Aeromodeller

JUNE 1979 45p
(U.S.A. & Canada $2.00)

plans
BABY ACE
P51B MUSTANG

CO_2 - IT'S A GAS
R/C EQUIPMENT EXPLAINED

QUICKSTART

The Motors for the Modern Modeller

No spares-backing worries—if you have a Quickstart you can be sure of full and continuous use of your engine

DART .5cc

MERLIN .75cc

WASP .8cc

SPITFIRE 1.0cc

SABRE 1.5cc

Quality engineered for lasting performance

Appointed official service agents:
FOX MANUFACTURING CO. (UK), The Haven,
Rixey Park, Chudleigh, NEWTON ABBOT, Devon TQ23 0AN.

SEE THEM AT YOUR MODEL SHOP

DAVIES CHARLTON LTD

HILLS MEADOW, DOUGLAS, ISLE OF MAN

Aeromodeller

JUNE 1979

Managing Editor TONY DOWDESWELL
EDITOR MARTYN COWLEY
Editorial Director R. G. MOULTON
Managing Director GOSPATRIC HOME
Group Advertisement Manager M. GRAY

MAP HOBBY MAGAZINE

Comment

WHATEVER HAPPENED to the British Nationals? The Utopian dream of an annual jamboree. The real Biggie on the calendar of events to which modellers of all ages and interests can join together during one weekend, with numbers swelled by families and spectators, to communally celebrate this wonderful hobby sport. It has turned into a disjointed monster! Control Line and Radio have the best of what's left of a Notional Champs sharing Barkston Heath, with all the facilities campsite, marquees, public address etc. Thermal Soaring becomes the isolated social outcast at nearby Cranwell, while the Junior Free Flight events become an odd spectacle amongst an inhospitable host of wires and aerials. The rest of the Free Flight fraternity will be subject to an assault course venue of tank tracks, waist high grass and patches of woods that still conceal some of the country's best models from last year's Team Trials. Is an area of undulating waste land punctuated only with warning signs of unexploded bombs, devoid of such luxuries as toilets, campsite, perimeter tracks or runways, really going to attract the traditional club or family outing? We think not! And so the whole event degenerates to being just another competition in a calendar already overcrowded with everything, except a National Model Flying Meeting.

Contents

Volume XLIV No 521

Page 340 *Page 342*

On the Cover

The father/son team of Stan and Brian Perry sort out their 1/6th scale control line Fairey Flycatcher (HP61) at the 1978 Nats, RAF Barkston Heath. Those Fairey patent flaps had jammed – nasty! On the real machine, the flaps drooped for carrier landings, and Stan's 58in wingspan model did not quite live up to that requirement – hence a third place despite highest static score in the Nats contest. Better luck this year! Maybe we shall see the big Flycatcher at Old Warden on June 10th for the Aeromodeller All Scale day.

Next Month

YAK 18 double feature, Aircraft Described scale drawings of the famous full size aerobatic light plane, plus APS plans of Peter Miller's semi scale C/L stunter. CO_2 – It's a Gas continues with a survey of simple almost-ready-to-fly kits and conversion tips, with full size plans for a quick build fun biplane. Free Flight glider hints from John Cooper explaining circle towing techniques. R/C sports flyer continues with more helpful hints plus news of Free Flight Control Line and Scale modelling, on sale June 15th.

Model & Allied Publications Ltd

P.O. BOX 35, BRIDGE STREET, HEMEL HEMPSTEAD, HERTS HP1 1EE Tel: Hemel Hempstead 41221 (Mon.-Fri.)

Also publishers of

RADIO MODELS – MODEL MECHANICS
POPULAR ARCHAEOLOGY
SCALE MODELS – MODEL ENGINEER
MODEL BOATS – MODEL RAILWAYS
WOODWORKER – MILITARY MODELLING
MOVIEMAKER – PHOTOGRAPHY
GEMCRAFT – CLOCKS
OLD MOTOR .
UNDERWATER WORLD
PUZZLES DIGEST
PUZZLERS WORLD

ABC

Second-class postage rates at New York, N.Y. Registered at the Post Office for transmission by Canadian Post. American inquiries regarding news stand sales should be sent to Eastern News Distributors, 111 Eighth Avenue, New York, N.Y. 10011 U.S.A. Telephone (212) 255-5620 and Hobby Shop Sales to Bill Doan Books Ltd., 166-41 Powells Cove Boulevard, Whitestone, New York 11357, U.S.A. Telephone (212) 767 6632

Advertisement Offices: Model & Allied Publications Ltd., P.O. Box 35, Bridge Street, Hemel Hempstead, Hertfordshire HP1 1EE Tel: Hemel Hempstead 56117.

Subscription Department: Remittances to Model & Allied Publications Ltd., P.O. Box 35, Bridge Street, Hemel Hempstead, Hertfordshire HP1 1EE (subscription queries Tel: 0442 51740) **Direct subscription rate** £7.50 per annum, including index, $15 (U.S.) for overseas subscriptions.

AEROMODELLER incorporates the MODEL AEROPLANE CONSTRUCTOR and MODEL AIRCRAFT and is published on the third Friday of each month prior to date of publication.

Aeromodeller is printed in Great Britain by Leicester Printers Ltd, The Church Gate Press, PO Box 20, 99 Church Gate, Leicester LE1 9FR for the Proprietors and Publishers, Model & Allied Publications Ltd, (a member of the Argus Press Group)
Trade sales by Argus Distribution Ltd, 12-18 Paul Street, London EC2A 4JS

Veron – BUY AND FLY THE BEST!

A 'MUST' FOR YOUR SUMMER PROGRAMME!

DOMINO

SPORT OR COMPETITION A 1 CLASS GLIDER

46¾" SPAN (119 cms)

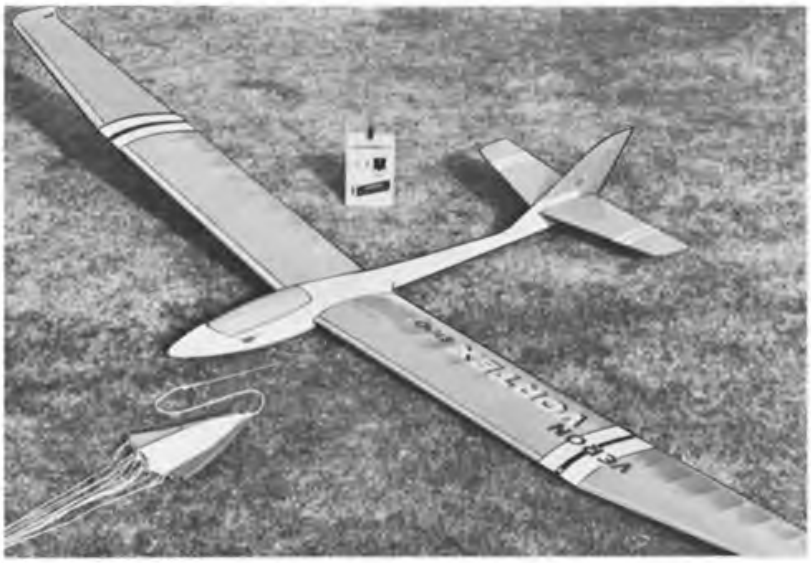
MODEL HAS ALL-BALSA JEDELSKY-SECTION WING FOR EFFICIENCY AND EASE OF CONSTRUCTION

Designed as a Competition class Performance or Sport Glider for International Class or SMAE Class A 1 Simplified All Balsa construction making for pleasurable assembly with a Jedelsky Type all sheet wing Ideal for Junior-class Sports Competitions – or even connoisseurs All selected Balsa for pod and boom construction

Kit is supplied with a shaped cast lead ballast weight

THIS MODEL IS IDEAL FOR INSTRUCTION AND FOR JUNIOR GROUP COMPETITIONS, SCHOOLS ETC

KIT PRICE – **£5 50**



THE VERON VORTEX 100S

THERMAL SOARER TO INTERNATIONAL 100 SPAN RADIO CONTROL FORMULA!

Super New Soarer incorporating all the best and proven features possible including low drag thin profile wing section for both penetration and light loading in all variable conditions

Once up – refuses to come down! Just as efficient as a Hillside Soarer For 2 Channel Radio

Span 99¼ (2521mm) Projected
Area 798 sq ins (Projected)
Wing loading (with 2 Channel Radio) – 8 1 ozs per sq ft
Prototype Model Weight – 41 oz
Ample room across fuselage for 3 Servos (for Brakes etc)

HIGH CLASS FINISH 2 PIECE FIBRE GLASS FUSELAGE IN WHITE GEL SURFACE

KIT PRICE – **£39 95**

OUR AGENT IN AUSTRALIA IS **DAWN TRADING 17 TENTERDEN ROAD BOTANY NEW SOUTH WALES 2019**

MODEL AIRCRAFT (BOURNEMOUTH) LTD
NORWOOD PLACE, POKESDOWN, BOURNEMOUTH

AVAILABLE FROM YOUR DEALER

SOLARBO

Yes, it is an Avro Lincoln, used as a flying test bed for Bristol Thaseus turbo-prop engines. Thaseus engines were installed in the outboard positions, with Merlins in the inboard positions. In this photo the Merlin props are feathered.

In our March advertisement we featured a Venom (?). Several aeromodellers have pointed out the question mark was justified! It was, in fact, a DH 100 Vampire F Mark III featuring new curved fin and rudder outline and lower horizontal tailplane surfaces – so we have been told. It's a good job we don't claim to be aircraft experts – only Balsa experts!

How about the Lincoln (?) in this photograph though, with both in-line and radial engines? We won't make it a competition – the answer is given bottom left – but we bet a lot of you knew it already.

Having produced our 'reply', it's back to the 'balsa factory' for the job we *really* know. Using our experience – and our factory units in Ecuador, USA and the United Kingdom – to make sure that Solarbo Balsa really *is* the best balsa you can get for aeromodelling. Right at the end of the production line we have inspectors who make sure that no 'boobs' get through – unlike our (occasional) mistakes in advert copy!

Why settle for 2-channel when 3-channel costs so little more?

RIPMAX FUTABA Medallion 3

It's the very latest proportional radio from Futaba, giving you THREE separate control functions at a very realistic price you CAN afford.

Nothing skimped. The same high quality, superb performance and outstanding reliability for which Futaba is world-famous. Simply the best in its class.

R/C Gliders

MEDALLION '3' gives you all the controls you ever really need. Rudder, elevator and spoilers on aerobatic gliders. Rudder and elevator on high aspect ratio thermal soarers, etc (you don't need ailerons on these) – PLUS an extra channel for independent operation of airbrakes or flaps. The '3' Tx is the master control for all your glider systems. Just buy an extra Rx and servos for each additional model.

R/C Trainers

These are nearly all *designed* for 3-channel radio – when Medallion '3' is the ideal choice. You know it will perform faultlessly through the toughest flying sessions. And the lightweight Receiver and Servos make it suitable for smaller as well as large models.

The MEDALLION '3' TRANSMITTER features two precision sticks with separate trims, with third proportional control function operated by top-mounted lever. Telescopic aerial . . . protected on-off switch . . . battery condition indicator. Specially matched double-tuned Receiver. Interchangeable crystals, giving you a choice of operation on any of the 12 standard 'spot' frequencies. An all-drycell outfit for initial economy.

SPECIAL INTRODUCTORY PRICE

MEDALLION '3' TRANSMITTER/RECEIVER Combo only £29.00
MEDALLION '3' plus 2 FD28M Servos* £54.00
MEDALLION '3' plus 3 FD28M Servos* £66.50

*These Servos specially recommended for AIRCRAFT; but you can use others in the Futaba range if preferred. Your local model shop can advise you on this. PRICES quoted include Tx and Rx Battery Boxes (batteries not included); wiring harness with switch; 1 pr crystals and frequency pennant. Outfits WITH Servos include servo mounting accessories.

AVAILABLE AT ALL RIPMAX STOCKISTS

Readers offer SPECIALS

Super Bargains especially for our readers

TASCO BINOCULARS

Powerful 10 × 50 Binoculars with fully coated lenses. Comes complete with lense covers, vinyl carrying case and straps. Essential for the outdoor person.

Normal price £32.95
Our Special Price £29.95

DUETTE PUSH BUTTON CAR RADIO

Dual polarity, 12v DC working Car Radio with audio power of 5.5 watts. Tunes 185-575 metres medium wave, 970-2000 metres long wave. Size 6.9 × 1.8 × 6 in. overall, comes complete with installation kit.

Normal price £29.95 **Our Special Price £25.95**

DUETTE PORTABLE CASSETTE PLAYER

Portable solid state Cassette Tape Recorder with automatic stop. Operates from dry battery DC power source or mains AC. Size 9.5 × 5.25 × 2.5 in. overall, comes complete with ear piece and AC mains lead.

Normal price £29.95
Our Special Price £26.95

TRAVEL CASES

Nest of three beautiful leather-look vinyl soft sided Cases 24", 26" and 28". Zipper closing and secured with tough buckle fasteners. Can be stored inside each other when not in use.

Normal price £43.40 **Our Special Price £39.50**

Please supply the following Readers Offer Specials:

- ☐ TASCO BINOCULARS
- ☐ DUETTE PUSH BUTTON CAR RADIO
- ☐ DUETTE CASSETTE PLAYER
- ☐ TRAVEL CASES

N.B. OUR PRICES INCLUDE POST, PACKING AND V.A.T.

(Please write in BLOCK CAPITALS)

Name.....

Address.....

.....

.....

.....

N B (i) Please make cheques, etc., payable to Model & Allied Publications Ltd
(ii) Allow 21 days for delivery
(iii) Goods found to be faulty will be replaced immediately
(iv) Please add 20% to our Special Prices if outside the U.K
Delivery could be up to 8 weeks

A.M.

MAP Model & Allied Publications Ltd
Dept. EO, 13/35 Bridge Street, Hemel Hempstead, Herts. HP1 1EE. Tel: (0442) 41221

DIGIFLEET CUSTOM II

THE NATURAL CHOICE!

- Available in 2, 3, 4 and 6 channel outfits.
- 6 channel illustrated, but 2, 3 and 4 channel transmitters similar in appearance.
- All models convertible to add more channels, up to 6 channel maximum.
- Excellent range, up to 1 mile in the air.
- May be all dry battery operation or all nickel cadmium rechargable battery with mains charger.
- Available direct from the manufacturer only – hence, the low prices!

FREE

Send large SAE or call in to our shop on Fleet Road for your FREE copy of our 6 page brochure, reprint of a magazine review, current price list and 1979 stock list.

OUTFIT PRICES

Convertible from 2 to 6 channels	All dry Battery	Dry Tx Nicad Rx	All Nicad
2 channel, 2 servos	**£68.50**	**£76.90**	**£93.50**
3 channel, 2 servos	**£78.50**	**£86.90**	**£103.50**
3 channel, 3 servos	**£93.00**	**£101.40**	**£118.00**
4 channel, 2 servos	**£85.50**	**£93.90**	**£110.50**
4 channel, 3 servos	**£100.00**	**£108.40**	**£125.00**
4 channel, 4 servos	**£114.50**	**£122.90**	**£139.50**
6 channel, 2 servos	**£95.50**	**£103.90**	**£120.50**
6 channel, 3 servos	**£110.00**	**£118.40**	**£135.00**
6 channel, 4 servos	**£124.50**	**£132.90**	**£149.00**

Additional FPS-3 servos **£14.50** each

Payment may be made by cash, cheque, etc. or by Access or Barclaycard, just write or 'phone in your card number for instant credit (also Hobbycard).

ALL PRICES INCLUDE VAT

UK Shipments: add £1.00 postage and packing on a complete outfit or 30p on units. Export shipments: subject 11% for the tax-free export price and add airmail postage. Any excess refunded.

Join SMAE – the model flyer's safeguard. Tel 0272 48869

FLEET CONTROL SYSTEMS, 47 FLEET RD., FLEET, HANTS. Tel: Fleet 5011

BADGER-the BIG air brush package!

Air brushes – propellants, filters, regulators, cleaners, masking tape, we have them all. Plus one thing more : a staff of experts to help you achieve the very best in air brushing. Badger equipment - you can't beat it !

Above 350 Model, a superb, single action air brush with a very high performance: 1/8" to 1½" spray pattern, depending on paint tip. An excellent choice for beginner and modeller alike. One of the nine models available.

I enclose 25p for fully illustrated brochure of full Badger range

Name: .....

Address: .....

.....

SM

MORRIS & INGRAM (London) LTD 156 Stanley Green Road POOLE Dorset Telephone: 02013-3757 AeM/6/79

MAKE A DATE AND BRING THE FAMILY TO:

MODELWEST 79

AT CHELTENHAM RACE COURSE

Approx. 3 miles from M5 junctions 10 and 11

SATURDAY and SUNDAY 16th and 17th JUNE

TWO DAYS
OF ENTERTAINMENT FOR THE WHOLE FAMILY

FREE PARKING

Admission Adults £1.00, Children 50p.
Gates open 10am. Licensed Bar & Refreshments.
Information on Party Rates and advanced bookings can be obtained from:

Mr T. B. Gilbert, 24 Castlemead Road, Rodborough, Stroud, Glos.
***Tel:* Stroud (04536) 4080**

Planned events:

Trade stands and exhibits; Full size and Radio Control model flying demonstrations; R/C Model Boats and Cars; Model Railways; including live steam; rides and family amusements, Film Show of Rothmans Aerobatic team. See the Models used in the TV series 'FLAMBARDS' in action.

ORGANISED BY MEMBERS OF THE COTSWOLD RADIO CONTROL SOCIETY

The Modellers Den

Classic Models

Classic Kits — by Gene Thomas — U.S.A.

All Classic Kits have full Documentation Book, Decals etc.

Church Midwing . . .39¾"	Suitable for .020 Free Flight or .049 Radio Control	£12.50
Super Parasol . . . . .37½"		
Baby Bullet . . . . . .27"		

Classic Peanut Scale Kits

Church Midwing Super Parasol Baby Bullet	£4.25

TELCO CESSNA
Complete with CO_2 motor and accessories £12.95

FRANK ZAIC YEARBOOKS

Yes, the Modellers Den are proud to present a collection of Frank Zaic Yearbook reprints which are authentic in every detail. Many of these now famous yearbooks contain plans for more than 100 different models and the design articles were all selected by Frank Zaic for their memorable contribution to the aeromodelling field. Each of the yearbooks gives you the designs and trends as they have been developed through the years — the older books are a fascinating, complete historical digest of model aviation!
The Frank Zaic yearbooks are an important part of any aeromodellers reference library. They're tremendously interesting. And excellent value for money, too!

Here are the Frank Zaic Publications available now:

Circular Airflow £2.30	Model Aeronautic Yearbook	1951/52 £2.50	1959/61 £3.50
Model Aeronautics	1935/36 £2.30	1953 £2.30	1964/65 £3.50
made Painless £2.50	1937 £2.30	1955/56 £3.00	You can obtain your
Model Glider Design £2.50	1938 £2.50	1957/58 £3.00	copies from

tmd

Retail Outlets:

THE MODELLERS DEN LIMITED
65, Fairfax Street, Bristol, BS1 3BG. Phone 23744
2, Lower Borough Walls, Bath, BA1 1QR. Phone 60115
39, High Street, Cheltenham. GL50 1DY. Phone 34644

Mail Order Address:
Dept 79/4, 84 Winchester Road, Brislington, Bristol BS4 3NG Phone 0272-775267
Please add 15p per £1.00 spent — Orders over £10.00 post free.

MICHAEL'S MODELS

Leading Control Line Specialists

646-648 HIGH ROAD, N. FINCHLEY, LONDON, N12 0NL Phone: 01-445 6531

Open 6 Days a Week 9.00–6.00

COMBAT

Superstar FAI Kit	£5.95
Superstar Plans Only	£1.45
Starlet 1·5cc Kit	£4.95
War Lord Kit FAI	£6.70
Mini Lord ½A Kit	£5.40
Jaguar FAI Plan only	£1.05

FAI ENGINES

Super Tigre G20/15 Glow	£21.78
100ml Syringe	£1.60
Griptight Pacifiers Tanks each	£0.15
Laystrate 100ft L/W a reel	£0.67
Varley 2v Battery	£6.55
Taylor 1½v Comp Plugs each	£0.62
Super Tigre STD Plugs	81p
Super Tigre N.V.A.	£1.23
Super Tigre Needles	38p
Rubber Fuel Tubing 40"	£0.44
Amp Meter 0-5 for glow plugs	£1.66
Mustard Tin Tank	£0.49
Tornado 7 x 4 Props each	£0.36
Taipan 7 x 4 Props each	£0.55
NEW Mick Tiernan's World Champs Combat plan	£1.65
NEW Dave Woods Super Titan II plan	£1.30

STUNT

Aero Star (Foam Wings)	£15.95
Mercury Crusader Kit	£18.74
Super Tigre 46 Stunt Engine	£34.28
Super Tigre 46 Stunt Engine Silencer	£6.39
O.S. 35 Stunt Engine inc. Silencer	£23.58
Fox 35 Stunt Engine	£16.14
Fox 35 Stunt Engine Silencer	£4.73
Merco 35 Stunt Engine	£15.95
Merco 35 Stunt Engine Silencer	£2.95
Sullivan Ready Made Lines ·012in x 60ft or ·015in x 60ft each	£3.15
Sullivan Lead Out Kits (Small A·B) or (C·D Large) Size	£0.65
4½" x 2" x 1" Stunt Tank	£1.10
Bellcrank, upright or suspended each	£3.35
New Cheap 35 Stunt Engine "Flash" including Silencer only	£14.95
"Magnum" C/L Handle Adjustable	£2.50

SPEED AND TEAM RACE

A.R.M. T/R Crutch	£4.25
Drazek T/R Crutch	£4.25
Propeller Pitch Analyser	£19.95
Glo-Bee Racing Plugs	£1.50
Nisson or Pilot Photo Tacho	£18.25
OPS Full Length 'B' Speed	£16.95
OPS FAI T/R Pan	£9.50
Irvine FAI Speed F/L	£8.75
Irvine 'B' Full Length Pan Speed	£8.75
Irvine 'B' Half Pan Speed	£8.75
'B' Half Pan Speed	£4.50
Rossi FAI Full Length Speed Pan	£8.50
Rossi Asymmetrical Half Pan FA1	£12.00
Nelson T/R Crutch Undrilled	£12.80
Drilled	£14.50
Glo-Bee Cox 049-051 Racing Head Inserts for High Nitro Fuels each	£1.45

New Range of Fibre/Glass T/R Props.

Type Drazek 7 x 7⅛	£2.00
Type Bugl 7 x 7⅛	£2.50
Type John Gray 7¼ x 7⅛	£2.50
Type Metkemeyer 7 x 7⅛	£2.50
Type Petersen 6⅞ x 7⅛	£2.50
Type Kroon 6¼ x 7⅛	£2.50
Type MVVS 7 x 8	£2.00
Type McCann 7 x 8	£2.50

NEW MONO LINE HANDLES

Stanzel Type with safety strap	£32.50

FOX CONNECTORS

Small, Medium, Large 4 per pack	£0.30
OPS Plugs, Special Racing each	£1.50
SMAE Safety Prop Nuts 5mm–UNF-untapped	£1.35
Stainless Steel Single Strand FA1 T/R C/L Wire 33m on 4" reel	£2.50

GOODYEAR

Ginny Kit	£6.77
KB 21 STD Goodyear engine	£39.95
Don's Quick Fills	£0.85
Rotary Bellcrank	£0.43
OPS 21 STD	£39.50
Single Wheel Alloy Hub	£1.04
NEW Aluminium Circular Bellcrank	£1.20
Housing for Bellcrank	£1.20
NOW AVAILABLE: STX15 Steel Piston/ Liners to replace ABC ones for Combat	£12.27

FREE FLIGHT & SPARK ACCESSORIES

Remco 29 Spark Ignition Engine	£59.25
Forster 29 Spark Ignition Engine	£49.50
Forster 35 Spark Ignition Engine	£49.50
3 Volt Coil	£7.00
Condenser	£1.45
HT Lead	£0.50
¼ x 32 TPI Plugs	£2.25
AC Ignition Cut Offs	£3.95
KBS 6 Min Timer D/T	£5.35
KBS 20 sec Fuel Cut Off	£4.80
KBS 30 sec Fuel Cut Off	£5.05
Robert Super Pumper for Petrol Engines	£16.50
Jap Tissue a sheet	£0.13
Silk a pack	£2.80
Rubber Strip 1/30in. x 1/30in. a foot	£0.01
1/16in. x 1/30in. a foot	£0.01½
Cox Diesel Conversion Kit ·020 or ·049 or ·051	£6.50
NEW ·09 Kit	£8.65
½A Tarno-Carb: fit TD ·049-·051	£7.95
Tarno Housing & Motor Mount for Cox 049 Reed Motors, takes R/C Carb	£2.85
Full Range of Trexler Wheels from 1⅞ to 4¾	

FIBREGLASS PROPS

Bartels 7 x 7½, 7 x 8, 7 x 3½, 7 x 4, 7 x 6	£2.60
Bugl – Baumgartner FAI T/R	£4.75
Fischer-Nitsche FAI T/R	£4.75
Metkemeyer FAI T/R	£4.75
8 x 8 'B' Team Race	£3.50
8 x 9 Jehilk 'B' T/R	£3.50
New Carbon Fibre Speed Props. Lenzen 6 x 6	£4.75
Tribe Bros Props Smith Fry Goodyear	£2.10
Tribe 3.5 Goodyear *NEW*	£2.10
½A Team Race *NEW*	£2.10
FAI Team Race	£2.50
'B' Team Race	£2.50

KELLY PROPS

MVVS type 180 x 180	£2.45
Nova 180 x 170	£2.45
John Gray type	£2.45

NEW FAI T/R GOODIES

Tank Valves STD	£6.25
Tank Valves Nelson	£6.25
Finger Valves	£3.95
½A Circular Bellcrank with Housing	£3.95
Mouse Racing or ½A Streamline Wheels, pair	£1.20
Team Racing Wheel Bushed	£2.40
Comp Screws (Allen Heads)	80p

NEW ITEMS

Fox Metal Elevator Horns each	35p
Fox C/L Handles Adjustable	£2.95
Full Range of Cox Spares – Head – Props	
Piston Liners, Cox BB & Golden Bee	£2.80
049 BB on TD Mufflers	£3.20

FIBREGLASS ITEMS

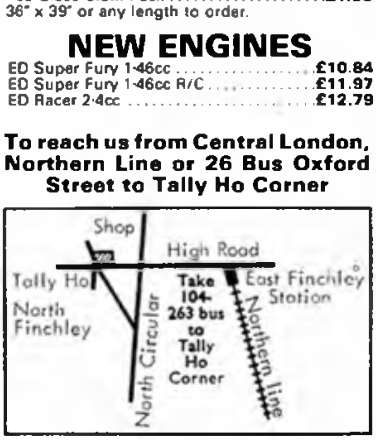
K.B. Polyester Resin	£5.95
Epoxycote Fuel Proof Paint – Use with our 1oz Cloth. Colours: Red, White, Black, Blue, Yellow each	£1.99
'KB Fibreglass Cloth ½oz, 2oz, 6oz pack	£3.25
Tufcote for Wings	£0.70
1oz Glass Cloth Pack	£1.95

36" x 39" or any length to order.

NEW ENGINES

ED Super Fury 1·46cc	£10.84
ED Super Fury 1·46cc R/C	£11.97
ED Racer 2·4cc	£12.79

To reach us from Central London, Northern Line or 26 Bus Oxford Street to Tally Ho Corner



Send 40p in stamps for new comprehensive lists. Refundable with first order.

MAIL ORDER A PLEASURE
EXPORT ORDERS WELCOMED

All inquiries must be accompanied by SAE

Phone Barclaycard, Access No. for same day service

BARCLAYCARD VISA master charge

ED Racer 2·4cc R/C	£13.74
ED Super Racer 2·46cc	£14.47
ED Super Racer 2·4cc R/C	£15.47
OPS 29 Glow 'B' T/R	£56.50
KB 29 Glow 'B' T/R	£66.95
Super Tigre 46 Stunt	£34.28
MVVS D7 Diesel 2·5cc	£19.75
MVVS Schneurle RV Glow	£27.50
Indian Mills ·75 Diesel	£9.45
Super Tigre X15 ABC Glow	£33.40
Super Tigre X15 Steel	£33.40
Super Tigre G20/15 Glow	£21.78
Super Tigre G20/15 Diesel	£21.78
Super Tigre X21 STD	£43.78
Super Tigre X29 Speed	£48.44
Super Tigre X40 Speed	£48.44
OPS 29 Speed ABC	£54.50
PAW 1·49 DS	£9.72
PAW 1·49 DS Tuned	£12.85
PAW 2·49 DS	£10.26
PAW 2·49 DS Tuned	£13.09
PAW 19 DS	£10.80
PAW 19 DS Tuned	£13.70
PAW 2·49 DS R/C and Sil	£17.82
PAW 19DS R/C and Sil	£18.36
Mabuchi Aero Motor Kit	£10.15
ZOM Mk II 2·49 Diesel, Spanish	£18.95
LLAM 2·5cc Diesel, Spanish A1	£22.95
LLAM 2·5cc Glow, Spanish A3	£21.95
LLAM 2·5cc Combat Diesel A2	£23.95
LLAM 3·5cc Glow A4	£24.95
LLAM 2·5cc Plain Bearing Diesel A5	£16.95
LLAM 2·5cc Plain Bearing Glow A6	£15.95
Kingcat 1·49 Diesel	£11.71
Kingcat 1·49 De-Luxe	£13.58
Glow Cat 1·49	£14.87
Fox 35 Stunt	£16.14
Fox 36X Combat Special	£29.92
Webra 2·49 Diesel Winner	£18.40
Webra 1·49 Diesel Record	£16.75
* OTM ·8 Diesel	£5.10
Mk 17 1·49 Diesel	£8.00
Cox ·049 Babe Bee	£8.95
Cox ·049 Black Widow	£9.65
Cox ·049 TD	£14.50
Cox ·051 TD	£14.50
Cox ·09 TD	£16.00
Cox 15 Medallion	£19.50
Cox ·010 TD	£15.00
Cox ·020 Pee Wee	£8.95
Telco CO_2 Kit	£8.45
KB21 Glow Goodyear	£39.95
Humming Bird ·03 Glow	£9.95
Seagull ·061 R/C Glow	£13.95
OS 35 Stunt	£23.58
Merco 35 Stunt	£15.95
Cipolla 1·5cc Glow STD	£9.62
Enya 35 III Stunt	£31.80
Thunder Tigre 25 STD	£12.95
Indian Mill. 1·3 diesel	£11.75
Indian Frog K150 diesel	£8.45
K200 Diesel	£8.95
* Russian PNTM 2·5cc Diesel	£9.50
* Russian 12B 2·5cc Diesel	£9.50
* For Collectors only	
Flash 15 Stunt	£10.95
Irvine 20 Stunt	£33.69
Irvine 40 Stunt	£42.69

Although the prices on this list were current at the time of printing (3-4-79) we reserve the right to supply at the price current when the goods are despatched.

We buy all types of engines for cash. Send for best quotation by return. Phone for new & secondhand stock position. Payment by Barclaycard, Bank America Card, Access Mastercharge, Eurocard & Vista Credit Cards plus Negotiable Currencies.

Hangar Doors

Details of Horst Handler's remarkable Radio Controlled Ornithopter show helicopter style motor installation connected via a clutch mechanism to drive arms exiting through fuselage sides which operate flapping wing tips. Complete model goes through its paces on a test stand and we eagerly await fuller details of flight testing.

R/C ORNITHOPTERS

Recent development of efficient engine cooling, clutch mechanisms and controllable drive ouputs for use in R/C helicopters has made the ornithopter a practical proposition. After John Drake's machine was described in the *1978/79 Aeromodeller Annual* (still available!) we heard from Horst Handler of Schlierbach, West Germany, who built the Lippisch wartime design. This has a helicopter style power unit in the forward fuselage, driving rotary cranks to the flapping tip units. Anymore anyone?

EUROPEAN CHAMPS

It's official, the FAI European Control Line Championships is now on! Following last month's announcement of an alternative open international event in Utrecht, in the absence of proper Championships, the French have now stepped forward to run the FAI event. The venue is Marville in Northern France near the Belgian Luxembourg borders, arrival on August 29th with contests on August 30th-September 2nd. All four C/L events will be flown F2A Speed, F2B Aerobatics, F2C Team Racing and F2D Combat. Camping is available and supporters should contact C/L Tech Committee Chairman Bob Horwood, 21 Burghley Road, St Andrews, Bristol 6. This late announcement leaves insufficient time for a team trials to be organised and the 1978 World Team will be invited to represent Great Britain for this European event.

EPIC FOREST DECISION

Swift action from Chingford MFC and the Wanstead Elfs Club to gauge public reaction to a proposal by the Epping Forest Conservators to ban powered model flying which has continued since the early 1900s, has resulted in a DoE decision to allow model flying all year round. A petition of 10,500 signatures was collected including residents local to the flying site and at least ten MPs took up the case as well as the Sports Council. The DoE ruled that the Conservators had not proved any reason for the need to so severely restrict modelling activity. The new bye laws now permit flying for 365 days of the year from 10.30am until sunset, subject to firm controls on noise. All power driven model flyers require a permit to verify their membership of an approved Model Club and proof of third party insurance. The two local clubs wish to thank all those who helped them defend their rights to pursue their model flying and in return offer their help to other clubs facing such restrictions.

SCOTTISH NATIONALS

News from north of the border details the plans of the Scottish Aeromodelling Association (SAA) to hold the 1979 National Championships at Lanark Racecourse on 2nd and 3rd June. Events will be held for F/F, C/L and R/C competitions backed up by Trade stands and flying displays. The Royal Air Force will again be in attendance and Scottish Television have already shown great interest in the meeting.

INDOOR INTERNATIONAL

Belgian modellers extend an invitation to attend their third international indoor event which has received good support from European flyers. Scheduled for September 1st and 2nd in Liege, events include F1D, "Papier" (Easy B?) and Peanut contests. For a full dossier of information on the competitions and hotel accommodation write to: Monsieur Van Hauwaert F., P.A.T., Grand Place I Bte 52, 4110 Flemalle, (Liege), Belgique.

SUEBIA CUP

Of interest to Control Line flyers abroad on holiday this Summer, is news of this annual German contest for F2B Aerobatics and F2D Combat on June 16–17th. The event, again run by the Bietlgheim Club near Stuttgart, usually attracts good support from German, Swiss and French participants, camping or clubroom accommodation is available and entry fee approximately £4 includes a free supper. Details from Peter Willmer, Marienstrasse 9, 7121 Lochgau, Germany.

Letters

IS IT A RECORD?

Dear Sir,

I am writing to find out if a record exists for consecutive control line eights with a dead engine, as this Sunday (March 11th) a longstanding member of the Fenland Model Aircraft Club achieved 110 with a modified Flight Streak and PAW19 as ballast. It would be interesting to read letters in your magazine from other control line clubs as most combat flyers must have achieved something similar.

Fenland MAC, Ely, Cambs. J. P. Prime

R/C ASSISTANCE

Dear Sir,

We are a small group of active aeromodellers and recently we decided to build a simple single channel R/C plane. We have built the single channel R/C system at home and now we are in need of an escapement. An enquiry to W. & H. models, Keilkraft etc. revealed that escapements are no longer marketed in UK. We hereby request to publish our appeal to your readers in your magazine for supply of escapement. We are willing to pay the proper price. Thanking you.

Pune, India. Nitin Joshi

To the best of our knowledge, escapements are no longer produced, however one of our readers may be able to help Mr Joshi.

NORTHERN GALA REPLY

Dear Sirs,

In his review of SMAE Centralised contests in February *Aeromodeller*, Dave Hipperson gives the impression that the Northern Area is frequently accustomed to dropping the Northern Gala in favour of other more profitable events.

I would like to make the point that the Northern Gala has been run by this Committee annually which also underwrites the cash prizes awarded in addition to SMAE trophies and plaques, a feature unique to this SMAE event. The sole exception being 1976 when pro-

longed airfield runway resurfacing work caused the Area's contest calendar to be considerably modified and curtailed, with the subsequent cancellation of the Gala.

It should be remembered that the Northern Gala is not purely a F/F event, featuring a comprehensive programme of C/L and R/C events for which SMAE awards are allocated and it is the intent of the Northern Area to cater for same indefinitely and without lapse, subject to the availability of airfield space on which to hold the Gala.

Unfortunately it is true that attendance from the London region and other parts of the South is sparse, particularly compared to entries from those areas in the past; it is probably equally true that Northern entries are as infrequent at the Southern Gala – both aspects seem strange in view of the ease of motorway commuting in this day and age.

N.A. Chairman *J. Moseley*

SOUTHERN GALA REPLY

Dear Sir,

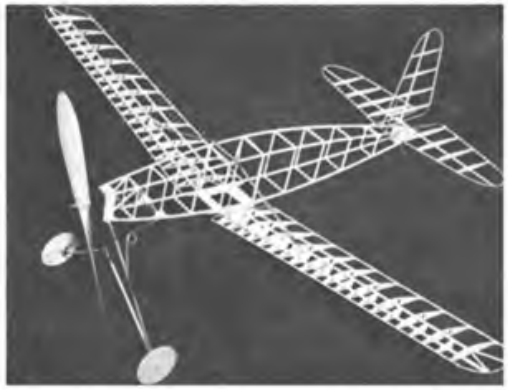
In 'Free Flight' in the February copy, Dave Hipperson says of the Southern Gala that it has "visibly suffered by having to use a difficult aerodrome and being run by people who although enthusiastic seem to take a delight in implementing home made rules often quite contrary to the SMAE current rule book". Perhaps Dave would care to expand on his statement and tell us which home made rules he refers to. As they are quite contrary to the rule book we will have to take a closer look at the offending rules and make them more compatible with the said rule book!

Vice Chairman S.E. Area SMAE *H. Hutchings*

OVER TO DAVE . . .

In answer to Jim Mosley's defence of the Northern Gala – I agree with almost everything he says particularly with reference to the running of contests in the past. Indeed I have always been impressed (and said so in print) by both the organisation and the fact that cash is often forthcoming in prizes – unique indeed! He quite rightly says the Northern Area is not 'accustomed to cancelling' this event. However, on the occasion they did, and the one to which I refer, I was serving on the Free Flight Sub-Committee and can recall the short notice that we were given that the Northern Area were unable to fulfil their obligations. It did not seem commensurate with such a lengthy problem as runway re-surfacing. Indeed we had so little time to re-adjust the calendar that the Northern Areas action led directly to invalidating the entire Senior Champs for the year. Understand our consternation therefore when we discovered that the Northern Area had a suitable venue (Rufforth) for a date only a few weeks different from the original planned date but insisting on using it for their own Northern Rally.

Mr Hutchings has more to answer for and has replied to my 'dig' in exactly the manner I had hoped. There was a blatant breach of SMAE procedure at the Southern Gala which could have invalidated the entire contest had there been a protest. However, I will come to that in a moment. As far as a difficult aerodrome is concerned, consider for a moment – a very arbitrary hooter control system used a number of times during the day which tells us we have to stop flying – but usually no signal to say when we could start again. Makeshift instruction boards for retrievers on bicycles telling them to dismount and walk along a section of the main runway for the benefit of the Radio Control Flyers (concentration or safety!) A finish time of 4.30pm when it was daylight until 9pm resulting in unrealistic fly-offs held in too thermally conditions! If that wasn't enough, as a final stroke there was an ***instruction*** *that fly-off participants could* ***not*** *use the runway* ***at all*** *after they had launched as the aerodrome was closed! I think that constitutes* difficulty. *As far as the rules themselves were concerned the organisation left early arrivals hanging about for over half an hour after the advertised start time before accepting entries or distributing flight cards. No, that is not a breach of the rules, but charging SMAE Comp Licence holders an entry fee* **is.** *Comp Licence holders have free entry unless the event has been pronounced exclusive of Comp Licences at the start of the season. (ie, Trials and more recently Nationals.) Otherwise the SMAE is guilty of misrepresentation when they sell their licences. These are* home-made rules *and they were implemented solely to 'force' pre-entry and in themselves go someway to admitting the difficulties of the drome. In his mitigation — I would hasten to say however, that for all its faults last year's Southern Gala and past ones – are better than no Southern Gala.*



Dear Sir,

The print enclosed is of a replica I've built from plans drawn up from the original model of Fleet-wing, a geared, low-wing Wakefield of the 1920 era – now well over fifty years old – which I am currently restoring. I have found that its spruce-and-bamboo charm is such that it captivates everybody who sets eyes on it – R/C hard-liners included!

I am told that the original model, which came into my hands quite by chance, was flown in the London area by a member of The Model Aircraft Club, the initials TMAC appearing on the fin. There is even an ancient cine-film of it in flight.

One point baffles me. I have no idea how to power the model! The set-up is that two motors just ¾in apart drive a 14¾in hardwood propellor through brass gears in the nose block. (The original gears were by A. E. Jones, the pioneer whose death was reported in the April edition.) Model weight (without rubber) is 6¾oz. A lot of rubber (3¾-4oz) seems to be called for, yet on a test rig I was unable to cram that amount in without tremendous bunching. What did R. N. Bullock and Co. do chaps? Did they pre-tension, or was the rubber taut between the hooks? How many strands? And, finally, how did they wind their geared motors in the days before stretch-winding?

All told, a fascinating model which I am sure, will capture the imagination of all vintage fans.

Orpington, Kent. P. Michell

What's Happening?

EVENTS

May 27th
FLYING DAY Shuttleworth Collection Historic Aircraft. Venue: Old Warden Airfield, Beds.

June 2nd–3rd
Sat: AIR SQUADRON AEROBATIC COMPETITIONS. Sun: AIR SQUADRON FLYING DISPLAY. Venue: Old Warden Airfield, Beds.

June 8th
FLYING EVENING. Shuttleworth Collection Historical Aircraft. Venue: Old Warden Airfield, Beds.

June 10th
AEROMODELLER ALL SCALE model flying day R/C, C/L, F/F, at Old Warden Airfield, Beds.

CONTESTS

May 20th
N.A. VINTAGE & PANNETT: *VINTAGE (N.A. RULES) AND OPEN POWER. POSSIBLY P.30 and MICRO GLIDER.* **Venue A:** Alamein Barracks, Driffield. Non-N.A. attendees pre-register with Nick Walton, 18 St. Nicholas Road, Copmanthorpe, Yorks.

May 20th
2nd C/L AREA CENTRALISED: *F2B, F2C, F2D, BT/R OPEN SPEED.* **Venue B:** Barkston Heath (P). Contact: Bob Horwood. Tel: 0272 48869.

May 20th
CROYDON QUIET CONTEST: *O/G, O/R, F1A, F1B (No rounds) A1, Cdh, VINTAGE RUBBER, HLG.* **Venue C:** Bassingbourn. Contact: Ray Elliott. Tel: 01 997 1563.

May 26th/28th
INDOOR NATIONALS: Sat: *IHLG, MAN, CO_2.* Sun: *F1D, O/F/LM;* Mon: *EZB, 35cm.* **Venue D:** Cardington. Contact: Bob Bailey. Tel: Stevenage 723642.

May 27th
COMBAT CHAMPIONSHIPS: *CLASS A DIESEL 1st ROUND.* **Venue E:** river Embankment, Peterborough. Contact: N. Gill. Tel: 0733 252645.

June 2nd–3rd
SCOTTISH NATIONALS: Sat: *F1A, F1B, F1C (5 rounds);* Sat & Sun: *1/2A T/R, F2C, GOODYEAR, THERMAL SOARING, STAND-OFF SCALE, CLUB 20, R/C AEROBATICS;* Sun: *F2D, O/G, O/R, O/P, MINI HLG.* **Venue F:** Lanark Racecourse. Contact: J. E. Glen, 5 Brownhill View, Bonkle, Wishaw, Lanarkshire.

June 3rd
"NORTHERN AREA NEWS" MICRO RALLY: *P.30 RUBBER, HLG, CO_2 DURATION MICRO GLIDER. (36" max span, flat bottom wing section, fuse D/T, 100ft towline).* **Venue G:** Heath Common, Wakefield. Contact: Ron Firth, Tel. 0742-304848

June 10th
INDOOR DURATION: *EZB, PEANUT (CO_2 postponed to July 22nd).* **Venue D:** Cardington. Contact: Bob Bailey. Tel: Stevenage 723642.

June 10th
4th F/F AREA CENTRALISED: *TEAM GLIDER (ME + PLUGGE) F1C (ASTRAL) CD'H.* **Venue:** Local Area. Contact: Mike Fantham. Tel:01 736 7163.

June 17th
OXFORD OPEN THERMAL COMP: *BARC'S RULES. £2 pre-entry essential.* **Venue H:** Port Meadow. Contact: J. Broughton, 12 Warnborough Road, Oxford. SAE.

June 24th
3rd C/L AREA CENTRALISED: *F2B, F2C, F2D GOODYEAR, OPEN SPEED.* **Venue I:** Wyton (P). Contact: Bob Horwood. Tel: 0272 48869.

June 24th
INDOOR DURATION: *F1D, 35cm.* **Venue D:** Cardington. Contact: Bob Bailey. Tel: Stevenage 723642.

NEW ANNOUNCEMENTS

June 2nd/3rd
RAFMAA INDOOR MEETING. Venue: Cardington. Contact: Bob Bailey. Tel: Stevenage 723642.

June 17th
VINTAGE MAS FLY IN. Venue: Chobham Common. Contact: Don Read, 21 Guildford Road, Farnham, Surrey.

July 1st
COMBAT RALLY *DIESEL ONLY FAI RULES.* Venue: Dewsbury. Contact: Greg Staves. Tel: Otley 56467.

July 1st
OLD TIMER RALLY: *RC ASSIST, PRE '51 DESIGNS, SPORT, PRECISION, DURATION and ANTIQUE (pre 1940).* Pre-entry £1 (2nd event 50p). Venue: Walsall Airport. Contact: M. Taylor. Tel: 0992 415316.

July 1st
N.A. FAI FF RALLY: *F1A, F1B, F1C.* Venue: Alamein Barracks, Driffield. 3 weeks prior notification of attendance to Nick Walton, 18 St. Nicholas Road, Copmanthorpe, York.

July 8th
1/2A COMBAT RALLY: Venue: River Embankment, Peterborough. Contact: N. Gill. Tel: 0733 252645.

July 29th
MIDLAND AREA RALLY: *SPEED AEROBATICS, GOODYEAR COMBAT.* Venue: Fulbeck. Contact: R. Giles. Tel: 0283 703323.

A full calendar of model flying events for 1979 appeared on page 145 March Aeromodeller. In order to comply with requirements for any event held on an MoD airfield, ONLY SMAE MEMBERS will be admitted. Contact Membership Secretary Mary Horwood. Tel: 0272-48869.

1/12 scale 750mm span for .5cc motors

North American P-51B MUSTANG

FREE FLIGHT SCALE

Designed by Cedric dela Nougerede

TRIBUTE MUST BE PAID to Stan Cole for his excellent designs of the *Spitfire* (plan MA/376 price £1.10+20p p&p) and *Me 109* (plan MA/355 price £1.35+20p p&p) upon which the design of this *Mustang* was based. The rugged structure is quite easy to build and comes together very rapidly, but because of its clean lines the model will look extremely plain until the paint job is complete. Panel lines and simulated paint chipping are a 'must' if the full effect is to be achieved.

To me, free flight scale is an extension of making plastic kits. A very personal relationship develops between myself and one specific aeroplane, and the desire to make an accurate replica has nothing to do with entering it in a competition. It is personal satisfaction only. Buy, beg or borrow a copy of MUSTANG AT WAR and if you have any feelings for this beautiful aircraft I doubt that you will be able to resist building one of the fine examples in there. Small modifications to the basic model can change it to an RAF Mustang I or III (P51A or C).

Fuselage

Start by cutting two strips 12mm wide from a 3mm sheet of medium balsa. Build the crutch over the plan view (see photograph). Attach all the formers to the forward faces of the crutch spacers. Cut out the spines from 1.5mm sheet and attach them to the formers. The spines will stand proud of the formers by about 1.5mm. Add the centre section ribs, leading and trailing edges and Araldite in the engine bearers. Make but do not fix the wing tongues yet.

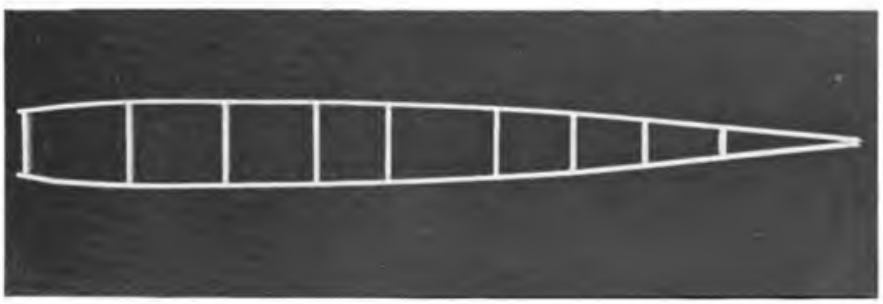
The sheeting of the fuselage was done in eight pieces, two above the crutch and two below, on each side of the fuselage. The sheeting butt joint was made at formers F6 and it might make joining easier if strips of 3mm square balsa are first glued to the rear face of this former. This will give a wider surface on which to make the joint.

Make paper patterns to represent the sheeting by placing the straight edge of a piece of paper along the top of the crutch. Curve the paper over the formers and mark along the spine with a pencil or thumbnail. Cut out the pattern and try it against the fuselage. It might take a few attempts to get it right but it is worthwhile getting one that fits fairly well. Cut the 1.5mm balsa sheet to the paper pattern, moisten the outer surface and hold in place on the fuselage with rubber bands until the wood is dry. Place scraps of balsa sheet under the rubber bands so that they do not bear directly on to the fuselage sheeting as they will mark it. When dry, glue the sheeting in place.

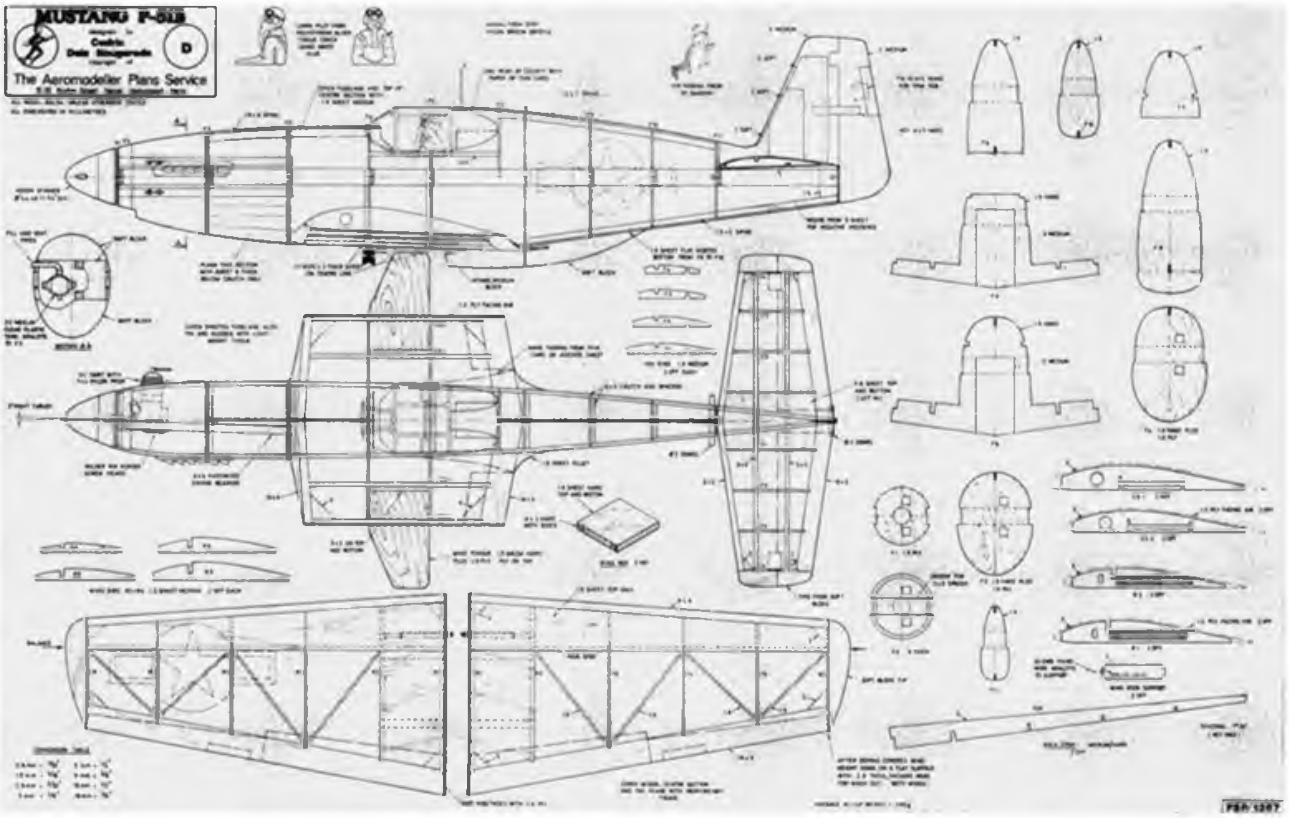
Do not sheet the centre section until the wings have been built and the wing tongues glued in position. Add the three strips of 3mm sheet by 25mm wide under the centre of the fuselage.

Wings

Pin leading edges and trailing edges down over the plan. Glue the ribs in position and add the main spars and the wing boxes. Glue on the soft block wing tips. When the glue has dried, remove the wings from the plan and hold in position on the fuselage



Heading: ***Realistic weathering, panel lines and paint chipping effect makes all the difference when creating the illusion of realism.*** Left: ***Basic crutch from 3 x 12mm balsa simplifies fuselage construction.*** Right: ***Two action flying shots endorse the models captivating performance — the flying scale modeller's bonus.***



using clothes pegs to clamp CS2 and R1 together. With the wings held thus, check the alignment and squareness before glueing the wing tongues in position. Sheet the top of the centre section and the wings between R1 and R2 and the leading edges. Make the diagonal ribs from rectangular strips of 1.5mm sheet, cut to length and the full depth of the wing. Glue in position and when dry, sand to the main rib contour with a wide sanding block.

Finishing

Sand all the sheeted areas smooth and give a coat of sanding sealer. Fill any bad joints with Polyfilla or soft balsa if the gaps are large. Fine sand the whole surface again then cover the fuselage, fin and rudder with lightweight tissue. Cover the wings (including the centre section) and tailplane with heavyweight tissue. Wing root fairings can be made from thin card or acetate sheet but I extended the centre section covering onto the fuselage side to form the fairing. I used cellulose putty to fair in the leading edge. The whole aircraft was painted with matt enamels. (*Note*. Extra coats of dope were needed on the wings and tailplane as the heavyweight tissue is more absorbant than lightweight).

There are so many colour schemes to choose from that I can only describe the one I chose in detail. The olive drab upper surface colour tended to be more brown than green so I used a mixture of Humbrol MATT 29 (brown) with Airfix M21 (green). The underside was Humbrol HU6 (light grey). All the panel lines were drawn in using a Rotring pen with TT ink and the panel chipping effect done with a mixture of silver and white enamels. The whole aircraft was finally given a coat of Blackfriar's polyurethane clear matt varnish. This tends to darken the matt enamels so when mixing your colours try a sample and varnish it before painting the whole aircraft. I cut stencils from thin acetate sheet for all the lettering and insignia. With a sharp soft pencil (2B) the letters are drawn onto the model using the stencil.

Full size copies of this ¼ scale reproduction are available as Plan FSP/1367 price £1.40 plus 30p postage. Export orders obtainable from appointed agents or directly from Plans Service, PO Box 35, Bridge Street, Hemel Hempstead, Herts. HP1 1EE.

Flying

Test gliding is of great benefit if you are lucky enough to have a long gentle slope covered with deep grass. The CG position can be corrected and the tailplane incidence altered to give a long steady glide with a slight turn to the right. Any tendency to drop a wing should be corrected by increasing the washout on the opposite wing, by twisting over a steaming kettle.

My DC Dart was run at full power with a 7 x 4 prop to produce a steady climb in wide left hand circles. It is the flying that is the bonus for the free flight scale modeller, over the builder of plastic kits, so have fun building and enjoy the bonus too. Good luck.

References: Mustang at War by Roger A. Freeman; Profile No. 100; Revell 1/48th scale P51B.

CO_2 it's a GAS!

How to get more from your CO_2 motor

PART 1 — BY IAN PEACOCK

ARE YOU GETTING ENOUGH from your CO_2 modelling? Are you at the novice stage and uncertain where to go next, or frightened off by the apparent complexity of the expert's models? Well don't despair! This series is intended just for you, to provide a comprehensive step-by-step guide from the very beginning up to a point where advanced models may be tackled with confidence.

The Gas Motor is not a new phenomenon, in fact motors driven by compressed air, and later by other compressed gases have been around for years but only recently has mass production and miniaturisation produced a choice of commercially available units at quite reasonable prices and low running costs.

Three UK manufacturers produce motors; HUMBROL, POWERMAX and TELCO. The much older, much better and more expensive BROWN JUNIOR Motor is still available from the USA and the Czechoslovakian Modela CO_2 Motor both offer alternatives.

The basic technology of the CO_2 motor is both simple and common to all types. Any minor differences between brands will be seen to have snags and advantages for the particular model of your choice! A deliberate policy during the presentation of the series has been to use all three British makes without grace or favour to provide you – the reader – with the widest possible experiences.

How CO_2 motors work

Compressed gas is housed in a strong, light aluminium tank, mounted within the aircraft. This tank is connected to the cylinder head of the motor usually by a thin, soft copper tube. Within the cylinder head is a simple ball valve, held closed by the pressure of the gas, fed from the tank. The piston has a small "pip" on its crown such that at Top Dead Centre (TDC) it opens the ball valve allowing gas to expand into the engine, forcing the piston down and allowing the remaining gas pressure to re-close the valve.

Two operating features become apparent from even this simple description:

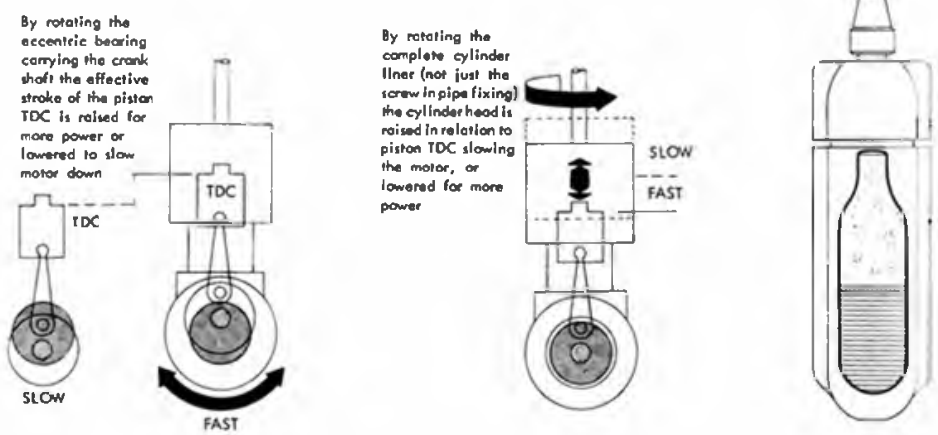
First is the fact that gas entry timing is symmetrical about TDC allowing the motor to run equally well in either direction. This yields advantages to those wishing to utilise a CO_2 motor in the 'pusher' mode. (As required for the POWERMAX WINGBAT flying wing kit!) The attendant snag is that motors will sometimes inadvertently start backwards without warning, so always check that the draft from the propeller moves backwards before launching a model!

Secondly, the engines include a speed control which alters the "compression ratio", causing the ball valve to be held open for a longer portion of each revolution allowing a larger gas transfer. This produces more power and higher revs at the expense of a shorter engine run. Reducing compression produces the reverse effect until carried to the extreme, when the ball valve is no longer lifted and the engine ceases to run.

Refuelling with CO_2

Getting the gas into the tank in the first instance is a simple exercise, as the tank is connected, again usually by another short length of copper tube, to a filler nozzle

Fig. 2: Speed controllers in CO_2 motors.



CURRENT PRODUCTION CO_2 MOTORS. Far left: ***The Humbrol motor with propeller and tank.*** Left: ***Telco unit, note wide mounting flanges.*** Top left: ***the Harden Shark motor with recharge unit.*** Above: ***from Czechoslovakia, the Modela CO_2 motor. Note feedpipe connector on cylinder head.*** Above right: ***from USA, the long established, finely made and very expensive Brown Junior.*** Far right: ***this spread of Telco motor components shows just what goes into one of these little powerplants.***

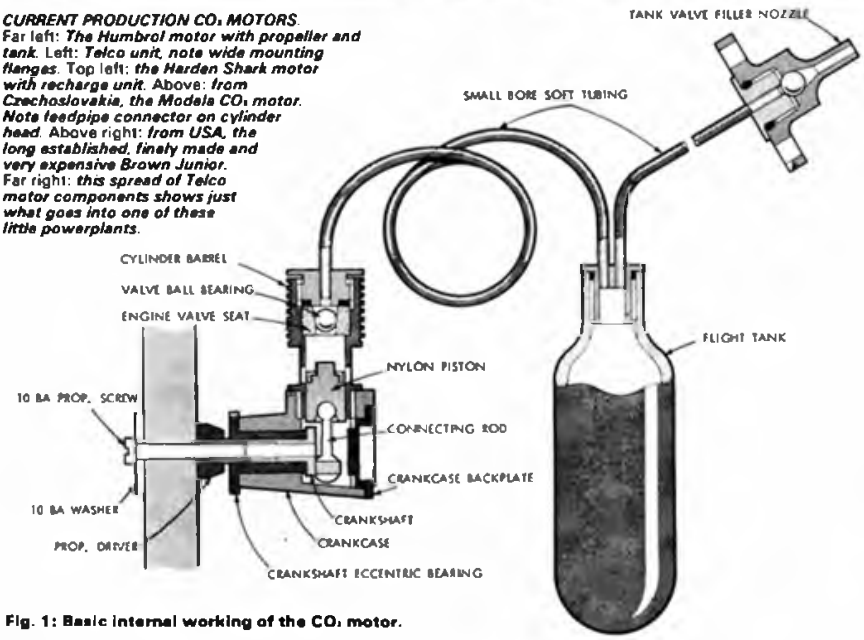


Fig. 1: Basic internal working of the CO_2 motor.

which also has a small ball valve arrangement. Pressurized Carbon Dioxide gas (in liquid form) is more usually supplied in small bulbs marketed to power soda syphons referred to as "Sparklet bulbs", being widely available from off-licences or chemists. Each bulb contains enough gas for several flights and are in the main too heavy to carry in the aircraft. They are therefore fitted into the special "charging gun" supplied with the motor, and used to "fill" the airborne tank with gas. The transfer of gas from charger to tank may be undertaken in one of two ways, with the charger pointing 'up' or pointing 'down'. The reason behind this is simply that the CO_2 in the bulb is partly in liquid form. Charging pointing down therefore fills the tank with *liquid* transferring more CO_2 resulting in a longer motor run. Charging pointing up (with the liquid at the bottom of the sparklet bulb) results in the transfer of *gas* only, which results in less CO_2 and a shorter run (useful on trimming flights!) but enabling more runs per bulb.

The modeller may expect some 5 – 8 flights from one bulb, dependant upon ambient conditions prevailing at the time and the method of CO_2 transfer as already detailed.

Safety warning

OPERATORS SHOULD HEED THE SAFETY ADVICE GIVEN WITH EACH ENGINE. THE GAS PRESSURE IS IN THE ORDER OF 800–900 PSI AT 15°C AND CAN BE UP TO THREE TIMES HIGHER ON A HOT SUMMER DAY.

Fig. 3: Filling the tank.

Left: THE GAS FILL

Holding the charger upright, only gas is transfered to the motors flight and tank, to produce short, low powered runs ideal for trimming

Right: THE LIQUID FILL

Holding the charger inverted produces a maximum transfers of liquid CO_2 for full power or long duration flights

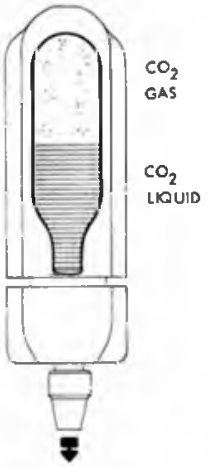
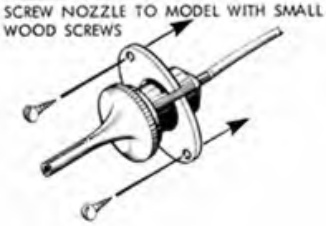


Fig. 4: Mounting filler.

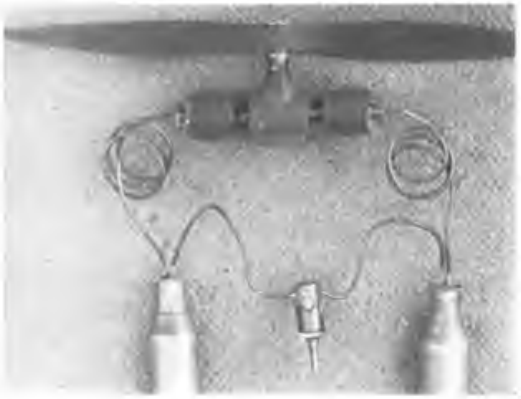
HUMBROL FILLER MOUNTING PLATE CUT TO DOTTED LINE & DRILL TWO NEW HOLES 3/32" DIA. DISCARD REST OF PLATE.

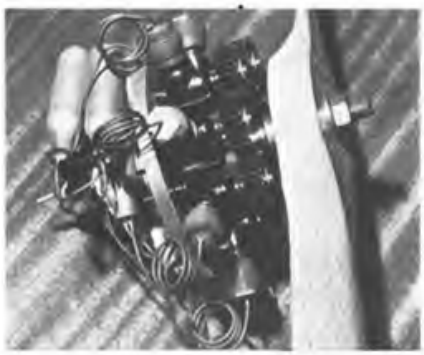
FIT NEW PLATE TO REAR OF FILLER NOZZLE WITH SMALL DROP OF EPOXY. SCREW NOZZLE TO MODEL WITH SMALL WOOD SCREWS



What you get for your money

All three UK manufacturers produce a comprehensive package containing everything necessary to get the engines running in a safe and controlled manner. HUMBROL & POWERMAX utilise the same approach to varying the compression (as in fact does BROWN in the USA). The technique is simply to screw the entire cylinder assembly into, or out of, the tight fitting thread in the crankcase. It offers ease of adjustment of engine revs without special tools but with the attendant problem of the repeated slight distortion of the copper gas feed tube, which in time will fracture and need refitting. Only the Czechoslovak motor has overcome this problem by allowing the feed pipe to be





Top left: ***the Harden PMSS Shark Twin presents the possibility of greater power for bigger things.*** Left: ***the new Humbrol motor features integral fuel tank which dispenses with the long copper tube tank connector and achieves neat installation pack.*** Below: ***life gets complicated! The impressive Harden 5 and 7 cylinder radial CO_2 motors – real engineering achievements.***

loosened during such adjustments. Furthermore, completely enclosed engine installations require a removable hatch to gain entry for such adjustments. TELCO, on the other hand, have chosen a most cunning, if old fashioned ruse, seen occasionaly on very early model diesel engines. The technique is to fit the crank shaft bearing into an eccentric sleeve within the crankcase. Rotation of this sleeve effectively raises or lowers the crankshaft relative to the rest of the engine and thus brings about the same overall effect. This makes the TELCO motor more complex in construction and therefore, a little more costly. However it DOES avoid any undue fatigue in the copper pipe and because the adjusting collar is immediately behind the propeller, adjustment may be carried out entirely from outside the model.

TELCO also offer a couple of useful accessories in the form of "twin" tank units. The first has two tanks, plumbed into one filler and one cylinder head enabling twice the volume of gas to be carried producing roughly twice the normal engine run. The other option also features two tanks and a common filler, this time plumbed into two engines. This enables twin engine operation with complete safety – even on free flight models – as both engines "die" in identical manner without change in trim. (Multi-engined models will be examined more fully later!)

POWERMAX too, provide twin tank installations for extended flight duration, together with a "tuned" competition version of the standard motor. Perhaps the greatest interest from this northern manufacturer concerns the multi-cylinder motors. At present the horizontally opposed twin is available to the modeller and a new 3 cylinder unit is under development (a 'scale' ANZANI perhaps?) which it is hoped to review towards the end of the series. The "piece de resistance" however, must surely be the 5 & 7 cylinder geared radials which are a staggering sight. Regrettably the degree of fine tolerance hand assembly on these engines puts a price tag on them that only the specialist and the collector can afford.

In general terms it would seem that the TELCO motors produce the best performance and are certainly the most consistent. The HUMBROL and POWERMAX motors are of a greater swept volume than that of the TELCO so it therefore becomes difficult to draw exact comparisons without scientific test equipment. The serious enthusiast will find these motors more fully reviewed in Peter Chinn's L.E.N. February '77 and April '77.

Over a dozen club members helped to build and fly more than fifty models for this series and one factor that emerged was the tremendous variation in performance flying in different ambient temperatures and humidities. As the carbon dioxide expands in the motor, it cools – often to the extent of icing up altogether. It takes quite a while to accept that the fins on the engine are "warming" fins and not "cooling" as we are most accustomed to thinking. It is obvious therefore that all CO_2 motors work much better in warm, dry weather than in the cold and damp where the performance will be poor and may even deteriorate to the point where they won't work at all.

Motor mounting

Appearance dictates mounting the filler underneath the fuselage if possible. With the TELCO filler, having fixed lugs, simple miniature woodscrews will hold it to a scrap of thin plywood mounted in the airframe. Considerable pressure is exerted on the filler during the refuelling operation so wherever it is mounted, the airframe must be stout enough to take such loads. Neither POWERMAX nor HUMBROL fillers have mounting lugs, although HUMBROL supply a metal fixing plate for the purpose, which is most unaerodynamic and furthermore is unsightly. Cutting this plate down in size and drilling the appropriate fixing holes will produce a similar unit to the TELCO. An alternative is simply to leave the filler nozzle dangling free on the end of its pipe in order that it may be held tightly between finger and thumb during fillings, thereby removing any stress from the model and it can be tucked away inside say, an open cockpit.

The majority of models tried required a small amount of downthrust and right thrust during trimming. Most manufacturers recommend packing washers behind the engine to obtain this thrust set up. In practice it was found that these angles (about 4° down and 4° right) were not supercritical and it became common practice to fit the engine mounting bulkhead at an angle to start with!

The greatest area of improvement was found to be the propellers. The HUMBROL and POWERMAX props were mildly out of balance and appear to have come from the same mould. The TELCO offering is of a totally different design, being considerably out of balance. A simple balancing jig was produced by imbedding two razor blades in a large lump of plasticene using a spirit level to get them flat and parallel. Using the propeller retaining screw as a bearing, the propeller may be gently sanded (the heavy end, stupid!) until a good balance is obtained. It is amazing how much needs to be removed and just how much better the models fly after this treatment.

Some models were found to perform even better on the American Williams Bros props. These are not widely available in Great Britain but if difficulty is encountered, try mail order from the Modellers Den, Bristol, or try propellers from the North Pacific Sleek Streeks or similar rubber stick models.

Next Month: We take a look at some of the simple Almost-Ready-To-Fly kits and how to make minor improvements.

Cut, carve, chisel, drill, file, shave, rout, screw, grip.

Make it with

X-ACTO

The worlds finest tools.

HALES

A A Hales Ltd., P.O. Box 33, Hinckley, Leicestershire

Available at all good model outlets.

Glider Towing

Following the publication of John's Pink Elephant F1A Glider design as last month's Aeromodeller full size pull-out plan, John provides some useful advice on how to get your model to tow correctly.

By John Cooper

LIKE MOST ASPECTS of model flying, the art of pursuading a glider to tow properly, whether straight or circle towing, is a matter of juggling all the forces acting on the model until they balance. Whilst it is easy to balance the forces well enough to achieve straight 'up and off' tows, it is far harder to trim the model to make it tow properly, either for long periods of time in windy conditions or for circle towing.

The following is intended to give advice on pursuading your model to tow properly and is based on practical experience rather than theoretical reasons. Since I started glider flying in earnest about eight years ago I have built twelve straight tow and eight circle tow models so my observations are based on a fair assortment of models.

The preparatory stages of the trimming should be carried out long before you set off to the flying field and consist of ensuring that the model is set up correctly when assembled. All the wing and tail panels should be fairly flat although washout on the wingtip on the outer side of the glide circle is permissible. On no account should there be more than 1/32in wash-in on any panel. A common fault with two piece wings is that although the panels themselves are flat, the two halves are not aligned at the same incidence, either caused by badly installed wing joining tubes or by a distorted wing mount. If the wing has a multi-spar arrangement, the wing tubes must be installed a couple of inches apart to spread the towing loads between the spars and in this case, great care should be taken to ensure that the wing halves are constructed so as to join at exactly the same angle. If the wing has an I-beam spar arrangement, a better solution is to install both wing joiners close together and in this way the relative incidences of the wing halves can be altered by suitable packing on the wing mount, see *Figure 1*.

The tow hook should be set in approximately the correct position before test flying the model. This position is such that when the model is being towed near the top of the line, the towline, towhook and the CG are in a straight line. This hook position is about one inch in front of the CG on an average A2 glider. An easy way to set the tow hook position is to suspend the finished model from the tow hook and then move the hook position until the fuselage rear end is balancing roughly 20° below the horizontal, slightly less than 20° for straight tow and slightly more for circle tow is acceptable, see *Figure 2*.

The glide trim of the model must be approximately correct before trimming for the tow, since a badly under elevated model will appear to diverge on tow and a badly overelevated model will try to stall whilst on the tow line and will appear to be weaving, see *Figures 3 and 4*.

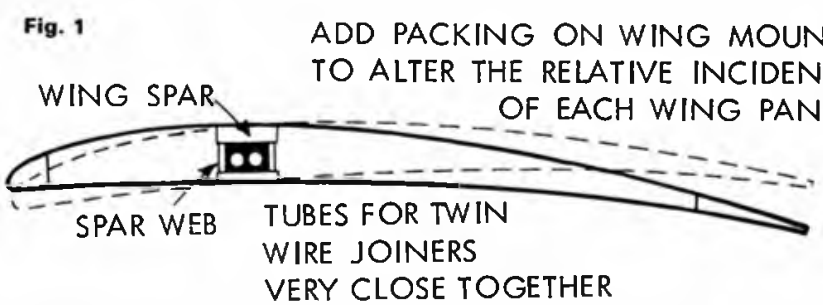
STRAIGHT TOW

The ideal characteristic for a straight tow model is a very slight weave when flown in about a 15mph wind, whilst hanging off slightly to the side of the line that the model glides towards. When the model is speeded up rapidly whilst it is near the top of the line, it should start to gently bank into its glide turn before release from the towline.

Carry out the trimming when the wind is blowing at about 15mph. Trimming in calmer conditions does little good, since calm conditions don't really test the model's tow stability. Trimming in windier conditions causes confusion in trying to judge whether it is the model's trim that is at fault, or if turbulence is upsetting the model (besides which you will wear yourself out continually retrieving the model!)

After setting the model up as described earlier, start your trimming by towing the model on a full length line with the rudder set straight. Over several flights adjust the rudder setting until the model tows as straight as possible. It will usually be found that the rudder has to be set up to 15° in the opposite direction to the glide setting thus counteracting the effects of the washout on the outboard wing tip. If

Fig. 1



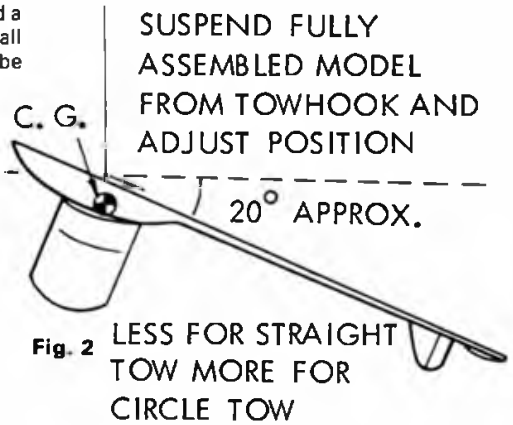
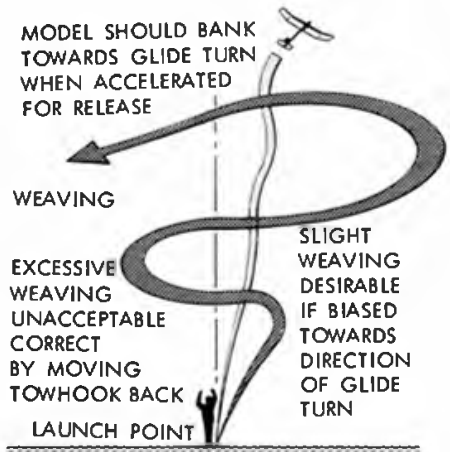


Fig. 2 LESS FOR STRAIGHT TOW MORE FOR CIRCLE TOW

Fig. 3



A tow hook positioned too far in front of C.G. position will cause weaving to each side even if auto-rudder is set straight. The remedy is to move hook rearwards until weaving just disappears.

the model cannot be pursuaded to tow in a reasonably straight line by just using simple rudder adjustments or if it needs an excessive rudder offset to tow straight, then there is something wong with the set-up of the model.

The most usual fault, and the easiest to correct, is an incorrect towhook position. If the model constantly pulls to one side on the initial stages of the tow (below 80ft altitude) and won't recover, try moving the hook forward 1/16in at a time. If the model weaves more than 15ft to each side of a straight line, move the hook backwards again 1/16in at a time, until the weaving is only just noticeable. On no account should the hook be moved more than 1/4in from the position shown in *Figure 2*.

All the above adjustments are straightforward to carry out and should produce a straight tow with most models, particularly if they are to a well tried and tested design. If the model still cannot be made to tow properly then it is time to start altering its geometry.

To help correct an aerodynamically unbalanced model, John sticks short lengths of 3/16in sq balsa to the wing tip on the outside of the turn.

Weaving is the easiest problem to cure and is caused by: too small a fin, too much side area in front of the CG or by too much dihedral. Experiment by altering these items, one at a time, until the weaving disappears. To alter the fin size try pinning extra pieces of wood in place until you see if this does the trick. Only glue in place when and if you are satisfied with the result. Wing dihedral is best altered by bending the wing joiners and even if the dihedral looks low whilst the model is sitting on the ground, remember that the joiners can bend when the model is towed fairly fast, thus increasing the effective dihedral. It is as well to remember that not all wire sold in model shops has the same tensile properties and it could be that your model has soft wire joiners and hence too much dihedral on tow. The remedy is obvious!

A model that constantly diverges to the same side on tow is not always so easy to cure. Constant divergence is sometimes caused by an oversize fin or too little dihedral; however these failings can usually be overcome by alterations to hook position or rudder setting, so if your model won't respond to these cures the divergence is almost certainly caused by unequal lift or drag on the two wing halves.

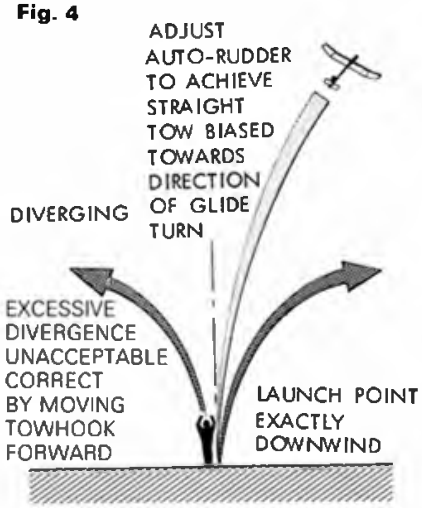
To find out whether it is lift or drag that is causing the problem try this simple test. Juggle your model on the towline until it is at about 50ft altitude and pointing squarely towards you, then run rapidly into wind so that the model accelerates sharply. If the model veers off to one side at a near constant angle, then the problem is caused by drag, whereas if the model progressively veers more and more it is caused by unbalanced lift.

Correcting for excess drag is the most straightforward to cure, firstly ensure that the two wing halves have a similar quality of surface finish and if this is so, simply cement a 2in length of 3/16in square balsa on the upper trailing edge surface, near the tip on the outside of the turn. Adjust the length of the wood until the model behaves in the desired manner. This set up looks very crude but works remarkably well.

If the divergence is caused by unbalanced lift, the cause is often a little amount of unintentional wash-in on the inboard wing panel. If alteration of the wing warps doesn't cure the model then try packing up the two wing halves to different incidences; this is where the twin-wire wing joining method mentioned earlier comes in handy. Usually very small angular changes in the relative wing incidences will give the desired result, although I do have one A/2 with a perfectly true wing that has the right wing at 2° more incidence than the left. The model seems quite happy to fly like this although it looks rather odd.

To finally test the model's towing stability put the model into a variety of odd situations *i.e.* by towing overfast, towing crosswind and by having the model launched crosswind etc. it should by now recover to the straight and narrow fairly rapidly.

Fig. 4



A tow hook positioned too far behind C.G. position makes the auto-rudder adjustment very critical, diverging first one way then the other. The remedy is to move hook forward until model just starts weaving.

By following the above you should be able to get a model that tows steadily and indefinitely if needed. Final fine adjustment of the rudder setting should provide you with a model that peels smoothly off the top of the line into its glide turn (and away for a max!)

Next month: Circle Towing

John in action keeps his eyes fixed on model overhead. Leather glove is essential to prevent friction burns as line is paid out. Fingers act as brake on line drum. Note winch is strapped to wrist to prevent accidental release which is both dangerous and results in instant disqualification.

TOPICAL TWISTS

by Pylonius
illustrated by Sherry

"What Luggage?"

TOO MUCH OLD LIB

ONE THING ABOUT A HOBBY – and this very much applies to model flying – is that it provides a much needed weighting against the Women's Lib movement. In modern style living, the husband is often little more than a porter cum chauffeur cum maintenance contractor to the household. He is kept under constant surveillance to ensure that he is gainfully occupied at all times. The kids are trained from an early age in the art of Dad manipulation, even the smallest of the Dad monitors will be seen running to Mother at the week end crying, *"Mum, Dad's sitting down again."* Whereupon Mother will wrathfully seek Dad out, armed with the formidable weekend work schedule.

The model flyer is fortunate in being given a 'loony licence' or 'idiot's charter' to allow some exemption from the domestic job load. And, as the wife is suitably consoled by friends and neighbours, she listens ruefully to the splosh of the leaking tap and looks gloomily over the unkempt garden where the children play Tarzan. What makes matters worse is that when she wrote to 'Auntie Agony' in the women's magazine on her plight she was merely congratulated on her husband having a nice fulfilling hobby, such a change from the usual wife bashing.

If there is one time the male chauvinist model flyer comes into his own, it is on the new style model flying holidays. These holidays are immensely popular with the modeller who does not want to 'get away from it all' but rather to take it all with him. Nothing is more distressing to the inveterate hobbyist than to leave behind his beloved models to play nursemaid to the kids on a wet and windy beach. Not only that, but he feels so out of place on the generally undressed sea front with his four pullovers and three pairs of socks as he tries to lose himself behind his copy of the *Aeromodeller*. But just think of two whole weeks with nothing to do but to fly, talk and generally mess about with model planes! Have you ever thought of that as you enviously watch the seagulls holding a gliding comp over the cliff walks?

Favourite seems to be the holiday camp- scene. Plenty of diversionary activities for the kids, and it would be heigho for the knobbly undercarriage competition and the donkey engine races. Quite an improvement to sneaking along a few chuck gliders with the buckets and spades.

A LONG STRETCH

Possibly the most strenuous form of model flying next to chuck gliding is Open Rubber. I know that the Glider boys do their stint of heavy jogging on the less windy day, but a lot of muscle energy goes into a five ounce rubber motor wind up, and a lot more leg muscle power required to get it back from its cross country trip. And if you are any good you'll be in the no limit fly-off at the fag end of the day when, tired out and in failing light, you launch the model into the evening haze. The real art of this form of flying, apart from the skill required in the handling of all that highly motivated rubber, comes in the retrieving. To do this successfully you need to have the sensory equipment usually associated with racing pigeons and home trekking cats. Without that sort of geared up instinct you might as well chuck it all in and get out the radio gear.

Not content with the 7-10 minute fly off times which make nonsense of average flying field dimensions the top free flighters are casting envious glances at the 50 minute times put up with the indoor flyers, feeling honour bound to narrow the gap. What has given them hope and encouragement is the latest batch of specially prepared Pirelli rubber, which has 'wham' written all over it. This, coupled with the near non-existant airframe, may be all that is required to cut down on the time differential.

But if my silicon chip is in good working order I calculate it will take a lot of homing instinct to keep track of a say, 30 minute flight at a wind speed of 15 mph or thereabouts. Seven miles plus represents quite a stretch of inhospitable countryside to traverse – and it's not likely that the prizegiving is going to be carried out in the dark.

ALL TOYS TOGETHER

Whilst we accept the way the terms 'Toy and Hobby' are neatly coupled together in commercial blissfulness there is still, in practice, a quite considerable gap between the toy dilettante and the hobby practitioner. This was only too evident years ago when the ready made model was a byword for its non-flyability. Since that time more sophisticated manufacturing processes and the advent of Radio means that you can get a model to almost fly out of your wallet or take off from a cheque card. But can we accept the buy-plane dabbler as an aeromodeller? You would hardly be able to have a convivial chat with him on 'aerofoil sections' or 'drag components', and it is difficult to establish any long term relationship with someone who's flying career is likely to terminate when his wing falls off.

Possibly the ready made flyer's biggest problem is to get started, since he is likely to traverse quite a bit of territory before he finds more than two square yards of space where model flying isn't prohibited, particularly if he has a plastic power model tucked under his arm. Then, being buoyed up with confidence in the toy of his choice, he is not likely to listen to friendly, experienced advice like getting his money back. Not that his reception on the flying field is likely to be all that friendly. Confronted with the ready made model the chap who has put in a long construction stint in the workroom feels a sense of grievance, and against all the inclinations of his better nature, cannot help giving an inner whoop of joy as the ready built model finishes up looking anything but ready.

On the whole, I think, I am all for the unscrambling of the 'Toy and Hobby' term.

Walt Mooney's Peanut Scale

MY FIRST INCLINATION with the Baby Ace was to make a fairly simple model with two inch rib spacing, only uprights in the fuselage and sheet tail surfaces. What actually happened can be seen in the photos. All of the fuselage structure, including diagonals, somehow materialised, and then sliced ribs at scale spacing etc. The result weighs 0.433 ounce without the rubber motor.

Careful attention needs to be paid to wood selection to keep the model as light as possible. Tail structure and fuselage frame uprights were sliced from fairly light (4 to 6 pound) 1/20th sheet balsa. Main longerons, tail spars, leading edges, were sliced from firm (8 to 10 pound) 1/20 sheet. All sheet parts were cut from very light wood. Incidentally I suggest that the two root ribs and the two tip ribs be made solid, rather than sliced. During the application of the trim colours, I broke the top cap of one tip rib. The tissue at the tip tends to pull more strongly in the down direction than it does over the other ribs and will tend to collapse the tip ribs if they are sliced and made from fairly lightweight stock. Solid sheet ribs will save you from tedious repairs later.

Use the lightest piano wire available at your local model shop for the landing gear wire and for the propeller shaft.

Two spar, sliced-rib construction is used for the wings. Lay down and glue the leading edge, trailing edge, and the bottom rib parts directly over the plan. Cut the wing spars from sheet balsa. Note that the rear spar, which is not shown on the plan, is to be made with 1/16th more dihedral at each tip. The difference in dihedral will result in some washout in the completed wing, which is desirable for good stall characteristics. Block up the trailing edge at the tip with a sixteenth shim. Cement the spars in place and add the top rib caps. If you use solid root and tip ribs as suggested, the spars will have to be threaded through the solid ribs. When dry, do a similar job on the other wing. If you have done it correctly, you now have a wing with equal washout in each panel and continuous tip-to-tip spars.

The model in the photos was covered with white superfine tissue (condenser paper would be lighter), shrunk with a light mist of water, and when dry, given two light coats of very thin dope over all the tissue. The wood parts were given four coats. For the colour trim I used a Staedtler Lumocolour 357 permanent felt pen. These are designed to be used on acetate sheet and work perfectly over nitrate doped surfaces (they appear to work fine on all plastics). There is simply no way I know of to get a lighter weight colour coat on a model. The real airplane is white with international orange colour trim and a black pin stripe. The ink will run into undoped balsa or tissue surfaces, so be forewarned.

A loop of 3/32 flat rubber was used to power the original model during the test flying. This motor was made up of a strip 23 inches long, giving an 11 inch loop after tying the knot. As installed between the propeller hook and the rear motor peg, it resulted in the model balancing at the point shown by the CG arrow on the drawing. The power obtained from the motor seemed about right for the model but obviously another model may vary in weight and require a slightly different size motor. The model should always be balanced as shown on the plan, or just slightly further forward for good stability. Use Plasticine, putty or modelling clay for ballast weight as required.

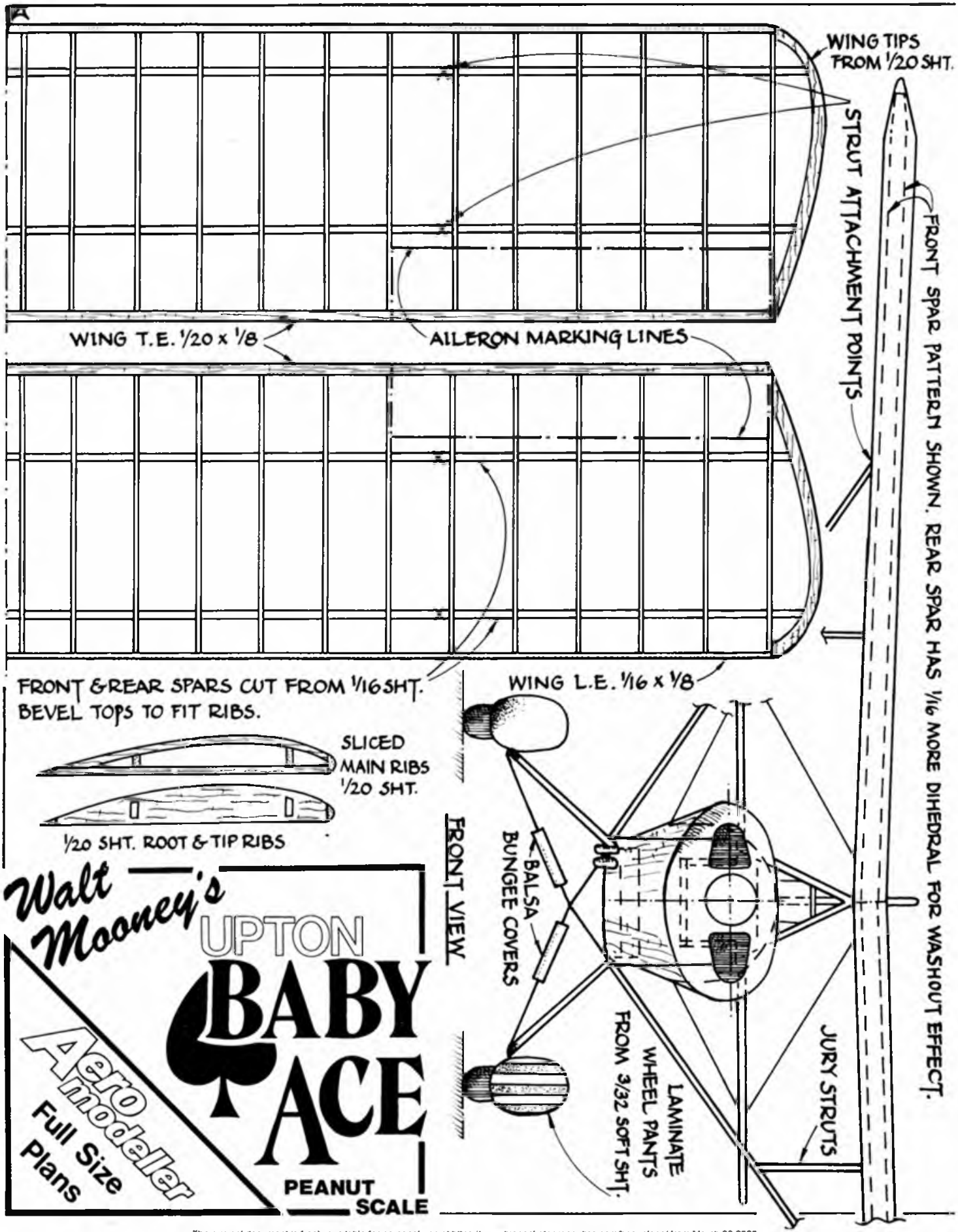
I am not particularly fond of the present Peanut rules. I would like the rules set up so the top flying model get the same number of flight points as the best scale model gets in scale points. Be that as it may, if you intend to fly your model in competition under the present rules, it should fly for as much duration as possible. This means it is important to keep the model as lightweight as possible.

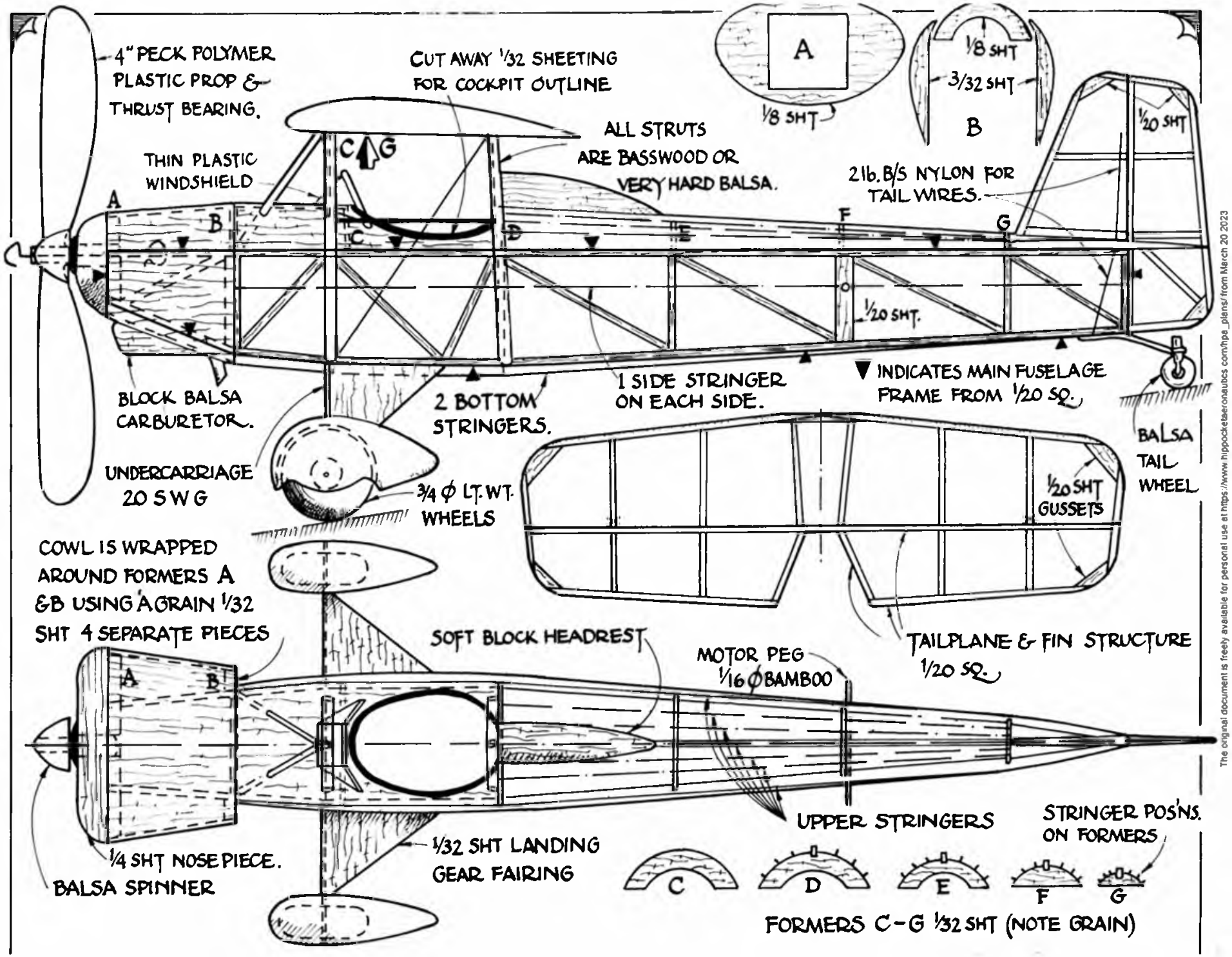
Some obvious things can be done to make your model lighter than mine without losing scale points. A reduction in stick sizes; this makes building and handling a little more critical. All the diagonal braces could be eliminated from the fuselage. The balsa blocks used for carburettor and headrest could be hollowed out. The seven top stringers could be reduced to five or even three. Ribs, formers and cowl sheets could be made out of 1/64 sheet. Balsa dowel exhaust stacks could replace 3/32 dia aluminium tube. Finally you can carve a balsa propeller, and will find your model requiring a smaller size of rubber strip for power.

On a Friday night, a week after the drawing was started, my wife Carole, agreed to hold while I wound it for its first test flight. On fifty turns, it did a smooth straight shallow descent and perfect landing on the pavement. On the next winding, of one hundred and fifty turns, hand launched, it did a nice smooth left circle about twenty feet in diameter. The third test flight was ROG on 600 turns. It climbed up in a smooth left circle and did four circles and a nice landing. We couldn't resist flying it about ten times, until it finally flew into the eucalyptus trees in front of the house. We retrieved it and quit flying well pleased.

Special indoor wood is available from Laurie Barr, send SAE to Micro X, 4 Hastings Close, Bray, Berks. See Classifieds.

Heading: ***Structure prior to covering illustrates sliced rib construction.*** Below: ***Finished model coloured using spirit based felt pens and fine ink lines.*** Left: ***Phil Owen proxy flew Walts model at Woodvale, assistant protects nose during stretch winding using geared winder.***





with
John Stroud

THIS MONTH:

First Flights: Launching Tuition and Control Techniques

IN THE FINAL PARAGRAPH of last month's 'Flying Start' I strongly recommended a new flyer get the services of an old hand. No matter how long ago it was that they last flew, their help will be invaluable. Not only will they be able to coach you in the art of flying but they will also be able to test fly the model and check it out. If you have not found this new friend don't give up yet. Keep asking around and don't forget to ask at your local model shop if they know any active or retired modellers in your district.

Let us first of all assume you have not been able to contact an experienced helper. With care and forethought you can still learn to fly. I learned on my own through persistance more than anything – certainly not through a god given gift and this is no doubt true of thousands of others. In some ways flying a control line model is a bit like riding a bike. When riding a bike one is constantly making small corrections of the balance and steering. Unless the correction is a major one, then it needs to be made quickly and instinctively before there is time to say what needs to be done. It is the same with control line flying and the knack of keeping a model airborne seems to come just as quickly. One minute you cannot keep a model flying straight and level and the next you can.

Advice and tuition from an experienced Control Line pilot is the surest way to flying success, ask your friends, model shop or local club for help. The experienced flyer can double-up on the handle to apply corrections as and when required until the novice gets the knack of flying and takes full control – this usually takes six to ten flights.

What should one aim to do on the first flights and what are the dangers? If you look at *figure 1*, you will see that a control line model can only fly in a path which is the outside surface of a hemisphere. Aerobatic models can fly across any part of this surface in the hands of an expert without problems. However, this is not so

Fig. 1: the hemispherical flight path of a control line model aircraft.

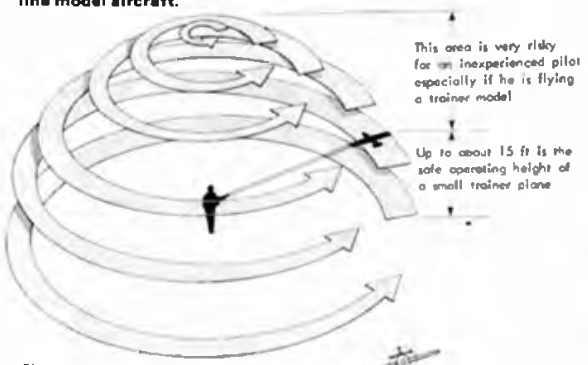


Fig. 2: model climbs and still maintains line tension at a moderate height.

I learned on my own, through persistance.

Fig. 3: model climbs too high and loses line tensions. The pilot regains line tension by moving from position A to position B.

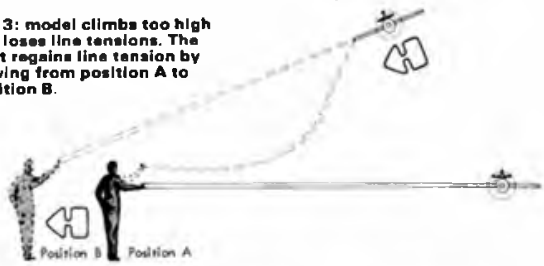


Fig. 4a: the results of overcontrol.

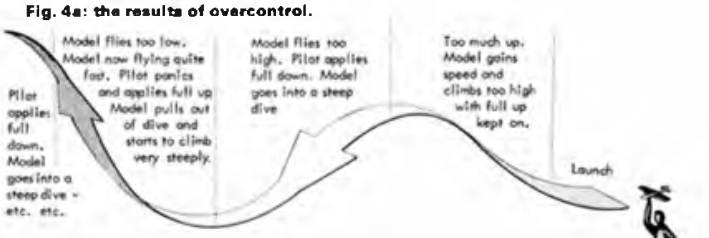
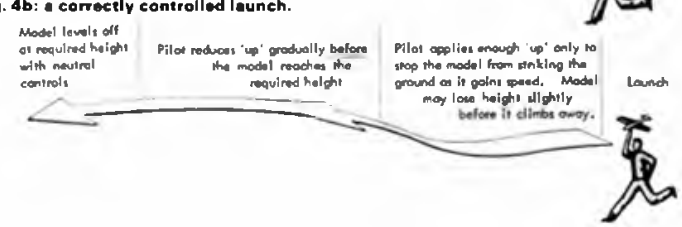


Fig. 4b: a correctly controlled launch.



Rigid-wrist or straight-arm technique is strongly recommended for early control line flights. Wrist movement is too sudden to learn with and gives no reference with regard to neutral elevator position. Note relatively handle positions for sequence, above left: ***neutral,*** middle: ***up*** and right: ***down, note also close line spacing on handle to de-sensitise controls.***

with your trainer plane. From *figure 2* you can see that as the aircraft is made to climb so it must bank over. From the pilots view this is not very obvious because his angle of sight of the model does not change. As the aircraft gets higher and rolls over on its wingtip, then it tends to slow down and gravity starts to get the upper hand. A trainer model flown above its safe height will lose line tension and fall into the circle, *figure 3*. When lines go slack the pilot has no contact whatsoever and needs to take a few swift paces backwards to retain line tension and control the model. That's the first common mistake of learners – allowing the model to fly **too high**. With most models the best height to fly is about 10ft. How high a model will fly depends upon the model design and the engine power. Experiment at a later stage and be ready for the almost inevitable loss of line tension.

The second sin of learners is **Overcontrol**; this is why one needs to learn on a stable and docile trainer. Imagine the sequence of events in *figure 4* if the model could loop on full up and 'bunt' or outside loop on full down.

To overcome the problem we not only choose docile trainers but also adjust the controls to make them less sensitive. The answer is to make quite small movements of the controls but apply them very quickly. At this stage of learning you will only be interested in learning to fly straight and level and to change flying height smoothly. The safe height changes for a model of this type will be between about 5 and 15ft. In practice these are achieved in a split second, but if you had time the controls would theoretically be put through the sequence of figure 5. In practice one goes through the middle neutral so quickly that it is hardly noticed.

Some people find it helpful to adopt the 'rigid wrist' method of control. Instead of moving the handle by flexing the wrist, the wrist and elbow are held rigid. This means that control is achieved by moving the arm at the shoulder only. Quite large and much less sensitive movements are needed to control the plane.

Because flying takes 100% concentration you must never take your eyes off the model. Don't be surprised if you feel a bit dizzy. I still do sometimes but it soon goes off.

If you have been able to get the help of an experienced modeller, there are a couple of ways of making the best use of his experience. For years I have taught people to fly control line by placing my hand over theirs and struggling for control. In some lessons I have only regained control by brute force and wrestling. For all that, I have used it many times successfully and your tutor may prefer to use a method he knows. Recently, I have made up and tried a dual control system. At the flying session last Sunday two trainees flew their

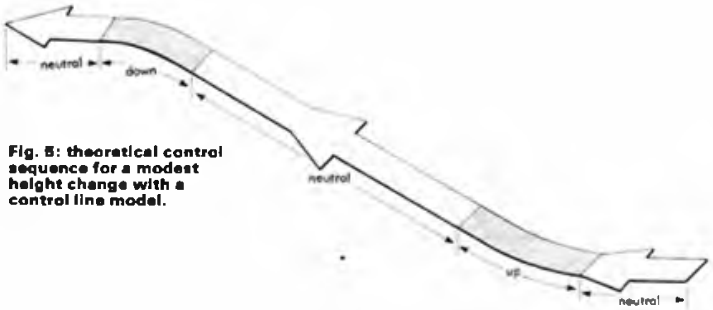


Fig. 5: theoretical control sequence for a modest height change with a control line model.

Fig. 6: dual control system.

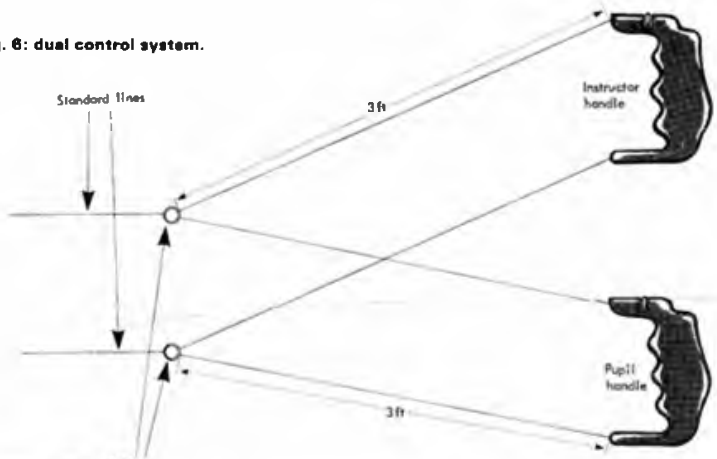
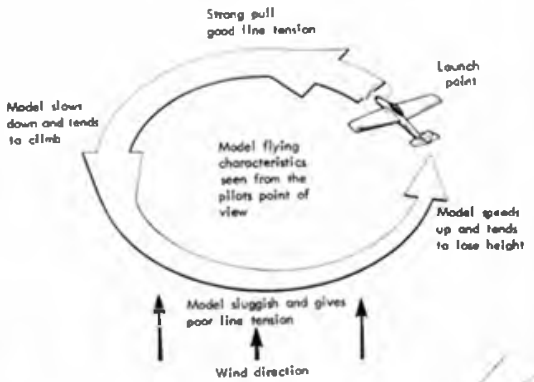


Fig. 7: model flying characteristics as seen from the pilots point of view.



Powerful Models are difficult to control.

Left: *Spot the mistake. Pilot should give clear indication to assistant to launch by raising arm, shouts will be drowned by engine noise. Flying arm however, should be out straight and not bent.* Right: *to ensure the pilot does not try to control from the wrist, try the Aeromodeller Rigidrist, which can be quickly made from thin ply.*

first few laps without mishap and I shall always use this system in future.

The model we were flying on Sunday is the prototype of my ideal trainer. At a later date we might find room for it in Aero Aces. The model is powered by a DC Spitfire and to my surprise it is too fast for the 30ft metal lines I have made up, i.e. it went round very fast and I got very giddy. It is always a good idea to fly prototypes on slightly short lines. I find a little giddiness easier to cope with than lack of line tension. Later I flew it on 35ft lines and the line tension is still very good but I rotate more slowly and do not feel dizzy.

The length of control lines depends upon the flying speed and type of model. If you feel very dizzy *and* feel strong line tension then it is certain you can try longer lines. In windy weather slightly shorter lines will prove safer than the ones suitable for still weather. All first flights should be made in calm weather as even a 'fresh breeze' can make flying quite difficult.

When you first fly in a wind, you need to be on your toes. Figure 7 gives a summary of what you can expect to happen. The exact theory of what happens is quite complicated if you think about it but it is only necessary to see its effect from the pilots point of view. Some models need little or no correction when flying in a wind whilst others are very difficult and must be flown every inch of the way.

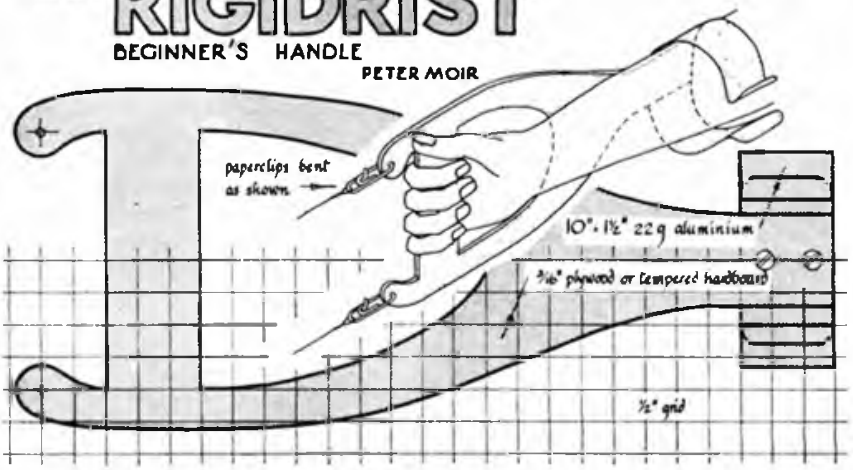
Next month I will deal with how to correct flying faults and how to repair crash damage. This weekend both the models we were flying finished up with broken fuselages. At the moment (March) the ground is pretty hard and the grass is pretty short. Not a good combination for model survival but even so my trainer crashed quite hard about 15 or 20 times before damage occurred.

The RIGIDRIST

1/3 FULL SIZE

BEGINNER'S HANDLE

PETER MOIR



Don't get left out of the flying fun this summer, join the Aero Aces by sending for your Membership card, badge and transfers. Members can benefit from our question and answer service to help them overcome familiar problems facing Aeromodellers, and the chance to win APS plans vouchers for the most interesting letters published.

Flying Starts Here!

Babe Bee .049

Pee Wee .020

For thirty years Cox have been world famous for their precision made engines and constantly winning competitions to prove that when it comes to producing engines no-one flies to a higher standard than Cox!

Control line, free flight, radio control, novice or expert there's a Cox engine that's perfect for the job. Take the two classics shown here, the Babe Bee .049 (.819cc) and the Pee Wee .020 (.327cc) both reed valve with metal fuel tank for easy mounting, both the finest of their type available. Ask your model shop about Cox today.

3500 Babe Bee .049 (.819cc)
Rec. Retail Price £6.95.
1000 Pee Wee .020 (.327cc)
Rec. Retail Price £7.95.
(Prices correct at time of going to press.)

HALES

A. A. Hales Ltd., P.O. Box 33,
Hinckley, Leicestershire

Our Fre

'ench Connection!

Presenting Heller, **"Our French Connection"** . . . a superior range of plastic model kits from France's leading manufacturer.

HELLER GIVE YOU CHOICE

The Heller range covers many scales and subjects. From 1/72nd scale aircraft – ideal for the young modeller – to exclusive models like the "Soleil Royale" galleon (with over 2,300 parts), or the superb 1/8th scale Citroen 15 . . . A challenge to even the most skilled modeller.

HELLER GIVE YOU QUALITY

Designers, draughtsmen and engineers spend months – sometimes years – carefully preparing plans and moulds – accurate to the last detail – to ensure that every Heller model you buy is just like the "real thing".

HELLER GIVE YOU VALUE

Skilled precision moulding, attention to detail and number of parts make Heller kits real "value for money". Prices from 75p to £49·95. Available from leading model and toy shops.

For range and authenticity . . . choose Heller . . . the French name for modelling!

1/125th CIVIL AIRCRAFT
460 DC10
461 Airbus (Air France)
459 Boeing 747
450* Boeing 727
451* Tristar 1101

1/35th HELICOPTERS
496 Super Frelon SA321

1/72nd FIGHTER BOMBERS
259 Crusader
258 Mirage F1
273 F104 Starfighter
263 Jaguar A, B & E
253 Mirage III
256 Saab Viggen
388 Stuka JU87 B1
351* Mirage IV A
380* Junkers JU52

1/72nd CIVIL AIRCRAFT
345* DH 89 Dragon Rapide

1/48th FIGHTER BOMBER
589* Mirage III C/B

1/72nd MILITARY AIRCRAFT
227 Fieseler Storch F1-156C3
228 Jungmeister Bucker BU 133
229 Messerschmitt 109K
230 Messerschmitt 109G
231 Messerschmitt 108B
232 Messerschmitt 109F
233 Messerschmitt 262B
234 Messerschmitt 109E
235 Focke Wulf 190F
236 Messerschmitt 109B
237 Messerschmitt 163 'Komet'
239 Arado 96
257 Alfa Jet
260 Saab J29
265 Zero A 6M5
266 Curtiss P40E
267 Thunderbolt P47N
268 Mustang P51D
269 Hurricane Mk II C
270 Gloster Gladiator
271 Airacobra P39 Q/N
272 Hellcat F6F
274 Tempest Mk V
275 Corsair F4U 1
278 Thunderjet F84G
280 Spitfire Mk I
281 Spitfire Mk Vb
282* Spitfire Mk XVI E
240* Heinkel He 112
277* Sabre Na F-86F
241* Arado AR 196A
224* Nieuport Delage NID 622

*NEW RELEASE

Special Offer

The latest Heller catalogue is available NOW (normal price 25p) Get your copy for **only 15p** by taking this special offer voucher to your nearest stockist.

only 15p

10p off

Heller Catalogue
(normal price 25p)
This voucher entitles the holder to 10p off the latest Heller Catalogue. Only one voucher allowed for each catalogue. Limited period only.

To the Retailer: Please accept this 10p voucher in part payment for the current Heller Catalogue. Coupons for full reimbursement should be sent direct to the Administration Sales Manager. Humbrol Limited, Dept AM Marfleet, Hull.

Your English Connection

HUMBROL

HUMBROL CONSUMER PRODUCTS DIVISION OF BORDEN (U.K.) LTD.
MARFLEET. HULL . ENGLAND

Rob Metkemeijer and Enrico Flores conclude

THE FMV STORY

PISTON AND CYLINDER. CHOICE OF MATERIALS, LUBRICATION (continued)

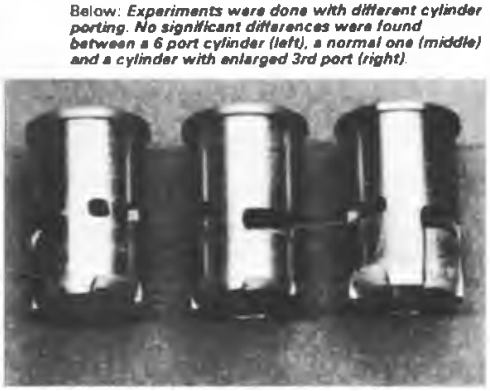
Another point of interest is the choice of material combination for piston and cylinder with respect of friction. Friction is very strongly determined by lubrication. In the conditions we're talking about (high temperature, zero to a few μm space between the piston and cylinder) a viscous layer of oil cannot exist so a boundary layer type of lubrication is probable. Heat generation as well as effectiveness of the lubrication is strongly affected by the surface properties. Very little is known about this in a quantative way, but people think, that porous materials help and cast iron on non-hardened steel gives relatively little generated heat. Graphite in cast iron improves lubrication and wear characteristics. Cast iron on porous hard-chrome is better than aluminium on chrome. But with an 18% Si-Aluminium piston the chrome is in contact with AL-Si crystals and we know nothing about that.

While trying to find out about lubrication, we were glad to hear from Emil Rumpel an indication of the cylinder wall temperature near the combustion chamber, measured in a model in a wind-tunnel. In a speed glow and a TR-diesel (both Rossi) temperatures were about 250°C. Hearing this, we really started worrying, because oil vapours will burn spontaneously (flash) and stop lubricating at this temperature range, impairing lubrication.

The following table shows the flash-point of a few types of oil:

Oil type	*Flashpoint*
Castor	275°-290°C
Palgol (synt.)	220°C
Ucon 650 X (synt.)	253°C
ML 70 (synt.)	260°C

Below: ***Experiments were done with different cylinder porting. No significant differences were found between a 6 port cylinder (left), a normal one (middle) and a cylinder with enlarged 3rd port (right).***



Rob & Bert Mekemeijer, joined by Enrico Flores, after their winning performance at the 1978 Woodvale World Team Race final.

So Castor oil turns out to be the best also with an extended distillation range, so no sudden effects occur. Synthetic oils will suddenly burn after passing a certain temperature. This is one of the reasons why they are so clean. They'll burn completely in and near the combustion chamber not leaving any sort of lacquer or carbon deposition. For all but the hottest glows synthetic oils can work very well, giving the advantage of a cleaner engine.

Another quite important point is the wear of piston and liner. The use of chromium plated cylinders will minimize wear, giving also a reasonably low friction. We are still convinced that a non-hardened steel liner is faster and more forgiving, but it is too much work to make a new one every contest.

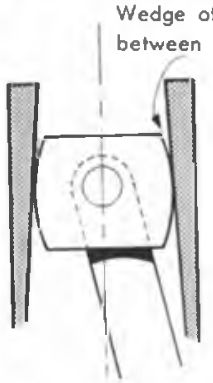


Fig. 12: Tapered liner with barrel-piston. Tapered liner produces tighter fit at top of stroke during compression and looser fit during power cycle.

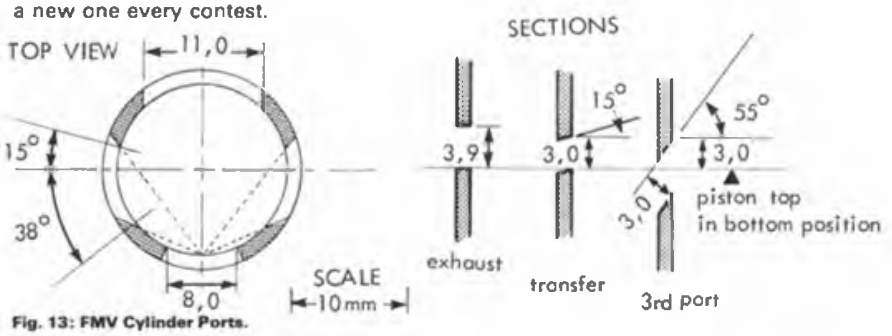


Fig. 13: FMV Cylinder Ports.

A few words on heat treatment of piston and liners. Theoretically, stress-releasing of pistons and cylinders machined from bar stock is necessary to prevent permanent deformation after thermal and mechanical load occuring when running. But it appeared that even after many hours of real 'hard' runs a cylinder turned from free turning steel without stress release treatment stayed round within 0,002mm, equal to the initial value. Pistons from cast-iron have been tested in the FMV either stress-released or not, and no significant effects in stability were found for Meehanite used by Bugl, Meehanite SFF40 and grey centrifugal cast iron.

The performance of all these types of pistons was similar. The only effect of the heat treatment of the piston (bringing it to 500-530°C and cooling it slowly), is that it 'grows', so it won't 'grow' anymore during running. This makes it easier to fit the piston to size and it doesn't need running in to compensate for a growing piston, giving the same fit for a long time after a few minutes of running in. Not to be misleading, we must add that stress-releasing treatments will probably be necessary in the case of a production engine, because machining according to production methods will introduce much more stress in the materials.

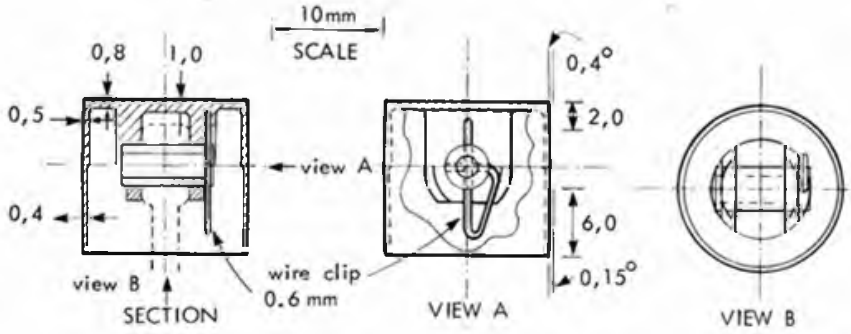


Fig. 14a: FMV Piston & Piston Pin.

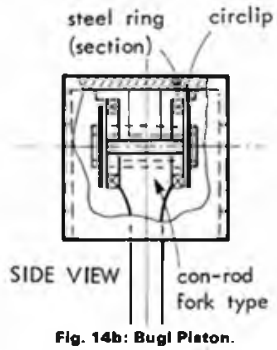


Fig. 14b: Bugl Piston.

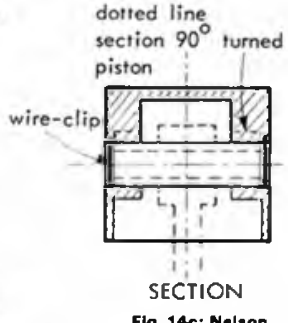


Fig. 14c: Nelson, K & B Piston.

SHAPE OF PISTON AND CYLINDER

In lapped piston 2½cc engines nowadays, tapered liners are widely used as well as a 'barrel' shaped pistons (see fig. 12). A taper liner gives better sealing at the point where pressure in the cylinder is high, and reduced friction where sealing is less important. From experience on different engines we found a taper of the liner between 0.015 and 0.025mm in diameter per cm gives best results. This is a bit less than Rossi, and about equal to Nelson and Bugl. A roundness of the liner within 0.0015mm in diameter, in the FMV cylinders, turned out to be (too?) good. The only effect of ovality (up to 0.005mm) seems to be more difficult starting, unless the piston is oval in the same way, but how can you make that? The 'barrel' shaped piston has two advantages: Firstly a wedge is formed to press the oil (if any) between the piston skirt and the cylinder to improve lubrication. Secondly it allows the piston to 'find its way' if the cylinder is deformed for thermal reasons. The way we barreled the FMV's piston is drawn in fig, 14a. The angles were turned after pre-honing the piston to about 0.005mm from its size.

TRANSFER AND EXHAUST PORTS IN THE LINER

As we have stated before, we don't believe in the effects of different portings. We are not convinced that the huge third port in the Nelson is the reason that it goes so well. Maybe it helps, but with a smaller third port it wouldn't be much worse. For a teamrace engine the exhaust width shouldn't be too wide, 10-11mm is enough. A bigger opening there may waste fresh mixture. For mechanical reasons it is favourable to keep the ports as small as possible, giving more cylinder wall for the piston for guidance. The inclination of the third port is in most engines 50°-60°, no differences were found between main transfer ports inclined between 0° and 15°. In figure 13 a section of the cylinder ports is drawn.

PISTON DESIGN AND COOLING

A few things were said before about the outside shape of the piston. A few other aspects of the FMV piston design are as follows: The design had to meet two demands: lightness and limited con-rod end play. With a piston pin directly supported by the top of the piston a very thin (0,4-0,5mm) piston skirt is possible. The small end construction is shown in fig. 14a. The FMV cast iron piston weight is around 3.6 grammes, to compare: Rossi cast iron 5.2 gramme; K&B-Nelson 6.1 gramme. The piston pin is short, and thus light at 0.6 grammes, 0.4 gram lighter than Rossi and Nelson.

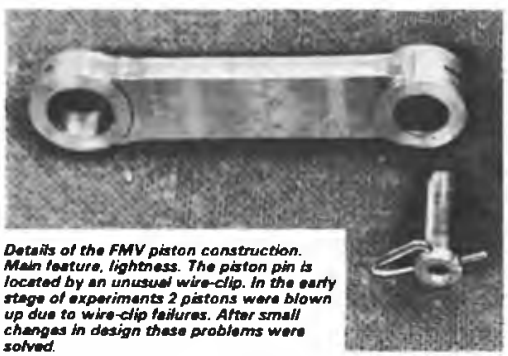
In principle Bugl's set up (fig. 14b) has the same advantages, but piston+ piston-pin construction is still about 5,2 grammes.

The piston pin in the FMV is kept in place by a wire clip of 0,6mm diameter going through the pin into the piston, see fig. 14a. The thing looks nice and simple, but needs further improvement in order to enable the separation of the con-rod and the piston in the motor. With our small end construction it is quite a hard job to get the con-rod off the shaft with the piston on.

By chance we found out that a very thin piston skirt has one more advantage. Because the piston can be easily radially compressed the diameter of the piston 'follows' the taper of the liner, making the motor almost completely insensitive to piston fit. It acts more or less like a piston ring. Unlike a Rossi-type piston, that will stick suddenly when pushed by hand towards TDC in a tapered liner, the FMV piston only gives a gradual increase in resistance. No fatigure failure in the piston has been found so far, so maybe thinner walls are possible for improved performance.

Since it was shown before that too high a piston wall temperature causes excessive expansion and lack of lubrication, the cooling of the piston is important. There are two main ways the piston can be cooled. In first place there's cool air and fuel at the underside of the piston. If, like in the Bugl all fresh gases flow through the piston, this can be a main way of cooling. In Nelsons, Rossis and FMV's we can only hope for 'refreshment' from that side. In the second place, there is a given amount of metallic contact between piston and liner, especially with tight fits. With a loosely fitted piston, hot gas will leak between piston and liner heating up the walls and preventing the already limited metallic contact. This must be the main reason that worn out piston and liners overheat quite easily.

One of the main sources of the heating of the piston will be radiation from the combustion process. A black piston (carbon deposition) receives far more heat than a shining type. So the cleaner it is, the cooler it stays. Striving for higher thermal efficiency with inevitable increased gas temperature, the piston temperature could turn out to be a bottle neck and may be it already is, due to possible oil flashing. At this moment we're thinking about a super shining piston top as a useful way to limit piston temperatures. Preventing cabon built up might be our future goal.



Details of the FMV piston construction. Main feature, lightness. The piston pin is located by an unusual wire-clip. In the early stage of experiments 2 pistons were blown up due to wire-clip failures. After small changes in design these problems were solved.

CYLINDER HEAD AND CYLINDER COOLING

From the previously discussed upper limit in cylinder and piston wall temperature, improved efficiency calls for improved cooling. In speed engines a power increase will normally go together with an even greater increase of fuel consumption to give more internal cooling.

It is not by chance that in the last years more and more cylinder heads with improved heat transfer from the cylinder and combustion chamber to the outside

were seen in teamracing. The Russians, Larsson-Rylin, Nelson and last year Bugl too, changed from the traditional steel contra-piston, directly fitted in the cylinder (fig. 15a), to an all aluminium alloy head. In the traditional system the cylinder is hardly cooled at all because as temperatures rise there is no direct contact between cylinder and crankcase due to the greater expansion of the aluminium crankcase. There's no way to keep a metallic contact above 150°C (with a steel cylinder). It would need an interference fit at room temperature of 0.025mm or more, which is quite impossible for different reasons.

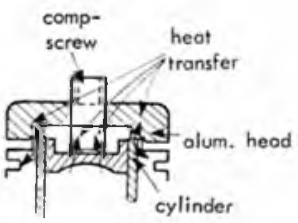


Fig. 15a: Traditional Steel Contra Piston.

The all aluminium head with a small moving contra-piston, gives a good thermal contact between the cylinder and outside because the head insert expands more than the cylinder. Fig. 15b shows the FMV version of this head. The compression is adjusted by a push-pull mechanism, avoiding the necessity of a very accurate tolerance on contra-piston fit. An interference fit of about 0.005mm is used with a moving contra-piston of 18% Si-aluminium alloy to counter seizure and to get a more constant fit over a wide temperature range.

Since the conductivity of heat is better in aluminium than in steel, this may turn out to be a strong argument to change to aluminium cylinders. A better heat conductivity also means smaller internal temperature differences, also an advantage with respect to thermal deformation. A logical next step to a better cooled cylinder will possibly be a cylinder with integral cooling fins like HGK and the small Cox engines. Thermal deformation of the cylinder wall due to temperature differences caused by cooling air entering from one side is the problem to be solved. We are sure, that when all the mechanical problems in the motor will be solved, only a better control of the piston and cylinder wall temperature will enable further improvements in efficiency.

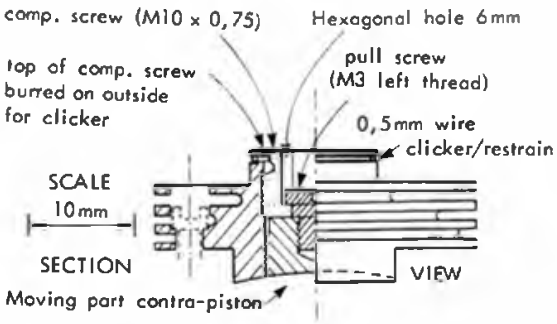


Fig. 15b: FMV Cylinder Head.

THE COOLING OF THE MOTOR IN THE MODEL

The goal of all cooling systems is to extract sufficient heat from the motor and limit thermal deformation. Temperature differences have therefore to be minimized. In the FMV model for '78 the cooling air supply was divided into 5 separate parts.

Fig. 16 shows the way the air was supplied (a bit different from Dave Clarkson's interpretation in Aeromodeller Nov. '78. It really *was* your own idea Dave, and probably not a bad one too!). The 4.5 i.d. 'pipe' directing to the carburettor is extremely important in our view. Air of a *constant* temperature is the only way to get constant needle settings. The only air of constant temperature is air directly from outside and this is also the coolest air we can get.

Vapour lock problems, being more common than most people like to think, are solved by this approach. In the FMV model the crankcase bottom (ballraces etc.) was not directly cooled for the earlier mentioned reasons. For an all aluminium crankcase cooling is absolutely necessary. The crankcase between the cylinder fins and the bottom gets a moderate amount of air. Some of this air is directed to the exhaust and leaves the model there through a hole near the exhaust.

The air to the cylinder fins is pressed through by making the cooling duct very closely fitted to the motor at the sides. The air is directed to the head by a tube and pressed through the fins in the same way as for the cylinder. All these cooling air openings are more or less independently variable by changing the tube diameters or the setting of the air baffle thus changing the distribution of the air between the cylinder fins and the exhaust/middle crankcase part.

This way of a regulated cooling for each part of the motor will only work, if the main air resistances in the system are the ones we can vary. So for the rest of the cooling ducting, an air resistance as low as possible is necessary. A relatively large air outlet is therefore used.

The problem of temperature difference between the front and the rear of the cylinder is not solved in our system. Until now, it doesn't seem to be important (for a side exhaust engine like the FMV at least!) because the thermal deformation of the crankcase (bending and getting an egg-like section) doesn't 'touch' the steel cylinder at running temperatures. With an aluminium cylinder and/or integral cooling fins, this problem may become more important.

Left: ***Cooling opening in the FMV model. Air baffle in cooling air opening distributes air to crankcase and cylinder fins.***

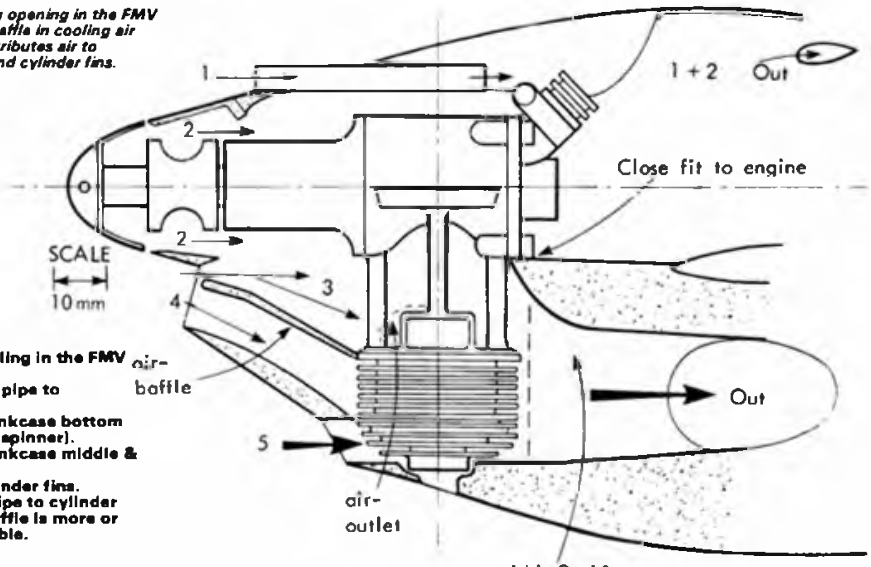
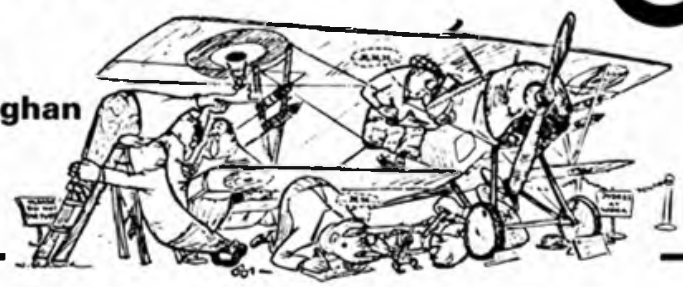


Fig. 16: Cooling in the FMV Model.
1. 4.5mm id pipe to carburettor.
2. Air to crankcase bottom (blocked by spinner).
3. Air to crankcase middle & exhaust.
4. Air to cylinder fins.
5. 8mm id pipe to cylinder head. Air-baffle is more or less adjustable.

SCALE MATTERS

by Alan Callaghan



NE AREA INDOOR MEETING

A VERY SWIFT weekend visit to the North-East gave another opportunity to attend one of the area's mixed indoor meetings which are now held at the Spennymoor Recreation Centre. The very large and excellent Washington sports hall, the scene of previous meetings, is now unfortunately no longer available, and although the Spennymoor hall is less than half its size, the latter is nevertheless a very welcome facility.

The scale event was staged under NE Area Class II rules which cater for rubber models only, but without any size restrictions, thus allowing Peanut and Open rubber scale models to compete together. Model flights are judged for both scale realism *and* duration so that one can aim for a high score in more than one way. Surprisingly, the scale flying was run at the same time as an EZB event, and although this was much to the chagrin of at least one duration flyer I do not recall seeing even one major mid-air disaster during the session. Eleven entries were recorded in scale from which my own RWD5 and Westland Widgeon made up the only double entry. In all, nine models actually took part, and the RWD5 was one of those to drop out, due to being brand new and largely untrimmed at this stage.

Although not amongst the winners, one of the most admired successes of the meeting was a Peanut DH Tiger Moth built to an own design by young Neil Turnbull. Neil was neither a member of any model club, nor had he contact with any other modellers in his area, but had scaled up and built the Tiger Moth from scale drawings published in *Aeromodeller*. With a built-up fuselage and all-sheet flying surfaces the model was deceptively simple in its all-yellow colour scheme, and had captured that rather elusive 'air' of the aircraft rather well. The model flew very steadily for times of 17-18 secs. which in view of Neil's inexperience with this or any other type of model, and also remembering the very first attempts at Peanut scale models in this country many years ago by experienced modellers, is what we could call a job well done.

Amongst the larger models, organiser Jeff Anderson's *Halton Minus* seen at previous meetings was still going strong, although towards the close of the meeting a motor burst did some minor damage when Jeff was trying very hard to improve upon his flight times. Reg Boor's nicely detailed large *SE5a* scored the second highest scale points and although it flew well enough to take second place overall it looked as if it would have been happier in a larger and less crowded hall. This subject must be one of the most suitable types for any kind of FF scale model with its generous dihedral, tailplane area, and prop clearance, and the flying prop was one of those very versatile Tern plastic types. An *Antoinette* by Steve Philpott was an own design which flew well despite the automatic restriction on this subject of having to use an extremely small prop. As a very rough guide for rubber scale models a flying prop should be roughly one third of the wingspan on biplanes, and between one third and one quarter on monoplanes. The close proximity of the nose skid to the motor makes these proportions unworkable on the *Antoinette* and Steve had to use a very coarse pitch prop with plenty of blade area to achieve the required amount of thrust. Other models that flew well included Paul Street's *Miles Sparrowhawk* that did marvellous take-offs, together with his twin rubber *Wright Flyer* that actually does! John O'Donnell was flying an ultralight *Fike* with a very slow and steady flying speed that was impressive, but John had a frustrating time trying to get the trim right and an undercarriage leg was lost in a heavy landing. Trimmed to turn right, the model would climb and circle steadily, but after a while would begin to increase its turn and spiral in. This is a slightly baffling phenomenon frequently seen on scale models that turn right and it occurred on my Widgeon when it was first flown some years ago. It seemed to me that the only thing that prevents the model from spiralling in is the torque reaction on the fuselage which rolls the model to the left initially. As the power dies down the torque decreases, the model loses the roll effect and begins to bank right. Since the flying surface trim is holding the model right already the spiral simply builds up and the model turns in. On the Widgeon the cure was to decrease the right sidethrust and downthrust while trying to keep the flying surfaces in a straight-ahead trim.

The *Widgeon* seemed to be well-suited to the prevailing conditions on this occasion since it will fly in very small circuits which helped to avoid the numerous EZB models. The rather cluttered ceiling meant that its motor could not be fully wound without taking the model into the roof and so flight times were around the 40 second mark, which together with one more modest but steadier flight on fewer turns managed to secure first place followed by the *SE5a* and then the *Halton*.

With modellers down from Scotland and from the Midlands as well as local fliers the meeting was well-supported and run in an informal and friendly way. Scale enthusiasts within reach of the centre are recommended to watch out for future events.

Newly completed RWD5 by Alan Callaghan is 19in span for rubber power. Fuselage, laminated tail surface outlines and wingtips are built from Basswood. Scale tailplane areas.

Above right: ***Neil Turnbull of Darlington with his own design Tiger Moth seen at Spennymoor. This was Neil's first attempt at any kind of scale model and it flew well.***

Right: ***John Blagg seen with his new Isaacs Fury Mk. II for rubber power. This model weighs only 8 ounces as shown and ought to have a very low wing-loading when completed.***

2FSA NEWS

Adding further to a month of consistent scale activities was the latest meeting of '2FSA' members whose association is aimed mainly at the outdoor free flight scale model enthusiast. This meeting was the first not to be held at a member's own home, but was organised by Rex Oldridge and took place at a local community hall at Virginia Water. This arrangement proved absolutely ideal since there was plenty of space with tables for the display of many models, together with a splendid spread of food and drink to keep enthusiasm in top gear.

Following a mixture of cine films of both model and fullsize flying we were treated to a most interesting slide show from the collection of John Hunt of Bagshot, whose subjects ranged from aircraft in continental museums to a fascinating selection seen at the Experimental Aircraft Association's museum at Hales Corners, Wisconsin. Many odd and obscure subjects really tested the powers of recognition of the members present.

A generous spread of models was on show and varied from a new ultralight Peanut Scale *Folkerts Special* built by Rex, to the ambitious *Curtiss Kittyhawk* recently completed by John Coker and resplendent in full camouflage, markings, and weathering effects. The scale *Latécoère* airline being assembled by Ken McDonough is now beginning to show its strength. These models are all being built to a constant 1:30 scale for CO_2 power, and Ken intends to include at least one example of each aircraft type operated by this company. They are all flying models, of course, with motors being easily changed from one model to another. The choice of these subjects which include at the moment *Farman* and *Breguet* aircraft is really quite unique, and the interesting and subtle markings are a joy to examine at close quarters.

A number of partially-built airframes were to be seen which included Dave Banks's *Albatros* for FF power, and two large rubber scale models, John Blagg's 1:6 scale *Isaacs Fury*, and David Kew's *Percival Proctor*. It seems that at least some people are beginning to think rubber is worth trying after all! John's model, at approximately 43in span, weighs only 8 ounces at this stage, and ought to have an extremely favourable wing loading when completed.

Many other older models were on display including an *SE5a*, *Gipsy Moth*, and *Puss Moth*, by Fred Longbon – still flying and enthusiastic as much as ever.

With regular flying sessions at Epsom Downs, together with these occasional social evenings, '2FSA' seems to be going from strength to strength and keeps alive many of the best traditional aeromodelling skills in this day of the plastic RTF instant wonder.

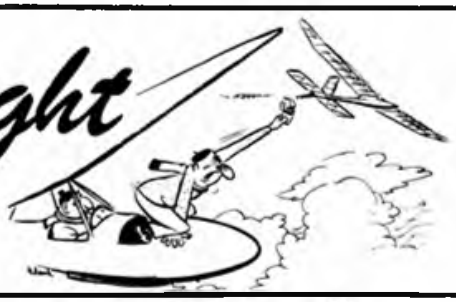
Seen at the '2FSA' meeting, Ken McDonough's 1:30 scale Latécoère airline is beginning to take shape. Subjects shown here are a mixture of Farman and Breguet types very colourfully painted

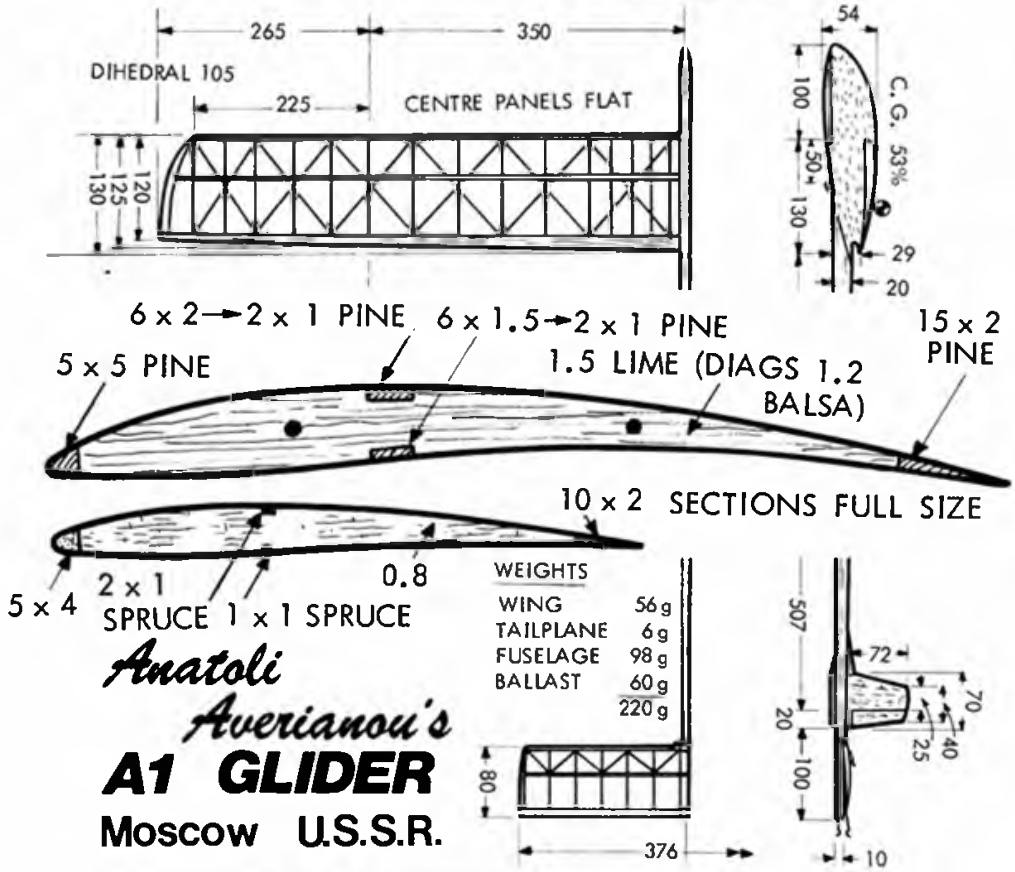
OUTDOOR RUBBER SCALE COMPETITION AND FLY-IN

The first of these meetings in 1979 is now scheduled to be held at *Old Warden Aerodrome* on *15th July* at the Shuttleworth Model Section's Open Day. A Class II *C/L Scale* event will also be held. The aim is to try to encourage more people to take part in a relatively simple event, and to explore the possibilities of the greatly neglected rubber scale model. The progress of indoor rubber scale flying performance over recent years only serves to demonstrate that they are no more difficult to develop and fly than most other types worth building. It would be most encouraging to see similar developments take place with larger subjects to be flown outdoors.

In this contest the models will be judged statically for scale accuracy, and will be required to complete two flights; one of which will be judged for realism, and the other will be timed only for duration. In each section a maximum of 50 points will be available so giving a potential total of 150 points when all three are added together. It can be clearly seen that the emphasis is on flying, which is the main idea anyway, but some simple form of documentation will be required to substantiate all that you would hope to get scale credit for. A 'Profile' publication would be a good typical example. Since the event is designed to encourage the larger scale model, Peanut subjects will not be eligible. Hopefully some nice prizes should be available but the main aim is to have some fun!

Free Flight Scene





Anatoli Averianov's A1 GLIDER

Moscow U.S.S.R.

Martin Dilly reports....

ANATOLIS A/1

Over the past year or so we seem to have concentrated on F1A gliders to the exclusion of the domestically very popular A/1. The class is elevated to the status of an FAI provisional one (category F1H). As a reminder the model specifications are: Max. surface area – 18 dM² (279 sq in); Min. weight – 220 gms (7.81oz). Towline maximum length is 50 metres and five two minute maximums are required.

This month we are remedying the dearth of A/1s with one from Moscow, designed by 1961 A/2 World Champion Anatoli Averianov. Designed to be at home in bad weather, the aircraft uses quite a lot of hardwood – spruce for the spars, leading and trailing edges, and lime for the chordwise wing ribs – which may be one reason why a fuse D/T is employed saving the weight of a clockwork timer. Although the original model had an Ekhtenkov-type circle towhook, which could only be used for a limited time with the D/T time steadily approaching whether or not the model is released, the model would no doubt be just as happy with a straight tow hook and auto rudder. The airfoils that Averianov uses here are unusual to British eyes and are the Mikulentov section, although the tailplane appears to have a rather blunter leading edge than the wing. The fuselage front-end is carved from beech and hollowed to take the circle hook and the ballast, which is inserted via a removeable lower part under the nose; tailboom top and bottom are spruce, 8 x 2.5, tapering to 6 x 1mm, with 1.5mm balsa sides. The fin is 2mm balsa.

FREE-FLIGHT AS PUBLIC ENTERTAINMENT

In the United States it is not only R/C and C/L that is catching on as crowd entertainment at Ballgames, but free-flight as well, *indoors*. Not just indoor models but A/2s and Coupe models. Seattle, Washington, boasts the Kingdome with a 350 foot ceiling, and the Boeing Hawks and the Strat-o-Bats have been wowing the crowds with circle towing HLG flying, EZBs, Pennyplanes and Peanuts. TV cameras followed the models and provided giant-size 30ft span models on the projection screens that help the crowd to follow the games; several A/2s were in the air at once, launched from one set of goal posts with the flyer at mid-field, and carefully caught by people in the crowd. Flying at a soccer game between the Minnesota Kicks and the Seattle Sounders, a Coupe model reached about 320ft on the climb during the half-time interval, when the referee and teams headed out to start play again; rashly blowing his whistle, he was treated to a chorus of boos and the game was held up until the Coupe descended and was caught by its owner as it glided down amid cheers from the crowd. The performance has been repeated at pro football games against the Los Angeles Rams, with 50 people flying, and a worthwhile contribution resulting to the free-flight club's treasury, as well as fine publicity for our sport.

The Strat-o-Bats newsletter is one you may care to subscribe to; it is wittily written and carries news from one of the most go-ahead F/F clubs in the US, which includes notables like Steve Helmick and Jim Thornbery among its members. 12 issues of Bat Sheet will cost you $3 from editor Tom Cashman, 2521 SW 323rd St., Federal Way, WA 98003, USA.

CZECHOSLOVAKIAN CHAMPS
Reported by Ivan Horejsi

I cannot remember more than two or three contests in 1978 with weather close to what we can call "nice". Anyway it was a rich flying season for us free flighters with the Country Champs, the Nats and the Trials all held during the year, the aim being not only finding the new champions but also the selection of the F/F team for the 1979 World Championships.

Czechoslovakia consists of two countries; Bohemia and Slovakia. The Bohemia champs were held at the end of August in Uherske Hradiste near Brno. As usual, the number of participants was limited to 100 people (although in all three FAI classes). The number of participants from particular regions was determined by the results of the previous Champs two years before. Unfortunately I cannot say anything about the Slovak Champs as I did not visit it, neither have I seen the results.

The Nats were held on the 16/17th September in Roudnice nad Labem near Prague. The airfield is close to the mystic mountain of the Czechs called Rip; Sazena airfield where the WC '67 were held is close to this spot. The number of paticipants was again held to 100 people – 2/3 of them being the best of the Bohemia Champs and the rest the best of the Slovakia Champs.

From the results of the Nats the seven best modellers in each class were selected to compete in the Trials for a team place. The Trials were held on 21/22nd October again in Roudnice nad Labem. We were again to fly two FAI contests, but the fortnight's long period of good Autumn weather ended suddenly the night before the Trials. Our team manager Jiri Kalina, decided on Saturday morning not to fly but to wait. It was a wise decision. Though the wind velocity was not yet above the FAI limit, the wind was strong enough to damage the models on the ground after landing. So we did not begin to fly until Sunday morning and were able to finish only five rounds as the weather did not improve at all.

The results of the five round contest: **F1A** 1. Pavel Kornhofer, 2. Pavel Dvorak, 3. Ivan Horejsi. **F1B** 1. Vladimir Kubes, 2. Vaclac Jiranek, 3. Josef Klima. **F1C** 1. Vaclav Patek, 2. Jiri Kaiser, 3. Cenek Patek.

Due to the small number of the rounds, the previous contests mentioned above were also taken into account. The only change that this made to the team was that Frantisek Rado changed with V. Siranek. So our F/F team looks like this: **F1A:** Kornhofer, Dvorak, Horejsi (Crha – reserve). **F1B:** Kubes, Rado, Klima (Jiranek). **F1C:** Patek, Kaiser, Patek (Adlt).

The most interesting glider of the year is beyond question that of Ivan Crha. It features full sheeted Monokoted wing with long tapered tips and the Wortmann FX-60-126 airfoil thinned down to 10% thickness. I would not believe it could fly if I had not seen it. Ivan claims it flies 10 seconds more in calm weather than his other models. The flight pattern in windy weather is a little erratic, which may be caused by low Reynolds number for this airfoil at the tips.

Pavel Dvorak flew his models with the old Saper wing layout. He had also built some full sheeted, mylar-covered versions of the wing but has not flown them in contests yet. It is interesting that the Saper is only seldom copied by other modellers, maybe due to the unorthodox layout and the difficulties which arise from it. The model is for sure very potent but Pavel himself has to spend much time to keep it "in" trim.

Pavel Kornhofer flew his own design that he used at the '75 WC where he was a Czech team member; the model uses a tissue covered wing, with short, slightly tapered tips.

Personally I flew my old 'BOHEMIA' (or 732' as published in *Aeromodeller* in '75) design, and also my "FIK" design after the Russian fashion (*Modelar* 7/78). I use

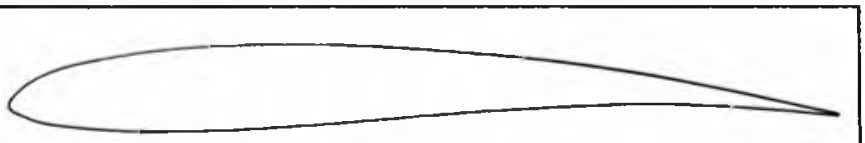
delayed rudder deflection after the launch; I invented this device several years ago when doing my second hobby – R/C soaring. The idea is very simple; an airplane in climbing turn must not have a fully deflected rudder, otherwise a spin will result; a similar device is also used by the Russian flyers.

As well as the gliders I should like to mention Josef Klima's new Wake, perfectly built as always, which uses the BOGART airfoil (the same as Bob White uses) and is reported to fly very well.

As for Power, all of our top flyers already use the Rossi engines. Tissued covered wings are the exception; some attempts have been also made by V. Hajel to improve the transition via an outside loop.

WORTMANN AIRFOIL FOR F/F

Ivan Horejsi's report on Czechoslovak free-flight in 1978 mentions an A/2 by Ivan Crha which uses a highly unusual airfoil for free-flight, the Wortman FX 60-126, thinned to 10%. The original airfoil's thickness is 12.5%, and fellow F/F Scene writer Mike Fantham, seated at the mighty calculator, came up with the new ordinates, after having calculated the original camber line and substituted a fairing to give the new thickness. In the case of Wortman sections ordinates are not calculated at the normal 5, 10, 15, etc. percentage chord stations, but at fifty positions from which we present here fifteen that are close to those usually used by modellers.



WORTMANN FX60-126 THINNED TO 10%

%age chord	0	2.7	5.2	10.3	14.6	19.6	25.0	30.9	40.2	50.0	59.8	69.1	80.4	89.6	100
Upper	0	2.9	4.1	5.6	6.4	7.1	7.6	7.8	7.8	7.4	6.6	5.5	3.7	2.1	0
Lower	0	−1.2	−1.7	−2.2	−2.5	−2.5	−2.4	−2.1	−1.4	−0.4	0.5	1.1	1.4	1.1	0

LATEST RONYTUBES

A super-lightweight version of the Tchop tube is now available from Ron Pollard; it weighs 25 grammes compared to 39 grammes for the earlier version, and it has a wall thickness at the front of about 0.8mm thinning to 0.4 at the rear. Diameter is 19mm, tapering to 10mm for an overall length of 1050mm. The larger diameter of this replica of the fuselage tube that 1975 World Champion Viktor Tchop of the Soviet team used to win at Plovdiv, increases fuselage stiffness compared to the normal diameter Ronytube A/2 blanks, and could result in some height gain on launch. Careful treatment with wet-and-dry paper will smooth the slightly ridged outside surface and reduce the weight marginally as well.

The other 1979 Ronytube is a Wakefield motor tube 520mm long, with a very slight taper from 30 to 28mm, presumably to aid removal from the lay-up mandrel. Weight of this one is also 25 grammes. This tube can be easily used for a couple of Coupe d'Hiver models if Wakefield flying is not to your bank manager's taste.

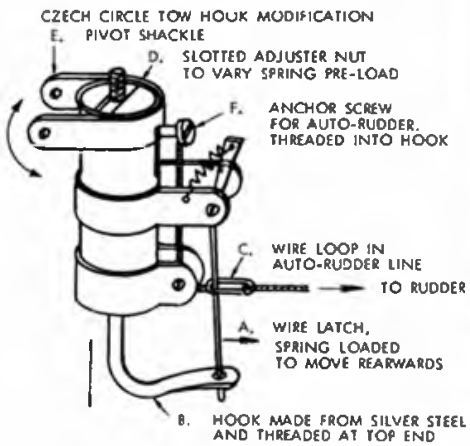
Prices of these new Ronytubes are £3.00+£1.20 post and packing for up to eight Tchop tubes, and £2.80+£0.60 p&p for one or two of the Wakefield ones. The Ronytube address is: 23 Ivy Road, Newcastle-on-Tyne, NE6 4PU.

CZECHOSLOVAK CIRCLE TOWHOOK MODIFICATION

Czech A/2 flyer Frantisek Ziegler has a useful modification to the now-standard circle hook used by many of his country's competitors. In common with most hooks with a circle tow and zoom launch facility, when the hook proper is loaded by increasing the airspeed and towline tension just before launch, it extends downwards, allowing the auto-rudder to deflect towards the glide setting. Although adjusting the pre-load on the spring that reacts against the line tension can reduce the tendency, it is not uncommon for gusts and involuntary increases in line tension to cause unwanted rudder deflections during tow. In the Czech hook this spring fits round the hook, inside the tubular barrel, and can be adjusted in compression by means of the slotted round nut D, turning on the threaded upper part of the hook proper, B, usually made of silver steel.

In its original form, the auto-rudder line extends as soon as the hook B starts to move downwards, even when latch A is still engaged; screw F is threaded into the hook, and acts as the forward anchor point for the auto-rudder line, moving downwards as the towline tension is increased. The original auto-rudder line was continuous from this anchor point back to the rudder horn, but Frantisek's modification consists of adding a small flattened loop of wire, C, in the line, through which the latch passes. This loop is positioned so that its front edge is restrained by the latch in its closed position, preventing any auto-rudder line movement until the hook, B, extends far enough to open the latch and free the loop and the line. This effectively prevents rudder deflection with the hook in the forward, straight tow position, right until the moment the latch opens, just before the model releases from the line.

Top: ***reserve Czech glider team member Ivan Crha with a model of similar layout to that described in text, uses unusual Wortmann aerofoil, sheet surfaces and mylar covering.*** Above: ***Ivan Horejsi with his pair of new models which helped win him yet another team place for 79 Champs.*** Right: ***Vladimir Kubes, the leading Czech Wakefield flyer, launches alongside thermistor mast.***



Dave Hipperson reports....

CO_2 DURATION

ALREADY THERE SEEMS to be two schools of thought on the best way to design for outdoor CO_2 duration and I have included drawings of what I believe will turn out to be the limits in each direction. The range falls between a glorified HLG to something built as light as an open rubber model and the size of a 1/2A.

As far as track record is concerned – and it is a brand new class remember – we have little to go on. Phil Bail's model has won virtually everything so far and has been rather unkindly referred to as a powered chuck glider. It is far from that! The version drawn here is somewhat stretched from the original that won the Nats scramble as duration was not the requirement in that event. Surfaces are from insulating foam plastic of around 2.7lb per cu ft and its low all-up-weight of 52 grammes and 120 sq inch wing area produce a respectable glide even with the slim flat bottom section. In fact Phil actually attributes a certain amount of the model's success to this low drag arrangement.

Powered by a stock Humbrol unit, the speed adjustment is backed off a little from flat-out to give an average run of a little over a minute using the standard prop. Actually with a good charge the motor has been known to run for 2 minutes at this setting. Still air times are usually in the region of 2½ mins which puts it more comfortably over the necessary 2 minute max, than even a very good Coupe!

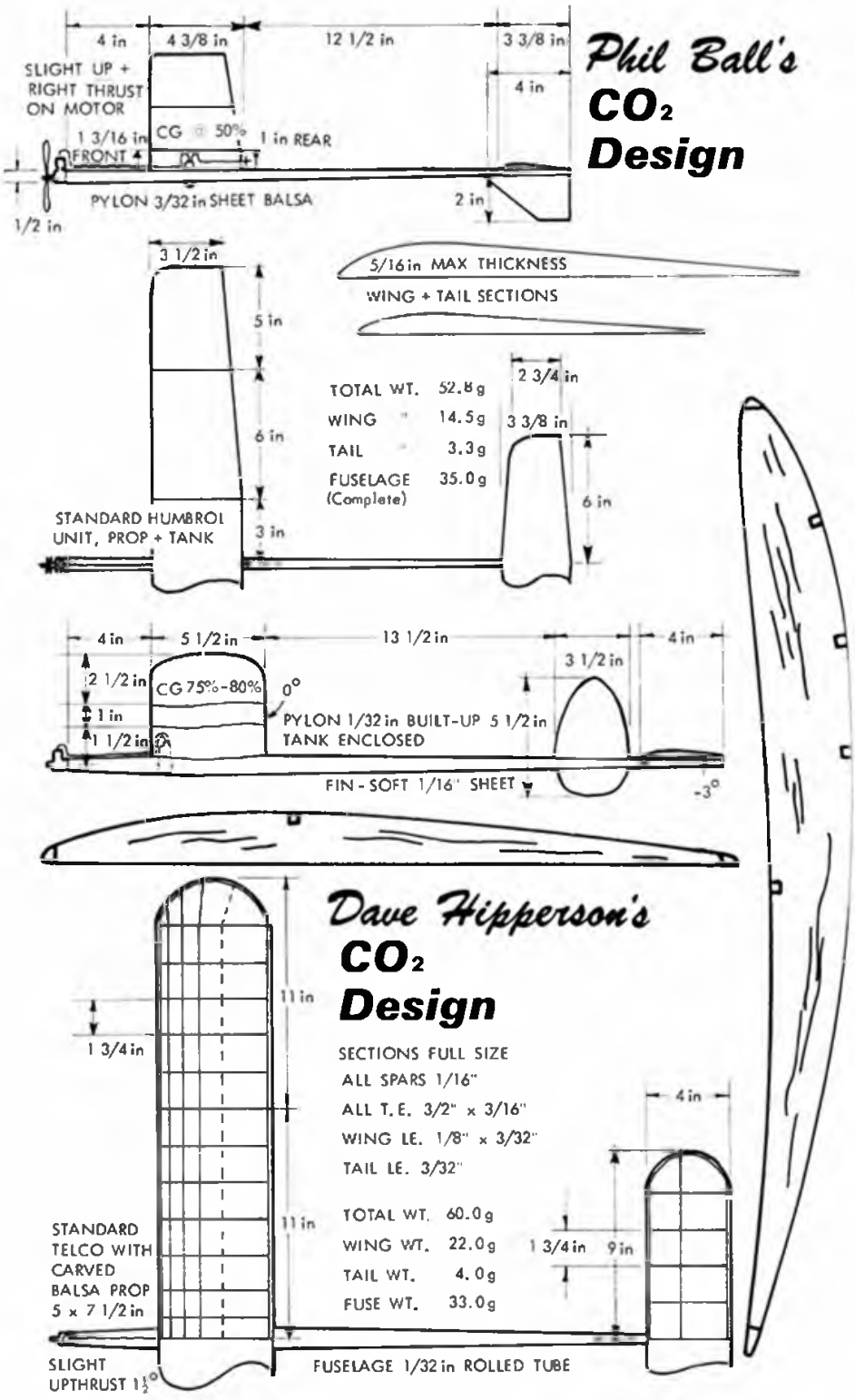
My own approach is from the indoor standpoint having satisfied myself that a 280 sq inch model weighing less than 30 grammes can produce consistant 5-6 minutes flights given a reasonable motor. Therefore my model drawn here weighs little more than Phil's but sports a 240 sq inch wing built to the same Davis section that I use on my large open rubber models. The choice of such a large airframe was more than just a reflection of indoor experience. During the past 15 years given a new class to play with, we in this country particularly, have always started development at the small end and increased areas only as we gained experience. Inevitably this has resulted in an improvement in still air performance if not handlability. The obvious examples of this are Coup d'Hiver where we all started at 150 and now most fly 200 sq inch plus and of course 1/2A power where we ignored the American's experience and persisted with tiny models until quite late into the 60s. (I can remember flying 160 square inch models with a Tee Dee and now the average area is something like 250 with quite a few people having success with even larger wings despite the shorter run of 7 secs!)

Therefore I expect something in the region of 3 min plus from this airframe although its first outing proved disappointing as I had risked using a 110% CG which the section did not take to at all kindly. The model was subsequently rebuilt and that is the design produced here. It tips the scales at 60g.

We have another variable in CO_2 class, and that is the power plant. At present there are several to choose from. The Telco – up until quite recently the favourite, followed by the Humbrol unit and of course the very expensive Brown Junior from the USA. My experience is so far limited to Telcos and I have found they vary enormously. I believe I may have an example of both ends of the performance scale! Phil Ball has stuck to the Humbrol unit and has experience of four! He reports that like the Telco they vary and two of his are significantly better than the other two. The only Brown I have seen operating is Ian Dowsetts and although he is most enthusiastic about it, the advantage initially was the larger tank which has of course been evened out by the rules. (Browns are available with a variety of tank sizes.) As far as outputs are concerned and specific figures are not available, I would cautiously suggest that a good Telco or Humbrol unit would be as good as a Brown. The problem being that you might have to buy half a dozen before you get a really good one. It may actually be cheaper to buy a Brown Junior in the first place!

As far as comparing one unit against another it is the old story of the best units being free enough to run fast and smoothly but not so loose as to waste gas. As a rough guide I reckon the maximum obtainable duration of engine run with the motor throttled to its slowest setting gives some idea of performance or certainly usefulness. A standard prop would have to be employed for such test but to give you some idea using the regulation size tank: the worst Telco I have will only run for 3 minutes odd and stops stiffly with enough in the tank for quite a few more five second bursts. This is after some rebuilding too. My best motor using the same standard yellow plastic prop can be adjusted to run for nearly 8 minutes and when it stops there is nothing left in the tank. I believe Ian Dowsetts best Telco is of a similar standard but they are rare. There is much to be learnt regarding methods of charging.

If you are being put off from trying, by the thought of more complex lightweight structures to build – don't be. We were delighted at Cardington recently by the performance put up by a well known outdoor flyer who produced a deliberately simple CO_2 lash up built the previous evening in two hours flat using some very basic construction techniques. Approximately 24in span, curved sheet balsa wing – I would hesitate to call it Jedelski – and a Humbrol PSM-1 for power. When he had stuck the wings together after breaking them getting it into the shed and some trimming damage had been sorted out (he isn't half as clumsy outdoors) it produced a string of 2 minute plus flights from a 1 minute or so climb. In many cases the prop stopping just below the 150 foot high catwalk and on one flight it actually hit the rafters! I suppose he could have a very good motor!



STORAGE AND USE OF RUBBER ON THE FIELD

It was a little surprising to hear of people using untried, untested and in some cases un-run rubber in some of the recent open rubber flyoffs. In most cases this has the result that either nowhere near full turns are reached, if they know what the full turns are anyway, or power variations adversely effect trim. Now we have some rubber in the country worth looking after it may be opportune to discuss some of the ways of recording information on motors actually in use with the aim of always being able to pick the ideal one for the conditions.

As far as open motors are concerned – and they have the longest life expectancy – I bag each one in a labelled freezer type self sealing bag as soon as it is made up and lubed. At this stage rubber type, weight and made up length are all noted. The motors are *not* run-in however. New motors are kept for trim and check flights and each time a motor is used the number of turns applied are noted on the label. Dates are not bothered with until the motor starts being used in contests. One of my oldest motor bags has considerable information dating back some years. I rarely bother to note flight times unless something special happened. On this particular bag the record shows that I have crept up from a very low max turns on its first contest flight – all these are flyoffs incidentally – of 235 when the motor was a little too new, to more recently at the end of last year and the beginning of this, where I have reached 280 (300 being considered the sensible maximum). The length is also continually up-dated as it has probably stretched 4 inches during this time. By computing the current length, what work it has done before and how many turns I have reached on previous occasions I can choose a motor most suited to the conditions and know what it should take. I tend to use the longest and oldest motor I have with me unless it is breezy then a shorter faster run is more appropriate. Before a flyoff I reckon to load the favourite motor and line up two or three more in their bags and in order of preference in case strands go in the one I am winding.

The bags are available from Transatlantic Plastics Ltd., Garden Estate, Ventnor, Isle of Wight. PO38 1YJ. They are called 'Mini Grip' and have three 'write on' panels that take ballpen quite well. They are available in a variety of sizes but I use 5in x 7½in which would be sufficient for a motor up to 5oz maybe more. The price was £1.50 for a hundred last time I ordered but would estimate they are more like £2.00 now. If you write for their catalogue you will find other useful things in it too – like heavy gauge polythene tubing for wing storage and cheap double glazing systems!

Below: ***Dave's box of pre-loaded cartridge tubes ready for a days flying, note pen and motor data sheet. Box is lined with polystyrene for insultaion on sunny days — what in England? Full details of system appeared in Aeromodeller April 75 pp209-210.*** Right: ***numbered Coupe loading sticks with inset details of notched rear ends, and front motor hood looped over peg. Ribbed texture of rubber clearly visible proves the rubber is genuine Pirelli***

For Wakefield, my storage on the field is in numbered loading tubes housed in a ply box. A note pad is kept in the box for all the information and this is referred to and up dated throughout the contest. In a central column on the pad the type of rubber of each motor and its current length are recorded. This will once again tell me what flight characteristics to expect. The previous turns applied are listed for each motor on the left of this column. When a motor is used the turns applied (or whether it broke or not) are noted on the right side of the pad. At the end of each days flying the motors are removed from the tubes inspected and repaired or discarded if they are very badly broken. The empty tubes are filled with new motors and the information pad is re-written with the up-dated info. Once again brand new motors are kept for test and trimming flights but usually the replaced motors have some history being used in open events already and will accept full turns straight away.

My rubber consumption is to make new rubber up into Open motors – I use two sizes 3½ and 4½oz. When these are retired or burst they become Wakefield motors. When the Wakefield motors fall apart they are cut up (or fall into) 10 gramme pieces for Coupe. Thus they are well used by this time and their life expectancy is short. Instead of using a scaled down tube system for Coupes I have built a motor stick loading arrangement which because it is far less bulky than tubes allows me to carry up to 20 motors ready to load. Additionally I can check them visually for both condition and length before use although I usually keep some sort of pad as to what type of rubber they are as this is not immediately obvious.

The sticks are constructed of ¼in by ⅜in spruce with a short piece of ⅛in dowel through one end at an angle to catch the S hook and a notch to allow the rear anchorage through when installing in the fuselage. Four short pieces of 20 swg wire are epoxied top and bottom of this notch to keep the rubber in place. They are all wrapped in polythene for transport and storage and laid out when I come to fly. Although a bit fiddly to make they are a god send when motors insist on breaking one after another and your fingers are getting colder and colder. Needless to say a tube is still employed for winding.

Top: ***Re-sealable plastic bags with write-on panels to record details of motor weight, length, strands, max turns, etc.*** Above: ***Wakefield motor data sheet, note four types of rubber and varying lengths from 20-22in, winds are actual turns applied to motor.***

SMAE 1st Area Centralised, 18.3.79

F1A Glider – KMAA Trophy: 1. B. Baines *(RAFMAA)* 15:00 + 4.40; 2. J. Cooper *(Biggles)* 15:00 + 2.50; 3. A. Wells *(Anglia)* 15:00 + 2.40; 4. M. Fantham *(Richmond)* 15:00 + 2.33; 5. R. J. North *(Croydon)* 15:00 + 1.54. **Open Power – Frog Senior Trophy:** 1. D. Cash *(East Grinstead)* 9:00 + 6.56; 2. R. Peers *(Falcons)* 9:00 + 4.45; 3. J. Hopper *(Stanstead)* 9:00 + 4.32; 4. A. Child *(Brighton)* 9:00 + 4.20; 5. P. Harris *(Birmingham)* 9:00 + 4.01. **Open Rubber:** 1. A. Grantham *(East Grinstead)* 9:00 + 7.07; 2. K. Taylor *(East Grinstead)* 9:00 + 6.24; 3. T. Gray *(St. Albans)* 9:00 + 5.36; 4. D. Wain *(Bristol & West)* 9:00 + 5.32; 5. J. Cooper *(Biggles)* 9:00 + 5.30. **Plugge totals:** 1. Biggles 269; 2. Croydon 249; 3. Bristol & West 263; 4. St. Albans 240; 5. Richmond 190.

SMAE 2nd Area Centralised, 8.4.79

F1C Halifax Trophy: 1. M. Cowley *(Biggles)* 14.55; 2. R. Johnson *(St. Albans)* 14.32; 3. R. Monks *(Birmingham)* 14.30; 4. P. Harris *(Birmingham)* 14.29; 5. P. Bond *(Anglia)* 14.21. **Open Rubber – Gamage Cup:** 1. T. Gray *(St. Albans)* 9.00 + 6.31; 2. D. Hipperson *(Croydon)* 9.00 + 6.25; 3. M. Fantham *(Richmond)* 9.00 + 5.16; 4. R. Elliott *(Croydon)* 9.00 + 5.11; 4. A. Jack *(Tynemouth)* 9.00 + 5.11. **Open Glider:** 1. K. Oliver *(Nottingham)* 9.00 + 2.13; 2. K. Taylor *(East Grinstead)* 9.00; 3. E. Drew *(Bristol & West)* 8.56; 4. P. Bayram *(Richmond)* 8.47; 5. A. Jack *(Tynemouth)* 8.37; 5. P. Ball *(Grantham)* 8.37. **Plugge Totals:** 1. Biggles 481; 2. St. Albans 419; 3. Anglia 345; 4. Croydon 338; 5. Birmingham 334.

R/C Sport Flyer

This month – some simple explanations of the inner working of radio control equipment.

AEROMODELLER'S RADIO CONTROL COVERAGE recommenced in January issue, since when we have covered some of the basic principles and criteria for selecting equipment and have dealt with the construction of a simple R/C power model and a glider with installation details of the control system.

Before scampering on to even more detailed explanations of the intricacies of what we like to call the "you-have-control" side of the aeromodelling hobby, it is worthwhile to pause and gain some understanding of what makes radio control equipment tick. It is arguably not at all necessary to understand the electronic theory of radio control operation, but if we can gain some basic understanding, without the necessity to absorb too much technical jargon, of how little groups of electronic components, tagged up to batteries, are used to exercise one's will over the airborne action of a model, then it is useful knowledge gained. So let's try, eh?

The Basic Signal

The information broadcast from an R/C transmitter is called a **'signal'** and to understand what this is all about, first consider a roaring bonfire (Fig. 1) which radiates heat in all directions. Heat is energy.

In much the same manner, an energised R/C transmitter (ie one which has been switched on) radiates energy in all directions, only in this instance a battery is linked to an electronic circuit to produce radio energy. Don't try for a deeper explanation – if you can accept it at that level you are on your way to understanding enough about what goes on underneath the lid of your R/C equipment.

The next step is to understand how this radiated energy or **'signal'** is electronically manipulated to achieve the desired response for a number of the model's control functions.

To put this 'signal' to use in controlling our model, we require a **'sensor'**, which, acting in the same way that human skin senses the heat radiated from our bonfire, (Fig. 1 again), detects the energy radiating from the transmitter. In a radio control system this sensor unit is the **receiver.**

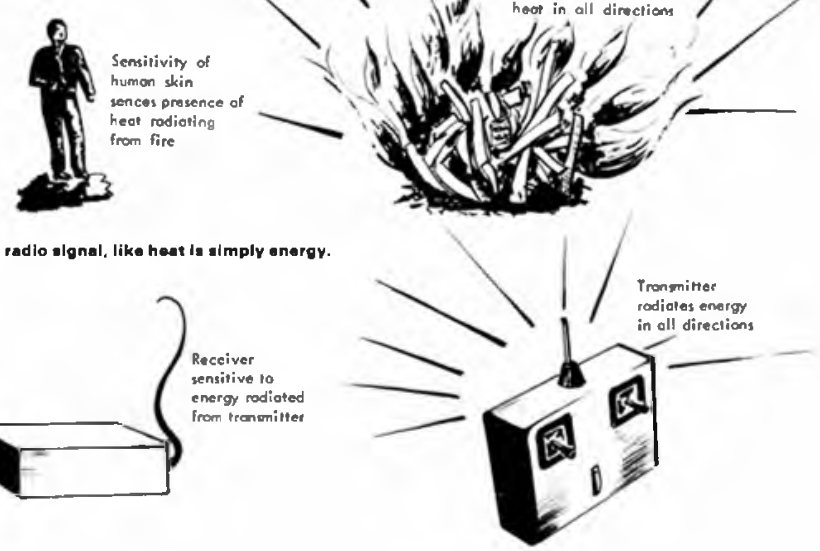


Fig. 1: a radio signal, like heat is simply energy.

Early Single Channel

In the earliest radio control equipment, the movement of the control function was based upon the simple reaction of the receiver to the transmitter signal. In effect when you turned on the fire, the receiver simply sensed the "heat" or signal and interpreted it as a simple switching action which was not proportional and could not be varied in any way. These were the old-fashioned simple 'single channel' radio control sets in which the receiver reacted to the transmitter to trigger a control 'actuator' to achieve a single control function. Fig. 2 shows how. "Single channel" is generally understood to mean a system with the capability to move one control function (eg rudder) in either of two opposite directions, left or right, but only in alternating sequence one after the other and only to full rudder travel – ie not proportional. The degree of control was very limited, imagine driving a car with only full left, full right or straight steering!

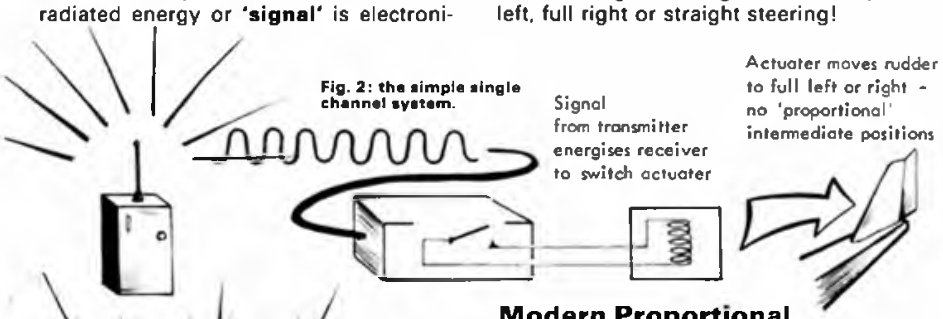


Fig. 2: the simple single channel system.

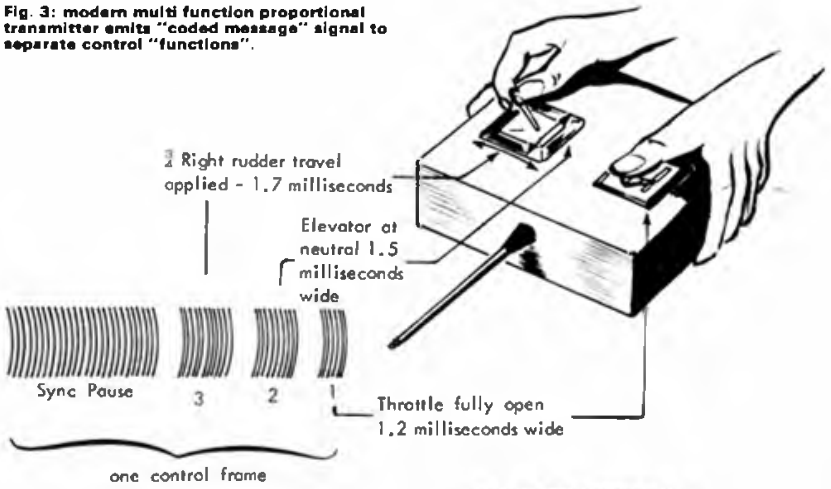
Modern Proportional Equipment

Modern, proportional multiple function equipment simply builds on the basic single channel signal and concept of the early R/C systems. **'Multiple functions'** is the ability to control the movement, both independently and simultaneously of a number of separate model control functions, while the expression 'proportional' implies that the position of the control surface is, for all practical purposes, infinitely variable between neutral and full travel, the control surface faithfully following the incremental movement of the transmitter control column – just like full size. You have now picked up and understood a number of basic principles which are at the very heart of modern model radio control lore!

The Modern Message

In modern proportional radio control equipment, the transmitter signal instead

Fig. 3: modern multi function proportional transmitter emits "coded message" signal to separate control "functions".



of being a continuous, unvarying emission (as in "single channel") is electronically interrupted into a sequence of pulses that form a coded message, like morse code. The interruptions, or code, become the **'information'** which tells the individual control surfaces where to sit in relation to the neutral.

Have a look at Fig. 3. In it you will see that the signal radiating from the transmitter consists of deliberately grouped 'information' pulses. Typically, a number of variable length control pulses (one for each control function) are followed by a long, fixed time, synchronisation pulse – a fixed reference called a **'sync. pause'**. It is longer in length than the sum of all the control pulses each of which is infinitely variable in length between fixed extremes of time which represent the extremes of throw of a control function – in the case of the elevator control for instance, 1.2 milliseconds (thousandths of a second) would represent full up elevator, while 1.8 milliseconds would be full down elevator positon. In between, a pulse length of 1.5 milliseconds represents the midpoint and would, in effect, be telling the control surface to sit at neutral.

Typically, the information code is repeated 40 times per second and the collective technical name of a single group of control pulses and accompanying synchronisation pulse is a **'frame'**.

The required control positions are fed in at the transmitter via the control stick, which are mechanically connected to variable 'potentiometers' or resistances. This is the point at which the pilot's commands, fed in by movement of the control stick, are translated into the equivalent electronic impulses. It is the value of the resistance (or impedance) across the potentiometer which sets the length of the control pulse and thus ultimately the position of the control function, faithfully following the positions of the control sticks. Fig. 3 shows a transmitter with radiated signal and how these relate to control function positions.

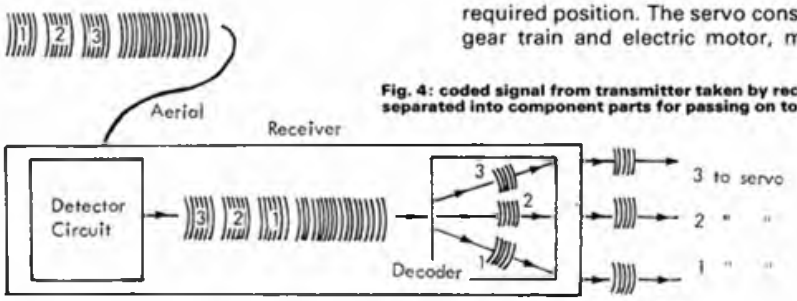


Fig. 4: coded signal from transmitter taken by receiver and separated into component parts for passing on to servos.

Message Received

As we've already noted, the receiver is the sensor which detects and reacts to those transmitter signals. In a modern proportional R/C system however, the receiver consists of a detector circuit which is then linked to a further integral circuit, the function of which is to unscramble that string of control information pulse codes and channel them to the appropriate control functions. In outline, what happens inside a receiver is shown in Fig. 4.

Remember, we said that the code of control information, or 'frame', is a **sequence** of pulses of signal. In other words, there is only one signal – broken up into pulses which run one after another in a continuous cycle punctuated by those synchronisation pulses.

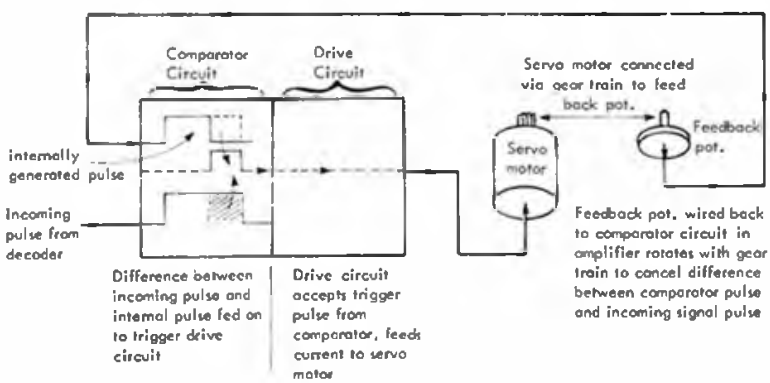
It is the decoder which turns what is, up to that point, still only a 'single channel' signal (like those old-fashioned systems), into independent control functions. In simplified non-technical terms, simply accept that the decoder is an electronic circuit with in-built criteria which allow it to understand that the long sync. pause is the start of an information 'frame' after which, control pulse No. 1 will always be channelled down the line of control ouput No. 1 and so on down the **pulse train** until the long sync. pause again 'appears' and the sequence starts all over again, channelling the control pulse commands to the **servos** 40 times per second.

Action Taken

It is the servo which provides the motive power to move the control surface to the required position. The servo consists of a gear train and electric motor, mechanically and electronically interconnected with an electronic circuit called an **'amplifier'**, and another variable resistance or potentiometer (technically termed a **feed back potentiometer** or 'pot') – just like we had in the transmitter remember, and this is no co-incidence either! Actually, the 'pot' in the servo is much smaller physically, but that's the only difference.

Servos have minds of their own, locked up in those 'amplifiers' just mentioned, but at the same time they're real copy-cats too and in effect what they are trying to duplicate are the exact movements of those potentiometers back in the transmitter, linked to the control sticks, which in turn are at the pilot's finger tips. Do you begin to get the picture?

Fig. 5: the basis of what goes on inside the servo.



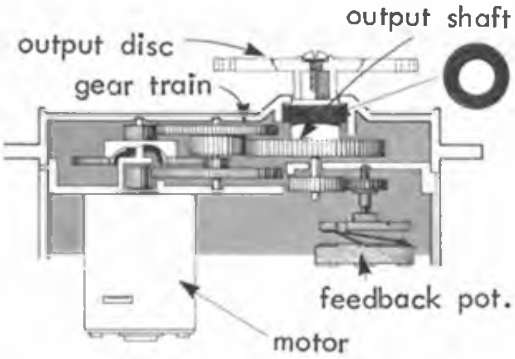


Fig. 6: the mechanism of the servo.

Left: *section through a servo unit showing the motor connected to the gear train, which in turn drives the output control disc and the feedback pot. Note that in this instance the latter is 'isolated' from the output shaft although directly driven from it. This is the latest in modern servo design to protect the delicate feedback "pot" from the effects of shock loads.*

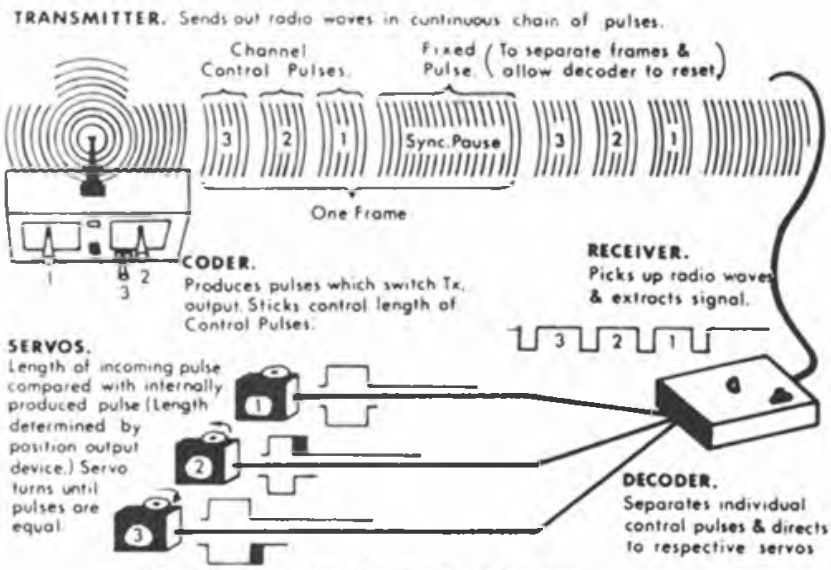


Fig. 7: basic operation of the complete R/C system.

Once again, without getting hyper-technical, when the R/C system is energised by the battery (another way of saying it's switched on!), the servo amplifier generates it's own **'reference pulse'**, (that mind of its own), the length of which is governed by the position of and, therefore, the resistance (or impedance) across that little variable resistance (feed back pot).

As soon as those incoming control command pulses from the transmitter are channelled in from the decoder in the receiver, the servo amplifier accepts them and compares the pulse lengths with those of its own internally generated reference pulses. See Fig. 5 for the basic idea. Any difference will cause the **'comparator'** section of the servo amplifier to energise its integral **'drive' circuit,** which will feed D.C. current into the electric motor unit. The energised motor turns, driving the servo gear train, which in turn is **mechanically** connected to that variable resistance (or feedback pot), which in turn is again **electronically** connected back to the servo amplifier, **feeding back** the value of its own resistance into the amplifier 'comparator' circuit. (Now you know the meaning of that expression 'feedback pot'!)

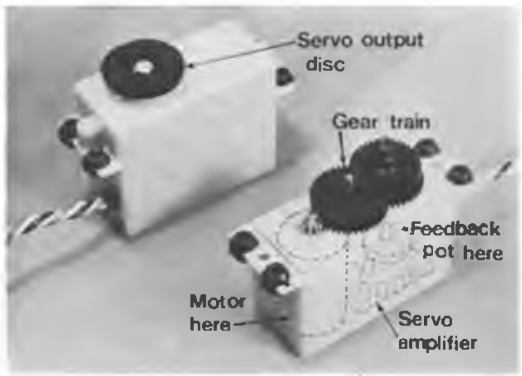
As the variable feedback pot, driven by the electric motor via the servo gear train, alters the length of its 'comparitor' pulse, it finally matches that of the incoming 'command' pulse. At that point the D.C. current to the motor cuts off, and the servo stops, at exactly the point commanded by the position of the control stick back in the transmitter, the signal from which is set by the variable resistance to which it is connected. If you like – the servo has sought to follow the control position dictated by the position of that variable resistor in the transmitter – as we said, 'a real copy-cat'.

And how does the servo move the control surface? Well almost as a by-product really. The control output drive is on the shaft of the final or **'output'** stage of the gear train which is also connected to the variable resistance, that the motor, via the gear train, is driving to effectively **cancel** the D.C. current. Devious ain't it? Fig. 6 shows the internal mechanism of the servo and how motor, gear train and variable resistance are inter-connected.

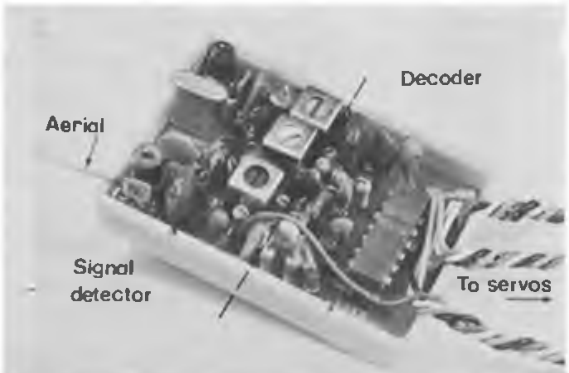
Such then are the semi-technical basics of how modern proportional radio control works. Much of what goes on in those electronic circuits has been disregarded in order to give a simplified picture of how the control is achieved and the summation of the whole process can be found in fig. 7.

If any of you have further queries on the workings of the system, we will be pleased to explain in greater depth, so let's be hearing from you!

Left: *inside the transmitter showing the electronic circuit which is basically divided into two parts — one for providing the signal code and the other which produces the radio signal which is fed into the aerial.* Below: *the receiver is also basically a two part circuit to first detect the signal from the transmitter and then "decode" it into its separate control messages for passing on to the servos.*



Top right: *the servo, showing the output drive disc, gear train and internal positions of the interconnected motor and feedback "pot".* Below right: *inside the servo, the electronic components of the servo amplifier. The motor slots into a holder which also carries the gear train and the feedback "pot".*



COMBAT US STYLE

Rick Von Lopez

IN ORDER TO REALLY understand control line combat in the United States one must be aware of the fact that there are two governing bodies that sanction control line competitions The Academy of Model Aeronautics (AMA) and Western Associated Modellers (WAM) AMA the national body sanctions contests throughout the USA and even though there is one rule book to cover all contests different areas of the country will interpret the rules differently WAM is nationwide in its membership but is effectivaly a Northern California reality as all of its contests are held in No Cal WAM holds tight reins on its rules and their enforcement through its event directors who hold their job for an entire year which often includes ten to twelve contests

The Miniature Aircraft Combat Association (MACA) is an organisation of combat pilots throughout the world but it is primarily concerned with AMA and FAI combat events and is also in charge of running the American team selection programme for the World Champion ships MACA also selects a set of USA top twenty com bat pilots each year based on 1st 2nd or 3rd place finishes in AMA fast combat AMA slow combat FAI combat and WAM expert fast combat The MACA monthly newsletter is excellent and if anyone is interested in a membership they may write to Gordan Segal 8314 West Oak Avenue, Niles Illinois, 60648, USA ($10 00 overseas subscription)

A combat pilot living in Northern California can very easily find himself having to learn and cope with three sets of rules for the different competitions that are held in that area A pilot can however get all the competition he wants through WAM and the various classes of com bat it offers

I have always thought of 1/2A combat as a sort of preliminary event in any contest In WAM and AMA competitions Fast combat is thought of as the main event 1/2A combat is always the first event flown in WAM and given their rules it only takes about 90 to 120 minutes to fly the event WAM rules only allow one model per contestant per event Each pilot may fly three times and the total score for all three flights is what determines the winner There is no kill rule in WAM and the pilots fly for cuts only There is also no air time score At the time the event is announced all of the pilots pre-pare their equipment a flying order is made up The first two pilots on the list will enter the circle and start their engines when the judges signal them to do so 5 points are given for becoming airborne within one minute No points are given for becoming airborne between one minute and two minutes A minus 5 points is entered if the pilot fails to become airborne within two minutes and that pilot must withdraw his equipment and let another pilot take his place in the circle 10 points are given for each cut and 5 points are given for drags on the streamer When the streamer is all gone 5 points are given for each pass within five feet of the opponents model The judges have a score sheet for each pilot where all the information is recorded

Once an aircraft hits the ground the pilot must with draw the model from the circle and another pilot will take his place Each pilot is limited to a flight time of 6 minutes if he goes over this limit he loses all his points for that flight In theory there is no break in the flying action once a class of competition has begun The spec-tators seem to enjoy this sort of competition A pilot may repair a damaged model or motor but entire units are not permitted to be replaced In other words a pilot is limited to the loss of just one model per event but remember he can enter up to four different combat events per contest

The Open classes of 1/2A and class A are sometimes broken down into beginner advanced and expert categories depending on the club sponsoring the con test New pilots are required to fly a qualifying flight of specified manoeuvres before the combat director or one of his assistants They must also enter initially in the beginner class They will stay in that class until they have earned a total of 7 trophy points Trophy points are given as follows: 3 for a 1st place 2 for a 2nd place and 1 for a 3rd place finish The next class is called Advanced and it takes 10 trophy points to graduate from this class into the Expert class To move up in class one must have also earned all the points in one combat event In other words you could not use 1/2A and Class A points together What you have in essence is an apprentice and journey man programme system

I will now take the time to offer my congratulations to Mick Tiernan Dave Wood and all of the British lads for their win at the World Championships FAI combat has

Meet some of California's 049 \A Combateers Top left *Nick 'the sailor Hallinan with a modified Li'l Snip model. Nick is in the Navy and is also a WAM expert* Top right *Flying Tiger expert Paul Leuty of Redwood City with his 'Dispose-All X-6 design* Middle *Larry Driskill's own \A combat design, he is in the US Air Force* Left *Dennis Tully also of Redwood City Ca., is a first year flyer who scored a first place win his first time in competition* Right *Glenn Williams the 1978 1/2A combat co champion Glenn is an expert builder with a great deal of natural talent from San Fransisco, Ca*

still not caught on over here in the States. Yes, we do have FAI contests, but the turn outs tend to be rather sparce. I flew in one FAI meet where I was the only entry and ended up talking my pit crew into using their practice models for the contest. The Americans do not want to give up their fast combat event in favour of FAI. The rules for fast combat are not very good for developing good FAI combat pilots. I tend to have a problem making the transition from WAM to AMA combat. I tend to still go after cuts rather than the kill. The Americans have the potential for being good FAI pilots but it will take some strict discipline for them to achieve excellence in this event.

If any of you fellows ever get to Northern California during the months of July or August please do look me up at 300 Frankfort Street, Daly City, Calif. 94014 Tel. 415-585-8816. During the rest of the year I work in Southern California and you can find me at 718 Appelby Street, Venice, Calif. 90291 Tel. 213-396-7577.

FAI SCORING

Paul Smith

THIS IS THE FIRST in a series of technical articles dealing with FAI combat, designated 'F2D', and deals with the scoring of air time points. Most US F2Ders were very disappointed at the FAI's decision to keep the penalty points for down-time. We feel that this takes the emphasis off cutting the streamer, which should be the main objective.

Through 1977, the FAI scored air time as one point per whole second airborne. With a 4-minute match 240 points of air time was available. The more advanced competitors soon found that they could get ahead by two cuts and land after 41 seconds thus scoring 241 points and winning the match in spite of their opponent's possible perfect 240 seconds of air time. Reportedly, this practice became so common in Europe, among the faster glow flyers, that the less-advanced nations decided a rules change was necessary.

The new rule (11g) stated that "Each whole second on the ground will be penalized one point". With this rule in effect, coupled with the existing one point per second air time, which is also kept in operation, the value of a second air time became two points. The range of possible airtime scores became +240 to −240. A flyer with two cuts advantage would now need 2:21 (141 seconds) air time to land with victory assured.

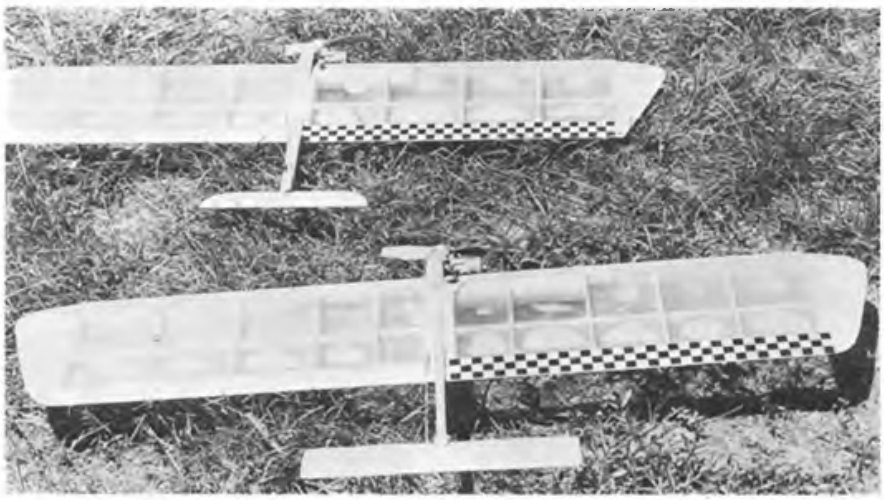
The FAI has a 4-year rule cycle, running from 1979 through 1983. As of 1979, the new rule is effective and should be enforced in all contests worldwide. The FAI Jury at the 1978 World Championship at Woodvale did not use Rule 11g – on the grounds that the rule was not effective until 1979. There was an attempt to rescind this rule at the December 1978 meeting of the FAI in Paris, which was defeated by a large majority and the rule is now effective for 1979 through 1983.

Scoring matches with this rule is a bit more tricky than before, especially if the contest is undermanned and the weather is unpleasant. Since both air time and ground time are calculated in WHOLE seconds, you must add one point to avoid penalizing the flyer for a fractional second of ground time. Remember, the fraction is neither air time nor ground time.

This rule change has made all previous knowledge of mine (and everyone else's) to a large degree obsolete. There have been no contests to date in which all competitors arrived with aircraft designed and built to these rules. As a result F2D is back to the drawing board worldwide.

I would assume that airplanes will become somewhat more robust. Consistant engine performance with a full four minutes of air time will become far more vital. Under these new rules, a contestant whose two models are both disabled would have no chance to win without a lead on the order of four cuts to none. F2D rules permit the contestant to use additional sets of lines over and above the two sets on the models. This option should now be used by serious competitors.

Perhaps a few people will decide to continue building light, fast models and hope to actually get four cuts ahead before both planes are destroyed. This strategy could certainly work if you have enough models, and skill!



Two of Paul Smith's FAI models 360 sq in area for Rossi 15 engines design based on Riley Wooten's Voodoo.

SIMPLE CENTRE RIB

Pete Jayes

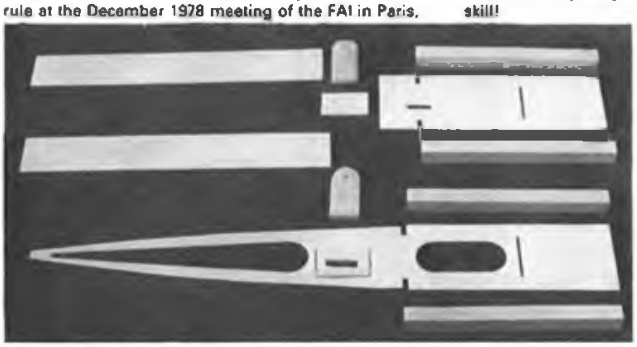
Firstly, all credit must go to Messrs. Dave Harrison and Dave Willis of Cosmo AC, who designed and developed the idea. The method has been extensively crash-tested and it is as strong, if not stronger, than the more traditional methods of centre rib construction, which can involve up to 14 parts.

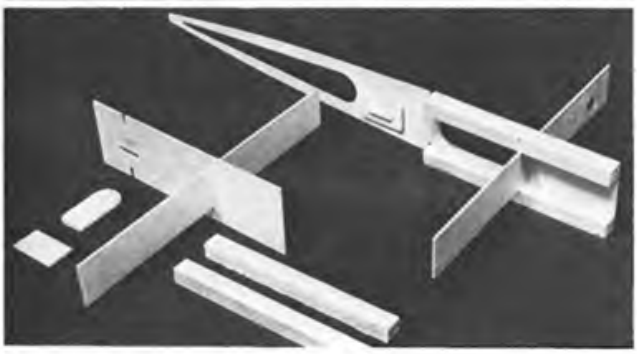
For those who still prefer models with separate tailplanes, the method can still be used by gluing 1/16in x ¼in spruce strips to top and bottom of tailplane, which is then pushed onto the trailing edge. This spreads the two pieces of wood, which are then epoxied to the wing. It may look weak, but this method has proved more than adequate in terms of strength.

The main advantages are as follows:

1. Cheaper materials.
2. Only 6 parts, including 2 bearers and a bell crank mount.
3. Quicker building, particularly when mass-producing models, as 5 or more centre-ribs can be cut, sandwiched together at once with a fret-saw or jig-saw.

Accuracy in cutting parts is important when using this method particularly where the crossbar passes through the centre-rib, and this must be a tight fit. The bellcrank mount can be gussetted with ¼ square balsa at the top and bottom on outboard side of rib.

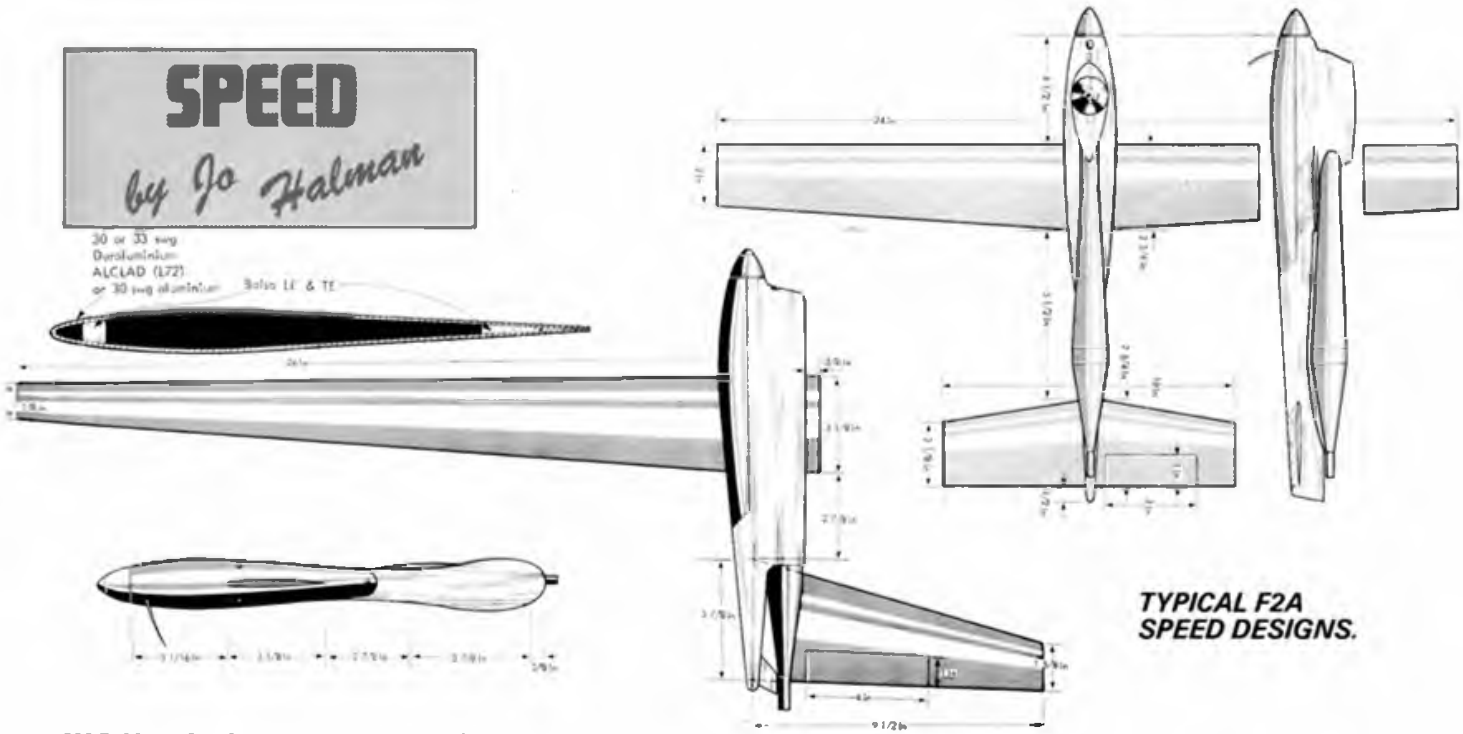




Left top: ***Layout of parts for short and long 1/16" ply centre ribs.*** Bottom: ***assembly of parts, note reinforcement for bellcrank plate, or gusset with ¼ sq balsa.*** Right top: ***Rib fitted to foam wing note front of aerofoil left solid on outboard wing for tip-weight effect.*** Below: ***completed model fitted with Vac-formed pacifier pod, (soon to be available) L.E. recessed for rear exhaust motors, note mandatory domed spinner nut.***

SPEED

by Jo Halman



TYPICAL F2A SPEED DESIGNS.

FOR THOSE WHO KNOW how to cut, join, build and fly control line models, but have never built or flown an FAI speed model, I shall tell you what other fliers use and give you the basic information which, coupled with practice and experience, should enable you to build as well, and fly as fast, as the other FAI speed fliers in Britain.

It is not particularly difficult to fly speed but there is a lot of hard work, gruelling practice, experimentation and record-keeping. It is essential not only to keep a record of all that you do but to be able to make sense of it all and then be able to utilise what you *will* have learned. The old saying "If it's easy, it's not worth doing" could well be the motto of FAI speed flying!

The FAI (2.5cc class) is the ultimate in speed flying. Competing against the rest of the world is an exhilerating experience and the fine tuning of flier, engine and model to produce speeds in excess of 150 mph is a stupendous challenge.

DESIGNS

These can be assymetric (generally one wing plus one, one and a half, or two tails) or symetrical (two identical wings and two identical tails). The current fashion is for assymetric designs, with engines either upright or sidewinder (the engine lies on its side) but of course personal preference prevails. It is considered that an assymetric model, does fly faster. Model specifications are found in the 'FAI Sporting Code' (an essential publication – available from the SMAE, Kimberly House, Vaughan Way, Leicester) which basically require; maximum engine capacity 2.5cc; minimum total surface area 2 sq dm per cc; maximum wing loading 100 grammes per sq dm; glow plug motors must use standard 80/20 methanol, castor oil fuel; control line diameter is 0.4mm minimum for 2 line control; line length is 15.98m. The flight is timed over ten laps i.e. 1km, therefore the radius of the flight is 15.92m – this is measured from the centre line of the pylon to the centre of the propellor, therefore half the diameter of the pylon fork *must* be added to the distance between the centre of the prop to the front of the handle cross bar = 15.98m.

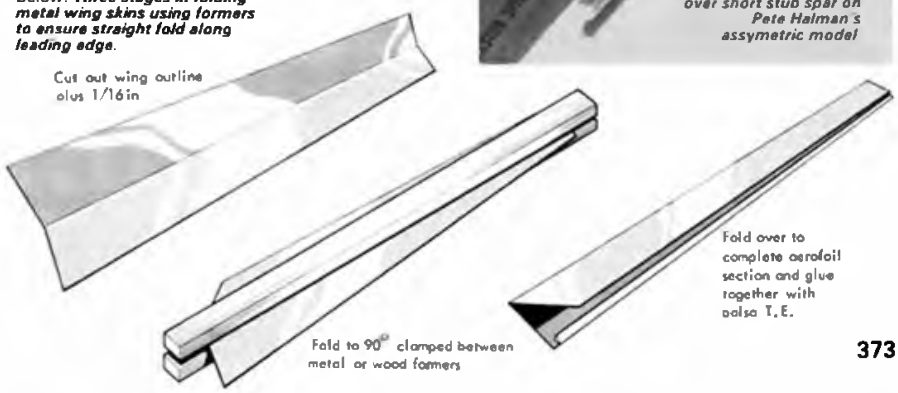
PANS

Aluminium pans are not as light nor as strong as magnesium ones but they are considerably cheaper. As FAI models are not particularly heavy an aluminium pan is quite serviceable. Rossi makes both upright and sidewinder pans while Emil Rumpel makes upright pans only. All Rossi parts are available direct from Rossi, Via-Dei Carabioli, 25060, Cellatica, Brescia, Italy, or Michael's Models, 646-648 High Road North, Finchley, London, N12 0NL. Rumpel parts are available direct from Emil Rumpel, Vorm Holzes Ring 32, 5810 Witten, 3, West Germany, but are somewhat expensive.

WINGS

Wings can be either wood; wood and aluminium skin or hollow metal. WOOD WINGS are best made out of glasscloth covered bass wood which is strong but difficult to get hold of – America is the best bet: find the addresses from any American model magazine. The glass cloth covering technique has been well documented by Dave Clarkson (Sept. 78 Aeromodeller p. 512). Balsa is a fair substitute but requires spruce re-inforced edges and spar for about half the wing span. WOOD AND ALUMINIUM SKIN is a balsa wing skinned with .006 aluminium – litho plates available from printers are ideal. Join these with epoxy. Ready made skinned wings are available from Emil Rumpel. HOLLOW METAL WINGS are best made out of duraluminium commonly known as 'dural'. The best is Aircraft Grade 30 swg L72 (English designation) but this is difficult to find. Personal contact with the aircraft industry is about the only way. The next best thing is .012 aluminium from aluminium suppliers found in the yellow pages of a telephone directory. The cost should be about £1 per wing. All metal wings can be joined with epoxy but contact adhesive is better as it is flexible. 'Tite Bond' is a good commercial adhesive readily available. 'Evostick' may be used but make sure it is heat cured after setting. Pop it into the oven until it goes brown. These wings really need a balsa fillet along the trailing edge to give a good glueing area plus a spar from the tip to almost the root to prevent the wing collapsing. The pan or fuselage requires a 5in long wood or aluminium spar, and stub wing, over which the wing fits. See the step-by-step diagram for making a hollow metal wing. It is absolutely essential to make the wing as stiff as possible. If the wing is not stiff, speeds in excess of 140 mph will cause the wing to bend and flutter and may easily shatter in mid flight.

Below: ***Three stages in folding metal wing skins using formers to ensure straight fold along leading edge.***



TAILS

These are usually glass cloth covered bass, or balsa, or balsa/aluminium skin. As for the wings, .006 aluminium should be used for skinning and use epoxy to join the tail to the fuselage; balsa cement is not for use on speed models! Ready made tails are available from Emil Rumpel.

FUSELAGE

These can be bass, balsa or glass fibre. Prototype models are usually made of wood with the glass fibre fuselage, which is extremely strong and easy to make, coming later. Remember that not least of a fuselage's functions is that of providing engine cooling.

Dural skin wing slips over short stub spar on Pete Halman's assymetric model

ENGINES

The front induction Rossi is the most outstanding speed engine of the last eight years. It is a great pity that they are no longer in production, and therefore new ones are difficult to find. However, there is no shame in buying a second hand crankcase and new piston/liner – the heart of the engine. (Rossi is developing a new engine for 1979 and it should be in production soon.) ABC piston/liners are used by most fliers today although they appear not to like cold, damp weather conditions.

It is not worth modifying engines except for small adjustments to the exhaust timing to change the peak rpm. Remember, an engine designer will have spent months, if not years, perfecting an engine to give maximum performance and efficiency. (*Essential* modification see FUEL SYSTEM: CFS.)

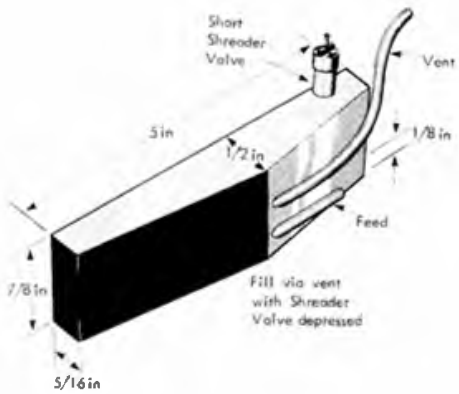
PIPES

Suction feed fuel systems require the standard Rossi pipe but the CFS (Centrifugal fuel switch) fuel system, because of the extra fuel being used, needs a home modified pipe. Modify the ED, OPS or Rossi pipe or use the commercially available Rumpel (modified Rossi) pipe available direct from Emil Rumpel.

FUEL SYSTEMS

Fuel systems have been narrowed down to two: the suction feed system or the CFS system which uses crankcase pressure.

Suction: it is easier to find engine settings with this system but it does limit model design to sidewinders – but there's nothing wrong with that – and it is also easier to use the tuned pipe. For a newcomer, it may be considered advisable to begin with the suction system in order to get to know, and understand, what the engine is saying and why – this is of the utmost importance. If you cannot understand what the engine says (relying solely on the garbled exhaust note is very misleading) you will not progress at all and this is where many would-be fliers fall by the wayside.



CFS: this system needs a bigger air intake which gives more oxygen which therefore burns more fuel which therefore gives more power and therefore higher speeds. The standard Rossi air intake of 6mm dia needs to be replaced with one of about 8mm dia. This modified air intake can be made at home. Pressure leaks are, however, not uncommon giving fluctuating pressure in the fuel pipe and tank. With CFS there are two needles to play with – and that's fun! The CFS itself can be made at home or bought from Emil Rumpel.

(to be continued)

The Rossi 15 has been the dominant motor for many years, pan mounting helps prevent power loss from vibration.

CLUB NEWS

SOME TIME AGO on the flying field I heard an older modeller pointing out to a youngster the advantages of free flight. Perhaps what he said may have been in one sense offputting, as he stressed the unpredictability of the free flight model, suggesting, no doubt, the variability of trim of these light, high performance machines. Certainly the contest arena is no place for the lazy or self indulgent, as you need all the skill and concentration you can muster to turn in a series of competitive flights in the face of hang ups and glitches that are so much easier to encounter than the elusive thermal. An ideal place, though, for the person who responds to a challenge.

Our first report comes from A. E. Pearson, PRO, of the **Teesside MFC**. He informs us that the club is in its thirteenth year, harking back to those hectic days when there was a model club at almost every street corner, for it was from an amalgamation of a number of such small clubs that the Teesside MFC, was born. Membership is high, a considerable 130, and needless to say, perhaps, interests are mainly radio control and control line, with a few members interested in free flight and indoor flying. There are two sites available for power flying – one with a tarmac runway – and there are several soaring sites. As we might expect, Thermal Soaring has a considerable following, and this has led to many successes in competitions over the last three years. Lectures and social activities feature largely on the agenda, typical being a 'Bring a Model Night' which was supported with a running buffet. Meetings are held on the third Tuesday of every month at the Settlement Community Centre, St Pauls Road, Middlesbrough at 7.15pm, where a welcome will be given to any interested person. *Sec. L. Nicholson, 188 Wynyard Road, Owton Manor, Hartlepool, Cleveland.*

Our next report has a not too happy content, concerned as it is with airfield problems. A casualty of the loss of the northern venue of Elvington is the annual rally of the **Vulcan Free Flight Group**, at least for this year. Mr B. Mackay goes on to tell us that if the situation has not improved by next season then the Rally may be changed to meet the requirements of a small flying area. *Sec. Brian Kenny, 8 Ketton Avenue, Norton Lees, Sheffield S8 8PA.*

A Bulletin issued by Alec G. Barber, PRO, of the **Huddersfield & DMAC**, sets out an agenda of club activities inclined to whet our appetites for the hopefully sunny months ahead. The club is mainly Radio, but other interests are not overlooked. The first item is very much for the patient watcher rather than the active participant, for it concerns an attack on the World R/C Slope Soaring Duration record. Current holder of the club Birds Eye Trophy is John Sykes, the Club Chairman, with a ten hour stint at the bleep box. Frozen fingers the order of the day! Next there is a two day static display in co-operation with other model clubs of various kinds in the Huddersfield area. There is also a club flying display at a local school, trips to Old Warden and Doncaster Gliding Club are on the programme, too, and a visit from a well known modelling personality to talk on his and our pet subject: model flying.

Sir Colin Buchanan, the distinguished town planner, now relaxes with his newly found hobby flying R/C gliders and already has his third soarer under construction. A light aircraft pilot for many years, he has now joined the South Cotswold Soaring Association and flies with the club on the hilltops around Stroud including Redborough and Selsley Commons.

The feature that immediately caught my notice in the well stocked pages of diverse interest in the **Grantham & DMAS's** *Hot Air* newsletter were a couple of outline plans of Phil Ball's sophisticated approach to CO_2 duration flying. These foam wing, long fuselage models already have a few notable successes to their credit, including the 1978 Nationals event, the Falcons CO_2 and Electric contest and a win at the Sssschush Gala. They look the part and fly it, too. A fine action drawing of Ted Evans' 'Jaguar' Wakefield accompanies a letter regretting the mutation of the Wakefield into F1B, expressing the belief, so common today, that we should revert to the old formula. Personally, I like the modern sophisticated model, which is consistent with the adult image we like to project for the movement. Curiously enough the letter refers to small boys flying Wakefield models on recreation grounds – a phenomenon which I personally have never witnessed. Further on Vintage, there is a presentation of the rules of the 'Vintage Twenty' which has taken hold North of the Humber. *Sec. N. Grantham, 115 Fifth Avenue, Alma Park, Grantham, Lincs.*

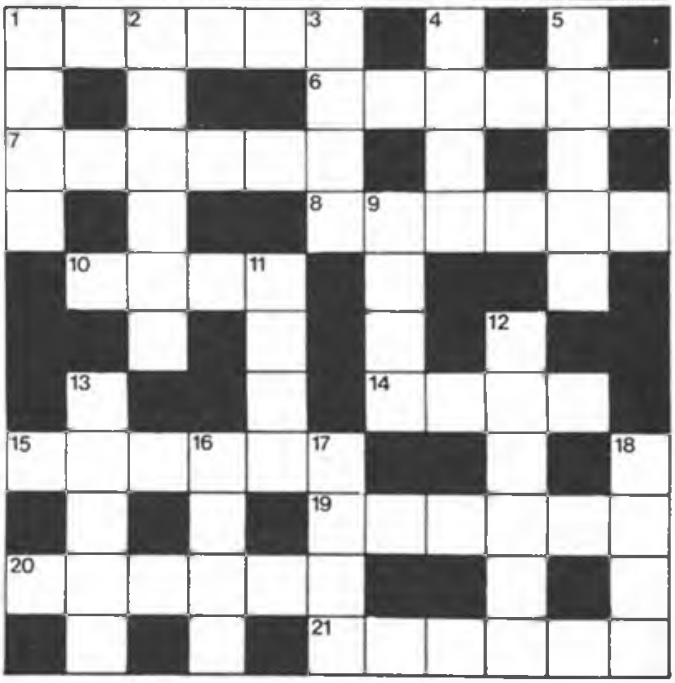
The loss of Elvington for free flight is still the subject dominating *Northern Area News*, wherein it is gloomily pointed out that other Areas also find their options being whittled away. Chetwynd, Barkston, Bassingbourn and Ouston have something of a question mark over them. The alternatives to the large flying area are considered in the newsletter, suggesting that the mini comp might become the thing of the future, going back to the parks and small commons we used before the war.

An unusual feature of the **Leicester MAC's** Winter Building Competition has been a decided swing towards free flight – over a third of the entries coming into this category. A list of entries in the current club bulletin covers the Uncovered stage, there being 27 assorted designs. Top man was Dick Child with an extensively modified Robbe Mustang Kit model. Scale cockpit detail a speciality. All looks set for a colourful turn out on April 23rd for the Covered stage. Those who battled their way through snow covered roads to Wymeswold in February for the Winter League Open Glider event were welcomed with light winds and a fair amount of lift, although the lift was more in evidence on test flights than in the actual contest. Martin Scott got off to a bad start with the test flight loss of his recently renovated A/2, but nevertheless won the event with his APS 'La Mouette'. What may be of interest to flyers in the Leicester area is that there is no restriction on model flying in any of the parks and open spaces within the City, despite reports in a local newspaper giving the opposite impression. This news goes with a caveat to mind your p's and q's and not be a nuisance. *Sec. P. Toyne, 1 Sherrard Drive, Sileby, Loughborough, Leicester LE12 7SG.*

Looking forward to flourishing year for the **Reading & DMAC**, in its *Windsock* newsletter, is Martin Dance, the Chairman. If there is a cloud on the horizon it is the threatened introduction of Citizen Band Radio. Obviously in a tightly knit country like ours the effect of a multiplicity of transmitters being operated capriciously on our radio frequencies would have a more devastating effect than in the USA. We can only hope that CB, will not be given legality, although unlicenced transmitters can give trouble enough. *Sec. R. M. Tiller, 49 Albert Road, Caversham, Reading, Berks.*

Ted Young, PRO, of the **East Grinstead MFC**, looks back, in his report, to a successful year for the club, in spite of the disruptive efforts of the Weatherman. Highlight of the year was the retaining of the RAFA Shield for the sixth year in succession in the face of fierce competition from the other keen free flight clubs in the Area. This success, and others at both Area and National level, owes much to the flair and enthusiasm of Tony Grantham, Mike Howick,

CROSSWORD



Trophy winners at the Annual Social of the Witham Model Aircraft Club, Essex. Left to right: *D. Powell, P. O'Sullivan, R. Braybrook, P. Frost, D. Siseman, E. Andrews.*

Bob Taylor and Derek Cash, all of whom took honours at various events. The lions on the contest field were equally leonine on the home patch, where two of the John Jones Trophies for Chuck Glider and Precision were won by Tony Grantham and Ken Taylor respectively. Possibly some sort of handicap system is called for. John Jones, incidentally, has recently been elected a Fellow of the SMAE, a distinction not lightly bestowed. Membership remains at a modest but steady 19, including two juniors. And, although there is an occasional foray into the dreaded Radio, members remain firmly loyal to free flight. *Sec. Ted Young, 7 Stephenson Drive, East Grinstead, Sussex.*

Other clubs and other interests, for next we have the **Cosmo Aeromodelling Club** of Bexley, Kent. Harry Jones, the Secretary, tells of 'pot hungry' Combat flyers being much to the fore in the 40 membership of active flyers. The accompanying newsletter, with the somewhat tortuous title of *Cosmutterings* is all about the wing on a string art forms, and it looks to be a busy season for the club if they make all the events listed in their 'Contest Calendar'. *Sec. H. Jones, 173 Wessex Drive, Erith, Kent.*

More control line news comes in the **South Bristol MAC**, newsletter, where there is a report of a meeting at Whitchurch in February. Somehow, between all the wintry days of snow, wind, hail and what have you, the fates insinuated a really perfect model flying day, sunny and windless. An exciting Mini Goodyear event, with six teams making it to the final. A particular hazard was the mud churned up in the inner circle, causing one pilot, Gordon May, to

CLUES ACROSS

1. Mercury counsellor for duration. (6)
6. Musical engine? (6)
7. Rubber birds from Keil Kraft. (6)
8. Alcoholic illustrator? (6)
10. Nothing of a plane? (4)
14. Angry engine from ED. (4)
15. Church liner precedes North American light aircraft. (6)
19. Piratical plane from Lockheed. (6)
20. Big game RC. (6)
21. To send to foreign port. (6)

CLUES DOWN

1. Carrera glider. (4)
2. Classic control line model. (6)
3. Engine loses one Scottish county. (4)
4. U/C stuff – for musical landings? (4)
5. Brew a continental motor. (5)
9. Swift fraction. (4)
11. Event for all comers. (4)
12. Their vine conceals a pan producer. (6)
13. After celebration little fellow manufactures kits. (5)
16. What limp tissue does. (4)
17. British aeroplane builders. (4)
18. Microfilm needs to be – for a day or two. (4)

fall flat on his face. Through it all Chris Coote's model just droned on overhead with a seemingly endless range to win in a time of 11.06. Still more about control line, there is talk of an attempt on the C/L duration record. Seems the procedure calls for a small engine, like a Mills 1.3 doing about 8000 revs on a 7 x 4 nylon prop. Two to three hours is a possibility, but depends of the twin hazards: overheating and over tiredness. *Sec. Gordon May, 4 Burchells Avenue, Kingswood, Bristol.*

It's mainly control line, too, in the **Belfast MFC's** *Nitro* newsletter, which opens with the question of whether model flying is a sport. Well, just as there are only three professions: the Church, the Army and the Law, the true definition of Sport is chasing, tracking or netting some poor creature or other, otherwise things we call sports are games, races and matches. But that's just being pedantic. The main factor in most activities recognised as 'sports' is the competitive involvement, plus a bit of energy thrown in. And model flying must certainly qualify on that basis. I certainly agree with the main thesis of the editorial that aeromodelling is deserving of recognition and support on its own terms, and not just if it can parade itself as a sport.

Things are looking a trifle hazardous down on the Croydon patch, according to the **Three Kings Aeromodellers'** *Court Circular*. Motor bike and go-cart fanatics have been using it as a skid pan during the season of snows and sins, messing up the gypsy barriers and generally creating mayhem. Apparently, the authorities impose no restraints upon them, and flyers are warned against the motorised intruder cutting across the circle. The patch has not been without its more legitimate visitors during the wintry months. One such was Arthur Eves, winner of the Three Kings Novice Stunt Event and holder of the Aeromodeller Trophy for his outstandingly finished trike Stunt model. An eye catcher on the

CAPTION CONTEST

model is the picture of a bird on the wing (But that's absoid, the wing's on the boid . . .). Arthur handles his machines with every capability although he is physically handicapped. *Sec. D. G. Woods, 133 Ravensbury Road, Southfields, London SW18 4RY.*

News in the **Hemel Hempstead MFC's** newsletter is of bovver at Bovington. Someone had the temerity, the audacity, the brazen nerve to fly a model on the sacred ground on a non-flying day. Trivial incident it may seem to be but in our tightrope world of do and don'ts must be taken with all seriousness. *Sec. T. Angell, 6 Curlew Close, Berkhamsted, Herts.*

Something quite new in model comps is being held by the **Coventry & DMAC**. It is a Quiet Model Competition for I/C Radio Powered models; the quietitude factor being measured whilst the model is static and at full throttle. Bonus points to be added for type of construction. No doubt the winner will receive Hush money, but there is a secondary award for the most pleasant sounding model as judged by a non-modeller. *Sec. N. H. Goodman, 23 Berwyn Way, Stockingford, Nuneaton, Warks. CV10 8QW.*

The **Western Area** newsletter is pleased to inform us that the Army has granted permission for the use of Colerne airfield for free flight meetings during 1979.

That's about all the space we have this month. Apologies for any omissions, and a plea for more club photos.

Clubman

CROSSWORD ANSWERS

ACROSS: 1. Mentor. 6. Oliver. 7. Robins. 8. Sherry. 10. Zero. 14. Fury. 15. Cessna. 19. Viking (Lockheed S-3A Viking – four-seat carrierborne anti-submarine aircraft). 20. Cougar. 21. Ostend.

DOWN: 1. Micro. 2. Nobler. 3. Ross. 4. Wire. 5. Webra. 9. Half. 11. Open. 12. Irvine. 13. Veron. 16. Sags. 17. Avro. 18. Aged.

APRIL WINNER

DICK STOKES
WHITLEY BAY
TYNE & WEAR

If an infinite number of aeromodellers wrote an infinite number of captions, then they would probably all write the same answer. At least that's how the results turned out with many entries suggesting wash-day blues or round-the-pole flying, some with almost identical wording! H. Foster of Ilkeston probably summed things up best with his offering "DAMN YOUR SMALLS ADRIAN, GET ON THE WINGTIP!" F. Cooksley, Harlington, wrote "HEY BORIS, SOMEONE'S PINCHED OUR WASHING!" D. Riggs of Carlisle suggested "WE WON'T BE NEEDING THAT BORIS, WE'RE GONNA HANG OUT THE WASHING ON THE SIEGFRIED LINE", while M. Stirling of Bristol said "THAT'S NOT WHAT I MEANT WHEN I SAID WASH-IN!" Changing the subject Jon Halford of Hampstead entered "COMRADE DEVCONSKI, DE DREAM OV LIGHTVEIGHT RADIO CONTROL IS OURS!" and finally our resident captioneer, Graham Pugh from Moreton in the Marsh excelled himself with "YOU SURE IT'LL TOW A HANG GLIDER?"

The original photo which first appeared in June 1956 *Aeromodeller* depicts two Russians operating the latest R/C equipment in the days before transistorised lightweight equipment. If you would care to join this month's contest and try winning a year's subscription to *Aeromodeller*, send your caption to *Aeromodeller*, P.O. Box 35, Bridge Street, Hemel Hempstead, Herts HP1 1EE. Results August issue.

SHOP GUIDE

READERS PLEASE NOTE:
Due to soaring postals charges many retailers are unable to answer postal enquiries unless accompanied by a stamped addressed envelope.
★Mail Order Welcome

MODELLERS — buy with confidence from these well-stocked shops

AUSTRALIA

MELBOURNE 3000 Tel. 347 8029 ★
RIVERSIDE HOBBY CENTRE
16 LITTLE LATROBE STREET
9am-5.30pm Mon-Fri
9am-12 noon Sat

AVON

BRISTOL Tel. 557764 ★
AVONAIRE MODELS
351 CHURCH ROAD, ST GEORGE
9am-6pm Mon-Thurs
Late night Fri 7pm
Half day Wed

BRISTOL 1 Tel. 23744
MODELLERS DEN
65 FAIRFAX STREET
Open 9am-5.30pm Mon-Sat

BEDFORDSHIRE

LUTON Tel. 36218
TAYLOR & McKENNA
73 ARNDALE
Open: 9am-5.30pm Mon to Thurs
9am-6pm Fri and Sat

BERKSHIRE

NEWBURY Tel: (0635) 46004 ★
TRENTS MODELS
25-26 CHEAP STREET
9am-5.30pm Mon-Sat

READING Tel. 51558 ★
READING MODELS
5 CHATHAM STREET
9am-5.30pm each weekday

READING Tel. (0734) 586899 ★
TRENTS MODELS
51 BUTTS CENTRE
9am-5.30pm Mon-Sat

WOKINGHAM Tel. (0734) 786522 ★
LINCOLN MODELS & HOBBIES
85 BEANOAK ROAD
Open: 10am-5.30pm.
Wed 10am-1pm
Fri 10am-7pm Sat 10am-6pm

BUCKINGHAMSHIRE

AYLESBURY Tel 85752
TAYLOR & McKENNA LTD
46 FRIARS SQUARE
Mon-Thurs 9am-5.30pm.
Fri-Sat 9am-6pm

BLETCHLEY Tel. MILTON KEYNES 70478
TAYLOR & McKENNA LTD
16 THE CONCOURSE,
BRUNEL CENTRE
Mon-Thurs 9am-5.30pm.
Fri-Sat 9am-6pm

MILTON KEYNES
WOLVERTON Tel. M.K. 312553
MODELS & HOBBIES ★
26 CHURCH STREET,
WOLVERTON, MILTON KEYNES
Open: Mon-Sat 9.00am-6.00pm.
Half Day Wed

CAMBRIDGESHIRE

CAMBRIDGE Tel. 59620 ★
MODEL MANIA
17 KING STREET
Open: 9.30am-5.30pm
Mon-Sat. Inc. Lunchtime

CHESHIRE

CHESTER Tel. 319723
CHESTER MODELMAKERS LTD ★
CHESTER MODEL CENTRE
1-3 CHRISTLETON ROAD
Open: Mon, Tues, Thurs, Sat
9am-5.30pm. Fri 9am-8pm
Closed all day Wed

STOCKPORT Tel. 061 480 5478
THE MODEL SHOP
280 WELLINGTON ROAD SOUTH
Open: Mon-Sat 9am-5.30pm
Closed Tuesdays

CLEVELAND

MIDDLESBROUGH Tel. 211212
HOBBYDROME
283 Linthorpe Road,
Open: 9.30am-5.45pm.
Late night Friday 8pm
Closed Wed.

DEVON

PLYMOUTH Tel. 0752 21851
PLYMOUTH MODEL CENTRE
11 OLD TOWN STREET
9am-5.30pm Mon-Sat
Late night Friday 6.30pm

PLYMOUTH Tel. (0752) 53330 ★
RUNWAY SOUTHWEST
16 DEVENPORT ROAD
STOKE, PLYMOUTH
Mon-Sat 9am-6pm
(Late night Friday 8pm)

TORBAY Tel. 0803 521767 ★
MANSEL'S MODELS
PALACE AVENUE, PAIGNTON
Open 9.15am-5.30pm
Mon-Sat inclusive
Half day Wed
Late night Fri 7pm

DORSET

BOURNEMOUTH Tel. 424038 ★
R. F. AUSTIN – MODEL SHOP
156 SEABOURNE ROAD
SOUTHBOURNE BH5 2JA
Open: 9am-5.30pm Mon-Sat
Closed 6pm Thurs-Fri
Half day Wed

BOURNEMOUTH Tel. 517032 ★
J. & H. MODELS
823 WIMBORNE ROAD
MOORDOWN, BH9 2BA
Mon-Thurs 9am-5.30pm
Fri 9am-6.30pm. Sat 9am-6pm

BOURNEMOUTH Tel. 763480 ★
WESTBOURNE MODEL CENTRE
59 SEAMOOR ROAD,
WESTBOURNE
Open: 9am-5.30pm Mon-Sat

ESSEX

BRENTWOOD Tel. Brentwood 226787
ARNOLD'S GIFT CENTRE
4 HIGH STREET
Open: 9am-6pm. Half day Thursday

HORNCHURCH Tel. 40016 ★
RADIO ACTIVE
94 ARDLEIGH GREEN ROAD
Open: Mon, Tues, Thurs & Sat
9am-6pm. Fri 9am-7pm
Half day Wednesday

WICKFORD Tel. (037 44) 2621 ★
WICKFORD MODEL EXCHANGE
ST PETER'S TERRACE
LONDON ROAD
Open: 9.30am-6pm Mon,
Fri-Sat. Late night Thurs 7pm.
Closed Tues and Weds.
Sun 10am-1pm

HAMPSHIRE

ANDOVER Tel. 61307
RADIO CONTROL SUPPLIES ★
1a UNION STREET
Open 9am-6pm. Fri 9am-8pm

FAREHAM Tel. 234136
G. M. H. BUNCE & CO LTD ★
206 WEST STREET
Open 9am-5.30pm. Closed Wed

PORTSMOUTH Tel. 25049
RAY BROWN MODELS ★
10 KINGSTON ROAD
Open: 10am-5.30pm
Lunch 1pm-2.30pm
Closed all day Wed

SOUTHAMPTON Tel. Eastleigh 617849
EASTLEIGH MODEL CENTRE
2c HIGH STREET, EASTLEIGH
Open 9am-6pm. Half day Wed

SOUTHAMPTON Tel. 25919
HOBBY LOBBY LTD ★
52 COMMERCIAL ROAD
Open 9.30am-5.30pm Mon-Fri
Sat 9.30am-5pm

HEREFORDSHIRE

HEREFORD Tel. (0432) 4152
FRED PERKINS LTD ★
48c COMMERCIAL ROAD
Open 9am-5.30pm. Half day Thurs

HERTFORDSHIRE

HATFIELD Tel. 63404
DESIGN AND HOBBIES ★
5 MANOR PARADE
Open: Mon-Sat 9.30am-6pm.
Thurs closed 7pm
Closed all day Wednesday

HEMEL HEMPSTEAD Tel. 53691
TAYLOR & McKENNA LTD
203 MARLOWES
Mon-Thurs 9am-5.30pm.
Fri-Sat 9am-6pm

HERTFORD Tel. 50101
MODELLERS WORLD ★
4 OLD CROSS
Open: 10am-5.30pm
Late Night Friday 7pm
Closed Thursday

ST ALBANS Tel. 53954
S A M S
12 HATFIELD ROAD
Mon-Fri 9am-6pm
Sat 9am-5.30pm

HONG KONG

HONG KONG Tel. 3-680507
RADAR CO LTD ★
3 OBSERVATORY ROAD,
TSIMSHATSUI, KOWLOON
Open 10am-7pm. Closed Sundays

KOWLOON Tel. 3-800155
SCIENTIFIC HOBBIES LTD ★
185-D PRINCE EDWARD ROAD
Open 10am-8pm. Sunday closed

HONG KONG Tel. 3-684184
WINNING MODEL & HOBBY SUPPLIES
2a AUSTIN AVENUE
KOWLOON, HONG KONG
Open 10am-7pm. Closed Sun

KENT

BROMLEY Tel. 01-460 0818
AVICRAFT LIMITED ★
15 CHATTERTON ROAD
Open: 10am-6pm
(not closed for lunch)
except Wed 10am-1pm

CANTERBURY Tel. 69888
THE MODEL SHOP ★
83 NORTHGATE CT1 1BA
Open 9am-5.30pm inc. Sat
Closed all day Thursday

MAIDSTONE Tel. 51719
THE MODEL SHOP ★
19-23 UPPER STONE STREET
Open 9.30am-1pm, 2.30pm-5.30pm
Closed all day Wed

NEW ASH GREEN Tel. 0474 872136
THE HOBBY HOUSE
10 UPPER STREET NORTH
Open 9am-5.30pm. Closed Mon

TUNBRIDGE WELLS Tel. 36689
E. M. MODELS ★
42 CAMDEN ROAD
Mon-Sat 9am-5.30pm.
Closed Wed

LANCASHIRE

BURNLEY Tel. 23983
A.D. MODEL SUPPLIES ★
22 PLUMBE STREET
10am-6pm Mon-Fri,
Sat 9am-5.30pm

FARNWORTH Tel. 0204 74688
JOYCRAFT ★
3 BOLTON ROAD, MOSES GATE
Open Mon-Sat 9am-6.30pm
Closed all day Wednesday

LIVERPOOL Tel. 051-709 8039
STAN CATCHPOLES ★
MODEL WORLD
85 BOLD STREET
9.30am-5.30pm Six days

MANCHESTER Tel. 061-834 3972
THE MODEL SHOP ★
(MANCHESTER)
209 DEANS GATE
Mon-Fri 9.30am-6pm. Sat 9.00-5pm

PRESTON Tel. 51243
PRESTON MODEL CENTRE ★
LIMITED
(Opposite Polytech.)
2 Fylde Road
Open: 9.30am-6pm Mon-Sat

WIGAN Tel. 45683
G. FORSHAW & SON
58 MARKET STREET
Open 9.15am-5.45pm
Early Closing Wed

LEICESTERSHIRE

HINCKLEY Tel. 30952
PUNCTILIO MODEL SPOT ★
6 WATERLOO ROAD
Open: Mon 9.15am-7pm.
Tues 2pm-7pm
Wed & Thurs 5.30pm-7pm
Fri 9.15am-7pm. Sat 9.15am-5pm

LEICESTER Tel. 544529
RADIO CONTROL SUPPLIES ★
52a LONDON ROAD
Open 9am-6pm. Fri 9am-8pm

LINCOLNSHIRE

LINCOLN Tel. 25907
THE MODEL CENTRE
24 NEWLAND, LN1 1XG
Open: Mon-Sat 9am-6pm
Early Closing Wed. 1pm

STAMFORD Tel. 4524
SPORTS & HOBBIES ★
4 ALL SAINTS STREET
Open 9am-5.30pm. Half day Thurs

LONDON NORTH

CAMDEN TOWN Tel. 01-485 1818
AERONAUTICAL MODELS ★
39 PARKWAY, NW1
9.15am-5.30pm Tues-Fri.
9.15am-5pm Sat.
Closed all day Mon

LONDON Tel. 01 607 4272
HENRY J. NICHOLLS & SON LTD ★
308 HOLLOWAY ROAD, N7
Open: Mon-Sat 9am-5.30pm

LONDON NORTH WEST

MILL HILL Tel. 01-959 2877
H. A. BLUNT & SONS LTD. ★
133 THE BROADWAY
NW7 4RN
Open: 9am-6.30pm Mon-Fri
9am-6pm Sat

LONDON SOUTH

ELTHAM Tel. 01-850 4324
ELTHAM MODELS ★
54 WELL HALL ROAD SE9
Mon-Sat 10am-5.30pm.
Closed Thurs

LONDON Tel: 01-703 4562
MODEL AIRCRAFT SUPPLIES ★
LTD.
207 Camberwell Road, SE5
Open: Mon-Sat 10am-6pm.
Fri 10am-7.30pm.
Closed all day Thursday

LONDON Tel. 01-653 4943
NORWOOD JUNCTION
MODELS LTD
3 ORTON BUILDINGS
PORTLAND ROAD, SE25 4UD
Open 9.30am-1.30pm –
2.30-6.00pm Mon-Sat
Early closing Wednesday 1pm

LONDON Tel. 01-228 6319
E. F. RUSS ★
BATTERSEA RISE, SW11
Open Fri till 7pm.
Other days 9am-6pm.
Early closing Wed 1pm

LONDON EAST

LONDON Tel. 01-520 7397
ARNOLD'S GIFT CENTRE
132-134 HOE STREET, E17
Open 9am-6pm Mon-Sat
Closed Wed

PLAISTOW Tel. 01 472 2471
A. G. HERMITE ★
633 BARKING ROAD, E13
Open 9am-6pm.
Closed all day Thurs

MIDDLESEX

HARLINGTON Tel. 01-897 2326
RADIO CONTROL MODEL CENTRE ★
214 HIGH STREET
Open Mon-Sat 9.15am-6.30pm
Fri 9.15am-8.30pm
Closed all day Wednesday

HARROW Tel. 01-863 9788
THE MODEL SHOP
190-194 STATION ROAD
9.30am-6pm Mon-Sat.
Half day Wed 1pm

ISLEWORTH Tel. 01-560 0473
RADIO CONTROL SUPPLIES ★
581 LONDON ROAD
Open 9am-6pm. Fri 9am-8pm

NORFOLK

KINGS LYNN Tel. 63164
BARNEY'S MODEL SHOP
SOUTH EVERARD STREET
Open 9am-6pm

NORWICH Tel. 0603 42515
GALAXY MODELS ★
88 CATTON GROVE ROAD
Open 6 days a week

NORTHANTS

NORTHAMPTON Tel. 31223
THE MODEL SHOP ★
230 WELLINGBOROUGH ROAD
Open 9am-6pm. Half day Thurs

NORTHAMPTON Tel. 35718
STAGG MODELS ★
20 DERNGATE,
Open 9am-5.30pm
Early closing 1pm Thursday

NORTHAMPTON Tel. 27726
TAYLOR & McKENNA LTD
41-43 PRINCES WALK
GROSVENOR CENTRE
Mon-Thurs 9am-5.30pm.
Fri-Sat 9am-6pm

NORTHUMBERLAND

NEWCASTLE UPON TYNE Tel. 22016
THE MODEL SHOP ★
18 BLENHEIM STREET
Mon-Fri 9am-5.30pm. Sat 9am-6pm

NOTTINGHAMSHIRE

NOTTINGHAM Tel. 204040
M. A. CHAPMAN MODELS
18 MANSFIELD ROAD
DAYBROOK SQUARE
Open Mon-Sat 9.30am-6pm

NOTTINGHAM Tel. 50273
GEE DEE MODELS LTD ★
19-21 HEATHCOTE ST,
OFF GOOSEGATE
Open 9.30am-5.30pm.
Early closing Thurs

SUTTON-IN-ASHFIELD
Tel. Mansfield 58157
MODELLERS CORNER ★
146 OUTRAM STREET
Open Mon-Fri 9am-8pm
Sat 9am-6pm
Half day Wed (1pm)

WORKSOP Tel. (0909) 2855
RUSSELL MODELS ★
MODEL CENTRE, RYTON STREET
Open Mon-Sat 0930-1730
Thursday 0930-1300

OXFORDSHIRE

ABINGDON Tel. 21927
F. KNIGHT & SON ★
44 BATH STREET
Open 8.30am-1pm–2pm-5.30pm
Late night Fri 6pm
Closed all day Thurs

OXFORD Tel. 42407
HOWES MODEL SHOP ★
9-10 BROAD STREET
Open 8.45am-5.30pm. 6 day week

RUTLAND

OAKHAM Tel. (0572) 56100
RUTLAND SCALE ★
MODEL CENTRE
11 Mill Street,
Open 10am-5pm Mon-Fri,
9am-5pm Sat, 10am-4pm Sun
Closed all day Thurs

SCOTLAND

GLASGOW Tel. 041-632 8326
RIDDEL BROS ★
61 MOUNT ANNAN DRIVE
Open 9am-6pm. Closed Tuesdays

STAFFORDSHIRE

BURTON-ON-TRENT Tel 64240
J. & N. MODELS
22 DERBY STREET
Open 9am-5.30pm Closed Wed

STAFFORD Tel. 3420
JOHN W. BAGNALL LTD. ★
18 SALTER STREET
9am-5.30pm. Closed all day Wed

STOKE-ON-TRENT Tel. 263574
JOHN W. BAGNALL LTD.
30 PICCADILLY, HANLEY
9am-5.30pm. Closed all day Thurs

WOLVERHAMPTON Tel. 26709
WOLVERHAMPTON ★
MODELS & HOBBIES
BELL ST. MANDERS CENTRE
9am-5.30pm Mon-Sat
Early closing Thursday

SUFFOLK

IPSWICH Tel. 51195
BOWMANS OF IPSWICH ★
37-39 UPPER ORWELL STREET
Open 9am-5.30pm Mon-Sat
Early closing Wed

IPSWICH Tel. 79279
GALAXY MODELS ★
160 FELIXSTOWE ROAD
Open 6 days a week

SURREY

ADDLESTONE
Tel. Weybridge 45440
ADDLESTONE MODELS LTD ★
63 STATION ROAD
Open 9am-6pm
Closed all day Wednesday
Late night Friday 6.30pm

GRAYSHOTT Tel. Hindhead 6135
GRAYSHOTT MODELS
5 HEADLEY ROAD, HINDHEAD
Mon-Sat 9.00am-5.30pm
Early closing Wed

HORLEY Tel. 2412
HORLEY MODELS
91 VICTORIA ROAD
9.15am-5.30pm
Closed Wed

KINGSTON on THAMES
Tel. 01-546 4488
MICK CHARLES MODELS ★
180 LONDON ROAD
Open Mon, Tues, Thurs, Sat
9.30am-6.30pm
Wed 9.30am-1pm. Fri 9.30am-9pm

WOKING Tel. 66493
WOKING MODELS ★
9 GOLDSWORTH ROAD
Open 9am-6pm Mon-Sat
Closed Wed afternoon

SUSSEX

BRIGHTON Tel. 418225
HARRY BROOKS ★
15 VICTORIA ROAD, PORTSLADE
Open every day except Sun
8.30am-5.45pm (no half day)

CRAWLEY Tel. 21921
HEATHER CRAFT ★
60 HIGH STREET
9am-5.30pm Mon-Sat.
Half day Wednesday

EAST GRINSTEAD Tel. 21750
SOUTH EASTERN MODELS
5 THE PARADE
LONDON ROAD, FELBRIDGE
Open: Mon-Sat 9.30am-5.30pm
Closed Wednesdays

WORTHING Tel. 207525
SUSSEX MODEL CENTRE ★
10 TEVILLE GATE
9am-5.30pm. Open six days a week
Monday to Saturday

WALES

CARDIFF Tel. 29065
BUD MORGAN ★
22 CASTLE ARCADE
SOUTH GLAMORGAN
CF1 2BW
9am-5.30pm.
Early closing Wed 9am-1pm

CARDIFF Tel. 31367
RYALL & WALTERS RADIO ★
MODELS
34 LLANDAFF ROAD
Open
9am-12.30pm–1.30pm-5.30pm
Monday 8pm. Closed Wed

NEWPORT Tel. 65061
MAKE A MODEL
123 COMMERCIAL STREET
Mon to Sat 9am-5.30pm
Late Friday 8pm

PONTYPOOL Tel. 58070
TREGARON MODELS ★
40b GEORGE STREET
GWENT NP4 6BY
Open: Mon 12-7; Tues, Weds
9.30-5.30, Fri 9.30-7.30;
Sat 9.30-5; Closed Thursday

SWANSEA Tel. (0792) 52877
SWANSEA MODELS & ★
HOBBIES LTD
PLYMOUTH STREET
SA1 3QQ
Open: Mon-Sat.
Late night Fri 6pm

WARWICKSHIRE

BIRMINGHAM 10
Tel. 021-772 4917
BOB'S MODELS ★
520-522 COVENTRY ROAD,
SMALL HEATH
Open 9.30am-6pm.
Early closing Wed 1.30pm

BIRMINGHAM Tel. 021-373 5945
021-373 3535
JIM DAVIS MODELS
311-313 MARSH LANE
ERDINGTON
Mon-Sat 9.30am-6.30pm

BIRMINGHAM Tel. 021-554 5569
MODEL MECCA
(G. I. & N. ROWANDI
204 WHITTON ROAD
Open 9am-6.30pm.
Wed 9am-1.30pm
Sat 9am-6pm

COVENTRY Tel. 0203 76409
MODEL CRAFT
61 SPON END
Open: Mon-Fri 10am-5.30pm.
Sat 9am-5.30pm
Closed Wednesday

SOLIHULL Tel. 021-744 3374
SHIRLEY MODEL SUPPLIES
62 STRATFORD ROAD
SHIRLEY
Open: Tues-Sat 9am-2pm 3-6pm
Late night Thurs 8pm

WILTSHIRE

CHIPPENHAM Tel. 2466
CHIPPENHAM MODEL
CRAFT LIMITED
65 NEW ROAD
Open: 9am-5.30pm
Half day Wednesday 1pm

SWINDON Tel. 26878
SWINDON MODEL CENTRE ★
2 CIVIC CENTRE,
THEATRE SQUARE
(Next to Wyvern Theatre)
Open daily 9am-5.30pm
Open all day Wednesday

WORCESTERSHIRE

KIDDERMINSTER Tel. 2179
P. & R. MODELS ★
1 SEVERN GROVE
RIFLE RANGE ESTATE
Open: Mon, Tues, Thurs, Fri,
9.45am-5.30pm.
Sat 9am-6pm
Closed all day Wednesday

YORKSHIRE

BARNSLEY Tel 43561
DON VALLEY SPORTS
28 NEW STREET
Open 9am-5.30pm Mon-Sat
Closed Thursday

BRADFORD 8 Tel 26186
MODELDROME ★
182 MANNINGHAM LANE
9.30am-5.45pm. Closed Wed

DONCASTER Tel. 62524
B. CURTISS & SONS
40 DUKE STREET
Open 9am-5.30pm.
Closed all day Thurs

DONCASTER Tel. 27255
EVANS MODEL CENTRE
D. C. EVANS & CO.
(HOLDINGS) LTD
65 SILVER STREET
Open: Mon-Sat 9am-5.30pm
Closed all day Thursday

DONCASTER Tel. 20767
SOUTH YORKSHIRE ★
MODEL SUPPLIES
313 BENTLEY RD. BENTLEY
Open:
Mon, Weds, Thurs 10am-6pm.
Tues 10am-1pm. Fri 10am-8pm.
Sat 9.30am-5.30pm.

You can buy with confidence from the shops in this Shop Guide

★ *Shops offering a mail order service are denoted by an asterisk.*

SHOP GUIDE Continued

YORKSHIRE

KEIGHLEY Tel 65662
AIREDALE MODELS ★
5 ROYAL ARCADE, LOW STREET
Open: Mon, Wed, Fri 10am-6pm
Thurs 10am-7pm, Sat 9am-5.30pm

OTLEY Tel 56334
H & S CLIFF
FLYING MODELS
57 GAY LANE
Mon-Sat 6am-6pm

LEEDS Tel 646117
FLYING MODELS ★
88 CROSSGATES ROAD,
CROSSGATES
Mon-Sat 6am-6pm
Sun 8am-1pm

YORK Tel. 0904-34281
YORK MODEL CENTRE ★
17 DAVYGATE CENTRE,
DAVYGATE
Open Mon-Sat 9.00am-6.00pm
No half day

CLASSIFIED advertisements

All classified Advertisements must be pre-paid.
Private and trade rate 12p per word (min £2.00). Box Numbers 50p extra. Display classified £6.25 per column inch (max 2in.). All advertisements are inserted in the first available issue. Box replies to be sent care of Advertisement Department, PO Box 35, Hemel Hempstead, Herts HP1 1EE. There are no reimbursements for cancellations.

FOR SALE

Trueline Executive 4 channel model aircraft. 53in wing span equipped with engine and 4 channel Skyleader radio control, ready to fly, £130 o.n.o. Apply to: Mr Hart, 33 Quebec Road, Hastings, Sussex, or Tel: Hastings 438875 (office hours). Y

Rossi 15 Glow, excellent condition, £30 o.n.o. Mk11 ED Bee, offers Mick Lewis, Dursley (0453) 2367. Y

For Sale: RS and V engines. SAE for details: Mr D. Scott, 3 Torrisholme Road, Lancaster, LA1 2RQ. Y

Engines: Rivers 2.5, Graupner 61 PDP, unused, £60. ¾in Perry Carb £6, crankcase pump £18, Profi 61 bench run £40. Tel: Chelmsford 421538. Y

Humbrol Airbrush £3.99 (normally £5.95) tyre adaptor 85p, postage 51p. Humbrol CO_2 engine £5.99, postage 31p. Humbrol Major craft kit £2.99! postage 41p. Model Railway Centre, 74 Austerby, Bourne, Lincolnshire. XY

Superb ballpens, pencils, combs, diaries, brushes, gold-stamped with club or personal name. Raise funds quickly and easily. Samples/details from: Northern Novelties, Bradford, BD1 3HE. S·Y

Spruce, obeche, mahogany strip. Large range of sizes in stock 36in, 48in, 60in lengths. SAE for list. Punctilio Model Spot, Waterloo Road, Hinckley, Leicestershire. T/C

WANTED

Wanted: Plan of Alpha Corsair vintage free flight model. R. Montgomery, 33 Kings Road, Coltishall, Norwich, Norfolk. Y

Magpie, Lapwing, any Gerald Smith Motor, conditioned immaterial. Write: Jim Shelley, 358 Birmingham Road, Walsall. Tel: 28553. YZ

Cash paid or part exchange for vintage and new engines worldwide! 646 High Road, North Finchley N12 0NL. Tel: 01-445 6531. T/C

Wanted – Ready built model aircraft, boats, yachts, cars, steam driven models, also engine kits, radio control equipment etc. If you are selling up. Tel: Godalming 21425. T/C

Morley Models – Buy, sell, exchange model aircraft, boats, cars, engines and all radio control equipment. If you are selling up we will call 10-12 Cheapside, Morley, Leeds, Yorkshire. Tel: Morley (0532-Leeds) 522693 evenings 537328. T/C

BOOKS AND PUBLICATIONS

'Sailplane and Gliding' – the only authoritative British magazine devoted to the sport of gliding and soaring. 48 pages of fascinating material and pictures. Published every other month. Send £4.90 (or $9.50) for a year's subscription to: British Gliding Association, Kimberley House, Vaughan Way, Leicester, England. T/C

NOW YOU'VE BUILT A MODEL
Why not build a full size aeroplane?
Join the Popular Amateur Aircraft Industry the **POPULAR FLYING ASSOCIATION** and learn how to build your own flying machine. Send 75p for information pack.
POPULAR FLYING ASSOCIATION
Terminal Building, Shoreham Airport, Shoreham by Sea, Sussex, England
Shoreham by Sea 61616

Pre 1943 'Aero Modellers'. Pre 1948 'Model Aircraft' wanted. Astronomical prices paid or will trade. Mike Thomas, 141 Spenvalley Drive, Downsview, Ontario, Canada. XY

Aero Modeller back issue mart, vast stocks of back issues held in stock. Beaumont, 656 Holloway Road, London, N19 3PD.

GENERAL

French student, 18, speaking English, seeks accommodation throughout July as paying guest, with aeromodelling family. Box no. 1010, (W. Midlands), c/o Aero Modeller, 13-35 Bridge Street, Hemel Hempstead, Herts., HP1 1EE. Y

Holiday Gliding Course. Learn to fly in beautiful mountain scenery on a week's gliding course at the Cairngorm Gliding Club – contact Course Secretary, Feshie Airstrip, Blackmill, Kincraig. Tel: Kincraig 339. YZ

Plans enlarged or reduced and additional copies made. Send for details from Causer & Co., 216 Goldhawk Rd., London W12. Tel: 01-749 3441. T/C

AMERICAN AERO-MODELLING MAGS

R/C Modeller	*Price on request*
M.A.N.	£1.20
Flying Models	£0.80
Scale Modeller	£1.65

Current – and some back issues available
THE AVIATION BOOKSHOP
656 Holloway Rd, London N19 3PD

TWIN PEANUT KITS FROM AMERICA

SES A/Fokker D8	2 FOR
Monocoupe/Catabria	ONLY
Waco SR/Kadet	£3.50

Rubber Motor Winder only £2.25
SAE for lists of plans and other Peanut Kits!!
SWINDON MODEL CENTRE
2 Theatre Square, Swindon
Tel: 26878

MICRO-X INDOOR SUPPLIES

Amazing quality Balsa (from .008"), Pirelli/Filati Wire, Bearings, Condenser Tissue, Cement, Microfilm, EZB Kits, genuine Jap Tissue, etc., all you need including expert advice.

Please send SAE and 10p for current price list.
(Please disregard all previous prices.)

LAURIE BARR
4 Hastings Close, Bray, Berks.

Mail Order Protection Scheme

If you order goods from mail order advertisers in this magazine and pay by post in advance of delivery this publication (*Aeromodeller*) will consider you for compensation if the advertiser should become insolvent or bankrupt, provided

1 You have not received the goods or had your money returned; and
2 You write to the publisher of this publication (*Aeromodeller*) explaining the position not earlier than 28 days from the day you sent the order and not later than 2 months from that day.

Please do not wait until the last moment to inform us.

When you write, we will tell you how to make your claim and what evidence of payment is required.

We guarantee to meet claims from readers made in accordance with the above procedure as soon as possible after the advertiser has been declared bankrupt or insolvent up to a limit of £1350 per annum for any one advertiser so affected and up to £4050 p.a. in respect of all insolvent advertisers. Claims may be paid for higher amounts, or when the above procedure has not been complied with, at the discretion of this publication (*Aeromodeller*), but we do not guarantee to do so in view of the need to set some limit to this commitment and to learn quickly of readers' difficulties.

This guarantee covers only advance payments sent in *direct* response to an advertisement in this magazine (not, for example, to payments made in response to catalogues etc. received as a result of answering such advertisements). Personal advertisements are excluded.

The largest range of MODEL BOOKS can be obtained from the following:
Albion Scott Ltd, 51 York Road, Brentford, Middx. Mon-Fri 9-5.30
Bewdley Bookshop, 7 Welch Gate, Bewdley, Worcs. Mon-Fri 9-4.30, Sat 9-5.
Foyle's, Charing Cross Road, London (Dept. 7). Mon-Sat 9-6.
Also worldwide mail order, write for lists or **see the MODELBOOK advertisements** in this and other modelling magazines.

World War II Aircraft
CHRISTOPHER CHANT

How they were constructed and their particular features. Full colour drawings of 72 aircraft. A beautiful book (9in x 11¼in, 143pp). PO/Cheque £5.95 to: **FDR Publications, 232 High Street, Northallerton, North Yorkshire.** *(Overseas orders in British currency please.)*

SCALE MODELLERS

At last 1:72nd Plans of some of the lesser known aircraft of WW2. Set of six working plans complete with data. Comprising of Blackburn Skua, Morane Saulnier 406, Hawker Henly, North American NA-50, Heinkel HE 112, Grumman F1. Can be used for most types of aero modelling. Only £1 inc. p&p (overseas extra).

HYSCORE (PLANS),
23 Sandford Road,
Weston-Super-Mare, Avon

Special offer Cox Conquest 15 **£25.00**. S.T. 46 Stunt (incl. Silencer) **£39.95**. Mills 1.3 **£11.95**. Mills .75 **£9.95**. Flash 35 Stunt **£12.95** (incl. Silencer). Merco 61 Stunt **£32.95**. Jetco Shark Stunt kit **£25.00**. Sig Mustang Stunter **£18.80**. 125cc Stunt Tank (special price) **75p**. Jetco F.F. Navigator **£21.00**. Lt. Wt. Modelspan red/yellow 10 for **£1.00** post paid. Hvy wt. Modelspan yellow only, 10 for **£1.20** post paid. Sig 18 swg ballraces 5 for **£1.00**. Pirelli 6mm (brown) per hank **£8.50** post paid. Austin craft ign. timers **£2.95**.

Special offers on radio control. Save up to 25% off recommended retail prices.

HENRY J. NICHOLLS & SON LTD.
the modern model shop
308 HOLLOWAY RD. LONDON, N7 6NP
Tel. 01 607 4272

MAPLE MODELS

(Steve Blake)

"ENGINE CLINIC" try us first for all your spares, repairs, and special work requirements.

K.2.cc DIESEL new from Aurora (India), £8.95+30p p&p.

ENGINE FIXING TEMPLATES our own manufacture, a sturdy cast aluminium mounting template/drilling jib, complete with clamp bar and screw. Range covers O.S. 10s, 10FSR, 15, 20/25, 25FSR, 30/35, 40 R/C, 40FSR, 60FSR, Merco 29/35, 49/61, Rossi 15 F.I., Irvine 40, Super Tigre G.20, X21, Enya 29/35BB, H.P. 40F, H.B. 20/21/25, 40/50. All at £1.99 each plus 20p p&p.

"MAPLE LEAF" newsletter plus S/H lists, S.A.E. brings copy.

Mail order a pleasure – SAE with Enquiries please
Access – Barclay Card – Hire Purchase – Welcome

16 Maple Road, Luton LU4 8AE. Tel: 0582-28435

The Cornish Gliding and Flying Club
Trevellas Airfield, Perranporth, Cornwall
Tel. Perranporth 2124
Gliding courses in modern fleet from May — B.G.A. fully-rated instructors—fine soaring—lovely coastal airfield — Ideal for a different family holiday. Details with pleasure from:
The Course Secretary, Tremearne, Breage, Helston, Cornwall
Tel. Helston 62294

NORTH EAST MODELLERS
We are your local suppliers for
HARRY BUTLER
ELECTRIC R.T.P. EQUIPMENT & MODELS
New: BRITTEN-NORMAN ISLANDER
For twin S3 motors. Wing span 26in.
Price £6.95 *inc. VAT*
Also suitable for CO_2, Glo or Diesel Engine power
Plus our usual stock of:
Pole head kits — Motors — Wire
Hand controllers — Flying scale kits
Illustrated Catalogued 50p plus 10p post
BILL GORDON (Models & Hobbies)
2 Tower Court, Dunston, Gateshead, Tyne & Wear **Tel: (0632) 605545**
Shop Hours:
Mon to Sat 9 to 5.30 except Wed-closed.
Late night Thurs-7.00pm.
Mail order please allow 75p

Why not try a Gliding Holiday this year?
Accommodation in the clubhouse and instruction by professionals at our lovely site in the Cotswolds. Bring your camera and record the holiday of a lifetime.
Write to: **The Holiday Manager**
Bristol & Glos Gliding Club
Nympsfield, Stonehouse, Glos
GL10 3TX. Uley 342

IRELAND
Skyleader R/C System
Large selection of kits by MK, Veron, M.F.A., Kamco, Ripmax, True-Line, Keil Kraft, etc.
O.S. ENGINES
Accessories by Kavan, M.F.A., Micro-Mold, SLEC, Ripmax, PB, Goldberg, Taylor, MK, TopFlite
SOLARFILM - EPOXY - DOPES
See the selection at:
W. J. OWENS
41 Main Street, Bray
(Phone: Dublin 863664)

QUICKSTART SERVICE
All Davies-Charlton engine repairs & overhauls are conducted by the appointed service agents.
JOHN D. HAYTREE
FOX MANUFACTURING CO. (U.K.)
The Haven, Rixey Park, Chudleigh, Newton Abbot, Devon, TQ13 0AN
Tel. (0626) 852330
Send engines direct for quotation or with order for specific repair.

Take to the Air!
GLIDING
4 or 5-day Holiday Courses, March–October.
From £80-£125pw (mid season)
All inclusive
KENT GLIDING CLUB
Challock, Ashford, Kent
Write for details or ring
Challock (023 374) 274

STARTING IN R/C?
. . . it should be compulsory reading for the non-modeller wishing to take up radio control flying. 'The whole style is one of utter practicality . . .'
That's what *Aeromodeller* wrote about
"RADIO CONTROLLED AIRCRAFT"
Sections include **very** simple aerodynamics, power trainers, soaring trainers, building hints, glues, Solarfilm covering, choice of engine, how it works, starting, running in, choice and installation of radio and finding a tutor. It costs £1.50 plus 15p S.a.e. (any size), contains a credit voucher *and* details of special offers to beginners. Send for it *before* you make expensive mistakes!
Swansea Models and Hobbies Ltd. (Dept AM)
Plymouth Street, Swansea, SA1 3QQ

Take a holiday gliding course with the YORKSHIRE GLIDING CLUB
Fully residential clubhouse with licensed bar – full-time professional instructors – wave and hill soaring – modern fleet of gliders and tug aircraft – winch and aerotow launches – Falke motor glider.
For brochure write to: **The Secretary, Yorkshire Gliding Club, Sutton Bank, Thirsk, Yorks.** Tel. Sutton (Thirsk) 237

MORE PROTECTION!

MAP Insurance Scheme Now provides for £250,000 cover

To comply with constantly increasing requirements for Public Liability Insurance (as demanded by Local Authority and Government Departments), the MAP third party insurance scheme has been extended to provide £250,000 cover for 1979. This also corresponds with anticipated requirements for Society membership conditions. How can you take advantage of this offer, which embraces all forms of modelling activity, whether it be concerned with aircraft, boats, cars, etc? Simple! Just complete the form below and send it together with a remittance for £2.00, which will provide cover for one year.
This scheme applies to all new memberships and renewals accepted in 1979. Please remember that the scheme applies to *regular* readers only (those who either have a standing order placed with their newsagent/model shop, or who have a direct subscription).

Model & Allied Publications Ltd., P.O. Box 35, Bridge St., Hemel Hempstead, Herts.
Tel: Hemel Hempstead (0442) 41221

Sales Office:
To: MODEL & ALLIED PUBLICATIONS LTD.
PO Box 35, Bridge Street, Hemel Hempstead, Herts.

Name (in full)

Address

Date

Registered No. A.M.

I enclose herewith postal order value £2.00 for membership of MAP insurance scheme. I understand that membership is conditional in my placing a regular order for:

MODELLING WIRE

and many others available – thicknesses from 0.0008" - 0.25" at very competitive prices

Example: 0.001" Tungsten wire 100 mtrs £11.00
or 25 mtrs £4.75
(inc p & p in U.K.)

WELLWIRE

81 NEWPORT RD, WOBURN SANDS, MILTON KEYNES MK17 8UN
TEL: MILTON KEYNES (0908) 582343

PERFECTION
...naturally

Nature's own covering – perfect every time. Weatherproof and waterproof – fur, feather, fruit, seed or skin – nature has the answer every time. When it comes to covering model aircraft, we have the next best thing to nature – Flightspan! Ultra-light, fuel proof, water resistant, and available in a range of 12 solid or metallic shades, each matched to the world-renowned Humbrol enamel.

Flightspan is easy to apply, requiring nothing more than a household iron and possibly a heat gun (or hairdrier). It's fully repairable and can be patched after accidents – even nature can't always guarantee that.
It's quick, clean, simple and smart – the modern way to cover model aircraft.

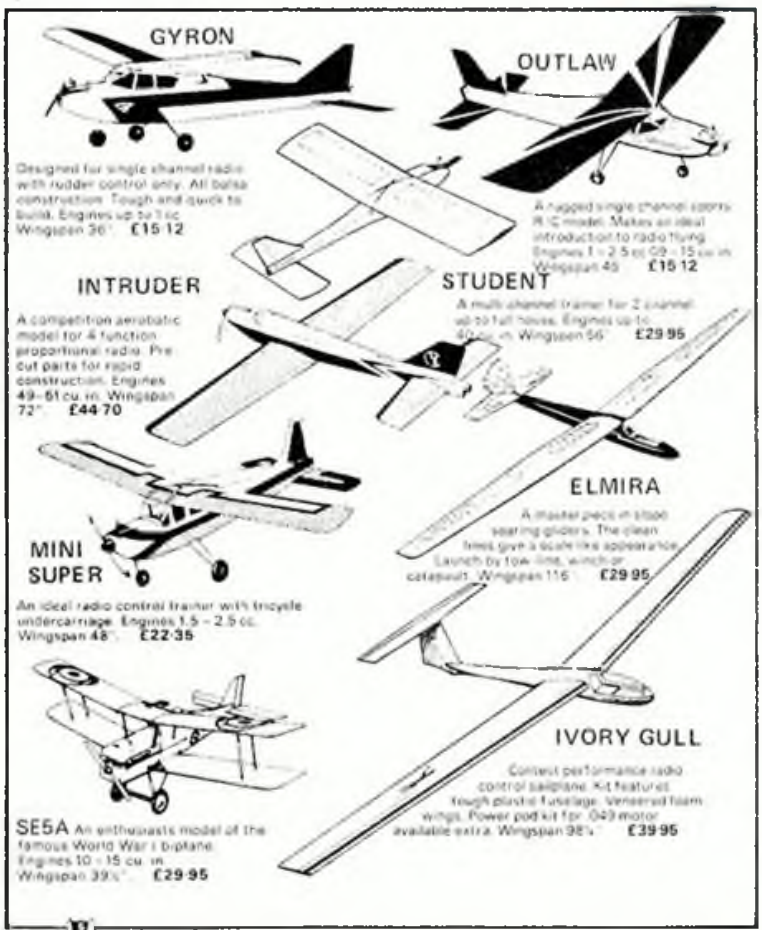
FLIGHTSPAN

HUMBROL Flightspan...second only to nature.

KEILKRAFT

RADIO CONTROL MODELS

The NEW Super 60



is designed to accommodate a wide range of power and flight requirements from steered 'free flight' to full aerobatic performance capability. This is made possible by combining built-in stability with great constructional strength.

The completeness of the kit must be seen to be believed. All hardware, control linkages, horns, cables, push rods, hinges, nuts and bolts etc. Also a plentiful stock of strip, sheet, and block balsa with many pre-shaped parts. Component items, wheels, fuel tank, undercarriages, motor mount, spinner, seating tape etc., manufactured to high standards. 2 full sized detailed plans and instruction booklet covering all aspects of building including flying notes for the uninitiated. Also adhesives, modelling pins, knife, sandpaper etc., in fact everything except radio, engine, covering and finishing materials.

Wingspan 60 ins. – Wing area 615 sq. ins. Length 47 ins. Engines 25 to 40 cu. ins. Radio from single channel rudder only to four function proportional.

£35.45

MADE IN ENGLAND BY KEILKRAFT

WICKFORD ESSEX

4" PECK POLYMER PLASTIC PROP. & THRUST BEARING.

CUT AWAY 1/32 SHEETING FOR COCKPIT OUTLINE.

ALL STRUTS ARE BASSWOOD OR VERY HARD BALSA.

THIN PLASTIC WINDSHIELD

A

B

C

D

E

F

G

1/8 SHT

3/32 SHT

1/20 SHT.

21lb. B/S NYLON FOR TAIL WIRES.

1/20 SHT.

BLOCK BALSA CARBURETOR.

2 BOTTOM STRINGERS.

1 SIDE STRINGER ON EACH SIDE.

▼ INDICATES MAIN FUSELAGE FRAME FROM 1/20 SQ.

BALSA TAIL WHEEL

UNDERCARRIAGE 20 S.W.G

3/4 ϕ LT. WT. WHEELS.

1/20 SHT GUSSETS

COWL IS WRAPPED AROUND FORMERS A & B USING A GRAIN 1/32 SHT. 4 SEPARATE PIECES.

SOFT BLOCK HEADREST

MOTOR PEG 1/16 ϕ BAMBOO

TAILPLANE & FIN STRUCTURE 1/20 SQ.

1/4 SHT. NOSE PIECE.

BALSA SPINNER.

1/32 SHT. LANDING GEAR FAIRING

UPPER STRINGERS

STRINGER POS'NS. ON FORMERS

C D E F G

FORMERS C-G 1/32 SHT. (NOTE GRAIN)

FRONT SPAR PATTERN SHOWN. REAR SPAR HAS 1/16 MORE DIHEDRAL FOR WASHOUT EFFECT.

WING TIPS FROM 1/20 SHT.

STRUT ATTACHMENT POINTS

AILERON MARKING LINES

WING T.E. 1/20 x 1/8

WING L.E. 1/16 x 1/8

JURY STRUTS

LAMINATE WHEEL PANTS FROM 3/32 SOFT SHT.

BALSA BUNGEE COVERS

FRONT VIEW

FRONT & REAR SPARS CUT FROM 1/16 SHT. BEVEL TOPS TO FIT RIBS.

SLICED MAIN RIBS 1/20 SHT.

1/20 SHT. ROOT & TIP RIBS

Walt Mooney's

UPTON

BABY ACE

PEANUT SCALE

Aero Modeller Full Size Plans