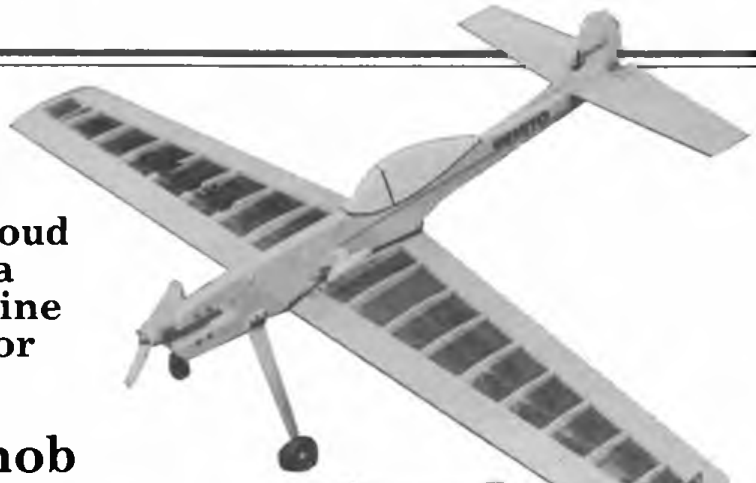
COVERING : Cover whole model in lightweight tissue use thinned clear dope.







POWER: One 9" long loop of 1/8"flat rubber.



John Stroud reviews a control-line trainer for 1.5-2.5cc

Modelhob YEYITO

IT IS A VERY LONG TIME indeed since I built a control-line kit and when the editor offered me the job of reviewing the Spanish *Modelhob* 'Yeyito' kit I gladly excepted. Something easy, and relaxing to build over Christmas was exactly what I needed.

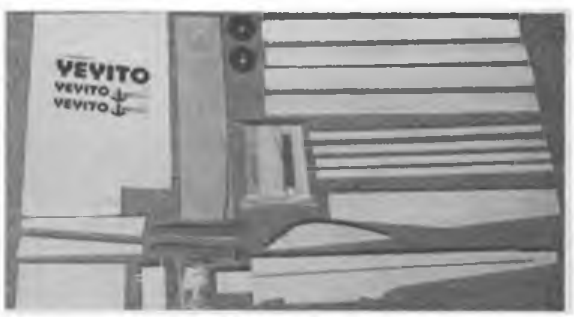
My guess is that the 'Yeyito' kit has been around for some time. Not that that matters very much, but it is reflected in the recommended engine size of 2.5cc. With a hairy modern 2.5cc engine it looked fairly obvious the model would be fun, fast and furious for an experienced modeller. My intention was to look at the kit through the eyes of an inexperienced enthusiast. To this end I obtained a new *Dav Cal* 'Sabre' (1.5cc) and set about running it in very carefully because I felt I would need every ounce of power it is capable of giving. More later about this choice.

The 'Yeyito' is supplied in a very attractive and stout box. Most of the information on the box is in Spanish, although it is easy to deduce the essential information of a 900mm span control-line kit for 2.5cc and the picture reveals it has a profile fuselage and built-up wings. On opening up the box one finds some very well cut wood, tissue, hardware and a comprehensive full-size plan. The hardware is particularly good, including a nice plastic fuel tank (non-aerobatic), dural undercarriage and wheels, tip weight, bellcrank and mounting bracket. My kit was an early import and supplied without instructions in English. (English instructions are now included . . . Ed.). If one has built a few models this would not be a problem, but the inexperienced might find English instructions useful. The kit is a typical 'dry' one and needs glue, paint and fuel-proofer for completion.

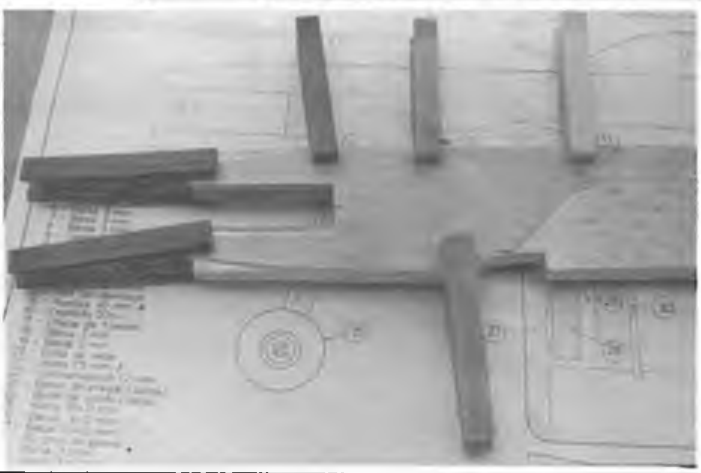
Closer examination of the balsa showed it is well shaped, but that some was noticeably heavier than other pieces. The only place this would really matter is in the wings and I put the heavier pieces to one side for use in the outboard wing. Unusually the ribs are supplied neither marked out nor shaped, but in straight strip which needs to be sanded to shape after assembly.

The fuselage can be glued together using a popular white PVA glue with little or no trimming of the parts. In my case I needed to modify the nose to move the bearers closer, in order to fit a smaller engine. Two strips of spruce did the trick plus a little extra $\frac{1}{16}$in. ply. An alternative would have been to mount the engine on a dural or plastic plate then bolt the plate to the nose. This method also makes it easier to fit different engines. I left the fuselage under weights on a flat surface to dry.

The wings need some work and cannot be 'thrown' together. The ribs are notched into both the leading and trailing edge. This job needs to be done carefully to make a satisfactory firm joint. First I marked out the notches *exactly* for width and depth noting that the trailing edge ones are at a slight angle. Cutting such notches out with a balsa knife is rather difficult and I prefer to use either a fine saw or a flat file. It is better to make them slightly tight and then open them up to fit with a small file. Those very cheap sets of small files are excellent for balsa wood (and ply) but not much good for anything else! I covered the plan with clingfilm and pinned down the leading and trailing edges after trimming the ends to the correct shape. Each rib needs to be cut to the exact length and glued in place. After all wing pieces had been assembled (except the wing joiner and part 25 next to the fuselage) they were left overnight to thoroughly dry. Next day they were sanded to the correct aerofoil shape. For most of my sanding I use strips of sandpaper glued to a piece of wood about 2in. x 1in. x 12in. These sanding sticks last a long time and are exactly right for this kind of work. The wings were then joined together still leaving out part 25. The supplied tip weight was epoxied into the outboard wing tip and the line guide glued to the inboard tip. It should be noted that the



Above and above right: what to look for in your model shop and what you get inside the box. Wood was good and shaped pieces all fitted together well. Left: one way of 'notching' the trailing edge. Right: use clamps, pegs or a weight to ensure that the ply doublers are well bonded to the fuselage.



Left: inboard wing under construction, ribs are sanded to shape when glue is completely dry (24 hours). Right: close-up of simple undercarriage fixing, easy to remove if desired. Below left and right: fore and aft control linkages showing very straightforward method of attachment.

covering instructions, in Spanish, show wings with dihedral which does *not* apply to this model *as they are meant to be flat.*

Whilst this is drying, the fuselage can have all the mounting holes drilled for the tank, undercarriage, bellcrank and engine. I mounted the engine well forward to compensate for its lighter weight.

The elevators were joined with the wire joiner supplied, epoxied in place and hinged with tape. After fixing the tailplane in place the fin can be added. I put on a little rudder offset not shown on the plan, 'just in case'. When thoroughly dry the wing and fuselage were joined and the final ⅛in. rib (part 25) put in against the fuselage.

Finishing the model is largely a matter of personal choice. I chose to use *Solarfilm* as it is the easiest way to get a good finish and keep the model light. The tissue supplied would have been better in some ways as it can be made more diesel fuel-proof. I have not worked out why diesel fuel sometimes makes Solarfilm go slack and sometimes it doesn't. If you intend to fly the model regularly using a diesel engine it is probably better to use either the tissue supplied for a light model or *Solartex* if you use a more powerful motor. I rubbed the model down with fine sandpaper and ironed on my film. Trim has been kept very simple using tape and the transfers supplied. I then gave the whole model a thin coat of fuel-proofer. Finally all the bits and pieces were bolted on and the control system installed. Some fitting and trimming was necessary to get a free-moving system.

If you opt for tissue covering I would strongly recommend putting it on with wallpaper paste. Cut the tissue roughly to shape then paint it all over with wallpaper paste. This can then be put on the model, paste side in, and pulled gently smooth. When dry you will find it is usually an excellent job, especially on the wings and needs only a couple of coats of dope. I normally restrict coloured paint to the fuselage and the whole airframe needs a coat of fuel-proofer. Remember that too much paint means extra weight and if you are using an engine of modest power keeping the weight down is absolutely essential. Lastly I bolted in my *Dav Cal* 'Sabre' with washers to give ample offset as shown on the plan.

Line length used for this type of model depends on the engine being used and the likely flying speed. A good 2.5cc engine will need 50 feet lines, whereas my model was tried out on some lightweight 35 feet lines.

During my wait for fine weather, five weeks in all, I began to have doubts about using a 1.5cc engine. In preparation I checked out a set of really light single strand lines and fitted a glass-fibre prop in place of the bendy one. At last dawned a Saturday which was bright and perfectly calm. Out to a field and run out the lines. A quick pull test and fire up the *Dav Cal*. The revs sounded good on the 8 x 4 prop, so my friend released the model. It bumped along the ground for about 12 feet and then was off. Surprise, surprise. It levelled out at a fair old lick as the motor picked up a few rpm. My fears were totally unfounded. Line tension was good even when flown high. Prolonged high flying made the engine sound laboured, so I brought the model down and tried a few gentle wing-overs. These were easy to complete with a good square pull-out accompanied by a slight cough due to the non-aerobatic tank. Perhaps at my age I have become forgetful, but I should have remembered how well even modest power will fly a light model. By the end of the tank I was a bit dizzy and wishing I had flown on 40 feet lines.

In conclusion, the 'Yeyito' is an excellent kit for a second model. It will develop a beginner's building ability one step on from an all solid model and at the same time provide a responsive model as a stage two trainer. It is obviously suited to a wide range of engines, so re-enginning it at a later date should be kept in mind. Worthwhile modifications especially for more powerful engines must be to fit an aerobatic tank and leave off the undercarriage. In this form I have no doubt at all you will have on your hands an excellent stunt and combat trainer. Good value at £9.75.

'Yeyito' is imported from Modelhob by *Micro-Mold*.

Above: power plant and fuel tank assembly, fine for training flight but 'Yeyito' could probably benefit from a small stunt tank. Left: finished model ready for covering. Right: just a small amount of trim tape will transform the looks of this smart model.

FREE FLIGHT SCENE

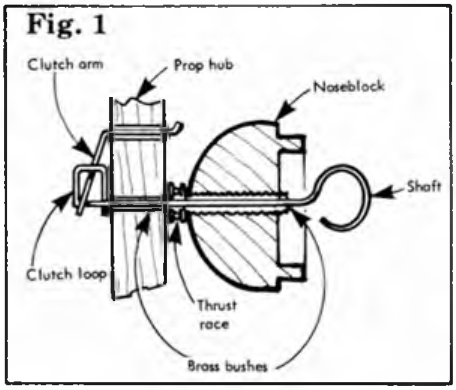
Dave Hipperson reports

Understanding Rubber Motors Part 1...

The increasing following for vintage Wakefield is doing much to rekindle interest in rubber as a power source. It also follows that many converts through this channel may not have had any experience with this form of propulsion before. To make matters worse they are learning on the most demanding of all rubber duration models! You learn fast on vintage Wakefields, cramming a quart into a pint pot but it can be a heartbreaking process. It is hoped that these articles will show some of the ways around the problems associated with all outdoor rubber duration models when flown to their limit. The rubber motor is an energy storage system and to extract the most from it we must understand its idiosyncracies. Success will come more quickly as it will then allow more time to be spent on the airframe and trimming.

The useful energy derived from a motor is directly proportional to how much is put in at the winding stage, minus of course heat energy generated by *friction* in the motor itself (minute), the prop assembly bearings (small even with side and down thrust) and the inefficiencies of the prop blades (large). It should not be forgotten that your effort in winding on the turns is what propels the model. Quite obviously the 'quality' of the rubber also determines how large a proportion of the energy put in at this winding stage is returned to the prop. The better the rubber, the more we get back. We will not concern ourselves with quality testing here but what is important is to differentiate between the types of rubber currently available, as this will effect arrangement of motor and trim. The best motor configuration will be affected by what make of rubber you use, so it might be best to discuss the two types right away.

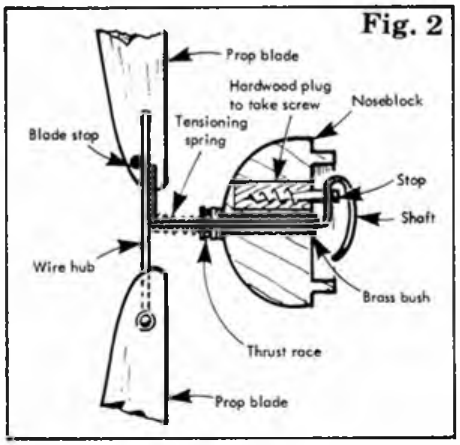
Fig. 1



Available rubber

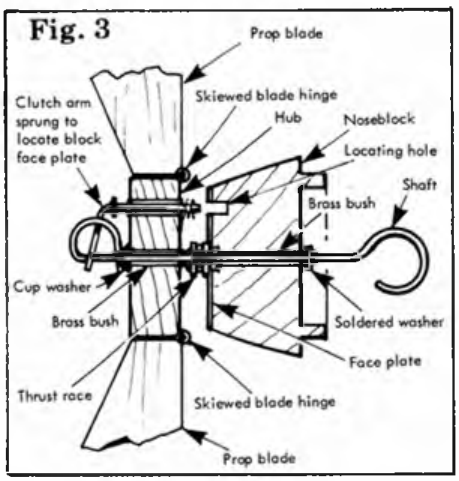
First, *FAI Supplies*, currently available over the model shop counter, is distinctive for its smooth grey surface. The other type is *Pirelli* which we are assured is no longer in production *but* is nevertheless regularly available and not just on the 'black market' as so many people insist. (Look no further than the adverts in *Aeromodeller*!) *Pirelli* has a slightly ridged surface finish which

Fig. 2



some believe tends to initiate the frays which may be a factor in why *Pirelli* seems to break strands rather earlier in its working life than a similar motor made from *FAI Supplies*. Although *FAI* does tend to be more robust and definitely more reliable in high summer temperatures, the smooth surface throws off lubricant and also makes effective knot tying very difficult in anything but dry rubber. *Pirelli's* ridges facilitate knotting easily but tends to be very variable in width and thickness, both from hank to hank and through any one hank. This need not be a problem as we will learn later, but certainly *FAI* is much more consistent in this respect and does actually tend to be rather thicker and wider generally than its Italian counterpart. As *FAI* is generally regarded as the easier of the two to obtain it is not surprising that many people

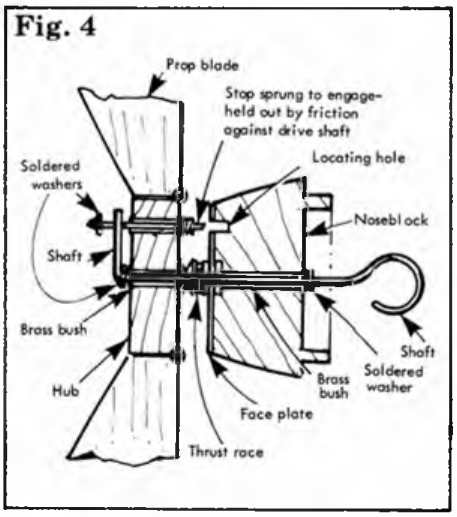
Fig. 3



are changing to it. However as we will learn later, it has very different performance characteristics to *Pirelli* and is overall slightly inferior as an energy storage medium as well. Supplies of both makes have certainly over the past few years been of a very consistent high quality — you would have to be most unlucky to find yourself with a 'duff' hank.

At present there are no other makes available in quantity although strip is manufactured in Japan and some I have tested certainly seems usable. It might not be superfluous to warn against use of the white *Aerostrip* which appears in certain model kits. It is not of sufficient quality for anything approaching contest work and I would advise against its use for any rubber model power. Holding the box lid on — maybe!

Fig. 4



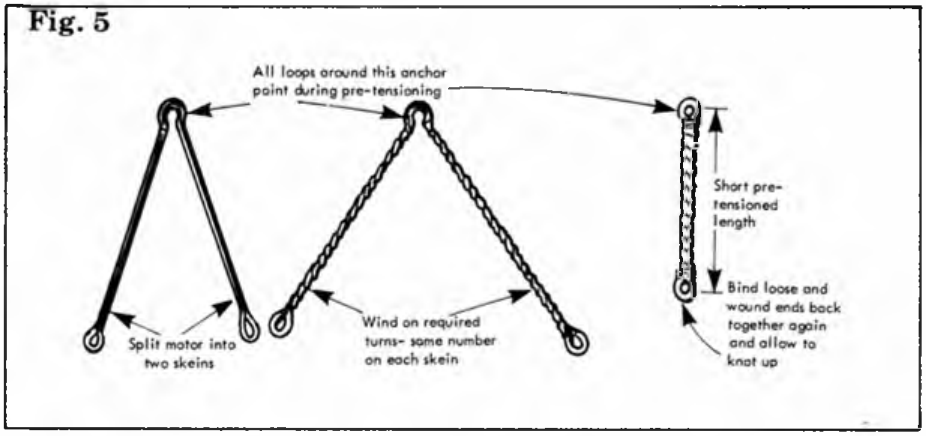
Lubricants

There are two types in common use. Either straight Castor Oil or a mixture of soft soap and glycerine. The latter is definitely the better lubricant but it has its drawbacks. It soaks into fuselage tissue and structure and will appreciably shorten the life of your model if you fly it a lot and are over generous with the 'lube'. Also because of its excellent lubrication properties it does tend to creep into knots and loosen them, particularly when used on *FAI Supplies*. It also has to be mixed — 50/50 by volume mashed together cold and preferably left to stand for some time to allow the bubbles to come out. Straight Castor Oil is ready to use right away and is recommended particularly if you intend to fly your models a great deal but don't intend to attempt full turns too often. It doesn't effect tissue and balsa in the same way and resists being thrown off the whirring motor, which makes it the ideal lube for *FAI Supplies*. If you are new to it, try both and see which you get on with best. Glycerine, soft soap (preferably brown but green is acceptable) and of course Castor Oil are all available at larger chemists.

Prop assemblies

If you have set your heart on building someone else's design as a first model, a recommended idea incidentally, and whether it be Vintage or a current type, you will have had the decision about what type of prop assembly you are going to use made for you. What type certainly affects how the motor is arranged and made up, so we will deal briefly with the choices. Obviously

Fig. 5



what the actual blades do themselves — that is whether they fold, freewheel or feather — is of little consequence to the motor but the hub *is*. Essentially the hub either freewheels, stops, or does a combination of both. To differentiate between one and another is important, so that you will know to which type I am referring later on!

The simple freewheel

This assembly allows the motor to run down completely and a clutch mechanism on the prop ensures that when it has done so, the blades become loose on the drive shaft, to windmill or feather depending on design (Fig. 1). The motor remains *tight* even when unwound.

The simple-stop or screw-stop

Here the prop shaft is tensioned against the pull of the motor by a spring in front of the nose block around the shaft. This spring is of sufficient strength to overcome motor tension just before the last turns run off *but only then*. At this moment the shaft is pulled forward, sufficient for a lug or bend on the rear of it to engage a stop in the back of the noseblock — often a simple wood screw with its head filed down. The prop in this way is stopped with turns and thus *tension* remaining in the motor and always in the *same position* (for folding) (Fig. 2).

Freewheel, fold and Montreal stop.

When we start to combine the idea of freewheel and stop, life gets complicated but the system becomes ultra reliable. The freewheel fold mechanism allows the motor to unwind completely and when it has done so, a clutch release system on the freewheel releases a pin stop to protrude back into a corresponding hole in the noseblock faceplate. This locks the hub in the same position each flight after it has freewheeled for just one revolution. Hence the advantages of both freewheel and simple stop mechanisms are combined. (Fig. 3)

Montreal stop

This mechanism, named incidentally after the club that invented it, retains turns on the motor and *never* freewheels but uses a similar release pin to engage in the nose block faceplate. This pin is activated when the torque from the motor has reduced sufficiently to let it spring back. Thus turns are retained on the motor in the same way as the simple screw-stop but the hub is locked in one position. It has the very considerable disadvantage of shock loading the prop and airframe at the end of the run, as the stop comes into action suddenly before all torque from the motor has been expended. Prop blades have been known to fly off at this moment and in extreme cases wings and pylons part company with fuselages, although this is more common amongst *modern* Wakefields. An advantageous facility however is that of being able to lock the blades very easily after winding and hence leave the model in the fully wound state as long as your nerves or more probably the motor will stand it. Useful for thermal picking or just relaxed flying. (Fig. 4).

You will realise from the above that in the cases of the simple freewheel or the freewheel fold system, it is essential that the unwound motor continues to have sufficient lengthwise tension to hold in the prop assembly and even in the case of the Montreal stop this is desirable to some extent, even though tension should be inherent in the system! For such assemblies therefore and the simple stop too if motors of enormous length are envisaged, we shall have to consider ways of retaining motor tension.

Pre-tensioning

Holding the noseblock in, artificially, with bands or pins is not the way to stop it falling out! It should always be held in by motor tension, as this virtually guarantees that the motor stays attached to the prop hook. To have it slip off can be very detrimental to the glide! If the motor in the unwound condition is longer than the hook to peg dimension, it has to be pretensioned when using a system that runs off all the turns. Pretensioning simply applies a few 'captive' turns that never disappear. The motor is split into two halves as near equal as the number of strands will allow. For instance a twelve strand motor would be divided into two skeins of six strands. These should be held at the centre and a number of turns wound onto each skein (wind in the usual direction), the two loose ends of the skeins are then bound together, released and allowed to intertwine (Fig. 5). The more pretensioning turns applied, then the shorter the finished motor becomes. The precise number of turns for your application are best decided by trial and error but as a starting point I find that a 100 gram motor (3.5oz.) made up to 44in. long, split in half with 50 turns applied to each half will shorten to about 36in.

A point worth noting at this stage is that the newly pretensioned motor finishes up *longer* than it will be when run down from full turns in the model. In other words if it appears that you need to pretension a motor to 27in. long to keep it tight, then you will probably find that it will finish up this length in flight if you pretension to 32-34 in. I have come unstuck once when pretensioning too tight on a fixed blade freewheeling prop, the extra friction against the clutch mechanism was sufficient to inhibit free running and the glide was adversely effected enough to ruin the flight. Of course with the correct freewheel-fold combination described earlier the freewheel period is so short (one rev) that a tighter motor would not be harmful.

Remember also that pretensioning reduces the possible maximum turns for any given motor. A good guide is to simply subtract the applied pretensioning turns from the estimated maximum — that should be close enough.

If you are using a simple fixed screw stop assembly then pretensioning should be unnecessary as the spring tension on the shaft should be such that sufficient turns are withheld on the motor to even out bunches and keep it tight. However usually this spring and screw arrangement will only cope with a motor up to 30% longer in its natural length than the hook to peg dimension of the fuselage. If the motor is going to be appreciably longer than this a few pretensioning turns can shorten it to a more acceptable length and avoid the prop falling out.

Rubber bunching

Another reason for pretensioning a long motor is to reduce the risk of rubber bunches upsetting the CG position and hence the glide trim of the model. Pretensioning on its own is only partially successful and the only way to guarantee that bunches don't occur is to have the motor drum tight between the hooks when run down, which is normally only possible with the freewheel fold and Montreal set-ups, when you have a sufficiently long fuselage or a heavily pretensioned motor. There is much to recommend the freewheel fold and numerous very consistent contest flyers use the system but often the amount of pretension is considerable and begins to make a noticeable dent in the turns remaining for flight.

There are two stages to bunching. What most people refer to isn't bunching as such. it is more likely the distribution of a short length of double knots, usually quite regular, somewhere along the length of the unwound motor. Obviously if that row of knots appears at the front then the CG moves forward and if at the back then the CG moves rearward. The more slack there is in the unwound motor then the more turns have to be retained by the stop and hence the greater the chances of these knots appearing and who can say where? Actually, we can control where but we will come to this later.

Real bunching is associated with a 'log jam' of knots, usually at the very rear of the fuselage and not always unwinding at all. It is often accompanied by unsightly bulges in the tissues just forward of the rear peg and then tearing noises when and if the bunches manage to free themselves in the air! Another side effect apart from massive stalls, is the real risk of the rubber levering the rear peg out and then ripping into the nose. This violent activity invariably induces either a perfect vertical dive or a mid-air explosion from which the fragments waffle down in comparative safety! Bunching of this sort is caused by too narrow a section at the rear of the fuselage. Avoid

designs with elegantly waisted fuselages at the peg and if designing from scratch make the fuselage large enough all the way along. Remember it should have to accommodate a winding tube anyway.

So let us return once again not to bunches but to this second stage knotting. With a screw stop system it is not always possible to allow enough turns to run off to eliminate the possibility of this altogether. To lessen the effects it is often beneficial to retain as few turns as necessary rather than more than necessary. It is surprising how few turns and how little tension is required to hold in the prop and stop the motor slopping about.

You will quickly discover that winding technique can effect the way a motor bunches when wound although to a much lesser extent on how it bunches when unwinding. However, the two are related, so it is worth developing a regular winding technique. Stretch winding is of course the only way to reach maximum turns. Various theories have been put forward on just how best this should be done. It depends on the length and cross section of the motor, the type of rubber being used and mostly the size of the fuselage into which it is to be wound. A safe system would be to start winding with the motor totally inside the fuselage and quickly stretch to about 3-4 times its natural length and continue winding at this stretch until approximately half the required turns have been achieved. Continue winding now whilst at the same time walking back in, to finish as the front hook once again lines up with the front former of the fuselage. Keeping the motor stretched too long will require your coming in quickly at the end and this will cause the motor to bunch badly at the front and it may foul the fuselage sides when you release the prop. Coming in too soon is safer but strains the rubber as more turns are applied when there is no lengthwise stretch. It is preferable to err in this direction if you are trying to squeeze a large motor into a short fuselage (vintage Wake) but stay out and risk it if you are winding a fairly thick motor into a long modern Open Rubber fuselage.

I have discovered that when using a prop assembly that retains turns — this doesn't apply to any freewheel system — the number of turns *to which* the motor is wound actually effects the way the *unwound* motor arranges itself. This can be particularly misleading when trimming a new model from scratch, when in all probability you will want to use very low power. It helps to know in advance what is likely to happen. It appears that from low turns, say one third, the unwound motor will tend to leave any double row of knots towards the front. As winds are increased so this residual knotting will tend to move rearwards until on full turns and only on *full* turns the double row will have moved to the very rear of the unwound motor. This can result in your carefully arranged, close to the stall glide, arrived at on the test hops being completely ruined when on full turns the resulting rearward CG shift stalls the model. The answer and more... **next month.**

SMAE Area event results

As in previous years I am offering the usual results service for all those who wish to receive complete copies of the six SMAE Area event results. If you require them please send me, D. Hipperson, *35 Anthony Road, Boreham Wood, Herts. WD6 4NF*, six SAEs at least 9in. × 4in. and a copy will be dispatched to you within 7-10 days of the close of each event. This service applies *only* to the Area events not to SMAE centralised meetings which are collated by the Free Flight Technical Committee and then copies held by the SMAE Records Officer.

Walt Ghio's torque meter seen at free-flight World Championships, see text.

Free Flight Technical Committee '84

Trevor Faulkner has taken over from me as Chairman for '84 and it is to him that you should send your pre-entries for all SMAE centralised events apart from the Nationals. This year entries are £1.50 per event — double on the day and a Season Ticket valid for all SMAE F/F events apart from the Nationals and Trials is available from the SMAE Competition Secretary for £15. To clarify; this Season Ticket should not be fonfused with the £10 Competition Licence which everyone must have if they wish to enter *any* SMAE contest be it only one event. Trevor Faulkner is at *4 Birchitt Close, Bradway, Sheffield S17 4QT.*

The SMAE Competition Secretary is Kath Watson and she is at *39 Bowhill Grove, Leicester LE5 2PD.*

The line-up of the Free Flight Technical Committee this year under Trevor's chairmanship is Mike Woodhouse, Ken Faux and Tony Cordes re-elected from last year and new men Trevor payne and Phil Ball. A very balanced team and our thanks are due to them in advance for taking this work on in such trying times. I hope all those who genuinely wish to see Free Flight competition flying flourish will give them their support and ideas.

Martin Dilly reports

Walt Ghio's torque meter

At the World Championships at Goulburn Walt Ghio of the US Wakefield team was using a very neatly-engineered torque meter, shown in the photograph. The heart of the device was a dial gauge; the rear motor peg was tubular and its holding pin was supported by a machined yoke, in turn supported in twin ball races. As the increasing torque rotated the yoke an arm attached to its support shaft reacted against a conical spiral spring and depressed the stylus of the dial gauge; although I have not taken expert advice on this, I suspect that the conical spiral spring was chosen to allow the torque to read directly off the dial.

It may also explain 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. This 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 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 when 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 one third 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 those turns before, it is more likely to upset the glide than the power!

D/T-ing on Mars

A fascinating paper for free-flighters appeared a few years ago in *Astronauts and Astronautics*, and deals with a project for a remote-controlled powered glider for aerial surveying in the atmosphere of Mars. I spotted details in Prasanta Banerjee's infrequently-published, but always fascinating newsletter *The Calcuttan*; the original paper was by Clarke, Kerem and Lewis.

Surface air density on Mars is about 1% of that on Earth and its gravity is about 37% of ours, and the aircraft will have to fly at 100 M/sec. or less, but at an equivalent of about

120,000ft. altitude on Earth. With a wing loading of 1.5kg/m² and a Reynolds number of between 45 and 90,000 (roughly the regime in which the faster-gliding F1As and normal F1Cs operate), this aircraft will also face problems of buffetting, since it will operate at a high mach number as well as a low Reynolds number, which today's F1Cs do not have to contend with. The airfoil chosen for the Mars Surveyor is the Eppler-E-61, found on page 61 of your copy of John Malkin's *Airfoil Sections*, and already used by some F1A flyers.

To land, the aircraft is intended to D/T, by nosing up with the power off and then changing the tailplane incidence to an extreme negative angle so as to completely stall the wing; this will give a 60 M/sec. rate of sink. Messrs. Clarke, Kerem and Lewis credit this technique in their paper as '...the standard way of retrieving free-flight models in updrafts ...' It is also mentioned that NASA have experimented with deep stalling like this as an emergency landing method for light aircraft.

The Trail of a trophy

When the British F1A team won their class at the World Championships last year and went up to collect their just deserts at the prizegiving banquet, the trophy, won in 1981 by the USSR, was not available for presentation. No note had been received as to its whereabouts, in spite of the FAI requirement that all trophies should be returned to the organisers of the next world championship in adequate time for presentation, this contrasted with the Wakefield Cup, whose 1981 winner, Lothar Döring, had freighted it from West Germany to Australia at a personal cost to himself of well over £100, in spite of the fact that he would be attending the Champs. in person.

CIAM secretary John Worth brought this up at the December Plenary Meeting in Paris, and it then transpired that the USSR had sent the glider team trophy to the FAI office in Paris, claiming that there were problems with sending it to Australia! Someone suggested that it could have been included in the diplomatic bag to the Soviet embassy in Sydney. After a suitable pause while the Soviet delegate was asked to suggest a means of delivering it to the current winning nation, it was mentioned that the British team manager was present at the meeting in his capacity of New Zealand delegate and just happened to have a car with him. At the resumed session the following day I had the pleasure of accepting the team glider trophy on behalf of Martin Gregorie, Steve Philpott and Andy Crisp, after which Ian Kaynes, Tom Køster, George Xenakis and I carted the immensely heavy lead crystal vase and its equally heavy marble base through the Paris Metro during rush hour en route for Britain.

A Free Flight feast in Yugoslavia

With the 1984 European F/F Championships confirmed for Livno from August 27 to September 2, the news of two Open Internationals just beforehand and within easy reach of the Championships site makes the idea of a fortnight's competing plus holiday an appealing one.

The Soko Cup, sponsored by Yugoslavia's major aerospace concern *Soko-Mostar*, is scheduled for August 22 at the superb dry lake bed site at Mostar, about 80 miles north-west of Dubrovnik on the Adriatic coast. Then on August 25th the Izet Kirtalic Memorial contest will take place on the huge 14 mile long site at Livno about 80 miles from Mostar, just before the European Champs at the same place.

Several of us competed at these two contests last year, and chose a Fly-Drive deal, which saved four or five days of driving to Bosnia and back; cost last year for a scheduled flight from Heathrow to Dubrovnik return for two people sharing a Renault 4 was about £240 each for a fortnight. With our team this year likely to have to pay their own entry fee of $300 plus their travel costs they will certainly be glad of your support when they represent Great Britain on what is surely the best free-flight site in the world — Livno.

Those going to compete in the Open Internationals will be sure of some excellent flying in very friendly company and a beautiful country; you will need an FAI competition licence, which you can get from the SMAE at no cost when you buy a contest Season Ticket. Entry forms for the Soko Cup can be obtained from Vazduhoplovni Savej Bosne i Hercegovine, 71000 Sarajevo, P.O. Box 177, Yugoslavia, addressing your request to Mr. Muhamed Ljutika; forms for the Livno contest can be had from Aero Club Izet Kurtalic, 71300 Visoko, Djure Pucara 3. If you are interested in the Fly-Drive option contact me c/o Aeromodeller; a group of us will probably get a reduced fare.

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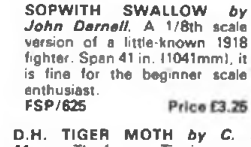

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