Aero modeller

JUNE 1982 60p
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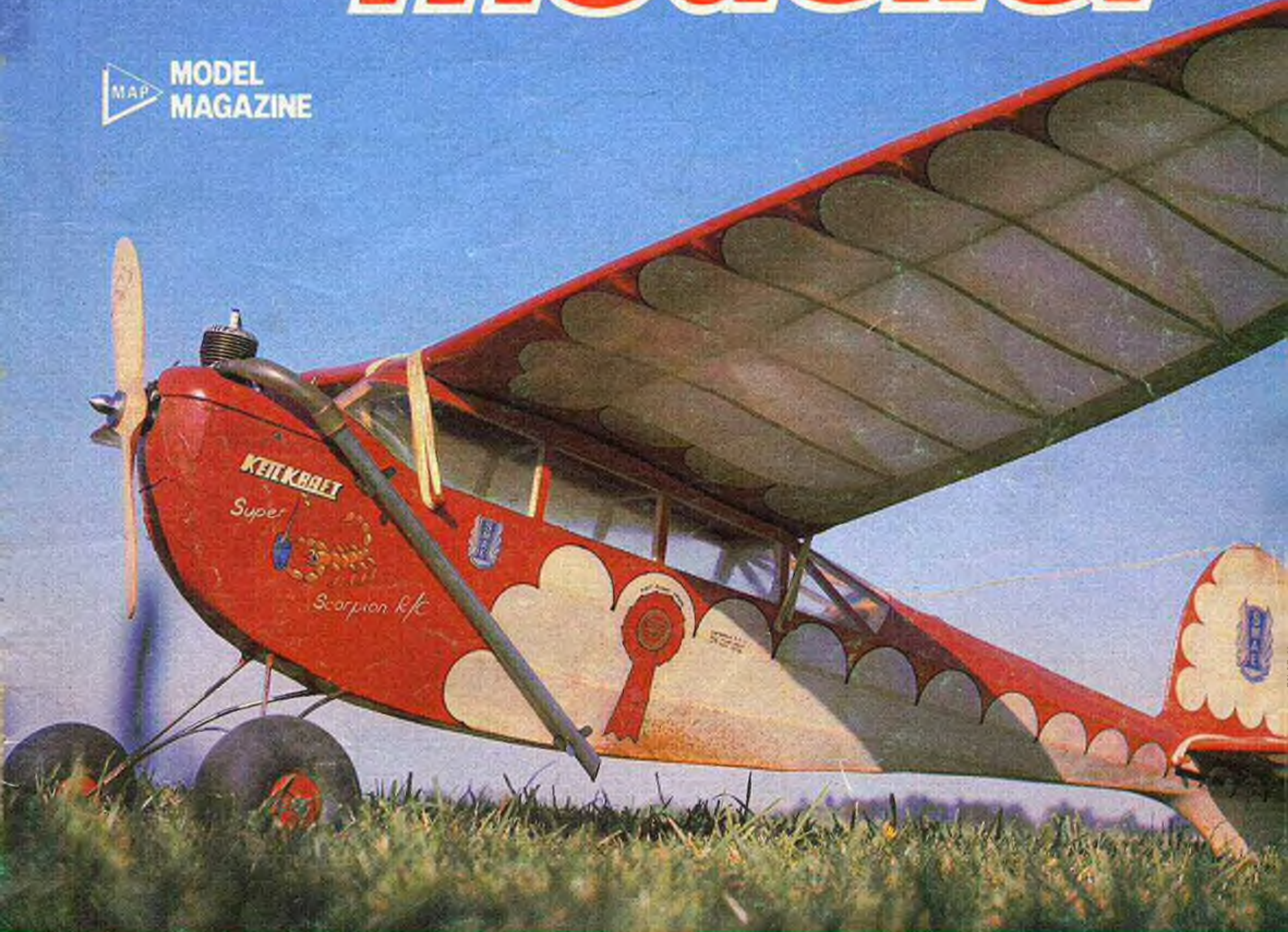
MAP MODEL MAGAZINE



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Aero modeller

JUNE 1982

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EDITOR COLIN RATTRAY
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MAP MODEL DIVISION MAGAZINE

Advertisement Director M. GRAY
Managing Director RON MOULTON

Comment

THE Indoor Scale Nationals held at Middleton Hall, Milton Keynes, on April 18th showed that there is tremendous support for this demanding area of our hobby.

It is probably not apparent to the casual onlooker, how difficult it is to gain those extra seconds of flight achieved by the winners. Probably the main factor in achieving a long duration can be attributed to lightweight construction. To achieve this it is necessary to have good quality light materials and also constructional skill, which plays an essential part in keeping weight down. For instance, one of the main areas of weight saving can be made simply by the amount of glue used to construct the model; hard to believe when one considers the contents of a tube of balsa cement or cyano glue. Of course covering and finishing also add considerable weight. Whether to go for a highly detailed finish using colour dopes etc. and as in the case of open rubber, remain in the 85 gram weight limit and still maintain 15 seconds duration that is required for a qualifying flight, or build a Peanut which gains points from long duration, has to be considered from the outset.

The challenge that these small scale models offer, as well as their low cost, seems to attract not only free flight aeromodellers but also some hard-bitten radio control enthusiasts. I must say for myself, it is only since I have been editor of Aeromodeller that I have seen the fascination in these small scale models. I wonder how many others would join the ranks (especially the modellers who only read radio control material) if they took the time off to see just what happens?

Editor

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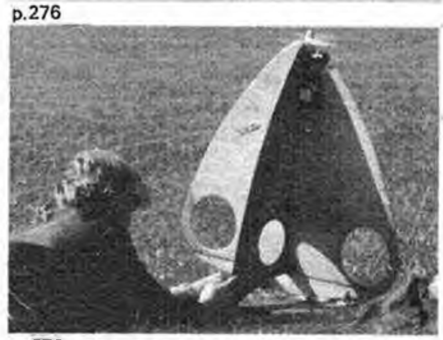

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On the Cover

This beautiful example of the Keil-Kraft Scorpion was built by Mike John. The photograph was taken by Ron Moulton at the 1978 Vintage Day held at Old Warden where the model made it's first flight.

Next Month

Following this month's theoretical description of 'SWINGLINER' V.T.O. stunt control line model, we will be publishing plans and full building instructions. As usual we will have news from all areas of Aeromodelling, plus trade and book reviews.

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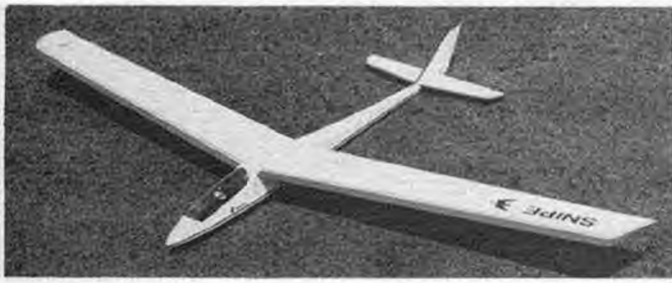

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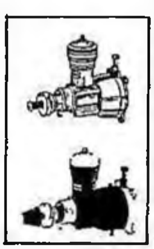

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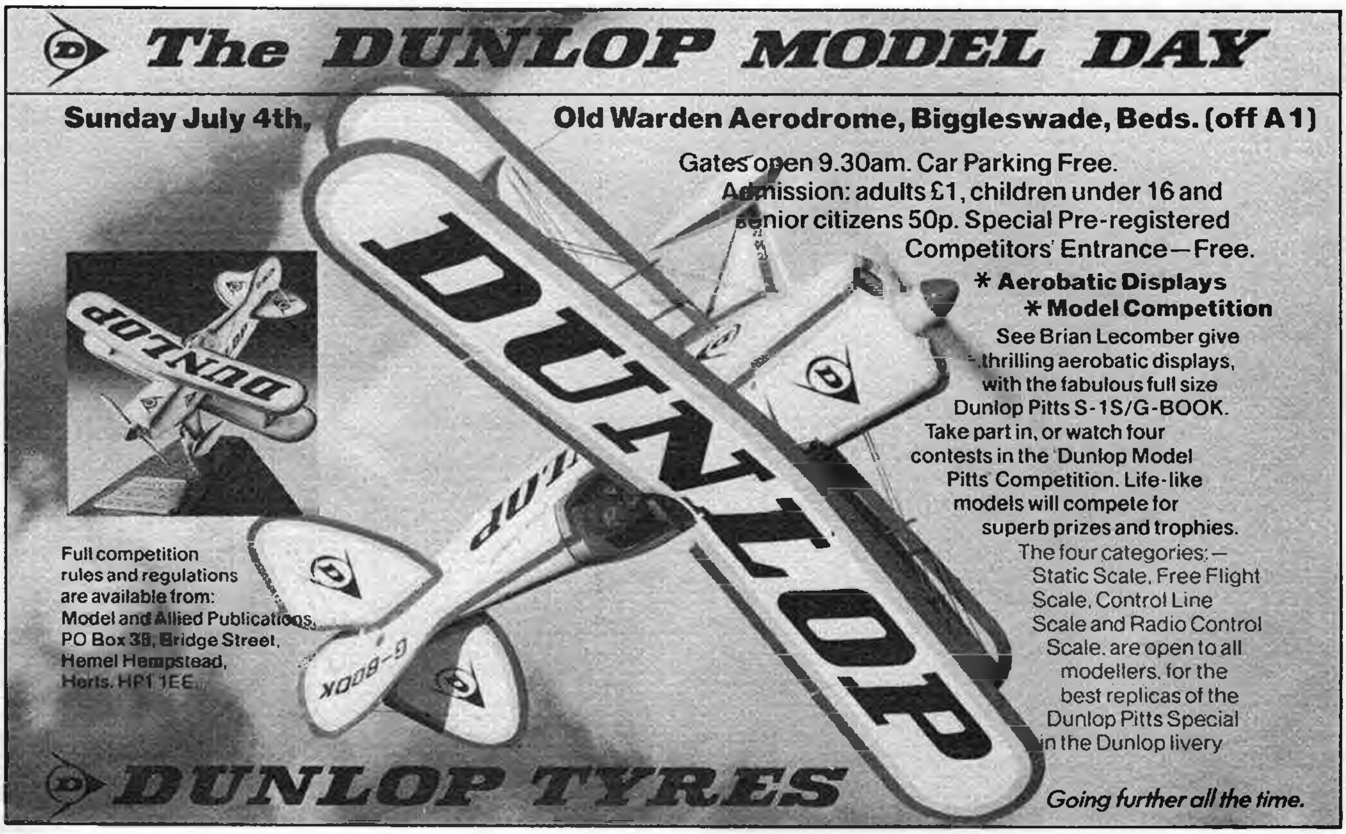
The DUNLOP MODEL DAY
Sunday July 4th,
Old Warden Aerodrome, Biggleswade, Beds. (off A1)
Gates open 9.30am. Car Parking Free.
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Hangar Doors

All-yellow clipped-wing Piper Cub be Peter Frostick, won the Peanut event at Crawley this year on its first day out and came third in this year's Indoor Nats. at Milton Keynes. Tailplane incidence is adjustable for trimming.

OLD WARDEN SCALE WEEKEND — JUNE 19-20

Our annual event will be held as usual at the Shuttleworth Museum Airfield, Old Warden, Beds. Limited camping facilities will be available for Friday 18, Saturday 19 and Sunday 20 at a cost of £3 per night. Prior arrangements must be made with the museum by phoning Northill 288.

As always all are welcome to fly their scale models just for the fun of it. So let's have a good turnout of free flight and control line models, to take the spotlight off those R/C boys!

MINI GOODYEAR MARATHON

Wharfedale and District Aeromodellers are organising a postal one hour sponsored Mini Goodyear Marathon with all proceeds to be given in aid of muscular distrophy research.

The object of the Marathon is for entrants to complete in competitions arranged at *their* own convenience, and then forward the results of the number of sponsored laps achieved in the one hour, for an overall placing to be compiled. Each individual event will be run to current Mini-Goodyear rules.

Here is a chance for everyone to compete and also aid a worthwhile research. For further details contact John Broadhead, 3 Low Fold, Longcliffe Settle, North Yorkshire. Phone day: Settle 2597, evenings: Settle 3805.

STOP PRESS

Model Craft and Country Show to be held at the National Horticultural Centre, Stoneleigh, Kenilworth on May 22/23, 1982.

This is one of the largest shows of its type and includes trade stands covering the whole of the craft and modelling field plus displays of loco's, car racing, boat and model aircraft. John Stroud will be giving a lecture on control line flying, which will include demonstrations of sport, combat and stunt flying. Radio control models will also be flown during the show.

All this is backed up with ample facilities which include a restaurant and a bus shuttle service every half-hour to the showground, from Coventry Pool Meadow Bus Station. Don't miss this day out with something for everyone in the family.

OLD TIMERS AWARD

Honoured by the Academy of Model Aeronautics Mel Anderson and Bob Palmer join the Model Aviation Hall of Fame for their outstanding contributions to the hobby over the years. Mel has been modelling since 1915 and building motors since 1919, he introduced the needle valve and worked with Bill Atwood to produce the Baby Cyclone and later the Super Cyclone and the Anderson Spitfire. Bob a past US Team member is well known to all C/L Aerobatic flyers for among others his classic designs Thunderbird and Smoothy.

Mel Anderson left, and Bob Palmer, two modellers whose contributions over the past 60 years advanced aeromodelling enormously, Mel with his development of the IC engine and Bob in the field of control line flying.

† R. W. INKER

Modellers in the Western Area are greatly saddened by the sudden death of Ray Inker at the early age of 39.

Until recently when he was forced to give up his free flight activities Ray was a member of the Bristol and West and South Bristol Clubs. A turner by profession he readily contributed his engineering skills and knowledge. These qualities and his forthright speaking will be sorely missed by all who knew him.

For Ray fishing superceded free flight and it was on a trip to the Bristol Channel coast that he collapsed. He leaves a wife, Margaret who cheerfully supported his activities and two children Bridget and David to whom we extend our deepest sympathy.

INTERNATIONAL PAPER AEROPLANE COMPETITION

The Yeovil Lions Club is part of an international organisation formed to help their community. They have hit on the idea of holding a competition for all paper construction model aircraft to raise money for charity. There are five categories:

Distance — the design that will fly the farthest in a straight line from a hand launch. *Duration* — handlaunch only. *Aerobatic, Origami* — the most ingenius form of construction, and a *Rotary wing* class.

Fly offs will be arranged before the final fly off which will be held at the Fleet Air Arm Museum, Yeovilto, Somerset on June 19, 1982. Shirley Cousins has been commissioned to design bronze sculptures which will be presented to the winners of each category. Closing date for entries is May 29 and a charge of £2 per entry is required, which should be sent to Lions Club of Yeovil, Princes House, 50A Princes Street, Yeovil, Somerset.

MANX VINTAGE MEETING

Performance Kits has moved premises to a castle on the Isle of Man. Peter Fisher of Performance Kits has organised a vintage flying meeting in conjunction with the Manx MFC which will take place on June 26/27, 1982 at Jurby aerodrome. This excellent venue has a runway of over a mile long and also a hangar which will be available for shelter if the weather turns bad.

A special half-price boat crossing has been negotiated with the Isle of Man Steam Packet Line, PO Box No. 5, Imperial Buildings, Douglas, IOM. (Tel: (0624) 3824), leaving Liverpool at 23.55 on June 25 and returning at 16.00 hours on June 27. Cost is £12 return or £40 with car. Those wishing to use this service should contact the company direct quoting Ref. D43/7.

Peter Fisher has also arranged a supper at the Creg-na-baa Hotel at 8pm on Saturday 26 (cost £3.50) so if you would like to go to this and the fly in, let Peter know. His address is Woodland Towers, Onchan, Isle of Man.

Letters

Dear Sir,

I note with dismay in 'Scale Matters' of the January 1982 'Aeromodeller,' that discussions are to take place with regard to holding the indoor scale Nationals at Milton Keynes instead of the usual venue of Derby.

I am sure I am not alone in hoping that these discussions come to nought. Thought should be given to those of us who live in the North, and who get little enough opportunity to visit National events.

Derby is within reasonable distance from North and South and the hall is very suitable in size and shape. It is admitted in 'Scale Matters' that the hall at Milton Keynes is subject to troublesome draughts, surely the last thing wanted in a National competition.

There seems to be no valid reason for changing the Nationals to Milton Keynes except to bring them nearer to London and the South.

Peterlee, Co. Durham. John Bray

Dear Sir,

Careful study of several past years' Contest Calendars will reveal that many more meetings catering for indoor scale flying are held in the north of England than the south. Apart from two meetings held at Crofton Park in London over five years ago, the only meeting that can be said to have a 'London and the South' bias is the one annual Crawley Club event. For the Indoor Scale Nats it has been Derby 'as usual' for some time now, and it was in fact the idea of the Derby contest Director to move the meeting to Milton Keynes in 1982 with the idea of playing fair and then alternating between the two venues in years to come. As the 'Scale Matters' articles explained, the draughts at Milton Keynes are in the process of being eliminated, but were a minor problem anyway compared to the physical and financial advantages that the larger sunlit space offers. As for attending other National events, Mr. Bray has to travel very little further than yours truly to reach the again usual venue of Barkston Heath/Cranwell.

Alan Callaghan

Dear Sir,

I was reading with interest the 'From the Handle' article in the January 1982 Aeromodeller, scanning the report of the Open Stunt Competition at Dodington House, Avon, when I caught a glimpse of something that amazed me. A statement was made that the overall entry was rather low at only ten people, one of the reasons cited being that the venue was at such a Westerly venue (in the sticks???). Certainly, people in this day and age do not relish always having to commute long distances to competitions, but what about people in the West of England? I agree that often the SMAE will be faced with a Hobson's Choice when it comes to selecting contest venues, but possibly they should consider a few more venues close to the West of England if only to encourage more interest there.

One might say that this situation was ripe for local Aeromodellers to correct by organising their own meetings; indeed, Bath MAC attempted this last season, advertising the same in the pages of this magazine, but to no avail, so what does one do? For one, I intend to spend rather more time flying free flight models this coming season (there appear to be competitions for these almost weekly, roughly evenly distributed around the country . . . so one can choose how far one wants to go, as control line tends to mean too much driving to too few contests. I fear some aspects of contol line flying will die in many areas if the contest situation is not resolved; as an indicator, compare the handful of people flying Team Racing today compared with fifteen years ago . . . it would be a shame if this supreme class of model flying was to fall from the calendar but is it inevitable?

Radstock, Avon. Stuart A. C. Lodge

What's Happening?

May 22/23
IRISH THERMAL SOARING NATS. Venue: Mallusk, Co. Antrim. Contact K. Townsend, Beechwood, Church Lane, Greystones, Co. Wicklow.

May 22/23
3 SISTERS INTERNATIONAL *F2A, F2B, F2C, F2D.* Contact Gordon Isles. Tel: 0625 21437

May 23
SMAE SOUTHERN AREA *OPEN FORMULA MOUSE AT HMS DABDALUS (LEE BEES).* SMAE members only. C/L Team Racing to rules published in August 1981 Model Flyer, but with £15 engine limit. Pre-entry required. Contact: Mick Harvey, 10 The Croft, Stubbington, Hants. Tel. Stubb 5232.

May 23
IRISH CONTROL LINE NATS. Venue to be announced. Contact: J. Molloy, 57 Auburn Road, Dun Laoire, Co. Dublin.

May 23
SMAE SPRING SCALE MEETING. *CONTROL LINE SCALE (STANDOFF).* Venue: RNAS Merryfield, Nr. Ilminster, Somerset. Contact: Vic Willson. Tel. 0734 471964.

June 5/6
ULSTER R/C CHAMPS. Venue: Nutts Corner, Co. Antrim. Contact: K. Townsend, Beechwood, Church Lane, Greystones, Co. Wicklow.

June 6
FINCHLEY & DMAC GALA. *C/L AEROBATICS, NOVICE AEROBATICS, COMBAT* (mufflers essential). SMAE rules. Venue: Glebelands, North Circular Road (entrance Summers Lane), Finchley. Pre-entry and map £1. Entry £2. Contact: M. Jackson. Tel: 203 1937.

June 6
SMAE NORTHERN AREA *C/L GOODYEAR MARATHON AND ½.* Venue: Dishforth. SMAE members only. Contact: Haydon Sykes. Tel. 0924 377432.

June 13
SMAE SOUTHERN AREA *NOVICE R/C THERMAL SOARING AT CATHRINGTON (WALTHAM CHASE).* Contact: Howard Metcalf, Brook Cottage, Winters Hill, Durley, Hants. Tel Durley 447.

June 12/13
LEINSTER R/C CHAMPS. Venue Fairhouse, Co. Dublin. Contact: K. Townsend, Beechwood, Church Lane, Greystones, Co. Wicklow.

June 19/20
SCALE DAYS. Venue: Old Warden.

June 20
LEINSTER C/L CHAMPS. Venue: Blackrock, Co. Dublin. Contact: J. Molloy, 57 Auburn Road, Dun Laoire, Co. Dublin.

June 20
SMAE SOUTHERN AREA C/L STUNT AT HMS DAEDALUS (LEE BEES). SMAE members only. FAI AND NOVICE pre-entry required. Contact Mick Harvey, 10 The Croft, Stubbington, Hants. Tel: Stubb 5232.

June 20
NOTTINGHAM MAC C/L EVENT *F2B AEROBATICS, NOVICE AEROBATICS, C/L SCALE 'STAND-OFF.'* £1.50 per event, good prizes and trophies for 1st, 2nd and 3rd. Venue: Basford Hall Miners Welfare. Contact: Reg Lowe. Tel. Langley Mill 66786.

June 27
MIDLAND AREA T/R RALLY *½A, FAI, GOODYEAR AND MINI GOODYEAR.* Venue: Fulbeck. Contact: Graham Howard. Tel. 07782 3995.

June 26/27
CONNAUGHT R/C CHAMPS. Venue: Shannon Co. Clare. Contact: K. Townsend, Beechwood, Church Lane, Greystones, Co. Wicklow.

June 27
PETERBOROUGH MFC COMPETITION ½ *COMBAT.* Venue: Peterborough Embankment. Contact: Brian Katerland. Tel: Market Deeping 343722.

June 27
COTSWOLD RCS OLDTIMER DAY *PRECISION & TEXACO & FUN-FLY* Venue: Cocklebarrow Farm Aldsworth Glos, on A433 Burford to Cirencester Road. Start 10.30am £1.50 pre-entry. £2 on the day. SAE to Mike Whittard, 2 Cotswold Terrace, Nympsfield, Stonehouse, Glos. Tel. Dursley 860793.

June 27
WHARFEDALE OPEN MINI GOODYEAR COMPETITION SMAE rules but no age limit. Venue: Dewsbury. Contact: Jeff Smith. Tel. (Leeds) 0532 663432.

June 27
FELTHAM & DMAC LONDON AREA GALA. *FAI, TEAM-RACE, CLASS 'B'* £50 for prizemoney; and *½A TEAM-RACE,* F2C and F2D. Venue: North Weald Aerodrome, Nr Harlow, Essex. Contact: D. Banks. Tel. 01 205 8809.

July 3/4
BRITISH COMBAT OPEN INTERNATIONAL 82. *FAI COMBAT F2D.* Venue: 'Dytchleys' Country Estate, 20 miles from Central London. Full on site accommodation plus three meals a day (limited camping available). Parking, toilets etc. Pre-entry essential. Closing date June 1. For full information large sae to: British Combat Int. 82, 26 Premier House, Waterloo Terrace, Islington, London N1.

Free Flight Calendar

May 29/31
FREE FLIGHT NATIONALS — Venue: RAF Barkston Heath, Lincs

June 6
2 EZB COMPS *EXPERT/NOVICE PAIRS PLUS OPEN EZB INDIVIDUAL PLUS FAI MICROFILM.* Venue: Cardington. Contact: L. Barr. Tel. 0628 25595.

June 13
4TH AREA CENTRALISED — *TEAM GLIDER, FOR ME CUP + PLUGGE POINTS, F1C ASTRAL TROPHY + Cd'H.* Area Venue.

June 13
VINTAGE MODEL AIRCRAFT SOCIETY ANNUAL FLY-IN All Vintage type F/F models welcome. Insurance essential. Venue: Chobham Common. Contact: Don Read. Tel: Farnham 723400.

June 13
SOUTHERN AREA CENTRALISED. SMAE AREA EVENTS + P30. Venue: Beaulieu. Contact: Barbara Tyson, 19 Wilverly Avenue, Strooden Park, Bournemouth BH8 0HT

June 20
CROOKHAM CONTEST F/F GALA. *O/P, O/R, O/G, ALL IN FAI (five flights – no rounds).* F1B Champagne Fly Off — weather permitting. SMAE members only. 10.00am start. Venue: Old Airfield, Beaulieu, Hampshire. Contact: P Uden. Tel. 0734 51366.

June 20
2 EZB COMPS EXPERT/NOVICE *PAIRS PLUS OPEN EZB INDIVIDUAL PLUS CO_2 DURATION AND MANHATTAN.* Venue: Cardington. Contact: L. Barr Tel. 0628 25595

June 27
SMAE CENTRALISED F/F MINI EVENT *½A POWER, C'DH, A1, HLG & CO_2.* Venue: Beaulieu. Contact: Barbara Tyson, 19 Wilverly Avenue, Strooden Park, Bournemouth, BH8 0HT

EVENTS

NORTHERN ASSOCIATION OF MODEL ENGINEERS 18TH EXHIBITION and will include five aircraft classes and 'Aeromodeller' Trophy plus trade stands. Venue: Welford House, corner of Belvoir Street and Pocklington's Walk, Leicester Contact: Mrs. M. Moore. Tel 0664 66170.

June 3/5
MONKLANDS FESTIVAL MODEL EXHIBITION. (Airdrie Model Club). 3rd and 4th 6.00pm to 9.30pm and Saturday 5 from 9.00am till 5.00pm. Entrance fees, adults 30p, children 15p. OAPs free. Venue: Broomknoll Church of Scotland, Church Hall, Broomknoll Street, Airdrie, Lanarkshire. Railways, Dinky toys, Meccano cars, aircraft, wargames, etc. Contact: Les Stephen, 23 Cromarty Road, Airdrie.

June 4/6
MILTON KEYNES MODEL SHOW. Venue: Middleton Hall, Milton Keynes.

SWINGLINER

Robert Dulake describes the development of his V.T.O. Deltoid Control Line Stunt model, that will fly on lines up to 200ft. in length! Next month we will publish a plan and building instructions.

Part 1 — Theory

There are good reasons for flying control line manoeuvres slowly on very long lines, time and space to assemble figures without stress or giddiness being especially important.

Conventional models offer little scope for improvement in the above respect as speed and line length are largely pre-determined by the centrifugal force which must be generated to hold the lines in a taut state. The relationship between centrifugal force, line length and speed is illustrated in **Fig. 1.** From this it would appear easy to slow things down and still maintain adequate line tension. The catch is that the speed of a stunt model is not constant. Headwind, turning and climbing all do their bit toward slowing the model and it is at the very slowest speed that centrifugal 'G' must still equal one or more.

There are some common methods for improving line tension which can be of limited help. Use of a light wing loading and a carefully tailored section minimises speed loss due to turning in manoeuvres, but does not overcome gravity or the wind, and the model still operates within the confines shown in **Fig. 1.** Wingtip weight will help in level flight and even when turning overhead, due to 'hingeing effect' but it will not help a model at the top of a wingover. Offset rudder will slew a model out of the flight circle but will only improve line tension when coupled with side surface area which gives more radial 'pull' than drag, which most fuselages arguably don't.

An interesting Chinese model at the 1980 World Control Line Championships used lifting sectioned wingtip fences to supplement centrifugal force, but so much side area can act against line tension upwind and 'overpull' on the downwind part of the flight circle. In other words, it is least effective where most required — unless, that is, the functional surface should be pivoted, in which case feedback may be used to vary its angle of attack in compensation for line tension changes. Then, if the radially 'lifting' surface can be made adequately large, centrifugal force may be supplanted as the source of line tension and a much wider choice of line length and speed will become possible.

Swingliner has nearly as much radially 'lifting' surface as wing, and an articulated leadout system which allows it freely to pivot in flight. The combination of these features enables it to perform all known manoeuvres and some new ones, slowly and on very long lines, irrespectively of centrifugal force effects. It is, as far as is known, the only control line type which has performed horizontal eights, loops, and direct overhead flight on 200ft. control lines using the power of a 2.5cm³ diesel.

The radially 'lifting' surface takes the form of a perpendicular wing and will answer to the name 'P.W.' from now on, in the interest of brevity.

Layout

Two deltoid surfaces, an engine and a control system make up Swingliner. The surfaces are interlocked at 90°, one the wing, the other the radially pulling P.W. A superimposable rounded delta outline is chosen for both surfaces, that of the P.W. usually being reduced spanwise by a small factor uniformly along the root chord. The choice of outline ensures minimum interference of the wing with the articulated control lines, and avoids the nose heaviness which would arise from the use of a truly triangular delta. Similar outlines give similarly positioned centres of lift for the two surfaces, and this is important as the roles of these are interchanged in overhead flight.

Control System

This is mounted on the inboard wing. It comprises an elevator-mounted bellcrank in the form of two large opposed horns, flexible leadouts which pass forward from the tips of these horns, and two coaxially mounted pulleys, one above and one below the wing, around which the leadouts engage before leaving the model towards the control handle and pilot. The lack of leadout guides in the accepted sense allows the model to swing over a very wide angle to the lines without kinking or binding at the leadout point, and without the elevator neutral point changing relative to the handle neutral point.

Technical description

The free-swinging ability of the model allows it to be appropriately aligned for line tension by means of a simple feedback system. This balances two opposing torques, the first generated outwardly to the flight circle by an offset rudder, the second inwardly to the circle by tension from the control lines. The latter leave the leadout pulleys forward of the coincident centres of lift of the surfaces and slightly inboard from the centre line of the model, the exact point being quite critical. The opposing torques pivot around the dynamic

Fig. 1.

Line Length (feet)	Airspeed (M.P.H.) to give centrifugal G=				Rotational time (seconds) to give centrifugal G=			
	Centrifugal G 0.5	1	2	4	Centrifugal G 0.5	1	2	4
	M.P.H.				Seconds			
35	16.1	23	32.3	46	9.3	6.6	4.65	3.3
50	19.3	27.25	38.6	54.5	11.1	7.86	5.55	3.93
70	22.8	32.25	45.6	64.5	13.1	9.3	6.55	4.65
100	27.3	38.6	54.6	77.2	15.7	11.1	7.85	5.56
150	33.5	47.25	67	94.5	19.24	13.6	9.6	6.8
200	38.5	54.5	77	109	22.2	15.7	11.1	7.85

centre of the model, this coinciding, in practice, approximately with the centre of gravity. The line tensioning force which is the resultant of the lift of the P.W., the thrust of the engine, and the drag of the model, plus any residual centrifugal force, acts radially from this point. **See Fig. 2.**

The outward rotation of Swingliner takes place equally whatever the cause of the reduction in line tension, whether this be wind pressure, loss of speed in turning or climbing, or gravity when flying high in the circle. A slight inward swing develops when line tension becomes very high, as it may on the downwind part of the circle in moderate wind, and this prevents pull from becoming excessive. This ability to compensate for extremes in line pull allows Swingliner to be flown safely on thinner lines per cm^3 of power than could a conventional model.

Flying

As a rule of thumb Swingliner will fly in wind of up to half its level airspeed. Stronger wind causes excessive upwind swing angles and loss of speed although elevator control remains unaffected in this extreme attitude. **See Fig. 3.**

In level flight, Swingliner aligns itself more to the airflow over itself than to the circle in which it flies, maintaining the P.W. at a positive angle of incidence to this airflow at all times. This angle of incidence is not fixed, it's variation being governed by the position of the leadout pulley, and in certain situations of reduced line tension, the resultant exaggerated side- slipping attitude of the model moves the centre of lift towards the inboard wingtip, and to maintain the longitudinal relationship between the centre of lift and the centre of gravity relatively to the airflow, it is desirable to place the C of G slightly inboard from the centre line of the model. This prevents an artificial tail heavy condition from developing when the model is compensatig for reduced line tension, i.e. at very large swing angles.

This is opposite to the requirements of a conventional model where the centre of gravity is traditionally displaced towards the outboard wingtip. Such an outboard placement on Swingliner produces some very interesting but not necessarily desirable manoeuvring characteristics, due to control sensitivity increasing with the sharpness of the manoeuvre.

The Swingliner theory was first dreamed up as a way of making slight line tension improvements to a centrifugal model, without much thought towards aerobatic flying. It all seemed sensible on paper, but the enormous side area and lack of leadout guides gave rise to gross misgivings, and surely, a delta, and a flat-plate delta at that, would not be very manoeuvrable? **Fig. 4.** shows layout of model.

By several strokes of luck the first experimental model was correctly set up in all the essential details and quickly began to spring surprises.

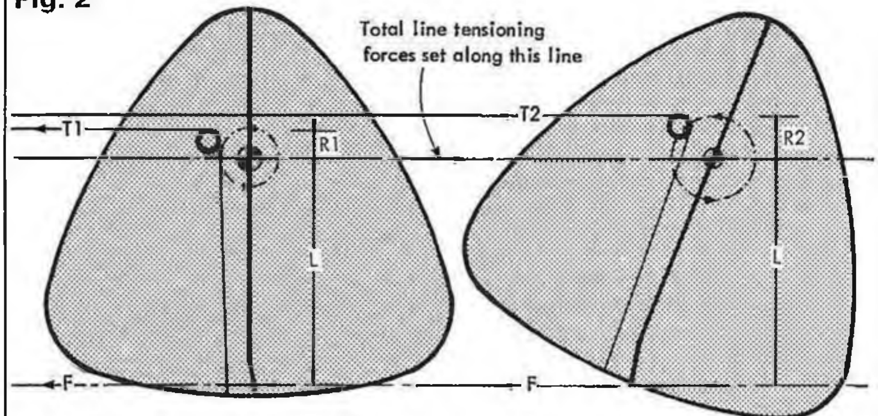
First Flights

In its first flights, Swingliner proved the line tension theories, turning out in and out of the circle exactly as planned. Yet more surprisingly, it was extremely control sensitive especially for a delta, and difficult to fly level, yet always safe as it could be pulled very sharply out of dives. A change in engine from M.E. Heron to A.M.15 gave a thrust/weight ratio of about 1½:1 and the ability to fly all manoeuvres, including squares, on 55ft. lines. The jerkiness remained however and this has been put down, in hindsight, mainly to control friction and a very small throw bellcrank, although a slightly outboard centre of gravity also probably contributed.

The next three Swingliners were all highly experimental and not very successful. The most memorable was a D.C. Dart-powered version which could manage wingovers on 55ft. lines.

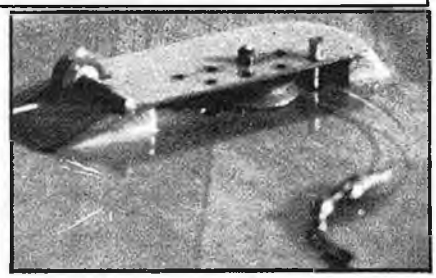
Swingliner 5, a $2.5cm^3$-powered machine gave the first really exceptional

Fig. 2



Example 1 Line tension, T1, high

Example 2 Line tension, T2 reduced



Detail of elevator control pulley system. With this design it is essential that there is very little friction in any of the moving components. Note the fishing tackle swivel used to connect to control lines.

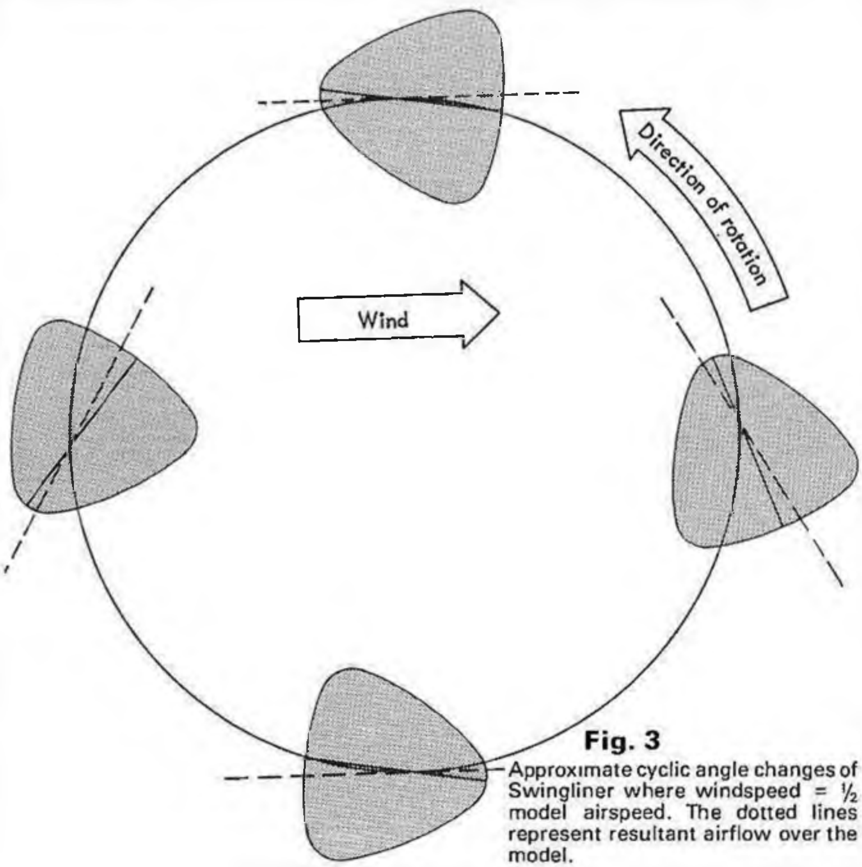
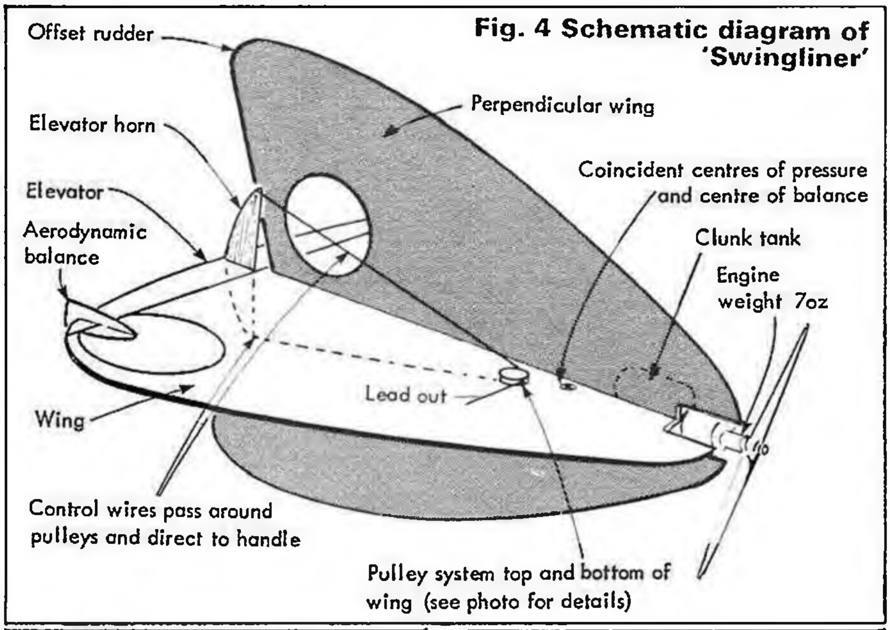
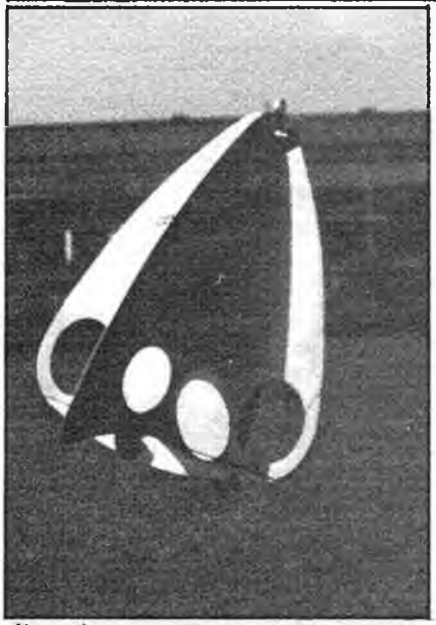


Fig. 3

Approximate cyclic angle changes of Swingliner where windspeed = ½ model airspeed. The dotted lines represent resultant airflow over the model.





Above: single handed flying is possible, with V.T.O. released by a line actuated by the pilot. Below: detail of elevator aerodynamic balance.

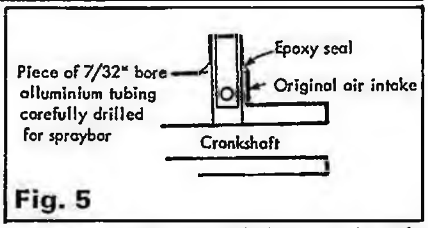
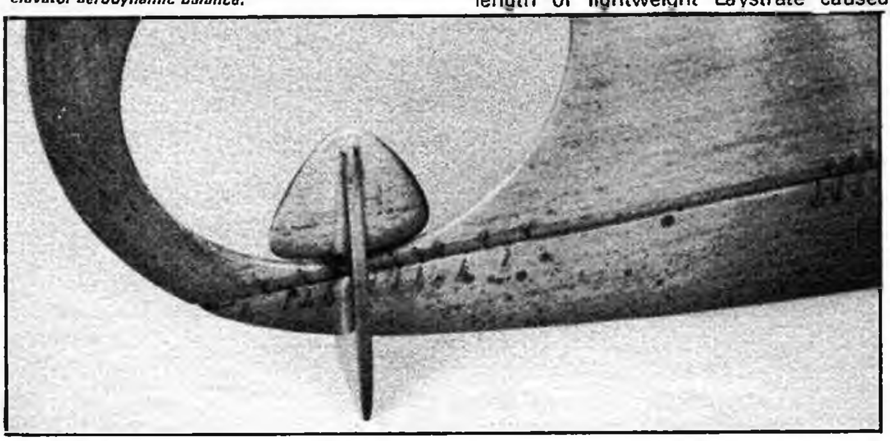


Fig. 5

performance. Control friction was by this time recognised as a problem and was decreased by using much larger pulleys than the earlier models. Flight became relatively smooth as a consequence. The bellcrank was wider too, and there was plenty of thrust from the Super Tiger G20D. No. 5 showed exceptional turning ability from the initial flights on 62ft. lines and proved itself quite capable of handling 105t. lines, even when these were wielded by the lab. secretary during a lunch-break flying session. Overshadowed by this remarkable event, but nonetheless notable in their own right, are the three aerobatic flights subsequently made by No. 5 on 205ft. lines. These showed cruelly a new factor limiting line length, namely line bow. The model design was quite capable of flying on 205ft. of line but the drag of this length of lightweight Laystrate caused such large bow that control was minimal, and an 8in. throw handle was necessary for manoeuvres.



Since these flights, the 205ft. lines have been used only once in order to fly Swingliner 8, a Sokol 5cm^3 diesel machine. The same problems were evident as before, however, and the 205ft. lines have now been temporarily retired until their problems of precise control have been more practically overcome.

Model development since Swingliner 5 has been confined to detail refinements to improve control and provide a firm three point stance for VTO.

The ten development Swingliners built to date, as well as having proved the line tension theories, and despite being flat sectioned deltoid machines, have proved the design at least as manoeuvrable as conventional layouts, yet forgiving enough to be used for training, two people having made successful first flights with No. 5. These flying properties have been put down to two factors. Firstly, most of the surface area is blown by the propwash and secondly, extreme deceleration in sharp turns is accommodated without losing line tension, and very powerful elevator control can be used to fly safely out of any tight corners.

Power

Swingliner is a bit of an aerodynamis nightmare and being basically an engine pointing device, benefits from a high thrust/weight ratio, preferably of the order of 2:1 to ensure line tension at all times and as a bonus, to give zippy vertical take-off. Diesels driving big low pitched props and fed on 'cool' fuel have given the necessary 'punch' very reliably on the originals, some successful engine/propeller combinations being:

PAW149 and AM15: 8 × 4
Super Tigre G20D: 9 or 10 × 4
PAW 19: 11 × 4, 10 × 4 or 10× 6
Super Sokol 5D: 11 × 7 or 12 × 6
Rossi 15 RVD: 9 × 3

and an example of a 'cool' fuel:

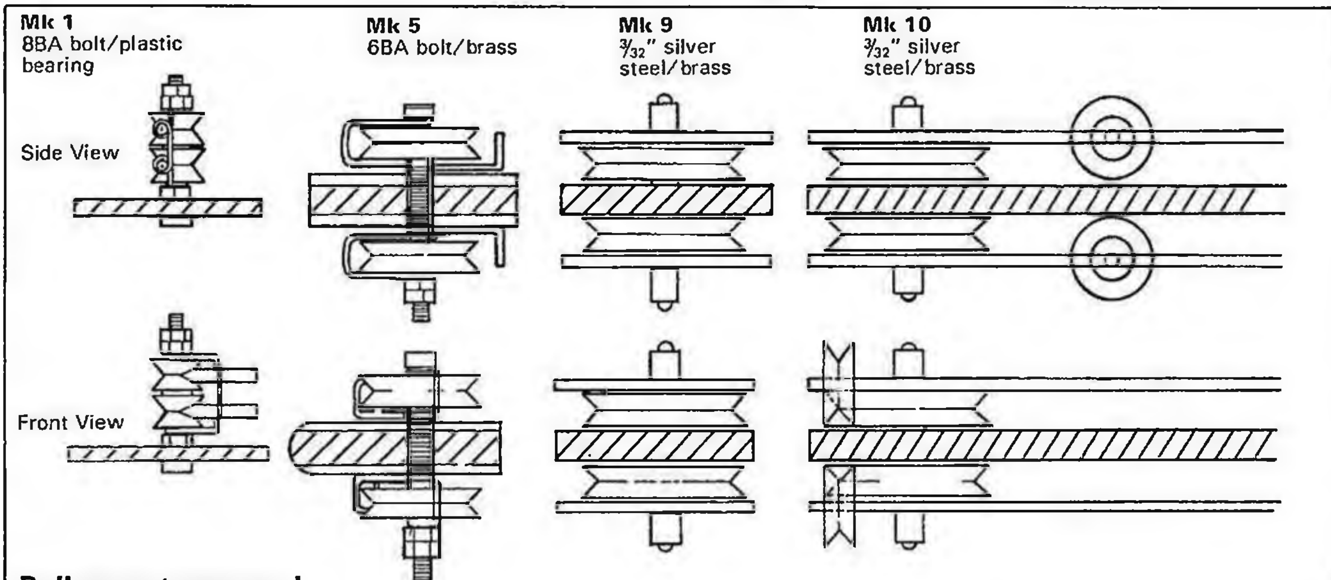
Castrol R30: 33% volume:
Paraffin: 33% volume
Ether: 33.5% volume
Isopropyl Nitrate: 0.5% volume.

A reliable fuel feed is essential and, when average centrifugal G is less than one, can only be given by a clunk tank. Unfortunately, commercial tanks may not be suited as they use bungs and flexible tubing which perish in diesel fuel, and these must be replaced if a diesel is to be used. Suction too is important and many engines will need a slight intake restriction. The PAW19 used in Mark 10 has its intake sleeved to 7/32in. to achieve this. **See Fig. 5.**

Line Bow

All C/L systems suffer from line bow but lines are normally so short that it is not recognised as a problem. The abnormal line lengths used with Swingliner give abnormal bow which varies continuously in flight, leading to imprecision in manoeuvres, and occasional balloonings in level flight when flying in wind. There are two approaches to overcoming bow. One is to minimise the amount of bow, and the other to make elevator response constant and positive despite bow.

As practical considerations make



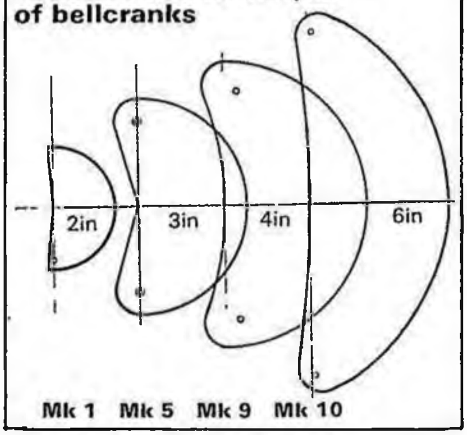
Pulley systems used

Lightweight Laystrate the sole line material choice at present, little can be done to reduce line bow for any given engine/model combination but, accepting bow, there are worthwhile control improvements which can be made.

Improving control despite bow

The factors which hinder accurate response to the reduced signal reaching the elevator through bowed lines are the force to neutral exerted on the elevator by the slip stream, and friction in the pulley system, which cases jerkiness of response. The former can be overcome by counter-balancing the elevator aerodynamically, by setting the line attachment holes in the bellcrank slightly behind the elevator hinge so that the neutral point becomes de-stabilised, and by increasing the throw of the bellcrank until line movement for control becomes large in proportion to the line movement absorbed by bow. All three methods have been incorporated and flight proven in Swingliner 10, a PAW19 powered machine which flies at a level speed of 42mph, and which produces a precision and smoothness on 105ft. lines comparable with that of a conventional large stunter on 60-70 ft. lines, whilst having half the rotational speed and using half the power of the latter.

Distance between eyes of bellcranks



Friction in the pulley system can be minimised by using large diameter pulleys with a low friction bush/axle combination and by attention to alignment. In the case of Mk. 10, which uses a very large bellcrank, a pair of auxiliary pulleys are necessary to keep the leadouts in correct alignment with the main pulleys.

Suggested areas for future design improvement

1. use of built-up structure.
2. better airfoils for the surfaces.
3. optimisation of pulley positions.
4. optimisation of C.G. position.
5. optimisation of rudder offset.
6. optimisation of wing/P.W. area and size ratios.
7. a method for safe landing over concrete.

Success with point 7 would set Swingliner as a very interesting cat among the centrifugal pigeons in FAI competition.

Other desirables, not directly connected with model development would be ultra-thin but manageable lines, diesel fuel resistant clunk tanks and a quality 5cm³ or larger diesel for stunt work.

As for the holes, these are not economy measures but an aid to lift distribution in the same way as the outlines of the surfaces.

(Patent applied for)

Next month we will publish a plan, building and flying instructions for Swingliner.

660mm span rubber powered scale model, of this famous World War II American fighter

Designed by Chris Chapman

IT HAS often been said that the P51D Mustang had the finest all round performance of any single seat fighter of the Second World War. It was also the first single seat fighter capable of escorting American heavy bombers all the way to Berlin, which at the time was quite an achievement for both pilot and aircraft.

In model form, the Mustang is also a faultless performer, and few problems should be encountered during construction and flying. In fact prior to the 1980 British Nationals, the model had only made two or three powered glides to check thrust settings and incidence angles. The first flight it made on full power was also its official contest flight in the Rubber Scale competition at the Nationals.

Apart from the model flying in rather a small circle, the flights were near perfect. Since then a piece of 0.8mm ply packing has been fitted behind the nose block to give 1° of right thrust, so making the model fly in much larger circles.

Fuselage Construction

The fuselage is constructed in the traditional 'half shelf' manner. The basic keel uses two methods of construction. The straight sections are made from strips of 1.5mm × 4.5mm medium balsa, while the curved sections are laminated directly over the plan from three strips of 1.5mm sq. medium balsa.

Note that the keel section between formers **F8** and **F10** is only a temporary brace and should be removed when all the stringers have been added.

Cut all the fuselage formers from 1.5mm medium balsa. Cement all formers from **F3** to **F15** into position over the plan using a small set-square to ensure that they are perfectly vertical. When dry remove from the plan and add the formers to the opposite side. Then add the wing saddles **E1** cut from 1.5mm medium balsa, and the 1.5mm sq. strips of soft balsa that run around the bottom edge of the wing saddle. Begin adding the fuselage stringers made from 1.5mm sq. hard balsa, fitting one stringer to each side of the fuselage at a time. This will prevent the fuselage being pulled out of line. After all the stringers have been fitted, cut away the temporary keel brace between formers **F8** and **F10**, and the keel support on top of former **F9**. Then add the cockpit surrounded **E4** from 1.5mm medium balsa.

Cut the two balsa nose laminations **F2** from medium balsa, cutting out the air intake at the bottom before finally cementing in position. The forward section of the nose between formers **F3** and **F4** is filled in between the stringers with 1.5mm soft balsa. The front former **F1** is cut from 0.8mm ply and a block of medium balsa is carved to a round section to form a snug fit in formers **F2**. This is then cemented to the back of former **F1**. This unit now forms the noseblock which is removeable for winding. Drill a 3mm hole through this to take an 18 gauge brass bush. No offset for down or sidethrust was built into the nose block of the prototype.

Spot glue blocks of soft balsa to formers **F10** and **F14** to form the radiator intake and tail fin fairing. Cement radiator intake formers **E2** and **E3** cut from 12mm and 3mm soft balsa, cutting out the air intake in **E2** before cementing in position to radiator intake block. Add the rear motor peg support from 1.5mm hard balsa before finally carving and sanding the fuselage to its final shape.

Wing Construction

Cut two wing ribs of each size from 0.8mm medium balsa. Sand the 2.5mm × 9mm medium balsa trailing edge to the section shown on the plan and pin in position over the plan. Next cut the 3mm × 6mm medium balsa leading edge to the tapering section shown on the plan. Pin this over the plan together with the bottom wing spar which is made from 1.5mm × 3mm hard balsa on edge. Add the ribs, trimming them for a perfect fit and the top wing spar from 1.5mm × 3mm hard balsa.

When dry, remove from the building board and add the corner gussets from 0.8mm balsa. Repeat the process with the opposite wing panel.

Cement the 1.5mm hard balsa dihedral brace into the slots in the underside of ribs **R1** and **R2**. Place the wing on the building board and pack up the wing tips 44mm. Then add centre section leading and trailing edges and spars. Sandpaper leading edge to final contour, carve wing tips from soft balsa and cement in position.

Lay one of the wing panels flat over the building board, packing up the trailing edge wing tip with a piece of 3mm scrap balsa. Hold the wing panel which is pinned to the building board over a boiling kettle and leave to dry overnight. Repeat process with opposite wing. This will give the required washout to the wing and is very important.

Tailplane and Fin Construction

The tail surfaces are constructed from 2.5mm sq. medium balsa for the leading and trailing edges and 1.5mm × 2.5mm medium balsa on edge for the remainder. Tips are from 2.5mm soft balsa. When dry remove from building board and add 0.8mm corner gussets. Finally, sand edges to a rounded contour.

Remove the balsa blocks that are spot glued to formers **F10** and **F14** and hollow out. When you have done this, cement the tailfin fairing block back in position to former **F14**. Do not re-fit the radiator intake block at this stage.

Covering

All the structure should be carefully sanded to remove any rough spots. The fuselage formers may be scalloped between the stringers with a piece of sandpaper wrapped around a length of 6mm dowel. This will prevent the formers showing through the covering.

Apply one coat of clear dope to all parts of the structure which the covering will touch. When dry, sand lightly with fine sandpaper to remove any roughness and apply two more coats of clear dope.

The original model was covered with Jap tissue applied by brushing dope thinners through the tissue, which softens the dope on the framework to provide adhesion. the fuselage is covered in narrow strips 24mm wide the length of the fuselage. At this stage leave the underside of the fuselage uncovered.

Cover the wings using six pieces of tissue and the tail fin and tail plane two pieces each. Watershrink the tissue on the wings and tail. When dry, give two coats of clear dope thinned with 75% thinners. Pin down and leave overnight to prevent warps.

Assembly

Fit the completed wing to the underside of the fuselage and add former **F7A** and stringers to fair-in the underside of the wing with the fuselage. Tissue cover the underside of the fuselage from the nose up to former **F10**. Then re-glue the radiator intake block to former **F10**.

Add reinforcing brace from 1.5mm × 6mm medium balsa which fits in a slot cut in the radiator intake block and glue to former **F9**.

Tissue cover the remaining parts of the fuselage. Water shrink and give two coats of clear dope thinned with 75% thinners.

Canopy

The cockpit canopy is moulded from thin acetate sheet in the normal method by first carving a block of balsa to the shape of the finished canopy. From a sheet of 4.5mm ply, cut a hole to the shape of the canopy plan view roughly 1.5mm larger all round. Pin a piece of thin acetate over the ply sheet. Heat in front of an electric fire until it becomes soft and starts to steam.

Now quickly force the balsa mould through the hole in the ply sheet forcing the acetate sheet with it, forming the canopy. Hold it in place for a few seconds until it cools. Trim the canopy to fit the contours of the fuselage but do not fit permanently at this stage.

Details

Carve the pilot from soft balsa block. Hollow out and give three coats of sanding sealer. Finish by painting with matt enamels. Cut the headrest from thin card and paint matt black together with the rest of the cockpit interior.

Now fit the canopy by holding it in position with a piece of masking tape. Then run clear dope around the edge of it fixing it in position. The canopy framework is made from thin paper.

Make the exhaust pipes from soft balsa and 3mm o.d. aluminium tube. Guns are made from 2.5mm o.d. aluminium tube with fairings from soft balsa. Navigation lights and fairings on the wings are from soft balsa. A.S.I. indicator pitot and aerial mast are made from thin acetate sheet.

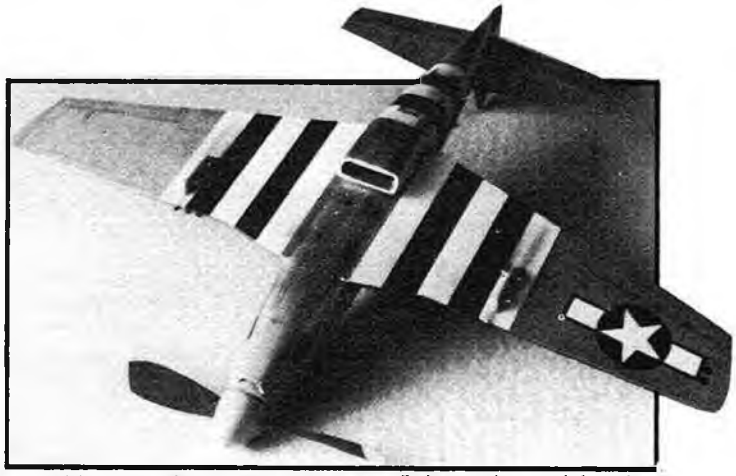
Propeller Assembly

A Peck-Polymer 240mm plastic propeller was used on the prototype. To the back of this, glue former **S1** cut from 1.5mm medium balsa. Bend the 18 gauge prop. shaft to shape, thread on the nose plug thrust bearing and the propeller. The spinner is moulded from 1.5mm plastic card in the same manner as the cockpit canopy.

When moulded, trim to shape, cutting a slot on either side to clear the propeller blades. Finally flue in position to former **S1**.

Painting

Colour schemes for the Mustang are many and varied from plain silver to elaborate multi-coloured schemes. All paint should be applied with an airbrush to keep weight to a minimum. The prototype was first sprayed with Humbrol Silver dope, followed by the yellow nose and spinner, Olive Green upper wing surface, rear fuselage and tail in Humbrol Matt enamels



This underside view and also the heading photograph, shows the very fine detail of the model. To keep weight down it is essential to spray finish. Further reference on the P51D (also includes type B and C) is available from MAP Plans Service Plan No. 2766 price £2.25 plus 40p postage.

thinned with cellulose thinners. All markings were sprayed on with Humbrol Matt enamels, using stencils cut from 50mm wide masking tape. Control surface details and panel lines are drawn in using a Rotring drawing pen.

Power

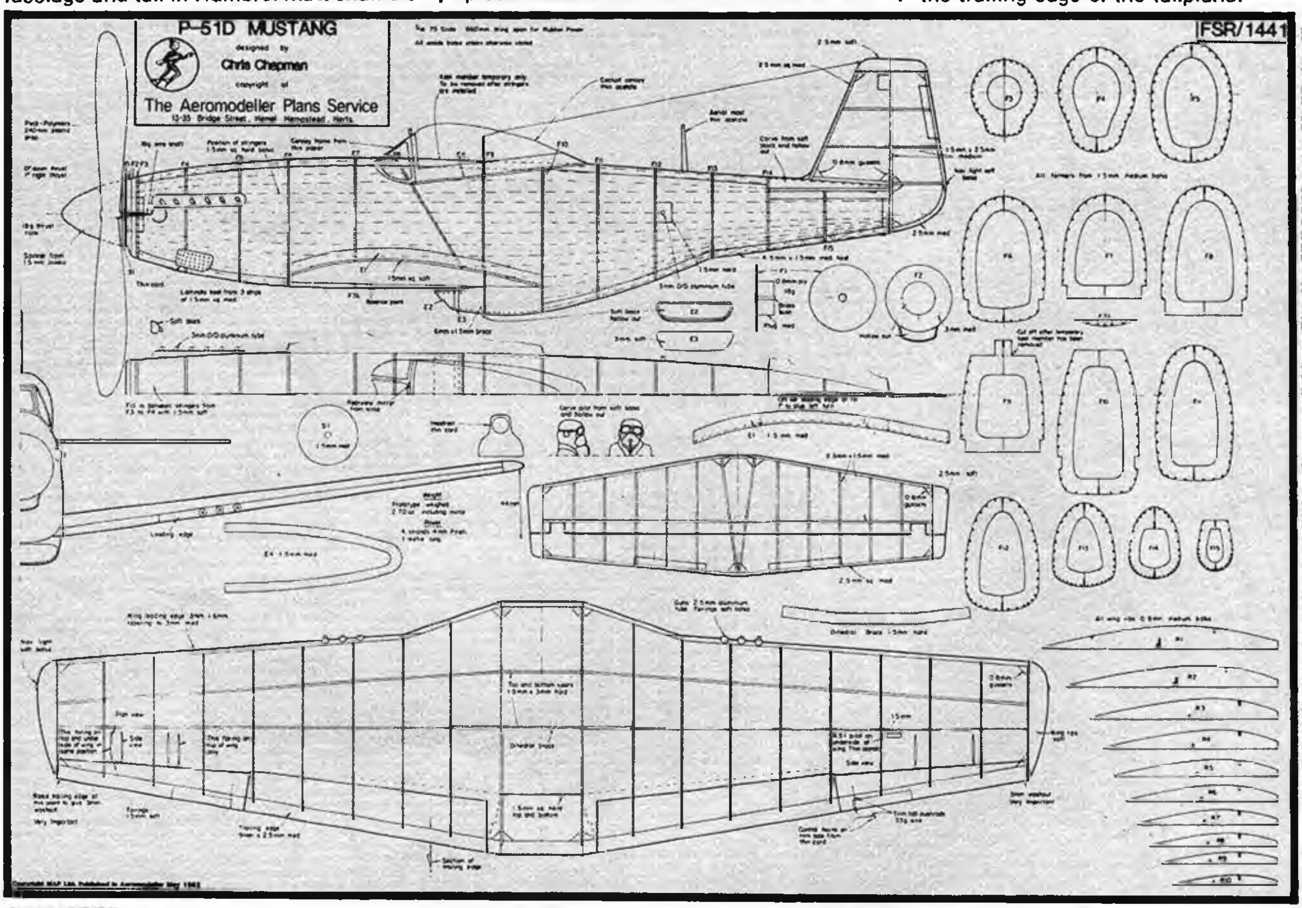
The prototype model was powered by four strands (two loops) of 4mm rubber and weighed 2.70oz. with motor. Heavier models might require additional power while a very light model might need less experiment with rubber sizes from four strands of 3mm rubber up to four strands of 6mm rubber. But try not to use anymore power than necessary.

Flying

Install the motor in the model using a piece of 3mm o.d. aluminium tube for the rear motor peg. Balance the model at the position shown on the plan. A small amount of nose weight was required in the prototype. Start test flights with about 200-300 turns, slowly increasing until the maximum is reached. The model should fly in large left hand circles; a right turn should be avoided as this will result in a spiral dive. the left turn is achieved by the fin being offset 1°.

A piece of 0.8mm ply packing behind the nose block is used to give 1° of right thrust, so preventing the left turn from getting too tight under power. Because of the low wing layout of the model, down thrust is not usually necessary but if a stall does develop under power, packing can be put behind the top of the nose block.

If the model will not climb under power, try adding a piece of 0.8mm packing under the trailing edge of the tailplane.



Full size copies of the plan reproduced here to 1/5th scale are available as Plan No. FSR 1441, price £1.85 plus 40p postage and packing from Aeromodeller Plans Service, PO Box 35, Bridge Street, Hemel Hempstead, Herts., HP1 1EE.

LEARNING TO FLY CONTROL LINE STUNT

Alan Dorrell continues his series of articles with 'Spindrift,' a 45in. span model for 15-25 engines capable of performing the full aerobatic schedule.

USING THE MOST conventional of stunt model building techniques I produced the first in a series I named 'Spindrift'. The wing was constructed from light 1/16in. balsa sheet almost entirely using a 'D' box leading edge and 'V' trailing edge with cap strips on the ribs. It was parallel chord with tapered flaps. At 45in. span its wing area was 450sq. in.

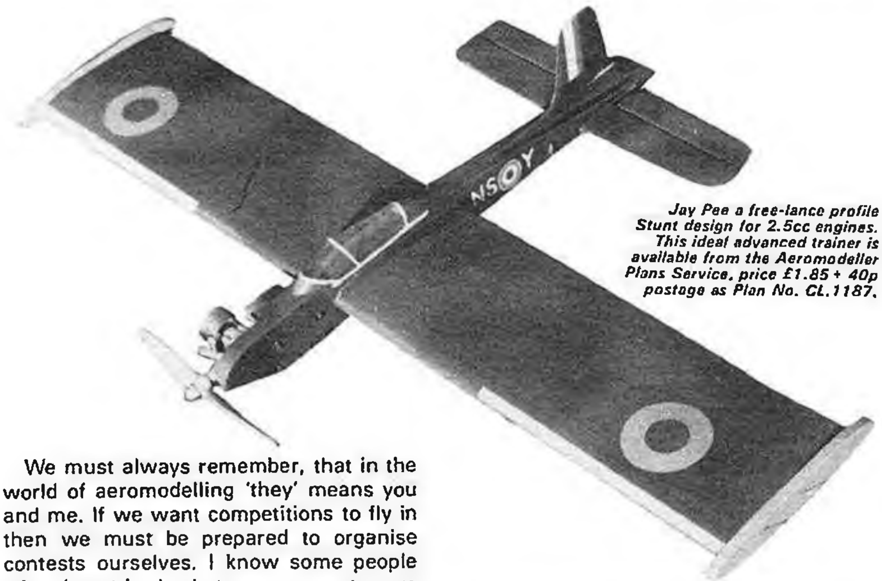
The fuselage was a simple box of 3/32in. sheet with 1mm ply doublers, the flaps and all tail surfaces light 3/16in. sheet balsa. The wing was integral and the whole was tissue covered. It weighed 23oz., five ounces lighter than the 'Calamanda' for an increase of 130sq. in. in wing area (8oz./sq. ft.) for the same engine. The scale drawing gives all necessary dimensions. With a model like this, the full aerobatic schedule — 'squares', 'triangles' and 'overheads' can be tackled. This article is intended for newcomers to stunt. Once you have reached this stage, may I advise you to obtain a copy of Jim Mannal's article on flying the stunt schedule. It was reprinted in MAP's 'Control Line Special' and is probably the finest breakdown of what is required, that has ever been published.

After 'Spindrift' I graduated myself back to '35' size stunters, but some years later I redesigned the 'Spindrift.' If you are looking for a more challenging design to build for the size of the engines we have been discussing, here is a list of M.A.P. designs I have been aquainted with, that some of you may not know: *CL 457 Ambassador, CL 632, 334G, CL 665 Skiffler, CL 673 Cougar, CL 687 Peacemaker, CL 771 Skua, CL 843X Flying Tiger, CL 865 Stallion, CL 866 Wolverine, CL 1187 Jay Pee, CL 1257 Thrift, CL 1294 Plover, M.A. 270 Scimitar.*

When one has mastered a set of skills, in any walk of life, the name of the game becomes 'competition'. Otherwise, we ultimately lose interest. Rather, we have no incentive to carry on.

I am a member of CLAPA and was delighted, when it was inaugurated, to see the tremendous increase in stunt events that it produced, particularly for novices and juniors.

It has seemed to me however, that in spite of the highlights of the 1981 flying season, there have been fewer events, particularly in the novice/junior categories. One reason, of course is the progression of juniors and novices into seniors and experts. The other reason, is that some of us have a tendency to wait until 'they' organise an event.



Jay Pee a free-lance profile Stunt design for 2.5cc engines. This ideal advanced trainer is available from the Aeromodeller Plans Service, price £1.85 + 40p postage as Plan No. CL.1187.

We must always remember, that in the world of aeromodelling 'they' means you and me. If we want competitions to fly in then we must be prepared to organise contests ourselves. I know some people take the attitude that one can get more flying done on the club field as a 'Sunday flier' than by going and waiting one's turn to perform in a contest. Fair enough, but if each one of us stunt enthusiasts was prepared to give up, say, just two Sundays (or Saturdays) in the season to promote a contest, the calendar would be filled with events. I am not taking exclusively of 'open' events either. Competition should begin at club level. Once you are no longer alone, an element of competitiveness is there. Choose a day for your 'Club Stunt Competition'. Persuade someone, one of the R/C fliers, or a free flighter, to act as judge. Explain to them what they should be looking for. If you think you are that good, give them a copy of the SMAE stunt schedule and a correctly itemised score sheet to mark.

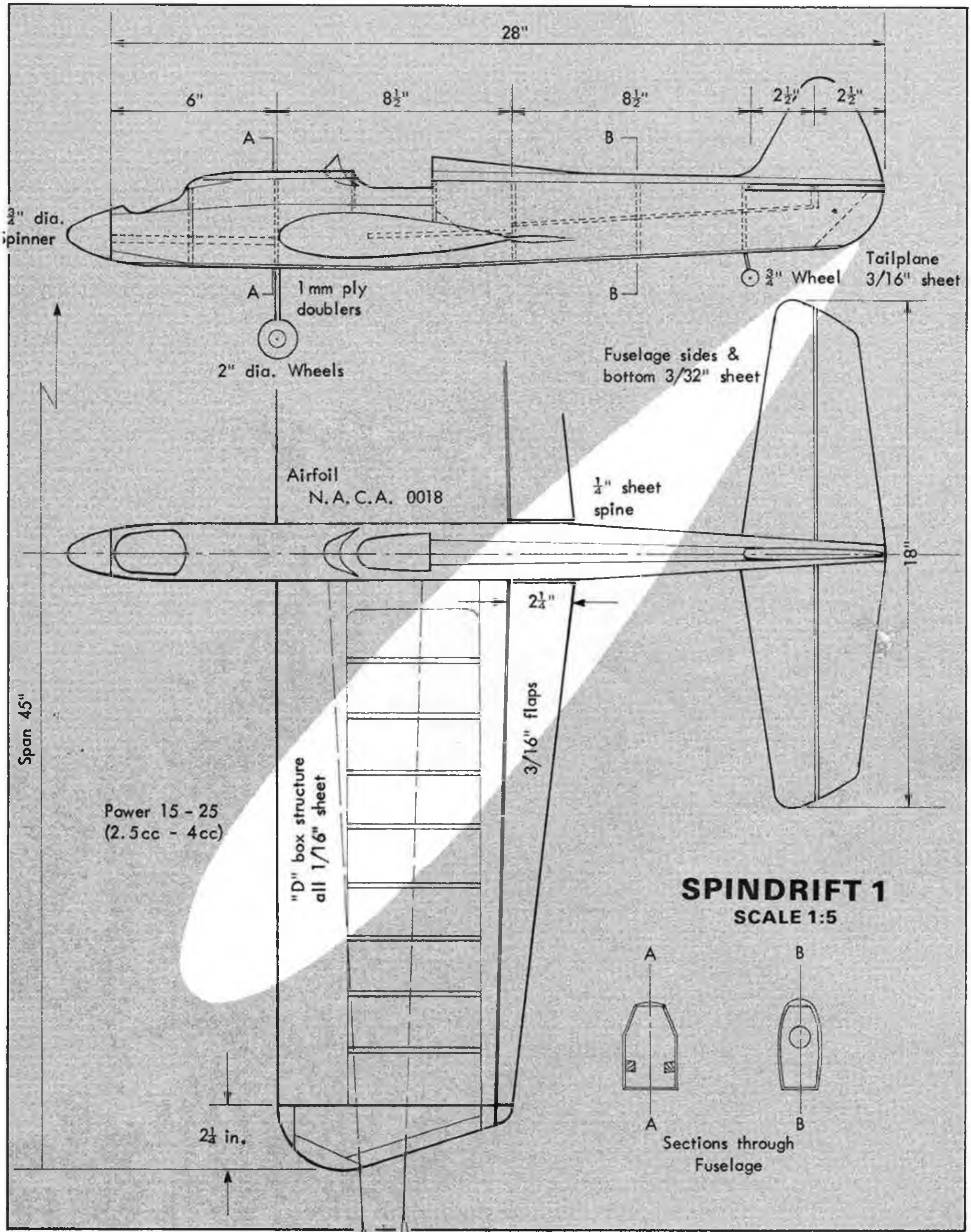
From the club level, try and contact neighbouring clubs with a view to a local 'derby', an inter-club competition.

Judges who are expert stunters themselves, are not always necessary, even for top class events. For years, in the United States, their National Championships were held at one of the U.S. Navy's Airplane Bases. Judges, etc., were provided from Naval personnel, carefully briefed beforehand. I am sure, willing friends can be found to perform a similar function for us. So hopefully, these words will be taken to heart and we will see yet another increase in both competitors and events for precision-control-line-aerobatics.

What lies beyond this flying of simple functional models in club competitions? Obviously we can look again at the elegant sophisticated models as used in recent World Championships. If you are sufficiently interested in stunt I am sure you will be able to obtain access to past copies of the CLAPA newsletter, CLAPTRAP, which will give technical breakdowns of current leading designs. You will also, I am sure, find an opportunity to read not only the previously mentioned 'Control Line Special', but also Ron Moulton's 'Control Line Manual' again published by MAP.

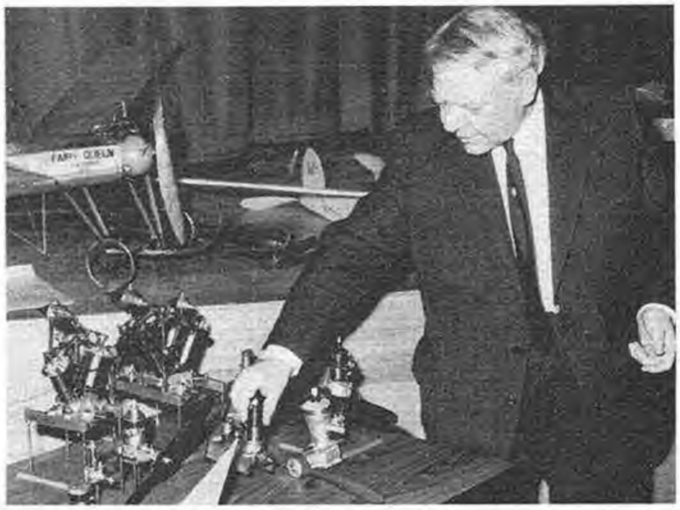
CLAPA Secretary,
Pete Tindal,
67 Grosvenor Drive,
Hornchurch,
Essex RM11 1PJ.

If you prefer a more scale looking trainer capable of most stunts, the Stallion is a good choice. Based on the P51 Mustang and incorporating flaps with a profile fuselage construction, and suitable 2.5-3.5cc engines. Plan No. CL.865, price £2.25 + 40p postage.


28"
6"
8½"
8½"
2½"
2½"
A
B
¾" dia.
spinner
1 mm ply
doublers
¾" Wheel
Tailplane
3/16" sheet
2" dia. Wheels
Fuselage sides &
bottom 3/32" sheet
Airfoil
N.A.C.A. 0018
¼" sheet
spine
18"
2¼"
3/16" flaps
Span 45"
Power 15 - 25
(2.5cc - 4cc)
"D" box structure
all 1/16" sheet
SPINDRIFT 1
SCALE 1:5
2¼ in.
Sections through
Fuselage

Vintage Corner

By Alex Imrie



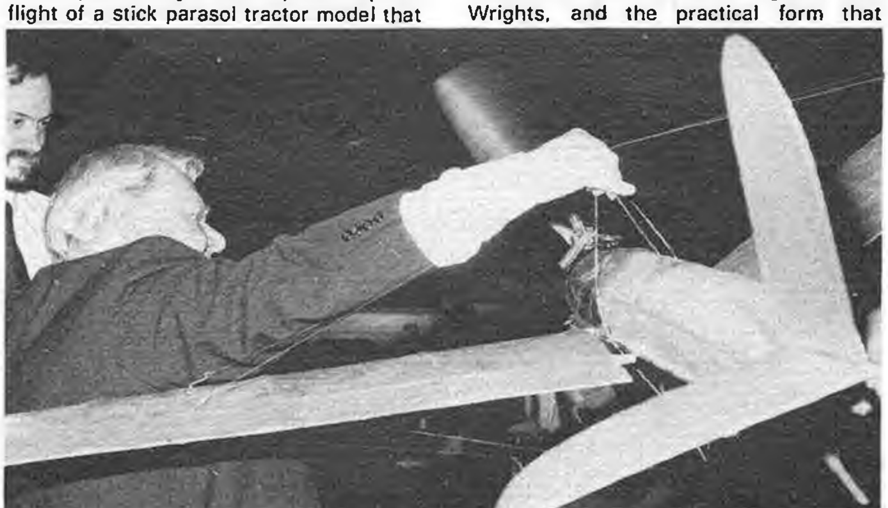
Alwyn Greenhalgh with some of his engines, showing the Stanger four strokes of vee twin and vee four configurations. Just look at that prop on the Fairey Queen in the background!

SMAE Diamond Jubilee Lecture

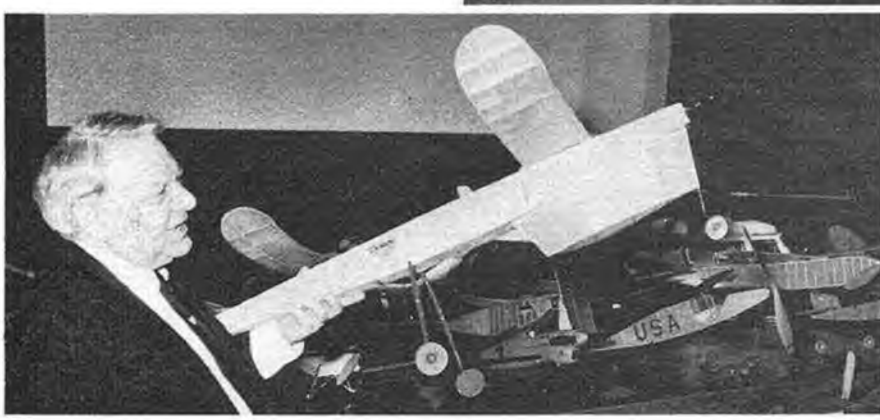
It was fitting that the 50th rendering of Alwyn Greenhalgh's lecture, which was held on 27 February in the lecture theatre of the Museum of London as a supplement to their current exhibition *'London's Flying Start'*, was made to coincide with the formative year of the SMAE in 1922. This function then was to celebrate the Diamond Jubilee of the official body that regulates the sport of model aeronautics in this country. The talk had been widely publicised, so it was little wonder that it was a sell-out. Entry was by ticket only, for which no charge was made.

Over the years Alwyn Greenhalgh has undertaken to collect and collate material relating to the history of model aeronautics. Note merely a keen aeromodeller in the thirties, his ability was such that he won (at the early age of 11 years) a place on the Wakefield team that went to the United States in 1936 to compete for this famous trophy. His 50 years of experience in the model aviation field has allowed him to make the personal acquaintance of many famous modellers, and it is this wealth of knowledge that allows his lecture to come through 'loud and clear, strength five'! He has the knack of making names and dates interesting, and his witty Lancashire humour is put to good account during his narration. The stage of the theatre was covered with models of every description, and each one of them became a talking point as the lecture progressed. Many of the models were original, some were replicas made from original materials by Alwyn Greenhalgh, who had also made a number of half scale balsa and tissue models specially for the indoor flying demonstrations, that are so much part of his lectures. A number of model aero engines were also on show, these being for the most part prototype engines of the rarest kind.

The proceedings were opened by the flight of a stick parasol tractor model that orbited over the audience at around 5mph for over 20 seconds. The lecturer divided his subject matter into two main fields, telling how initially model aeroplanes were made by fullsize aeroplane constructors to try out new ideas, and this area encompassed the whole history of man's battle to fly until about the time of the Wright Brothers first successful powered flight in 1903. The second part was seen as general interest in the newly found world of aeronautics that blossomed after the first flight of the Wrights, and the practical form that airmindedness took included the pursuit of model aeroplanes as a pastime.



Demonstration of the compressed air engine in Pavely's 1920 Fairey Queen, with only 30 psi in the container.



D. A. Pavely's 1936 canard fuselage monoplane; this was a good performer despite the modification to increase the fuselage cross-section area to meet the then Wakefield rules.

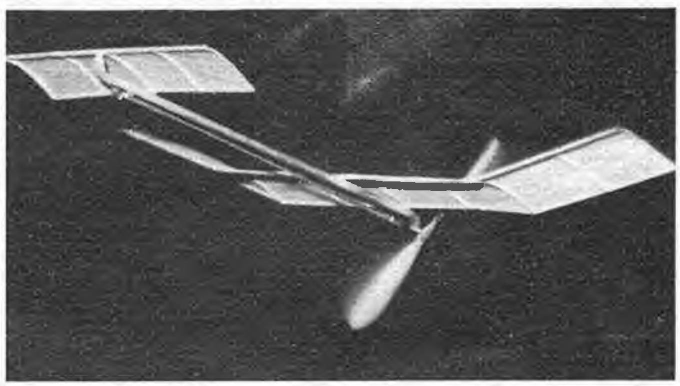
Alwyn Greenhalgh led his audience from Leonardo da Vinci and other early supporters for the wing flapping flying man concept via the statement made in Borelli's book (1680) that man's muscle was insufficient to provide power for sustained flight, '. . . must have been a great disappointment for tower jumpers' to the successful experiments in hot air balloons by the Montgolfier Brothers. Possibly to emphasise the importance of these experiments, a paper envelope some six feet in length was inflated from a paraffin heating stove. Although its first flight was a gentle drift across the front row of seats, a second ascent, where the therms were allowed to accumulate in the envelope before release, resulted in a rocket-like climb that was only arrested by the theatre ceiling!

Names and dates now flew thick and fast, and after being introduced to Sir George Cayley, Alphonse Penaud, William Samuel Henson and John Stringfellow, the audience was treated to the vertical ascent of a replica French feather helicopter and the mushing horizontal flight of a Penaud pusher . . . history at school was never like this! Now mention was made amongst others, of Twining, Bragg-Smith, A. V. Roe, Geoffrey De Havilland, Kite and Model Aeroplane Association and London Aero Models Association, leading to the actual birth of the SMAE, an event due largely to the efforts of A. E. Jones although F. J. Camm actually suggested the title. The names of presidents, secretaries and chairmen who had given sterling service were remembered, and the flight of a half scale replica Bragg-Smith 1912 pusher canard biplane orbiting the auditorium brought applause from the delighted watchers.

A short discourse was given on twin pushers; shown was an original 'T' frame made in 1912 by Robert Gosling. The lecturer related how the tension of the wound motors altered the trim of this model since the frame lacked rigidity, and that the 'A' frame was developed to counteract this. More practical demonstrations now followed when the flights of a single pusher canard and a small 'A' frame twin pusher showed the great stability advantage of the tail-first configuration. As these little models gently essayed around the theatre, one could clearly see the effect of the tailplane stalling and dropping thus reducing the angle of attack of the mainplanes, as a result the models themselves never stalled. This stability factor was one of the reasons why the twin pusher lasted as a competition machine for as long as it did.

Alwyn Greenhalgh winding the left-handed propeller of Kinglet from 1931.

Above right: Resurgam, Kinglet and Pelly-Fry, three famous designs from the birch spruce and silk era.



One of Alwyn Greenhalgh's canard demonstration models in flight.

Photographs by courtesy of the Museum of London

Attention was now focused on models of the tractor type. An early commercial example of the spar tractor named the 'Skysail' was to be seen, when it appeared in 1924 this model cost 12s. 6d. (62½p). Also on show was a replica of W. J. Platter's 'Resurgam' of 1929, this was one of the first fuselage machines and brought forth this comment from the lecturer, '. . . built like a Welsh dresser and flies like one'! Also shown as an early fuselage model was a replica of M. R. Knight's low-wing 'Kinglet' from 1931. The 'Mossturn' commercial propeller recommended for this model rotated clockwise when viewed from the front, left handed, because the manufacturer was left handed and only carved them that way! The replica 1927 Pelly-Fry 20in. wing span high wing monoplane was also present, as was the original commercial machine that it sired, the famous *FROG* Interceptor Fighter, resplendent, absolutely as new, in its sample winder box that fitted into the miniature attaché case used to transport it by senior management of that company.

The Wakefield Trophy given for international competition was an extremely important milestone in model aviation history, and as such received considerable coverage in the lecture. Won for the first time in 1928 by T. H. Newall with his triple geared 'Falcon', a replica of which was on view, the gears allowed a high number of turns to be put on the rubber motors, these being fitted across the width of the fuselage instead of vertically as was later the norm. The balsa wood revolution of 1930, how Joe Erhardt from USA won the Wakefield with his 'Floater and the general impact that balsa wood and Japanese tissue had on the hobby was recounted, as was the initial opposition to the use of these materials, said by some to be completely unsuitable for our climate, caused the lecturer to remark that here in UK we don't have a climate as much as an experimental environment! However, as we all know, balsa wood was here to stay.

Just how the Wakefield scene changed occasioned by the modifications to the rules was easier grasped by looking at the models present that listening to a long narrative on the subject, and the lecturer did it with six representative machines. Replicas of models like the 1933 winner 'Conqueror' by J. K. Kenworthy from Manchester, Gordon Light's ultra lightweight model from USA, proxy flown into third place by James Pelly-Fry in the 1933 event, and Dick Korda's slabsider that won the competition in 1939 differed mainly in the final airframe weights, fuselage cross-sections and amount of rubber carried. Korda's machine was of course, subject to the 8oz. minimum weight rule introduced in 1937, while the earlier two models not even restricted by the 4oz. minimum weight rule introduced in 1934 were real lightweights weighing 2.8 and 1.75oz respectively.

Two beautiful original machines were to be seen, J. B. Allman's 1934 winner, the 4oz. 'Grasshopper', and R. N. Bullock's red and yellow streamliner from 1938. To complete the Wakefield picture there was a nicely build original by the late Fred Boxall to the 1951 rules. Only a small amount of attention was given to gliders, with two examples being on show The first was an original spruce and oiled silk 1925 design by B. K. Johnson, while the other was the original Ivory Gull I by Robert Gosling, it was this last mentioned model that set up a 5 minute 21 second record flight in 1939 at the Model Engineer Cup Competition. Laurie Barr kindly demonstrated a modern microfilm model and this had to be retrieved by bamboo pole long before the power run out, in fact the propeller was rotating for the rest of the lecture, as the model sat on its special stand.

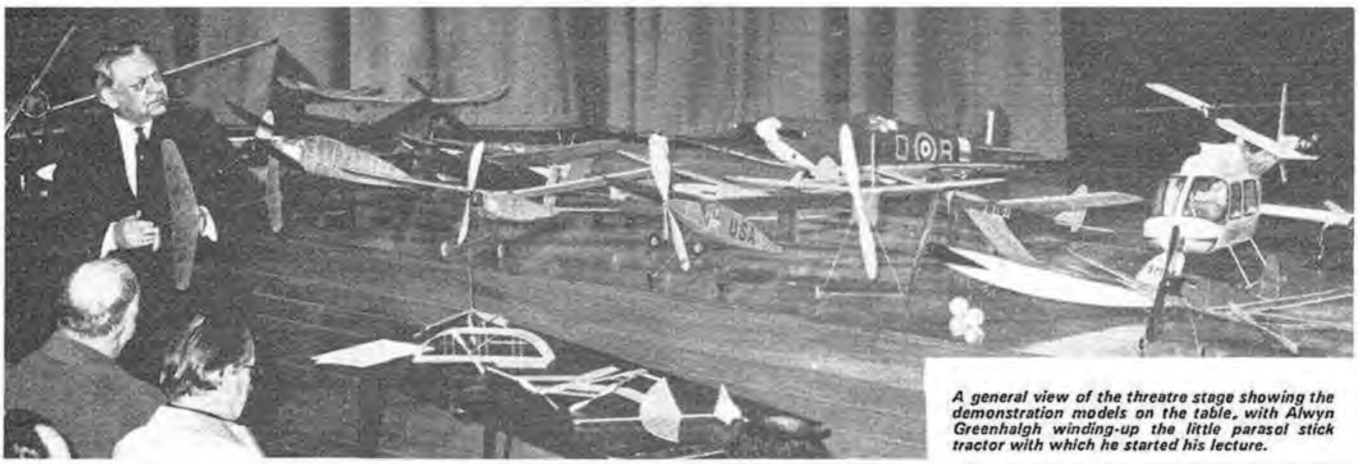
In the search for an alternative source of power from twisted rubber, compressed air became a popular choice and the large London store of Gamages did in fact sell a complete German compressed air model before the outbreak of the First World War. Named *'Autoplan'* this fine machine sold for twelve guineas, its flying consisted of twenty yards distance at a height of some three feet after a realistic rise off the ground. An example of this model from Alwyn Greenhalgh's collection was to be seen in the 'London's Flying Start' exhibition in the museum. The leading exponent of compressed air in this country was D. A. Pavely, and on show was his original 1914 single cylinder compressed air engine. Additionally the lecturer demonstrated the engine running in a 7ft. wing span Pavely Fairey Queen design from 1920. This model was an all silver monoplane wth cane rimmed spoked wheels and a toothpick skid undercarriage, the complete model was extensively braced with wire and had an enclosed compressed air container. A few strokes with Pavely's original high pressure pump was enough to raise the pressure in the container to 30psi (the normal flying pressure was 150psi which is about as much as the 30swg wire bound 7 thousandths of an inch thick brass foil air container will stand) and when the valve was opened the 20in. dia. walnut propeller dissolved into a disc of spinning light, the whirr of the propeller and the clatter of the three cylinder radial engine were moving indeed, and produced a far more infectious sound than the scream of a diesel or glow plug engine!

More difficult than compressed air, but also obviously more rewarding was the use of the internal combustion engine to power model aeroplanes. David Stanger began experiments in this direction during 1908 and eventually he flew both a tractor monoplane and a tractor biplane of around 8ft. wing span powered with a 4-cylinder Vee, 4-stroke petrol engine of his own manufacture. This motor produced 1¼hp and drove a 28in. dia. × 30in. pitch propeller at 1300rpm and weighed 5½lb. It was however, not until April 1914 that Stanger got a model to fly well enough to create a record for this type of model, when a flight time of 51 seconds was officially observed by the Royal Aero Club at the old Hendon aerodrome. This record was flown by a machine that was a canard biplane of 7ft. wing span and used a 2-cylinder Vee 4-stroke petrol engine which was virtually one half of the previous bigger engine. The motor weighed 2¾lb. and drove a 22in. dia. × 18in. pitch propeller at 2,000rpm. Both of these historic engines have fortunately survived the ravishes of time and Alwyn Greenhalgh has restored them to exhibition standard. They were on view in the theatre and provided the engine buffs amongst us with the thrill of a lifetime. Also on show was a Stanger single-cylinder 2-stroke petrol engine from 1927. The late Edgar Westbury's work with small petrol engines is well known from his 1925 52cc Atom I, through his 1932 Atom Minor of 14.2cc weighing 1¼lb., to his Atom Minor Mk III of 6cc. Examples of both of these Atom Minors were exhibited. It was of course Edgar Westbury who while an instructor at the RAF aircraft apprentice school at Halton, modified the 28cc Wall speedboat engine to enable its use by C. E. Bowden in his famous Kanga biplane, when it broke Stanger's old record for petrol driven model aeroplanes in 1932.

The history of the model diesel engine was touched upon when the lecturer related how the French Micron company were experimenting with a small compression ignition engine during the war intended for driving a generator for the Maquis underground movement. British government made Stuart Turner steam engines available for this purpose, and the Micron firm went on to develop their model diesel which became commercially available at the end of the war. George Court's original 1cc diesel which had a cylinder made from a rifle barrel was also shown, this design was bought by *FROG* who produced the engine as the Frog 100 Mk I Diesel. Flying scale models were represented by H. J. Towner's Hornet Moth and T. Newall's Puss Moth. The lecturer ended this part of his treatise with a flight of his 1¾oz. Bleriot monoplane of the cross-channel type. Radio control was briefly mentioned by demonstrating the control functions of both an aerobatic model and a fine flying scale Spitfire. The lecturer's note on what was possibly the first public radio control demonstration of a flying model in this country was interesting. This took place in 1910 in the Tottenham Palace Theatre when a 12ft. long hydrogen-filled electrically driven airship was flown under the control of a spark transmitter . . . imagine being allowed to demonstrate such a lethal mixture today!

Finally some original unorthodox models were shown, these were Howard Boys' 1938 tail-less pusher, D. A. Pavely's 1925 helicopter mounted on a twin pusher and the 1936 fuselage canard monoplane also from the Pavely stable, quoted as being an excellent flier despite the addition of quite a severe bulge under the fuselage to increase the cross section area to meet the then Wakefield rules.

The lecture ended with the showing of Robin Lehman's film *'Wings and Things'* and so brought to a close an excellent account of the history of model aeroplanes interspersed with the practical flight demonstrations that are the hallmark of Alwyn Greenhalgh.



A general view of the threatre stage showing the demonstration models on the table, with Alwyn Greenhalgh winding-up the little parasol stick tractor with which he started his lecture.

VINTAGE PLANS REVIVAL

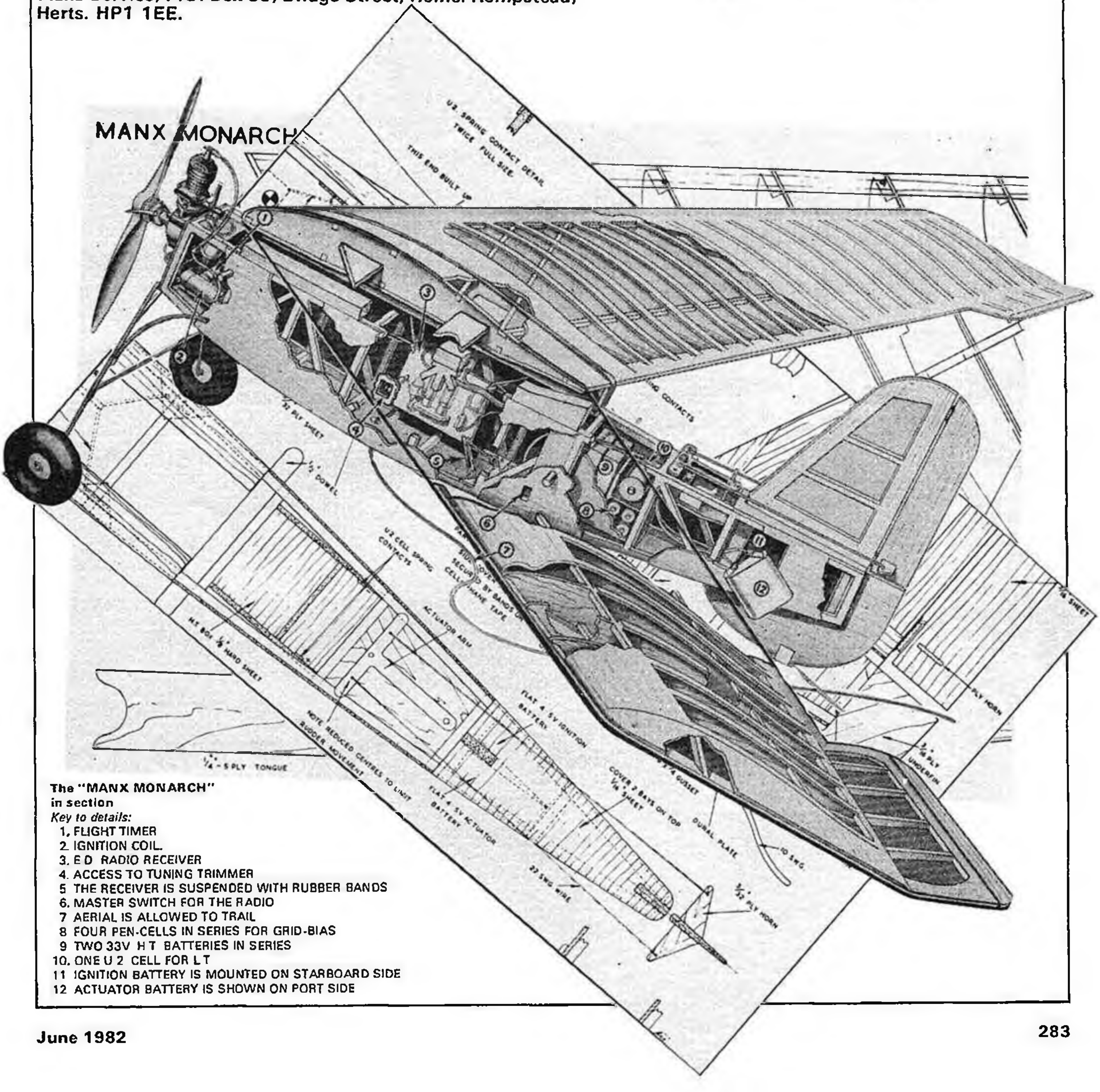
MANX MONARCH

Many of the very early designs introduced to Aeromodeller Plans Service are still available. Due to the increasing volume of enquiries, we will be re-featuring types listed but not illustrated from time to time.

The Manx Monarch illustrated here is one design that has aroused particular interest. The model was first published in *August 1950 Aeromodeller* and was designed by A. H. Wilson to test radio control equipment, which at that time was at a very early stage of development for model control purposes.

The original model was powered by a 10cc Ohlsson Gold Seal spark motor, which apparently gave ample power for the 10 sq.ft. of wing area and was fitted with E.D. radio. No need to make any mods to this design, apart from perhaps using a servo to control the engine throttle.

The plan number is R/C 386 and costs £3.60 for the two sheet plan, plus 40p postage. Available from Aeromodeller Plans Service, P.O. Box 35, Bridge Street, Hemel Hempstead, Herts. HP1 1EE.



The "MANX MONARCH" in section
Key to details:
1. FLIGHT TIMER
2. IGNITION COIL.
3. E D RADIO RECEIVER
4. ACCESS TO TUNING TRIMMER
5. THE RECEIVER IS SUSPENDED WITH RUBBER BANDS
6. MASTER SWITCH FOR THE RADIO
7. AERIAL IS ALLOWED TO TRAIL
8. FOUR PEN-CELLS IN SERIES FOR GRID-BIAS
9. TWO 33V H T BATTERIES IN SERIES
10. ONE U 2 CELL FOR L T
11. IGNITION BATTERY IS MOUNTED ON STARBOARD SIDE
12. ACTUATOR BATTERY IS SHOWN ON PORT SIDE

Book Reviews

Building and Flying Ducted Fan R/C Aircraft by Dick Sarpolous, published by Kalmbach Publishing Co., 1027 North Seventh St., Milwaukee, Wi 53233. Size 210mm × 287mm softback, price $6.95.

Although ducted fan powered models have been around since the early 50s, it is only recently that we have seen realistic flying scale models. This is largely due to the very fine commercial fan units and high output motors which are not available on the market.

This well designed and illustrated book gives the low-down on all aspects, which includes good diagrams showing pressure fuel systems, balancing fans, and a plan for a non-scale aerobatic design. The ample photographs are clear and show the essential details so often left out by book designers who are striving to make an attractive layout!

If you want to make and fly Jet R/C Scale aircraft, this book is worth having.

This will be available from Albion Scott Ltd., 51 York Road, Brentford, Middx.

Profilpolaren für den Modellflug. By Dieter Althaus. (Review copy bought by mail direct from the publisher, Neckar-Verlag VS Villingen 7730, West Germany. Cost about $15).

This is probably the most important book published in the last forty years, for those who are seriously interested in model aircraft design and performance. For several years past, the famous Aerodynamic and Gasdynamics Research Institute at Stuttgart in West Germany, under the leadership of Professor F.-X. Wortmann, has been testing wing sections in a special wind tunnel, at speeds and sizes relating directly to model aircraft of all types. Thirty profiles have been tested, some of them with turbulators in various positions, others with flaps, some with both flaps and turbulators. The selections tested include several traditional model wing profiles such as the Clark Y and the NACA 4409, and the very popular sailplane profile, Eppler 193, has been tested with turbulators and flaps. There are also results for several symmetrical profiles and some streamlined strut sections. Some of Wortmann's own profiles, intended for full-sized sailplanes, have been measured, and also his old M2, which was designed many years ago for A2 free-flight sailplanes.

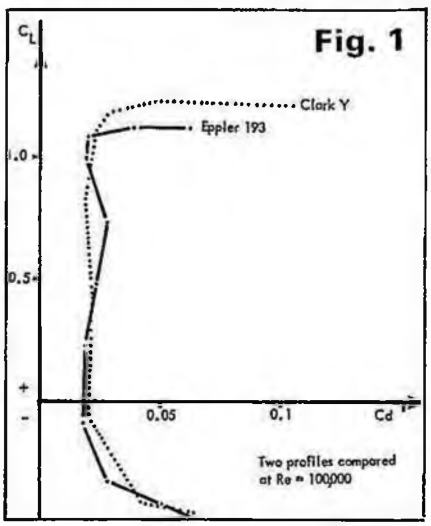
The range of Reynolds Numbers covered in the tests is from 40,000 up to 250,000, that is, from the typical rubber-driven free flight model or sailplane of FAI F1A sizes, up to the larger and faster types, quarter scale, etc.

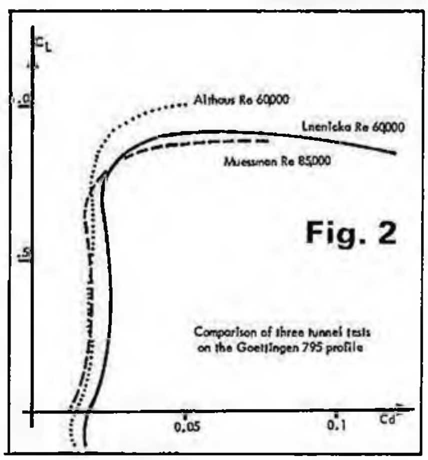
The results are presented fully in this 176 page paperback book. The ordinates for each profile are given, in a slightly different form, but more accurate, than those familiar to modellers. The wind tunnel test results are carefully graphed, and all to the same scale, so that sections can be compared very easily by use of tracing paper. Additionally, the lift-drag ratios and 'power factor' (important for rate of climb of powered models and minimum sinking speed of sailplanes) of every section are plotted in as series of special graphs so that, again, comparisons are very easy.

The text is of course in German but there is very little of it, and anyone with the least comprehension of the way in which wind tunnel test results reveal the performance of a wing profile, will find the whole book fascinating. There has not yet been time to analyse the enormous amount of information given in the volume, but even a superficial study indicates that further work will reveal some very interesting facts. For example, the Eppler 193, plain and without flaps, appears if anything slightly *worse* than our good old friend, the Clark Y, at the very important Re number of 100,000, which corresponds to a 100in. 'standard class' model sailplane at about its best glide ratio. (Figure 1). As a matter of fact, this slight advantage for the old section still shows up at higher Re numbers, suggesting that fashions in wing profiles are no more than fashions and are not often based on real differences in aerodynamic performance. This also helps to explain why some very ordinary models still fly so well against the ostensibly much more refined and 'modern' designs. What most modellers will be looking for, of course, is guidance as to which wing profile will give the best results when used on their preferred type of aircraft. This is where the new book will prove invaluable in future, for there *are* important differences between the profiles, and there are definitely some pitfalls waiting for the unwary. We should in future be able to avoid falling into most of these. Another interesting point is that, among the sections tested at Stuttgart, are two that have been tested at model speeds before, in other tunnels. These are the Goettingen 795 (an 8% thick profile, flat bottomed with 2.4% camber) and the Goettingen 801 (9.8% thick with 6.1% camber). The Goettingen 795 has actually been tested at model speeds twice before, by Muessman at Goettingen and by Lnenicka in Czechoslovakia. There has not been time enough yet to make a thorough comparison of the various test results, but they are sure to reveal some differences between the *wind tunnels*. (Fig. 2). Such variations need to be borne in mind when looking at test results. The great advantage of the new book from Dr. Althaus is that the results were obtained under standard conditions and hence should all be directly comparable.

Of course, to get the wing on the model to behave like the one in the wind tunnel, we shall have to build it at least as accurately . . . but that is another problem. Anyone but the crudest 'balsa basher' should sleep with a copy of this book under his pillow for quick reference in the night.

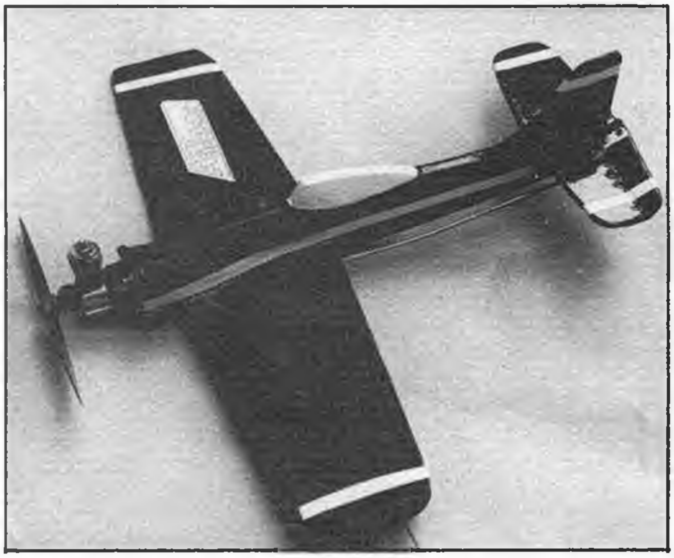
Martin Simons





LAWN RANGER

John Stroud designed this model for fun flying in the garden. It can be built from one sheet of 3mm balsa, plus a few odds and ends.



Although very small it has a lively performance.

The seed for Lawn Ranger was sown at the '81 Model Engineer Exhibition. A young man who had just bought a Humming Bird .03 glow engine, asked me if I would think about designing a suitable control line model. Later in the year one of the boys to whom I had given the Testor Ready-to-Fly C/L models told me he was flying his in the garden. The seed germinated when I stepped out my own fairly small front garden and realised that if I took in the path and flower beds as well as the lawn I could fly on 3 metre lines. Out came my old PeeWee and Lawn Ranger was born and finally christened by my son with a name which is so corny it's good. By using chuck glider technology, building time is less than an hour excluding drying time. Materials can consist of just one sheet of 3mm balsa and a few odds and ends.

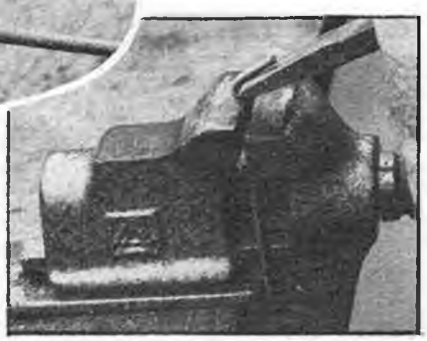
Construction

Select a medium-hard sheet of balsa and lightly mark out on it all the balsa components required. It should be fairly easy to get them all out of a standard 3in. sheet. The shapes can be transferred by laying the plan over the wood and tracing with carbon paper or pricking through with a pin. The exact outlines of the components do not matter very much providing they look right. What is important is that the engine, wing and tailplane line up correctly. Careful checking with a ruler will show up any innacuracy. Cut out all the balsa components, glue the two sides of the fuselage together and leave them under some weights to dry. Sew the elevator onto the tailplane as shown and glue and pin the fin in place with the amount of offset shown. Cut out the line guide and bellcrank mounting plates from 1.5mm ply and the engine bulkhead from 3mm ply. Drill the engine bulkhead to suit your engine and bolt them together. Very carefully epoxy the nuts to the back of the bulkhead making sure the epoxy does not get onto the threads. If the threads are lightly greased the job is made easier. When the epoxy is set, trim the bolts to length. Make two saw cuts in the inboard wing and glue in the line guide. I made the wing tip weight from two 2in. nails with the heads removed which I epoxied in place and then filed to shape. Trim the fuselage to shape and glue on the tailplane, wing, cockpit and engine bulkhead fairings.

When the assembly is dry, sand to final shape and round off the edges of the wing, tail and fin. Drill four blind holes in the engine bulkhead fairing to recess for the nuts and then sand it very carefully to mount the engine with *no* up or down thrust and about 2° of right side thrust. Bend up the wires for the control system and install as shown.

I used a commercial horn and link and a bicycle spoke for the push-pull rod. In this way it is possible to make up the control system without soldering. If you have trouble bending up neat little 'zig-zags' try the method I have just started to use. It is much easier, especially with the heavier wire gauges which seem to defeat my long nose pliers.

Method of bending zig-zag on the push/pull control rod for solderless connection. Bend the first right angle as shown, using pliers.



Then hold the wire in a vice and bend second angle by hitting with a drift. As shown in the inset, you will end up with a neat job.

Covering

As a practice exercise for myself I covered the prototype with iron-on film. It worked out very well although I imagine most modellers will use a more conventional method. After removing the control system, make good any mistakes with filler and sand to a smooth finish. cover the entire model with lightweight modelspan either by doping it on or, as I prefer, by putting it on with wallpaper paste. Build up the finish with several coats of dope mixed with talcum powder, sanding between each coat. Finally paint with coloured paint of your choice. Finally add a good coat of fuel proofer and when that is dry, re-install the engine and control system.

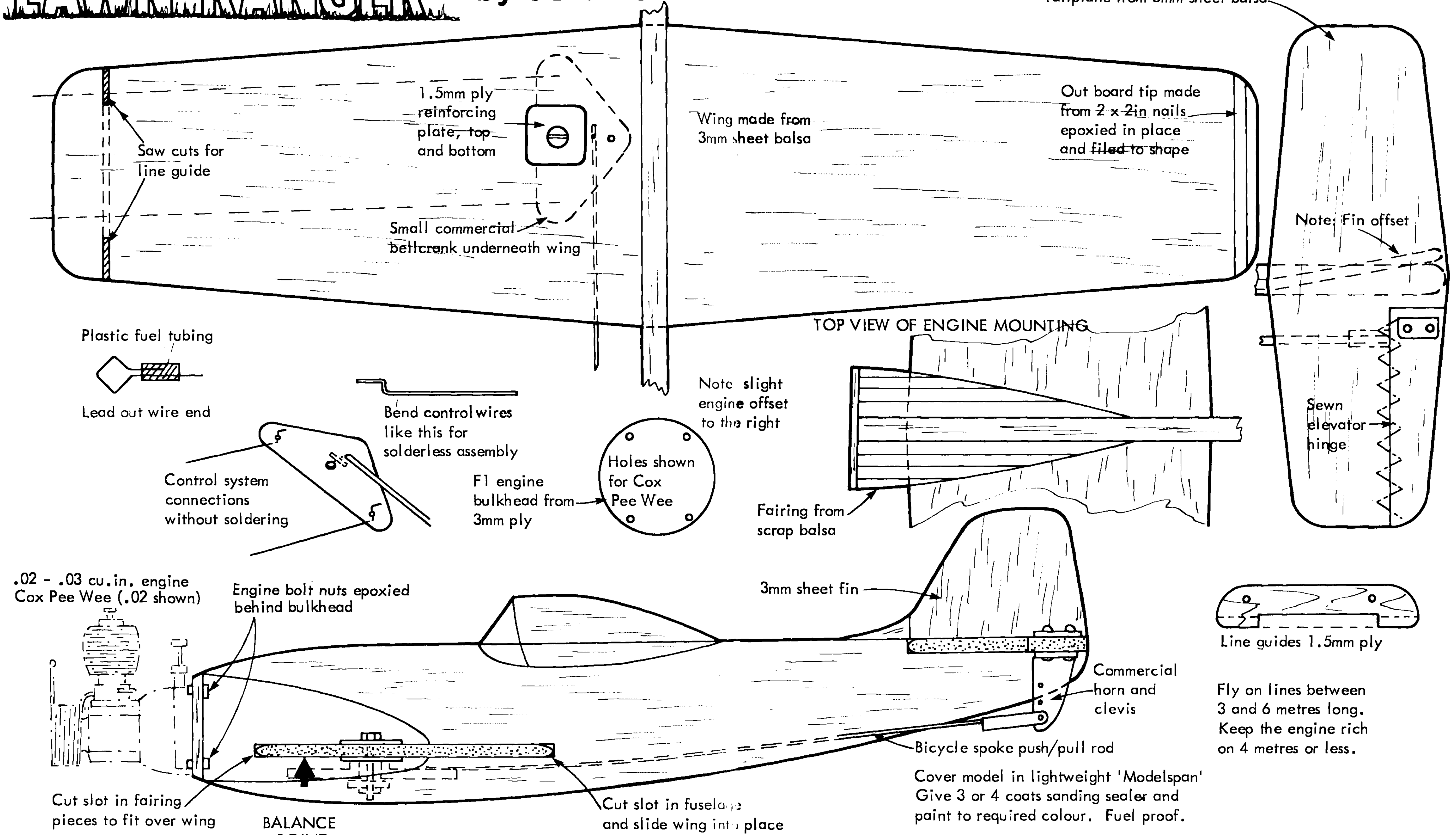
Flying

Check that the balance point is as shown on the plan and add ballast to adjust if necessary. Although I dislike nylon cord lines, for the shorter lengths up to say 6 metres, they are quite sensible and acceptable for non-aerobatic models. Lawn Ranger will fly on lines between 3 and 6 metres although with the motor 'on song', the 3s are a bit too short.

Choose a calm day for your test flights and remember that these tiny engines usually need fuel with at least 15% nitro for satisfactory running. They use so little even 25% nitro does not work out very expensive. My PeeWee powered model is surprisingly lively in the air and fun to fly. (It has made me think a lighter version might do some basic aerobatics). Launches with neutral controls can be achieved with the launcher standing still. If your circle is a tight fit on the lawn, remember to mark the centre so that you know exactly where to stand.

Finally a word of warning. Flying in your front garden will no doubt amuse the folks next.door at first. Before you do it persistently, make sure you are not converting them to the 'stamp out model flying' brigade. There are enough recruits without our help.

LAWN RANGER by JOHN STROUD



AEROMODELLING TECHNOLOGY

Here are a few tips received from readers. If you have any ideas worth telling others, why not send them in and win a year's free subscription to Aeromodeller, or the equivalent in plans.

PLY FUSELAGE CONSTRUCTION
From Mike Woodhouse

IF YOUR FIRST reaction to the title of this article is that its 'much too heavy', then read on, because I'm talking about 0.8mm or 1.0mm plywood. The principle isn't new, and I'm sure you have seen it used on Sean Bannister's models or Mick Reeve's Racketeer, but how many models have you seen at the club field which utilise plywood as the primary structural material? Not many, I'd guess.

I have used 0.8mm plywood extensively, on most of my glider designs and would like to bring to your attention some of the advantages and applications.

Strength is the first and foremost advantage, and I personally believe that the strength of a plywood fuselage cannot be equalled by any other modelling material currently used, including, and especially, GRP. I have yet to be able to inflict any damage to my glider fuselages, with the exception of removing the nose block, despite 'playing darts' in the landing circle at competitions. I know Sean Bannister will vouch for this!

Sheet size enables you to cut fuselage sides, including integral fin, without joining sheets together. Current sizes are available up to 1.2m × 0.3m, and in some cases 1.2m × 0.6m.

Finishing is made easier because it doesn't absorb dope, etc., as much as balsa wood.

Applications

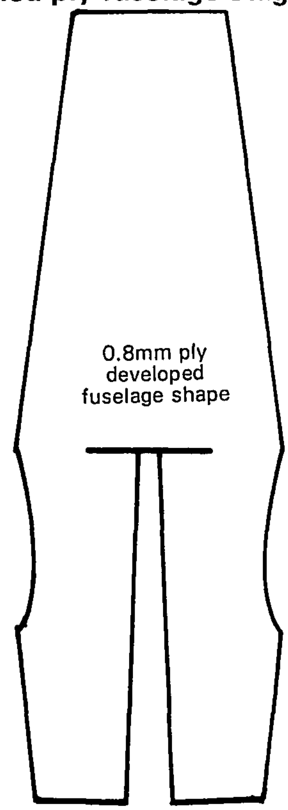
1. Rolled tail boom.

This is only a part of the fuselage, but nonetheless is a simple, light and very strong way of producing it. Select a table leg, billiard cue or similar as a pattern, and using 0.4mm ply, soak in water for half an hour, spread with Borden PVA glue and wrap around two to four thicknesses, according to strength required, and bind in place with Sellotape or string until dry (24hrs.).

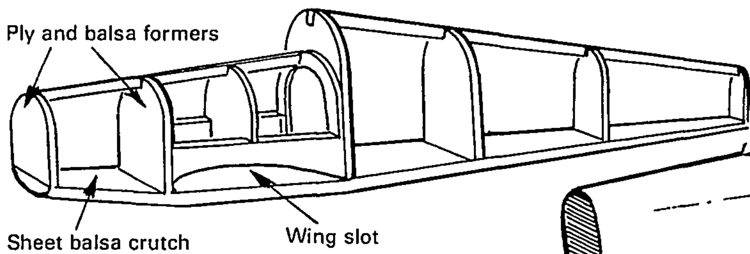
2. Rolled ply fuselage.

By using say, a 6mm balsa base and balsa or ply formers with a 0.8mm ply skin, a whole fuselage (minus tail) can be formed, simply and easily. Cut the base to plan

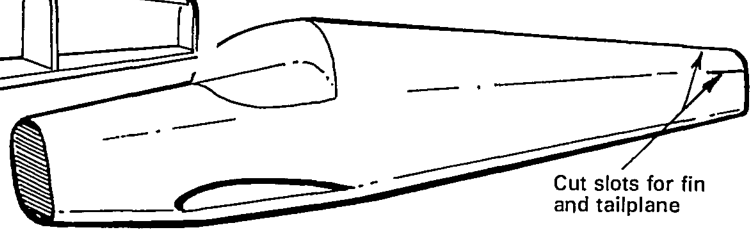
Rolled ply fuselage stage 1



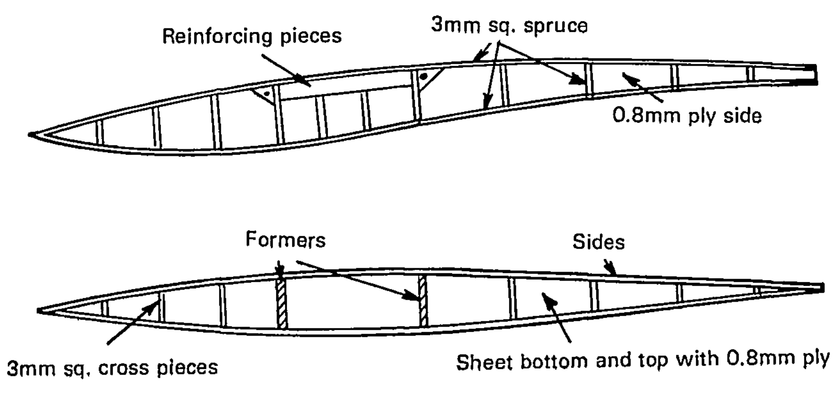
Rolled ply fuselage stage 2



Rolled ply fuselage stage 3



Ply box fuselage construction



shape, cut the formers and doublers and stick in place. Wrap thin paper over the structure to plot the developed shape of the skin and then transfer to 0.8mm ply and cut out. Smear all formers and base sides with epoxy (say 1hr variety) and apply the skin, holding in place with rubber bands or tape. Cut away the wing seat position and slots for the tail surfaces, sand the base edges round, and there you have a fuselage!

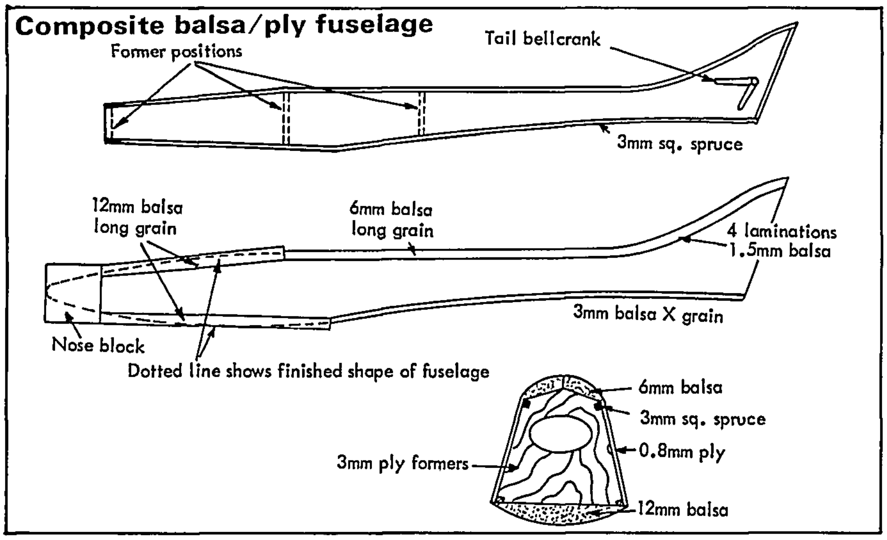
3. Ply box fuselage.

As its name implies, this method is only suitable for fuselages of rectangular or square cross section. The shape of the sides are cut from 0.8mm ply and 3mm sq. spruce strip is stuck around all edges with Borden PVA glue. Reinforcing pieces are added at wing positions etc. and 3mm spruce uprights are added at say 75 to 100 mm centres. Two hand sides are produced and only three formers (two for a pointed nose) are cut from 3mm ply or 6mm balsa. The sides are joined conventionally with the formers and the tail pulled together. 3mm sq. spruce cross pieces are added in line with the uprights and the top and bottom is sheeted with 0.8mm ply.

4. Composite balsa/ply fuselage.

This is a technique that I have developed for my own glider designs, and has the advantage of forming an integral fin and more streamlined curved surfaces.

This method employs 0.8mm ply for the sides only and has balsa top and bottom for the curved surfaces. The fuselage sides are cut to shape and 3mm sq. spruce is stuck around the edges only. Two handed sides are made and three formers cut. The sides are joined with the latter and the fin post pulled together, having first fitted an all moving tail bellcrank and cable. The wings can be fitted on the top or bottom or fixed in a mid position by means of dowels. The top and bottom sheet is added, along with a nose block and the whole assembly planed and sanded smooth.



Conclusion

I have attempted to list all the basic methods within this brief text, although there are, of course, variations upon the theme and added refinements which can be incorporated. I hope this text has given some insight into the possibilities of plywood construction, and that next time you make a model, you might think twice before adopting balsa wood as a matter of course. I'm not knocking balsa and I haven't got a plywood factory!

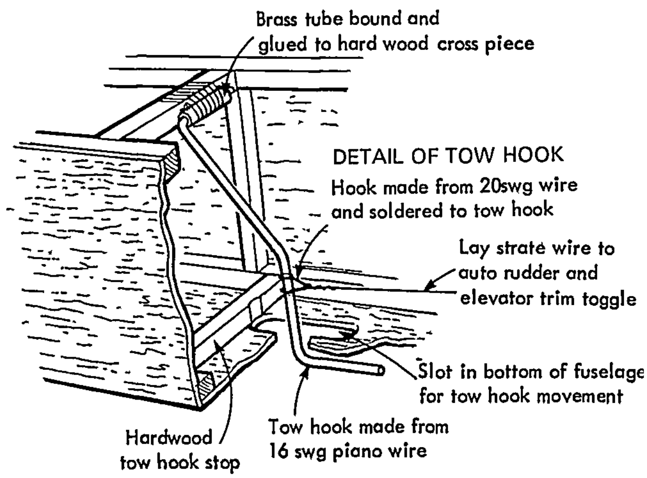
A METHOD OF TOWING A GLIDER UP IN CALM WEATHER

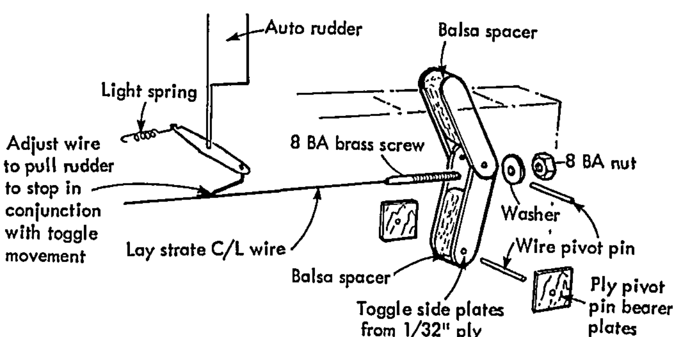
From Brian Faulkner

Some days in the winter are very calm and in club competitions or for test flying, difficulties can be experienced in towing a glider to the top of the 164ft. line. This method has been used by the writer and gives full tow height.

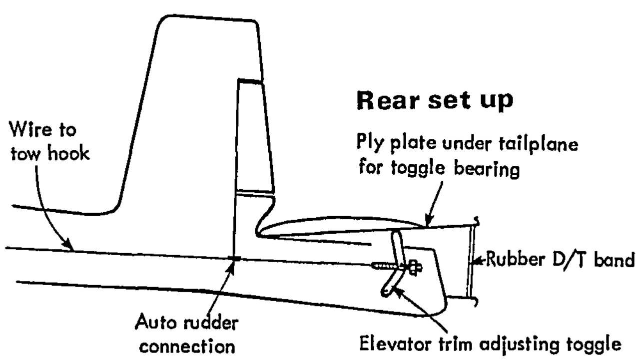
Action

Pull on pivoted tow hook causes tension to move auto rudder clockwise onto stop. Also if the 8BA nut is screwed onto 8BA toggle screw, the tension will expand the toggle lifting the rear of the tailplane against the tension of D/T band. After the tow tension is released, the D/T band will pull the tailplane down onto platform to the glide setting. Choose a D/T band to give a light tension. With a stable glider only moderate towing speeds are required as the glider will kite up in a series of 'stalls'. For windy weather, slacken the 8BA nut to make the toggle in operative.





Exploded view of toggle



Free Flight Scene

Russell Peers on form in Power at Grantham Grand Prix – spent late evening trimming this new lightweight.

DAVE HIPPERSON reports

Northern Area Winter Rally Church Fenton, 24 January, 1982

Cold but virtually flat calm brought out many for this rather less-than-well-publicised event. Had it been on the Contest Calendar entries could well have been doubled, particularly in Power. As it was, many used the occasion for a trimming session so entries no way reflected attendances.

Results

Open Rubber		
1. J. O'Donnell	Whitefield	9:00 + 6:38
2. P. Ball	Grantham	9:00 + 6:16
3. R. Pollard	Tynemouth	9:00 + 6:16
Open Power		
1. R. Peers	Falcons	9:00 + 6:20
2. D. Brown	Morely	9:00 + 2:18
Open Glider		
1. P. Owens	Liverpool	8:37
2. D. Bartle	NYFFG	8:25
3. T. Cordes	Whitefield	8:06
Combined Mini (4 × 2.00 min./max.)		
1. P. Ball (CDH)	Grantham	8:00 + 2:23
2. D. Scott (1/2A)	Morely	8:00 + 2:02
3. G. Beal (A1)	C/M	7:57
Vintage		
1. T. Chambers	Darlington	9:00
2. R. Peers	Falcons	8:41
3. K. Joiner	Morely	2:28

The Grantham Grand Prix, Barkston Heath, 7 March 1982

A great opener with warm sun and never more than a 10mph breeze sometimes much less. This was Grantham's first attempt at an early season event and they were serious enough to collect some proper prizes for a simple yet well thought out programme. The pleasant conditions attracted substantial entries and considerable flyoffs. Open Glider finishing with nearly as many as Rubber and four more A2s making it into the Combined FA1 flyoff too.

The early ending of 4.0 pm turned out ideal as the flyoffs were then held in good light, a 5mph breeze and occasional lift to make things interesting. Rubber was first and the 10 minute period gave both Godden and Wells winding headaches as they both blew motors and flew partially wound. At least there was no question over the periods as the clear horn blasts were most accurately timed. Eventually all 15 qualifiers got away and it proved a most satisfactory finish with two very different models taking top honours. Mark Croome's winning flight of nearly a quarter of an hour in sight was made with his 'conventional' 500sq. in. Cabaret Star although he had been testing a colossal 750in. model during the afternoon. Mark's winning flight was anticipated with the remark from him a moment before of "At least the drift is going towards home." He was not seen again that evening although his model was. Maurice Gilmore searching in vain five miles downwind for an earlier flyaway was scanning the trees through binoculars just before dark when Mark's enormous model flew a few yards in front of him. This was nearly an hour after it was launched. Others faired less well with early season gremlins getting to George Sharp's model which picked up a huge stall after performing impeccably all day and one new recruit to the ranks of Grantham hardly impressed with his first effort of the year — stalling all over the sky.

Open Power saw Stafford Screen come in tight off the top after a wayward climb and harris climb on pattern but short and rather slowly. Peers showed the way with a perfect spiral pattern and pull out from his trusty Woodpecker which had it in the bag almost immediately. Russell is throwing himself into power more seriously this year and is equipped with much new hardware including a very fast and light new model which he was trimming when he should have been collecting his tankard from the prizegiving!

Open Glider flyoff came next and this was a demonstration of effectiveness by Brian Lavis who was towing early and released quite quickly without a circle to climb away very gently whilst a number of the remaining 12 seemed so engrossed in their circle towing dances, tangles and shouting matches that none of them came off well enough to catch his air. Brian's 7 minute plus was more than 3 minutes more than he needed. Only six others broke three minutes. Has circle towing become an end in itself? It all appeared a strange pantomime.

Combined FA1 should have been a fly

Anthony Ball poses with Dad's Vintage Hi-Ho – winner at Church Fenton.

away victory for the one power model in it — that of Ken Faux. As it turned out his climb was rather flat at the end but saved by the VIT and the resulting 4.23 was closely chased by a superb Wakefield flight from George Foster in the same air. It climbed almost as high as Ken's power model. Gliders made up the remaining slots.

There was a prizegiving and the promise from Phil Ball that this will become a regular season starter at least whilst Barkston stays available — which seems more likely than the half-built missile compound on one perimeter would have us think. Now we can add to Phil Ball's talents the fact that he can read an analog time piece to an accuracy of four seconds over a 7 hour period — not bad.

Results

Open Glider (22 flew) (13 in flyoff)	
1. B. Lavis	9:00 + 7:16
2. M. Scott	9:00 + 4:02
3. P. Hawkins	9.00 + 3:27
Open Rubber (23 flew) (16 in flyoff)	
1. M. Croome	9:00 + 14:20
2. J. O'Donnell	9:00 + 11:10
3. M. Pressnell	9:00 + 8:15
4. J. Carter	9.00 + 7:00
5. J. McDonald	9.00 + 5:46
Open Power (7 flew) 3 in flyoff)	
1. R. Peers	9:00 + 5:24
2. P. Harris	9:00 + 4:34
3. S. Screen	9.00 + 1:58
Combined FA1 (21 flew) (6 in flyoff)	
1. K. Faux	15:00 + 4.23 (F1C)
2. G. Foster	15:00 + 4:02 (F1B)
3. M. Gregory	25:00 + 3:06 (F1A)

1st Area Centralised Meeting, 14 March 1982

Not untypically for this time of the year the entire country was 'blessed' with high winds and in some cases gales. There was no ideal place to be apart from perhaps the North West that has no official flying site but which was actually lucky enough to have a considerable slackening in wind in the afternoon. Winners came from widely different areas. Mike Cook taking glider at Driffield with a complete five flight total that comprised no maxes but regular 2 minute and 2 minute plus flights. Tom Chambers may be kicking himself for not repairing and having a go at his last rubber max. there too. Ron Pollord came a close 2nd in glider, flying even further North in weather that included 30mph gusts at ground level in its repertoire. Biggles established a commanding lead in the Plugge by fielding no less than seven glider fliers at North Luffenham and two more in other parts of the country. Their club was responsible for one third of the entire glider entry. Pete Hawkins achieved the distinction of starting his day with two maxes only to throw it on a 5 second fifth flight.

The wind undoubtedly frightened off the Open Rubber fliers — many Areas recording no scores at all in this event. Hipperson flew at Barkston in patches of air that were hardly helpful but at least were only travelling at between 20 and 25mph. Models suffered extensive damage on all flights.

Ken Faux receives tankard at Grantham Grand Prix for 1st in FAI.

Chasing the Frog Senior the Open Power men tieing at 2nd all flew at different locations Harris and Peers both dropping the same time on their last flights. Taylor completed his total at Ashdown from one max and two rather larger sub-max flights. Hero of the whole day must have been Stafford Screen flying with Pete Harris in the gale at Everleigh. He not only completed the full score but had a model and the inclination for a fly-off. This final flight of 3:40 covering a little over two miles — the full length of the site — and that needs a wind of over 30mph!

Results

A2 — KMAA Trophy — Plugge Points 28 flew		
1. M. Cook	NYFFG	10:46
2. R. Pollard	Tynemouth	10:31
3. A. Crisp	Biggles	9:59
Open Rubber — No Trophy 8 flew		
1. D. Hipperson	Grantham	8:56
2. S. Fairless	Tynemouth	7:58
3. J. Cooper	Biggles	7:56
Open Power — Frog Senior		
1. S. Screen	Birmingham	9:00 + 3:40
2. P. Harris	Birmingham	8:35
R. Peers	Falcons	8:35
R. Taylor	East Grinstead	8:35

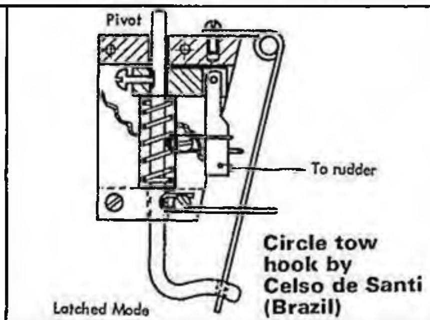
Plugge Totals after one event
1. Biggles — 258.
2. East Grinstead — 147.
NYFFG — 137.
Grantham — 133.
Tynemouth — 96.

MARTIN DILLY reports

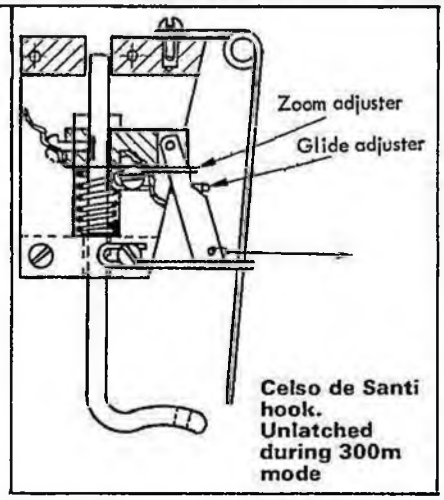
South American circle towhooks

There is now so much material available in newsletters and by correspondence on circle towhooks that a not-so-slender volume could easily be written on that subject alone; perhaps it should be. To keep you up-to-date with developments, here are a couple from Brazil and Argentina that will be of interest.

The first one is by Celso de Santi of Brazil; while alteration of the hook spring pre-load and thus the unlatch tension is possible only by changing the spring itself, the hook incorporates a zoom inhibition that will be useful to those of us who fly in gusty weather. The two diagrams show the hook in latched straight tow and unlatched zoom modes. The hook is similar in principle to the Soviet hooks that we now refer to generically as the Isaenko type. The main difference is that the pivot of the lever controlling the rudder position during zoom moves vertically along with the extending part of the hook itself; to prevent rearwards movement of the lever, it is constrained by a

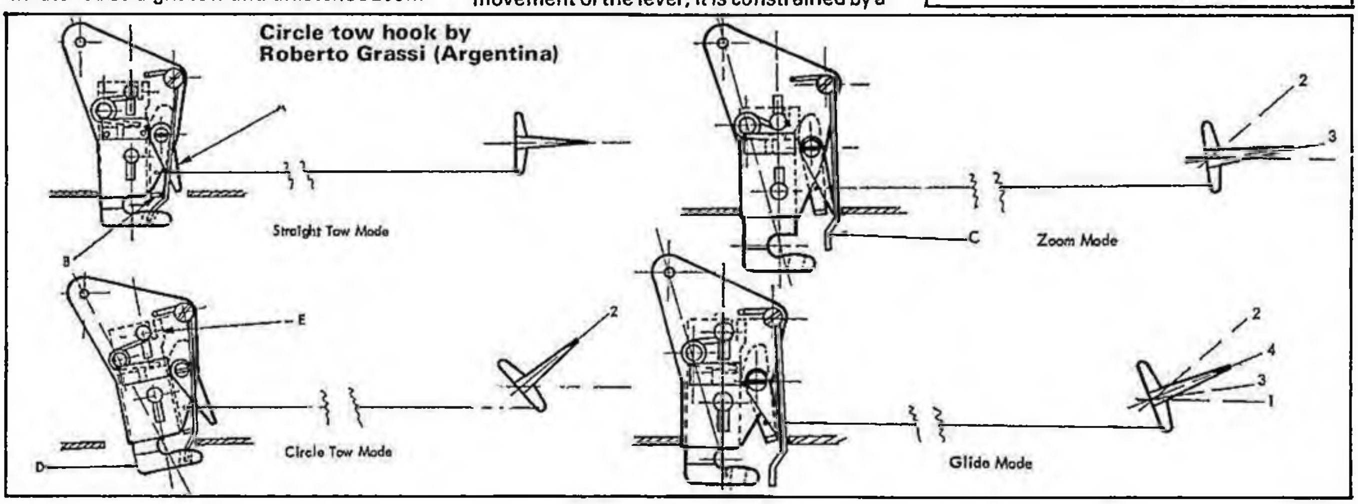


Circle tow hook by Celso de Santi (Brazil)



Celso de Santi hook. Unlatched during 300m mode

Circle tow hook by Roberto Grassi (Argentina)



wire yoke attached to one of the outer plates that form the chassis of the entire assembly.

The shape of the rear edge of lever allows it to pivot back only after a considerable downwards extension of the hook during a zoom launch, and, like my own modification to the basic Isaenko system, this reduces unwanted rudder deflection during gusts.

From Argentina Roberto Grassi sends details of some more modifications to the same original hook principle. The aim here is to enable the tow ring to separate more easily from the hook. Roberto suggests that on most Isaenko-type hooks the rudder bias spring tends to swing the hook rearwards, thus angling the lower part of the hook upwards at its rear end. As the towline tension is relaxed after the hook is unlatched for a release, this rearwards swing could tend to prevent the ring from dropping clear.

Instead of using the rear edge of the hook aperture in the fuselage bottom as a rudder setting adjuster against which the wire latch bears after release, Roberto's hook includes a glide adjuster. Marked A on the drawing, this adjuster is set by its locking pivot screw, and acts as a stop against which the tip of the zoom lever bears. This zoom lever, B, has its lower end bent at right angles (i.e. 'out of the paper'), so it will contact in turn the wire latch C and the adjuster arm A. Latching the hook moves the zoom lever forward, in which position it is held until unlatch.

The upper rear edge of the sliding part of the hook, D, includes a small jug or lobe, E, which bears on the upper tip of the zoom lever as D slides downwards during the high tension of the unlatch phase of the launch. Lug E can be bent by careful application of brute force in the slot between it and the main part of D, so the amount of rudder deflection during zoom can be adjusted.

Finally, as the line tension is released to launch the glider, the spring action of the latch wire C swings the entire hook forward and 'flattens off' the extreme lower part to let the drag of the pennant pull the ring off.

DENNIS DAVITT REPORTS

Indoor Meeting at Kelham on 21 March 1982

The indoor site at Kelham is some 60ft. high and 60ft. square, on top of which is a hemispherical dome. It sounds and looks to be a good site, but is in fact heavily dependant on the weather.

The first event, HLG, attracted a variety of models, from the stiff and heavy Cardington type, to the low-weight flexible wing style. Ron Green turned up with a new flapped wing model weighing some 10gm and quickly worked up to excellent practice times of 45 seconds. However the 20thou. tailplane broke and was hurriedly replaced with 1/32in. sheet, after which Ron struggled vainly.

Mick Page soon realised that his Cardington model was not suited to Kelham. He broke one wing flap during the contest but just grinned and pulled off the other side. It did not seem to make any difference.

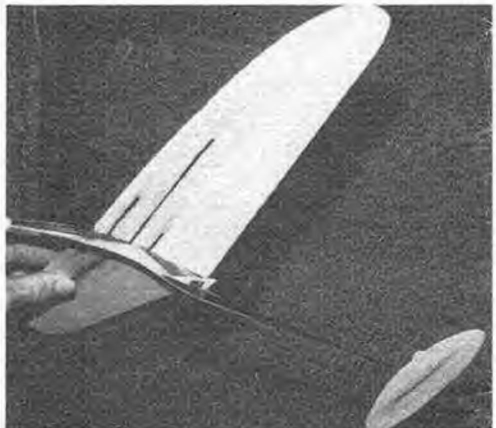
On form during the actual contest was Bernard Hunt who got things just right. Graham Davitt struggled to match him but his models were slightly off-tune.

Scale, for some inexplicable reason, had a very poor entry of six. The hall was almost unused at times during the two hour scale period, and flight times were low. John O'Donnell won with his usual Fike, making flights of some 30ft. altitude.

Last event of the day was EZB, run to the now universal 1.2gm rules. Steering was allowed close to the walls, but even so the number of clear flights was probably less than 1 in 10. The very turbulent conditions, together with the certain end of a flight on touching the dome, made for a very frustrating session, with only three people managing to clear the twenty minute total for two flights. Towards the end flights from Derl Morley and Graham Davitt straddled the scores from Bernard Hunt, who had led for most of the session.

In hindsight it is questionable whether Kelham in March is suitable for EZB. The massive structure of the building must take two to three months to change in temperature. EZB would probably be better in October, if a free date can be found. Alternatively a March date could be used for Scale, HLG and Manhattan. Manhattan would be appropriate because so few other sites are suitable.

Thanks go to the ever-cheerful organiser Mike Coombes, assisted by Scale judges Pete Robinson and Ken Bates.



Ron Green's 10gm flapped model has great potential, did 45 seconds in practice. Much use made of carbon fibre.

Results

EZB		
1.	D. Morley	21:45
2.	B. Hunt	20:59
3.	G. Davitt	20:54
HLG		
1.	B. Hunt	80.5
2.	G. Davitt	75.1
3.	R. Green	72.0
Scale		
1.	J. O'Donnell — Fike	
2.	M. Sanderson — ABC Robin	
3.	M. Sanderson — Whittman Tailwind	

BOB BAILEY reports

Trimming Hand Launch Gliders

To anyone who has built and flown a hand launch glider or 'chuckie', it is well known that there is very much more to flying them well than meets the eye! Often they will go up in a super straight climb and then come down again in a super straight dive! To use an Australian expression — a figure one. I have often admired the way Mick Page of Peterborough gets that super consistent spiral climb with transition to match and asked him if he could put his thoughts on paper. He did, and provided the following description and troubleshooting technique. Over to Mick and many thanks:

"I am often asked what makes my models roll to the right at the top of the climb. In fact they don't, they turn to the right and roll to the left. Some fliers say they bend the left trailing edge of the tailplane down to make the model turn right. This isn't strictly true; the tailplane adjustment provides an extra force which helps to counteract the excessive effect of left rudder on launch.

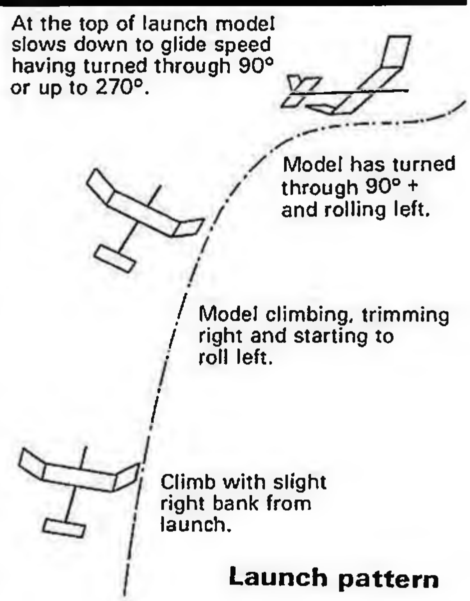
The standard S type of pattern is still the most commonly used as right turn prevents loop at the top of the climb and gives the easiest way of getting a good transition.

One can see from the sketch that by varying when the model starts to turn and how much loop is present on launch, we can produce different types of climb pattern e.g. a straight climb with a flick turn to the right at the last possible moment in launch; this is usually used with rear C.G. models. Models may turn through only 90° to 180°. Advantages maximum possible height gained.

The disadvantage is that if the model does not do a perfect transition, then all or most of the height will be lost. One may have difficulty in obtaining this trim and maintaining it as it is very critical at top of climb.

The other type of transition is a complete spiral climb with the model often turning right through 360° and even going up again as it comes back into the wind.

Advantages because this type of trim is used mainly on models with C.G. at 50%



Launch pattern

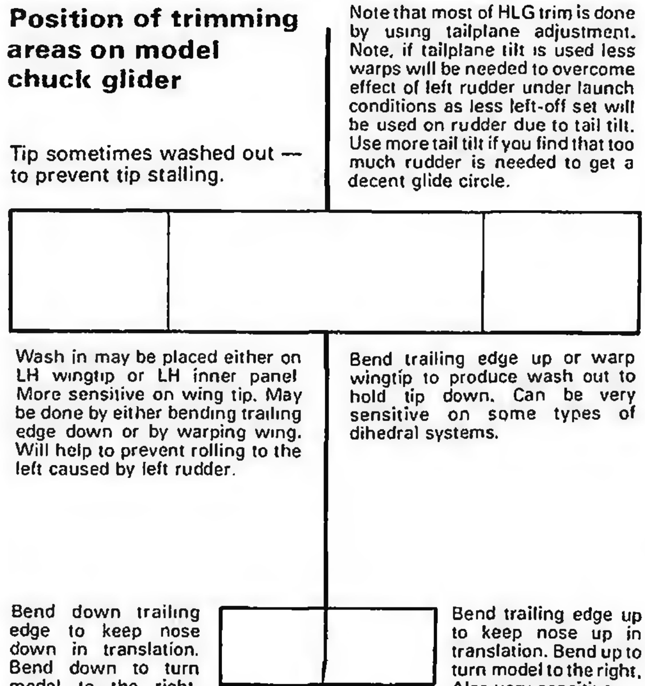
Trim diagnosis chart for Hand Launch Gliders

Launch Pattern	Reason	Remedy
Model bunts under speed of launch	Too much lift on tailplane	Re-glue tailplane with ½° more negative incidence.
Model loops	Too much negative lift on tailplane	Re-glue with less negative — by about ½°.
Model will not turn to the right and when power of launch runs out, model is still nose up, then dives in and does not recover from dive.	Effect of left rudder is preventing model from turning right. Model set with just a touch too much lift on tailplane, thus preventing recovery from dive.	Up on right hand side of tailplane.
Model will not turn to the right and when power of launch is ended, model is left in a nose-up attitude, then dives but recovers quickly from dive.	Effect of left rudder is preventing turn. Due to lack of turn, model is left in a nose-up attitude. As model recovers quickly from resulting dive, longitudinal stability is correct or slightly too much negative.	A touch of down on LH side of tailplane. If tailplane now has too much positive lift, then re-set back again and read next item.
Model will not turn to the right but longitudinal stability correct. Model may even roll or turn to the left. If the total of all of these fail to make the model turn right, then the design is wrong or the model is badly warped.	Left rudder still having too much effect at speed of the launch. It is essential to make the model turn to the right; start turn by getting RH wing-tip to hold	More wash-out on right wing-tip. A touch of down on left side of tailplane and an equal amount of up on RH side of tailplane. More wash-in on LH wing tip or inner panel. Try more right bank on launch. Reduce left rudder and use tailplane tilt to regain turn.
Model follows correct launch pattern but stalls early in transition	Tailplane just set slightly too much negative or right turn just a bit too slow to prevent stall.	Just a touch of down elevator on LH side of tailplane. Launch with slightly more right bank. If one can launch just a bit faster, it may put it right.
Model follows correct launch pattern but stalls at end of transition and beginning of glide circle.	Loss of circular airflow as model goes straight before changing to left glide turn. Read Frank Zaic Book Circular Airflow	You may have to put up with this one but anyhow try a slight touch of left rudder and a touch down on LH side of tailplane; may have to move C.G. back. Try tip weight on LH side; reduce frontal area of fuselage.

Launch	Reason	Remedy
Model follows correct launch pattern but sinks in deceleration; may stall at end of deceleration.	Tailplane just set at too much positive or right turn too effective so that model is coming out of transition too fast.	A touch of less down elevator on LH side of tailplane. A touch of less up on right wingtip, a touch of more left rudder.
Model turns too much to the right at top of the climb.	Warps overdone. Too much bank on launch; rudder may be flexing. Too much tail tilt and too little rudder offset.	Reduce warps i.e. less up on RH wingtip or less down on LH elevator. Strengthen rudder with glue. Reduce tail tilt and and increase rudder offset.
Model follows correct launch pattern but rolls too slowly back to the left.	Right wingtip being held down too much or too long.	Try tip weight on LH wingtip. Reduce up on right wingtip. Reduce wash-in on LH; touch more left rudder.

Position of trimming areas on model chuck glider

Note that most of HLG trim is done by using tailplane adjustment. Note, if tailplane tilt is used less warps will be needed to overcome effect of left rudder under launch conditions as less left-off set will be used on rudder due to tail tilt. Use more tail tilt if you find that too much rudder is needed to get a decent glide circle.



wing chord; the model will always go up and if transition is poor it will still recover very quickly, and may still be high enough to catch a thermal.

The disadvantage is that it may have difficulty in obtaining and maintaining trim to get maximum height.

Transitions

Firstly, bad transitions can be caused by incorrect trim, or incorrect design, incorrect launch or by a combination of these!

Launch

Basically, launch at 45 to 60 degrees elevation. May have no bank or up to about 20° depending on the model and type of launch pattern in use. This is only determined by trimming.

Troubleshooting Guide for Trimming HLG

I will assume that the model will have some wash-in on LH wing and some slight up elevator on RH side of tailplane. Test glide and adjust to give a good glide and a very slight left turn. Then give a good hard launch and adjust as necessary, see chart above.

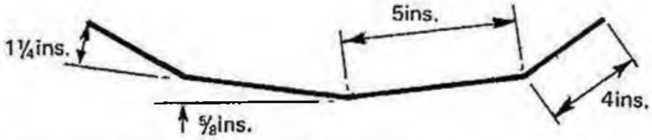
Design

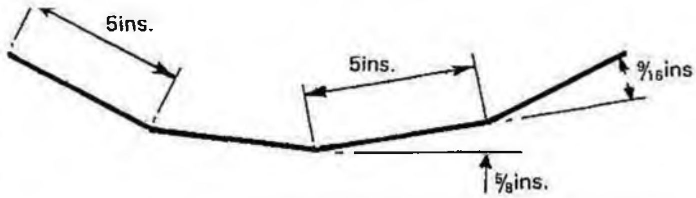
Basically any design can be made to work but it's an old story that some work better than others. The most important of these are fuselage frontal area and the dihedral system. If one increases the frontal area, then the model will have greater difficulty in turning on launch and also glide circle. So if you have built a Slarmi designed by my old friend Tony Slater, and you have had difficulty in getting it to turn, as many people have told me that they have, then the large frontal area is the reason. But it does have the advantage that the model goes where you point it on launch, provided you throw it correctly!

Dihedral System

The angle on the centre section decides if and by how much the model will roll or

Dihedral systems





bank. The more you use, the more the model will roll, therefore, on models with forward C.G. and spiral climbs, one would use more than models with rearward C.G. with straight climbs and flick turns. Also the length of the centre section decides the amount of roll; the longer they are, the greater the resistance to rolling.

I myself use a dihedral system as drawn. It would be wrong to say that my dihedral system was the only solution to a good transition, but I have lost count of the number of people who have built a Sweepette and have found that they cannot get that type of dihedral system to transition properly. (B.B. I have had the same problem!)

So I strongly recommend that you start with my system and then by all means try to improve on it.

Vee Dihedral Tailplanes

Basically models with vee dihedral tailplanes are slightly more loopy on climb and seem to roll and turn more easily, also more sensitive to tail tilt. The greater the angle of dihedral, the greater these characteristics become. Also as one moves C.G. forwards, the model will roll and turn more easily on launch.

One final comment; unlike vee dihedral wings where the rudder size is very critical and will be much smaller than normally used on polydihedral system, the rudder area is not very sensitive although if way out, will prevent good transition.

P.S. When model is about correct, the final adjustments will be super sensitive, so adjust by a few thousandths of an inch at a time. Also many plans of HLG show wing and tailplane set at 0-0. I would say that the number of people who can do this can be counted on one hand, so always put some negative on the tailplane however little."

Postscript Bob Bailey

One perplexing problem I have found is that the model turns immediately after launch, will not roll to the left and comes down before settling into the glide. Many of you won't believe this, but the model is over elevated i.e. too much negative on the tail.

The reason that I say perplexing is that one tends to think just the opposite. I think that most contest power fliers will know what I mean; I have wated much trimming time trying to find out what was wrong with the power model that appeared to have too much right turn, but was in fact, over-elevated.

25 YEARS AGO IN AEROMODELLER

"New rules for old" was the heading of an editorial which noted sweeping changes in the FAI rules for F/F rubber, all powered models, C/L Team Racing and Speed. In closing, the editor said that he was frankly amazed at the wide acceptance of these changes which had been rejected out-of-hand by British modellers, and hoped that they would be accepted with good grace, however unpalatable they may be. Whether they were accepted with good grace or not is a matter of opinion but the ensuing few years were to see some notable British successes in both Teamrace and Speed classes at international meetings.

1957 was the thirtieth anniversary of Lindbergh's solo transatlantic flight and as the June Aeromodeller was due to be on sale just six days before the actual anniversary date, it paid due homage to the fact. The cover photo was of James Stewart posing with one of three replica aircraft produced for the feature film "Spirit of St. Louis." Aircraft Described No. 85 featured 1/72nd scale drawings of the famous Ryan NY-P and a new Plans Service introduced featured a ¾in. to the foot F/F model of the "Spirit of St. Louis" for .5-.8cc motors, designed by Ron Moulton.

A report of the first indoor meeting to be held in the Manchester Corn Exchange makes fascinating reading today. Highest time was 13:53 set by Ray Monks with a microfilm model. On view for the first time in this country was a new covering material — condenser paper. Commenting on the lack of venues for this "most neglected phase of aeromodelling," the reporter notes that the Midland area Monks/Read/Poole 'combine' had been maintaining interestin the class "since the halcyon days at the Cardington balloon sheds." Does anyone know just how many times we have won and lost Cardington over the years?

The other plans introductions for the month were Brian Cracknell's F/F Sports 'Courier' for .5-1cc motors and 'Skiffler,' a strikingly semi-scale Stunt model for 3.5cc-6cc motors by Dave Platt. Dave is still designing models but for me the 'Skiffler' in its German markings was the most attractive one of the lot.

Almost into the realms of model engineering was an article by Tommy Ives on building your own high resistance actuator, the 'Relaytor,' which combined the functions of relay and rubber driven actuator into one unit. This seemed to me to be an excellent idea as I never could understand the logic of using a solenoid (relay) to switch another solenoid (actuator).

Engine Analysis featured the OS29 Max-1. At this time OS were virtually unknown but have since become world famous for their quality. About this time I acquired an OS35 which became possibly the best Stunt motor I have ever owned.

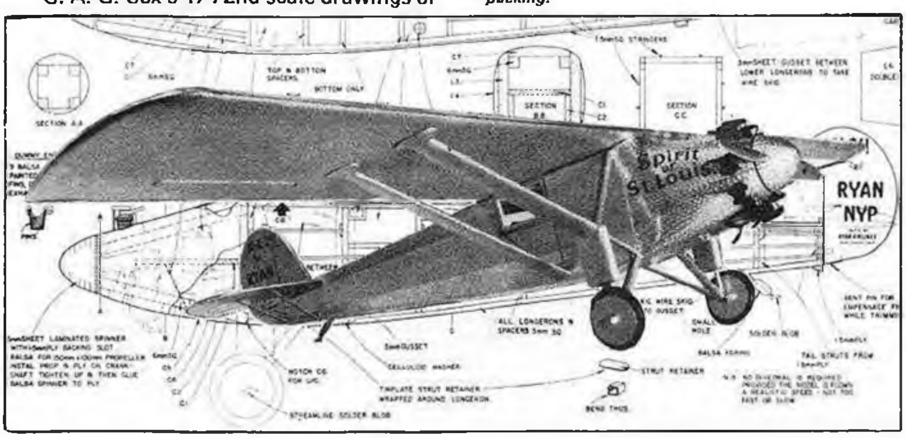
G. A. G. Cox's 1/72nd scale drawings of the Boulton Paul Overstrand were squeezed into a two page centre spread (Famous Biplanes No. 9).

"Aeromodelling Step by Step" showed you how to mould canopies, "Know Your Engine" Part II dealt with engine speed controls, and "Visit to Veron" contained details of their newest ducted fan kit, the 'Fairey Delta 2.' This was in fact Veron's *third* DF kit and the only real difference between these early kits and those of the present generation is in the engine performance.

A two page article on learning to Stunt contained some helpful hints of handling steel lines, which 'World News' and Club News had the usual miscellany of gossip.

"Heard at the Hangar Doors" contained news to the effect that "Darryl Zanuck Nicholls" would be going into action to produce an 8mm epic on the "British Nationals." Wonder if a copy is still obtainable!

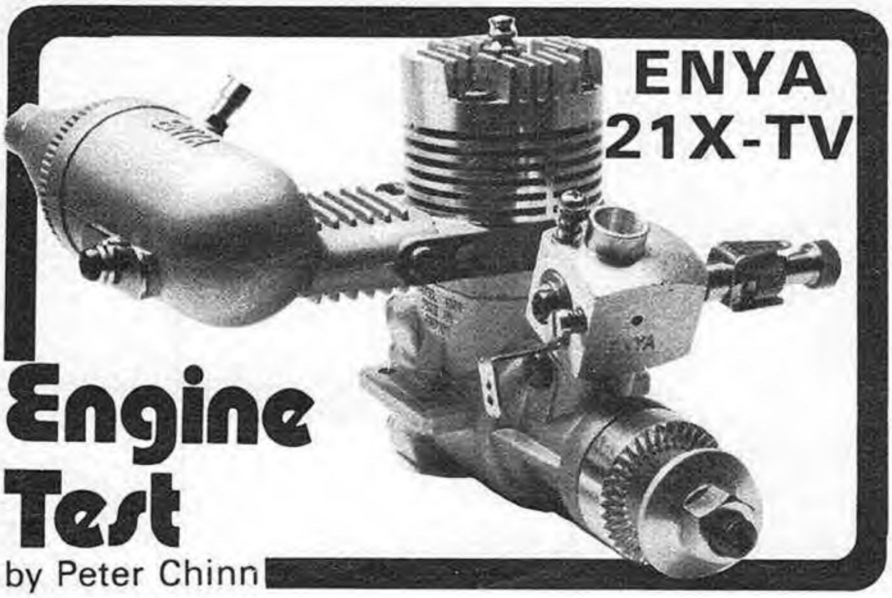
Ron Moulton's 'Spirit of St. Louis' still in the Plans Service No. FSP 663 price £2.25 plus 40p post and packing.



Engine Test

ENYA 21X-TV

by Peter Chinn



Specification

Type: Single-cylinder, glowplug ignition, Schnuerle-scavenged two-stroke with shaft rotary-valve and side exhaust. Crankshaft supported in two ball bearings. Throttle type carburettor with automatic mixture control.
Bore: 16.6mm (0.6535in.).
Stroke: 16.0mm (0.6299in.).
Swept Volume: 3.463cc (0.2113cu. in.).
Stroke/Bore Ratio: 0.964:1.
Measured Compression Ratio (full stroke): 8.5:1.
Measured Compression Ratio (exhaust closed): 6.3:1.
Checked Weights: 234 grammes — 8.25oz. (less silencer); 286 grammes — 10.1oz (with silencer).

General Structural Data

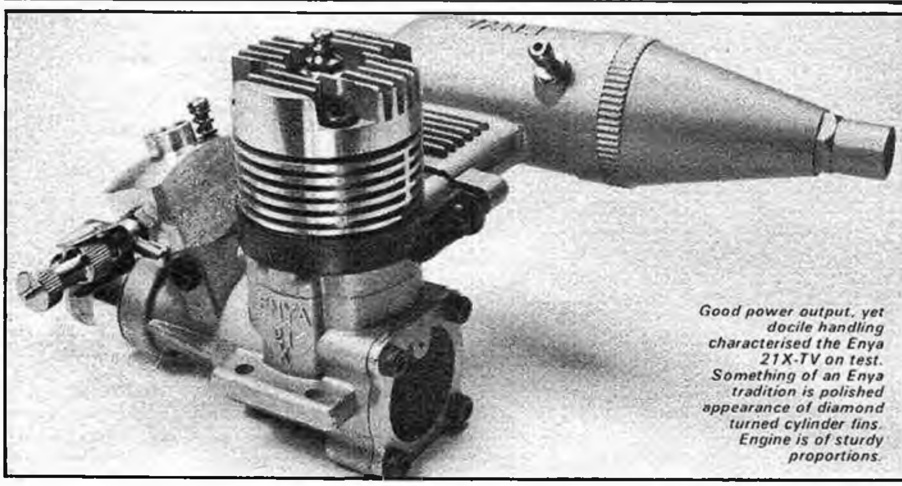
Pressure diecast aluminium alloy crankcase/front-housing unit with beam mounting lugs and 12mm i.d. intake boss. Detachable diecast aluminium alloy crankcase backplate, secured, with paper gasket, by four 3mm Allen cap screws. Detachable pressure diecast aluminium alloy cylinder block, aligned with crankcase by cylinder liner and secured, with cylinder-head, by four long 3.5mm Allen cap screws. Joint between cylinder-block and crankcase sealed with paper gasket. Machined aluminium alloy cylinder-liner, 1.85mm wall thickness, with hard-chromed cylinder bore and located by flange at top. Cylinder head of pressure diecast aluminium alloy, with brass thread insert for glowplug, and 0.3mm soft aluminium gasket. Case-hardened steel crankshaft with 12mm dia. main journal, 7mm dia. front journal, 8.3mm bore gas passage and 7mm thick crankweb counterbalanced by means of cutaways each side of integral 7mm dia. solid crankpin. Prop-shaft length threaded M6 × 1.0. NSK-6901 12 × 24mm 10-ball steel-caged rear ball bearing. NSK-607Z 7 × 19 mm 6-ball steel-caged front ball bearing. Machined aluminium alloy prop driver keyed to shaft by two flats on end of front journal. Flat-crowned ringless aluminium piston machined from special low-expansion, high silicon content aluminium alloy, with rectangular skirt cutaways fore and aft to avoid masking transfer channel entries. Fully-floating 4mm dia. solid gudgeon-pin retained by wire circlips. Forged aluminium alloy connecting rod with bronze bushes and lubrication holes at both ends. Enya G5.5 automatic mixture control type carburettor with machined aluminium alloy body and ground steel throttle barrel. Enya expansion chamber type silencer (optional) with pressure diecast body and pivoted steel cover plate to allow exhaust port priming. Silencer attached to engine with steel strap and two screws.

Test Conditions

Running time prior to test: One hour.
Fuels used: (i) 80 per cent methanol, 20 per cent castor-oil (running-in). (ii) 75 per cent methanol, 20 per cent castor-oil, 5 per cent nitromethane (tests).
Glowplug(s) used: Enya No. 3 platinum-rhodium element.
Silencer used: Enya expansion chamber, as recommended.
Air temperature: 16°C (60°F).
Barometric pressure: 758mm (29.8in.) Hg.
Relative humidity: 78 per cent.

Test Results

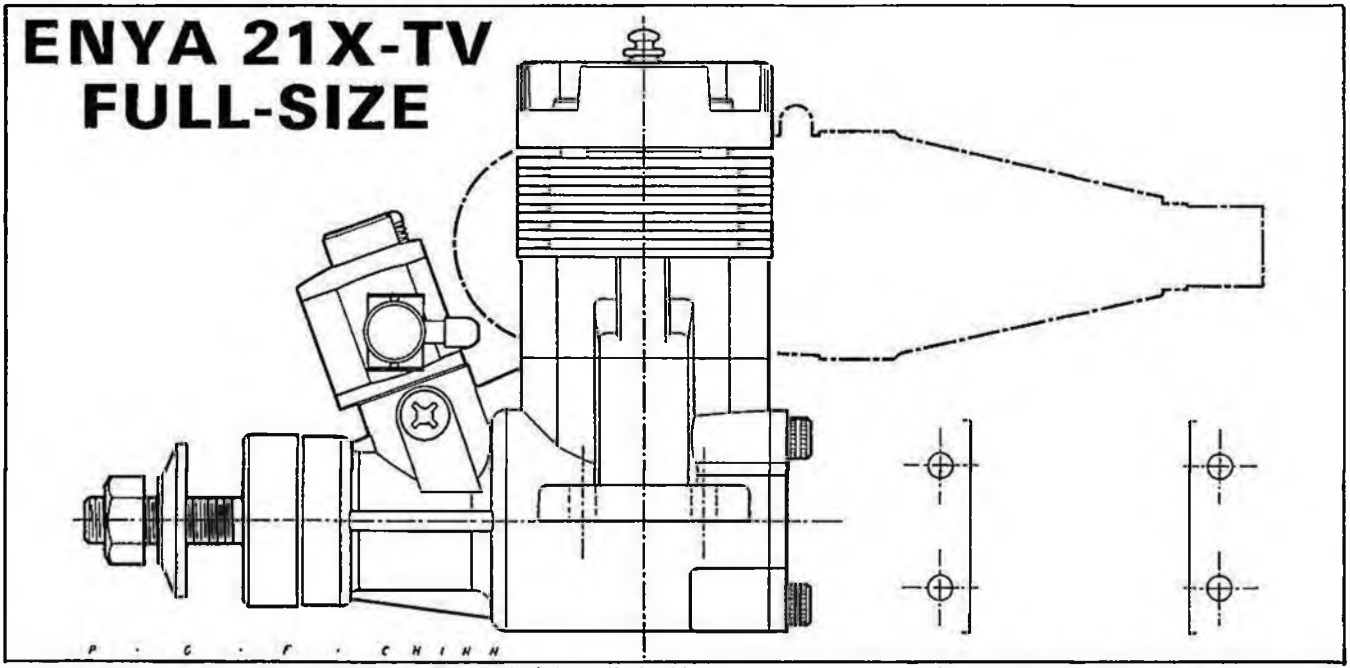
Power output, gross: 0.57bhp at 18,500rpm.
Power output, net: 0.49bhp at 16,300rpm.
Torque, gross: 36oz. in. at 11,000rpm.
Equivalent b.m.e.p.: 67lb/sq. in.
Specific output, gross: 165bhp/litre.
Specific output, net: 141bhp/litre.
Power/weight ratio, gross: 1.10bhp/lb.
Power/weight ratio, net: 0.78bhp/lb.



Good power output, yet docile handling characterised the Enya 21X-TV on test. Something of an Enya tradition is polished appearance of diamond turned cylinder fins. Engine is of sturdy proportions.

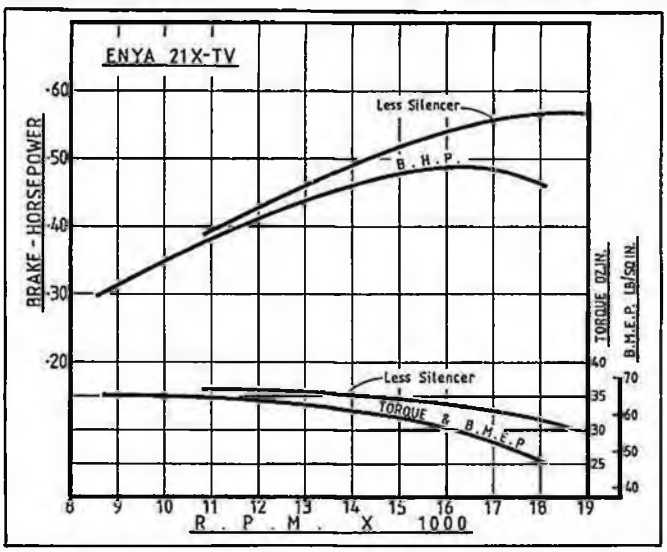
FEW COMPANIES can have had so much experience in producing glowplug engines in the .20cu. in. or 3.5cc classes as the Enya Metal Products Company Ltd., of Tokyo. It was in the late 1940s that the Enya brothers began making model aircraft engines, initially the robust 10cc class Enya '60' and '63', then, in 1950, the first of a long line of Enya '19' models. Currently, the Enya range is one of the world's largest. It comprises no less than 43 throttle-equipped models, ranging from 0.8cc to 10cc, some of which are also available in standard non-throttle control-line or free-flight versions and/or in water-cooled marine units. Included in the range are three basic '19' models (plain bearing and ball bearing crossflow scavenged, plus a ball-bearing Schnuerle-scavenged unit)

ENYA 21X-TV FULL-SIZE



and seven '21' models and it is the standard 21X-TV version of this group that is the subject of our report this month.

Like all the 'X' series Enya engines (the 'X' identifies them as modern Schnuerle-scavenged designs) the 21X-TV is a well-built and nicely finished engine. In addition to having a twin ball bearing crankshaft and Schnuerle porting, it features an 'Al-Chrome' piston/cylinder assembly: that is to say, it uses a ringless aluminium piston running in an *aluminium* cylinder liner having a hard-chrome plated bore. This, like a ringless piston in a chromed brass liner (ABC), combines the advantages of a light piston, a cylinder sleeve whose thermal expansion is closely matched to that of the piston, thereby maintaining good piston seal without risk of seizure over a wide temperature range and, finally, giving better heat conductivity to the surrounding metal of the cylinder block.

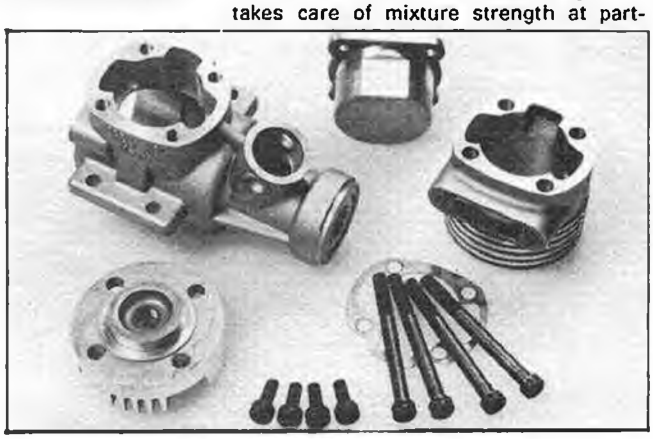


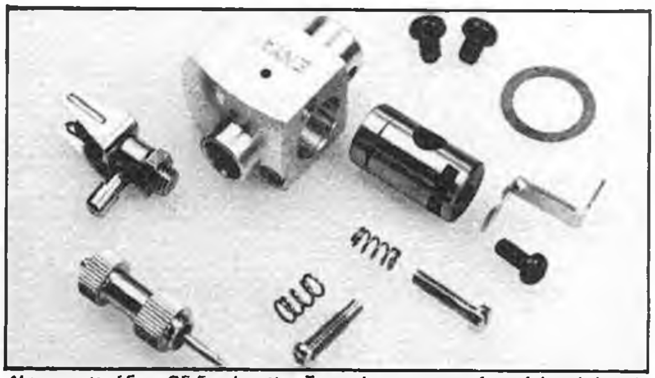
The cylinder-block is, in fact, another unusual feature of the 21X in that it is separate from the crankcase proper. The channels for the three transfer ports are cleanly cast into the two components which are then aligned by the cylinder sleeve, the whole assembly, with cylinder head, being clamped together with four long cap head screws. The cylinder porting consists of an unbridged exhaust port, flanked, each side, by a transfer port that is angled to direct gas both away from the exhaust and slightly upward, with, diametrically opposite, a third port inclined sharply upward to carry the charge well up into the combustion chamber. The exhaust is timed to remain open for approximately 150 degrees of crank angle, while the main transfers are open for 128 deg. and the third port for 122 deg. As is usual with ringless piston engines, the cylinder bore is tapered slightly towards the top to improve piston seal. The actual reduction in bore is of the order of 0.001in. The cylinder head has a shallow (2.6mm deep) bowl shaped combustion chamber surrounded by a 2.5mm wide annular squish area.

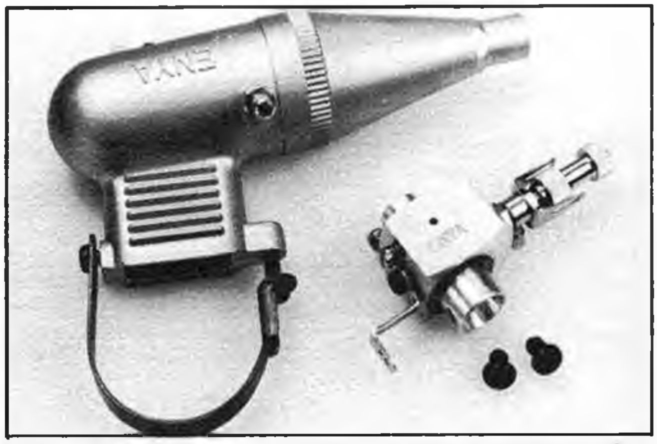
In common with most other current .21cu. in. motors, the 21X has a 12mm crankshaft running in twin ball bearings. It has a rectangular valve port, 13mm long, which uncovers a parallel sided intake port for 195 degrees of shaft rotation. Nominal timing is 35 degrees ABDC to 50 degrees ATDC.

The 21X-TV is fitted with an Enya G5.5 carburettor. This is of the fixed automatic mixture control type. From a conventional needle-valve assembly, fuel enters the carburettor body and then, via a short internal transfer channel and a tapered groove on the surface of the throttle barrel, is admitted to the fixed jet tube within the barrel. The tapered groove meters the quantity of fuel relative to the amount of air admitted at different throttle openings. This takes care of mixture strength at part-

Below: slightly unconventional is use of separate cylinder block. Note transfer channels.







Above: parts of Enya G5.5 carburettor. Tapered groove, on surface of throttle barrel, meters fuel according to throttle opening. Right: silencer is of simple expansion chamber type. Carburettor incorporates fixed automatic fuel metering, plus adjustable air-bleed.

throttle settings. For fine-tuning the idle mixture, a separate airbleed adjustment is provided.

The carburettor has a 5.5mm i.d. choke and an effective area of 18 sq.mm.

The silencer for the 21X-TV is of typical Enya design and is of the non-baffled expansion chamber type, with a pivoted cover which permits exhaust port priming to assist cold starting. The silencer has a volume of 40ml and its 7.6mm i.d. outlet nozzle gives a fairly generous outlet area of 45sq. mm. A nipple is fitted to the silencer for pressurising the fuel tank where assisted fuel delivery may be desirable.

Performance

As an indication of the type of fuel best suited to the Enya 21X, the manufacturer lists three simple mixtures, each based on a 20 per cent lubricant content: the first a straight blend of methanol and castor-oil; the second containing 5 per cent nitromethane and the third containing 10-20 per cent nitromethane. Our motor was run-in on the straight mix, after which all tests were carried out on the 5 per cent nitro blend as this is similar to the standard fuel used for most of our tests of two-stroke R/C engines. Typical commercial equivalents are Model Technics GN-5 and GX-5. The glowplug (not supplied) used for all tests was the Enya No. 3.

From the very beginning, the Enya 21X was found to be a pleasant engine to handle. It started instantly with an electric starter, was docile when being hand started and ran smoothly and evenly on a wide variety of props. Some engines having ringless pistons in chromed non-ferrous cylinder liners can be more difficult to hand start from cold, when new, due to excessive tightness in the piston/cylinder fit at the top of the stroke. This was certainly not so with the 21X which plopped over TDC smoothly and started easily by hand, when cold, from the very beginning. Hot restarts were usually obtained with a single flick of the prop. Only when the engine had cooled down, but was still warm enough to reduce compression seal and needed to be primed, did hand starting become less positive. Quicker response was then obtained by applying an electric starter.

Being quite free, even when new, the Enya obviously needed little running-in and, from an early stage, showed none of the tendency, frequently encountered in other engines, to lose power as it warmed up from cold. Typical prop rpm readings obtained on 5 per cent nitro fuel, without the silencer fitted, included 9,400 on a 10× 6 Top Flite maple, 10,000 on a 10 × 5 Top Flite maple, 11,000 on a 9 × 6 Power Prop maple, 11,600 on a 9 × 5 Zinger maple, 11,600 on a 10 × 4 Top Flite maple, 12,300 on a 9 × 4 Top Flite maple, 13,500 on a 9 × 4 Zinger maple, 14,200 on a 9 × 4 Power Prop maple, 15,000 on an 8 × 5 Zinger maple, 15,800 on an 8.5 × 4 Zinger and 16,300 on an 8 × 5 Power Prop maple.

On test, a maximum torque of 36oz. in. was recorded. The torque curve was relatively flat, as a result of which, maximum power was reached at high rpm (between 18,000 and 19,000) where a gross output (i.e. less silencer) of 0.57bhp was determined. This is a very good figure for a 3.5cc engine fitted with a standard R/C carburettor and running on mild fuel, but the 21X is perfectly happy on higher nitro content mixtures and, where the user wishes to boost output, 20 or 30 per cent nitromethane can be expected to raise peak output well beyond 60bhp, along with an improvement in torque for increased performance on the more useful prop sizes.

Fitting the silencer did not cause excessive power loss on the sort of props that most owners would be likely to use. On 10 × 4 and 9 × 5 props, for example, the rpm loss (static) was of the order of 200-300. Under much lighter loads (e.g. 8 × 5) aimed at getting the engine up to its bhp peak, losses are somewhat greater, but unless one is thinking in terms of a very small, fast aeroplane, we have to call into question prop efficiency and whether it is not better to forgo peak power in the interests of the possibly greater thrust of a larger prop turning more slowly. For the majority of models using an engine of this type, a 9, or even 10 in. dia. prop will probably be the most appropriate.

As the performance curves show, fitting the silencer did not have a very great effect on maximum torque, but the torque curve fell off more sharply as load was reduced, resulting, finally, in a maximum power output of just under 0.5bhp at approximately 16,300rpm.

Controls were good. The needle-valve was just about right as regards sensitivity, while the response to the throttle was equally satisfactory. Safe, continuous idling at 2,600rpm was obtained on a 10 × 4 prop.

In all, a very pleasing motor.

Manufacturer: Enya Metal Products Co. Ltd., Nerimaku, Tokyo, Japan.

U.K. Distributor: Ripmax Ltd., Ripmax Corner, Green Street, Enfield EN3 7SJ.

U.K. Service: John D. Haytree, The Haven, Rixey Park, Chudleigh, Newton Abbot, Devon TQ14 0AN.

Crankshaft is orthodox: cylinder liner, of chromed aluminium alloy, is not. Note: hefty forged conrod.

SCALE MATTERS

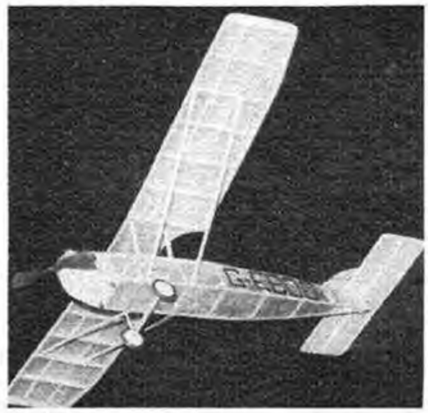
by Alan Callaghan

Making Fillets and Fairings from Balloons

Microballoons are extremely small hollow glass and ceramic spheres. Sizes range from 10 to 300 microns in diameter, and they have a wall thickness of 1.2-3.5 microns. For those of use non-millionaires who simply cannot comprehend a micron, which is one millionth part of a metre, a million sheets of 1/16in. balsa would make a stack almost one mile high, and that's a lot of wing ribs.

For modelling purposes, Microballoons are almost unusable by themselves, but are meant to act as a filler medium for use in conjunction with a separate binding agent such as a glue, resin, epoxy putty, or similar. They have a density that is approximately one tenth of any other inorganic filler, so that a given weight of them will occupy ten times the volume of the same weight of the straight filler. They are totally inert, non-toxic, and once made into a paste or 'matrix' with another filler they can be sanded and machined as easily as can the filler itself. They are, therefore, ideal for saving weight where large or even small amounts of filler is required, so how does one go about using them?

The American manufacturing patentees, Emerson and Cuming, produce many types of Microballoons, each type designed for a particular job. There are microscopic high strength versions, special low density versions, high temperature resistant, and types that are buoyant down to depths of 20,000ft. for use in oceanographic equipment. Larger versions, called Eccospheres, which can be up to four inches in diameter, are used to float on



Seen at Derby two years ago, Jeff Anderson's 24in. span 'Halton Minus' uses a relatively small slook streak prop. Electronic flash freezes the model in flight at 1/125 second.

liquids to control fumes and losses by evaporation.

The SIG manufacturing company market a grade of Microballoons for use with their own glues and Epoxolite putty. Epoxolite is a two-part putty which is lighter than many similar products and is ideal for making fairings on any kind of model. I have been trying these two products together on the Rearwin Speedster recently and find that they work very well and can make excellent lightweight fairings and panel details.

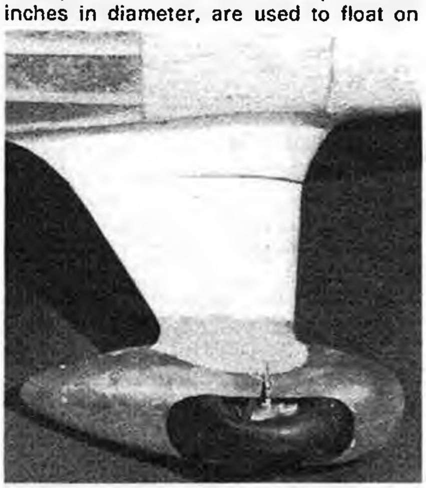
The Speedster has a number of deep carefully tailored fairings on the under-carriage legs and wing root junctions and these were made as follows. From the start it should be made clear that Epoxolite used either by itself or with Microballoons is best *wet-sanded* to shape after setting, using wet-or-dry paper. Consequently those parts to which it is applied should already be well-doped and sealed beforehand. It is not recommended to try to put tissue over the Epoxolite, so use the filler only after the model has been covered and doped.

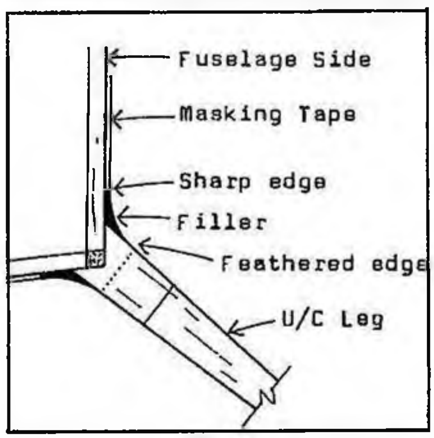
A carefully shaped mask is cut from broad masking tape or Fablon with the edges cut to the outline of the finished fairing. With this in place on the model, the mixture is applied using a small balsa or plastic spatula. Being slow-drying one can work at an easy pace, but when it is all in place, leave it for about ten minutes before going over it with a wet finger, smoothing and pushing the putty more carefully into place. Try to get it as near to the desired profile as possible but if in doubt, leave some extra on the surface. Patience is required next because it seems best to leave it all to harden for 24 hours before beginning to sand. This should be done gently starting with 220, then 400, wet-or-dry, taking care at the feathered edge not to go through the doped surface underneath. If this happens, simply re-dope the area again when all the moisture has been dried off. At the sharp edge of the fillet, sanding should continue until a cleanly defined line occurs between the filler and the masking tape. Only when this and the feathered edges are satisfactory should the tape be removed. This should reveal a moulded fairing, apparently only as thick as the masking medium, which blends in smoothly with the adjacent component. Any small irregularities in the raised edge can still be rectified with a sharp scalpel blade since the putty will cut easily even when hard. Epoxolite does not crumble at the edges as some fillers do, but a couple of coats of thinned dope over the whole area will prepare it all nicely for the final colour scheme.

The combination of these two products makes an easily workable, lightweight, composite material, which apart from the above application, could be cast into a solid block that would make an ideal basis for carving a dummy pilot, as it is capable of taking very fine detail indeed. As to costs, a 4oz. pack of the two-part Epoxolite will be approximately £3.50 (4oz. of deadweight filler is an awful lot when thinking of FF Scale models and should last a long time), and a 2oz. pack of Microballoons will be around £2.00. The latter is the same size as an 8oz. tin of coffee. These prices are only a rough guide provided at the time of writing by *Henry J. Nicholls*, one of SIG's main importers, and could vary 15% either way due to currency exchange rate fluctuations. Fresh shipments usually arrive in late Spring since winter conditions in the North Atlantic are not exactly the most favourable for surface transportation. (Editor's note: Irvine Engines Ltd. also have an excellent line of Microballoons — £1.95 per can).

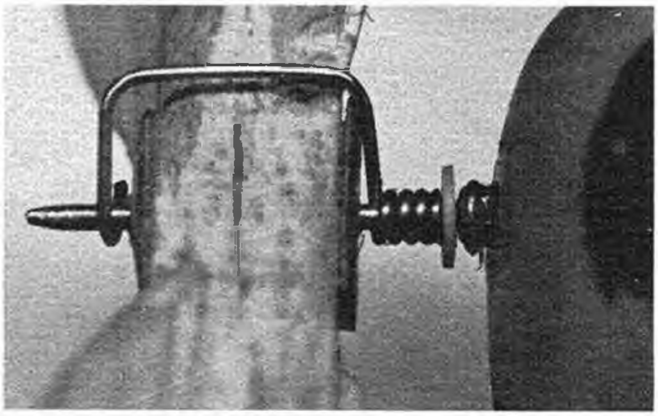
Crosswinds

As most readers with wide-ranging model flying interests will know, there are many modelling newsletters published worldwide, apart from the national magazines, which are devoted entirely to one particular class of model e.g. control line racing, aerobatics, pylon racing, F/F duration, R/C quarter scale, etc. It is worth reminding regular readers of this column that there is an excellent newsletter available devoted to those aspects of scale





Left: SIG Expolite putty together with Microballoons filler was used to form the compound curve fillets of the undercarriage legs on the author's Rearwin speedster. Right: detail section of undercarriage showing masking and feathered edge.



Prop hub detail on Peter Frostick's Peanut Piper Cub allows the prop to be changed very easily. See text for details.

Don Sankey with his latest model 41in. span 'Short Stirling' powered by four Telco motors - see Multi CO_2.

flying regularly featured in 'Scale Matters'.

This is the 'Crosswinds' newsletter published by the Cleveland Free Flight Society of Ohio, of which a further three copies recently became available. Issue No. 61 runs to no less than 36 pages and features a most amusing series of articles on fictional aircraft from American flying stories from various pulp magazines printed during the 30s, but with fullsize plans for model versions of them! The aircraft are the Griffon's 'Black Bullet', Kerry Keen's 'Black Bullet II' and Crash Carringer's 'Hale Hellion'. No use reaching for your Janes or Observers books to find these. Model plans, 3-view documentation, and even a story to complete the package are all there, and they certainly make an interesting change from the more serious side of scale flying.

Issue No. 62, 30 pages long, has an Eastern flavour, with details of the *Polikarpov 1-16* fighter, a most unusual *Polish UT-2M* low-wing trainer, and a Russian *Mosca* fighter. The entire newsletter is akin to a scale documentation folder complete with model plans for all three subjects, written histories, colour and marking details and three-view drawings, as well as much other assorted model flying news. Issue No. 63, 26 pages, includes a feature on the *Farman David* biplane, with fullsize plans for a CO_2 version, details of a CO_2 motor tachometer, and an article with a plan dealing with scale models of vintage F/F Sports designs.

These newsletters were each produced by a different editor, which is a good way of spreading the work-load and putting forward a wide variety of opinion. Each year a full report on the Flying Aces National Scale Championships is made which covers F/F scale power, rubber, electric and CO_2 models. A good deal of the information included is reprinted from other magazines covering both fullsize and model aviation, some of which readers will have already, but *'Crosswinds'* is aimed at bringing plenty of relevant documentation on one subject together in one issue, and with the fullsize plans featured, is very stimulating reading. Those interested in this highly enjoyable and recommended newsletter, should write to: *TRW/TM 2833,23555 Euclid Avenue, Cleveland, Ohio 4417, for full details of subscription.*

Interchangeable Props for Small Models

Getting the best flight performance out of a Peanut or other small rubber-powered model is largely a question of carefully matching the propeller to the model. One of the neatest and simplest methods of making an interchangeable prop is that used by Peter Frostick on his clipped wing *Piper Cub* — winner of the Crawley Peanut event earlier this year. The device is a wound wire clip which is an extremely firm friction fit on the prop shaft, and of which the front loop simply clips over the hub of the prop and then around the tip of the shaft. The tightly wound rear part — about four turns, is first made around a piece of wire that is one gauge smaller than the prop-shaft itself. It is then unwound slightly to allow the heavier gauge prop-shaft (with a slightly sharpened tip) to be forced through the coils far enough to engage in the front loop. To change the prop you simply disengage the front loop, push it to one side, slide another prop on the shaft and then relocate the front loop. For extra grip, a drop of cyano glue or solder could be put on the rear coils, but Peter finds this unnecessary and has yet to have the device fail in flight. It is not possible to have a free-wheeling device, but for indoor flying this is not necessary anyway.

Multi CO_2

On the subject of the more ambitious scale model, reader Don Sankey of Leyton provided some information on his latest model, a 41in. span *Short Stirling* powered by four Telco motors. The particular aircraft modelled, XY-N 524, was actually flown by Don himself when serving with 90 Squadron RAF in 1944. The model is radio controlled, and uses the extremely small American Cannon servos in conjunction with radio built by Mick Wilshere to a total system weight of 3ozs. The Telco motors are connected in pairs to 6cc tanks, with the two inner motors linked to one and the two outer to the other. The entire model weighs 12ozs and even during the recent cold spells when the CO_2 is unable to give of its best, the model nevertheless managed to make reasonable powered glides according to Don. No details of construction are given, but the builder asks whether the model is the first R/C 4 engined CO_2 model. Of this I would not be too sure, can any reader enlighten us? Add to this Don's personal experience of the fullsize craft and there certainly must be a good case for a first of some kind.

Coincidentally readers who attended Old Warden Scale Days last year may remember the large tissue-covered *Short C-Class* flying boat by Geoff Smith which was also powered by four Telcos. The model was not flown on the day due to the windy conditions but Geoff now reports that it too has completed many successful test flights. Although larger than the *Stirling,* the 12oz *Short* has a lighter wing loading and is purely free-flight. It will pull away cleanly from a hand launch and after climbing to an altitude of 30 feet or so, it will level off to a sedate cruise with all motors humming away nicely. Directional stability is something of a problem which Geoff claims is due to varying asymmetrical motor thrust. As the C-Class boats were designed with quite small tail surfaces, and they have not been enlarged on this model, I would suspect that this is the cause rather than the motors, but I have yet to see the model fly. Flown only in flat clam so far, the wondering flight pattern is very unpredictable. In this situation I would be tempted to try a little dodge often used on indoor scale models to get them to turn consistently. This is simply to add weight to one of the wingtips to induce a turn. Unlike a trim tab, the effect of this does not vary according to airspeed. It works just as well on a glide as on powered flight and only very small amounts of plasticine are required as ballast.

Geoff mentions that the papier mache planing surfaces to the hull are standing up well to general wear and tear, and his next modifications will include building some upthrust into the engine mounts, together with the carving of a set of carefully matched propellers. High wing multi-engined subjects do seem to benefit from upthrust and a rough guide is to align the motor centre lines with the angle of incidence of the wing.

FROM THE HANDLE

MIKE WHILLANCE reports

BRITISH COMBAT FLIERS are the best in the world and have won nearly all of the International, European and World Championships since the Battle of Britain. That doesn't mean that you have to compete at international level to enjoy combat. On the contrary, it makes little difference whether you are competing for the World Championships, the Town Hall Clock or an engine bolt. It doesn't matter whether you are flying FAI, slow diesel or a brick. The enjoyment comes from fighting it out, model against model, skill against skill and cut against cut. It's you against him and all you are concerned with is winning that particular bout. The standard or prize has very little to do with it.

It is also a lot more sophisticated than people think. So before you rush down to the flying field with a box full of streamers you had better heed the following advice, most of which is aimed at the novice and first time fliers.

It is important that right from the start you use the correct equipment. Fast foam models are a waste of time for the beginner. They break the instant they hit the ground and you might as well accept that you will hit the ground a lot whilst you are learning. So build a strong model to begin with. There are plenty of plans and kits for strong models available, so build a Warlord or Ironmonger or something of that type. Make it exactly to plan, cover in nylon with three or four coats of dope and one complete coat of fuel proofer. Pay careful attention to ,details, i.e. ensure that the control surfaces are free and easy, and that the push rod has a good securing clip. Make a strong, tight streamer clip and make sure that it is securely fastened to the model.

You will need a 2.5cc diesel engine. Oliver Tigers are probably the best but P.A.W. are also good and are a lot cheaper. Fit a small piece of rubber tubing over the venturi to prevent dirt entering the engine when you crash. make a needle valve protector (**Fig. 1**). This will not only save you constantly replacing the needle valve but could make the difference between winning and losing a bout. It takes a long time to change a needle valve and time on the ground means points against you.

Use an 8in × 6in. propeller. Nylon ones are best for beginners as they do not break as easily as fibre-glass ones. Always sand the leading and trailing edges of propellers, otherwise they will cut your fingers when you are trying to start the engine. Drill out the centre of the propellers to the correct size. Make sure that they just slide on and off the engine, as valuble seconds can be lost in a bout when changing tight fitting propellers.

Your control lines should measure 52ft. 3in. from the centre line of the model to the centre line of the control handle. Connect the lines to the model and handle with small line clips or split rings. Cover your handle to line clips with rubber tubing to prevent you opponent's lines getting snagged in them. Make yourself a strong wrist strap that is securely attached to the control handle. (**Fig. 2**).

These may seem like very fiddley details but if you do not learn to be fussy and get these details just right, then you will lose models and bouts because of them.

Before you start combating you should be able to perform the following manoeuvres with ease. Loops, Bunts, Figure Eights, Low Inverted Flight and Half Bunts. The half bunt (**Fig. 3**) is the most common of all evasion manoeuvres. You should also be able to perform this manoeuvre when the model is initially inverted. You should practice this manoeuvre until you can come out within 6ft and flying parallel to the ground. If, whilst you are practising, you happen to misjudge this distance, you will be glad you made a strong model with needle valve and venturi protectors.

When you have mastered these manoeuvres you are ready to fly combat. In addition to local flying you should enter as many slow diesel competitions as possible. There are a lot of ½A combat competitions, so if you build yourself a ½A model as well, you would be able to enter every diesel combat competition in the country. You won't win any yet but there is no substitute for competition practice and it is great fun.

When flying you must always remember *Golden Rule No. 1* 'You cannot cut your opponent's streamer if his model is behind yours.' Therefore, get behind his model and try to follow it through every manoeuvre. Keep behind it for as long as possible. If your opponent's model gets behind yours, shake it off as quickly as you can — get behind his model again — and try to stay there. If your opponent is behind you and you cannot 'shake him off' then try the half bunt dummy (**Fig. 4**). With a bit of luck he will go the wrong way and you can try to get behind him again. With a bit more luck he will crash into the ground. Whilst you are behind his model and you are trying to follow it all over the sky, you should always remember *Golden Rule No. 2* 'If your opponent is standing 6ft. away from you, then your propeller will be 6ft. away from his streamer.'

You propeller is only 8in. in diameter, i.e. 4in. either side of the centre line of your model. Therefore, if your handles are more than 4in. apart laterally, you will not be able

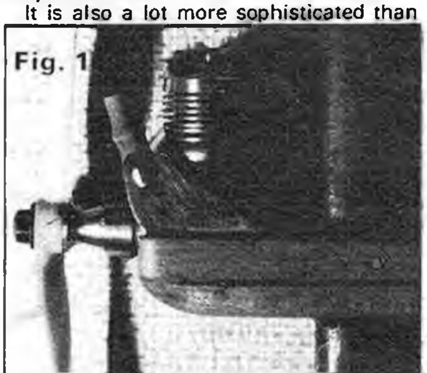


Fig. 1 Plan view of combat model showing the side winder engine, fitted with rubber tubing over the venturi to protect against dirt entering on a crash. The forward sloping triangle is a needle valve protector.

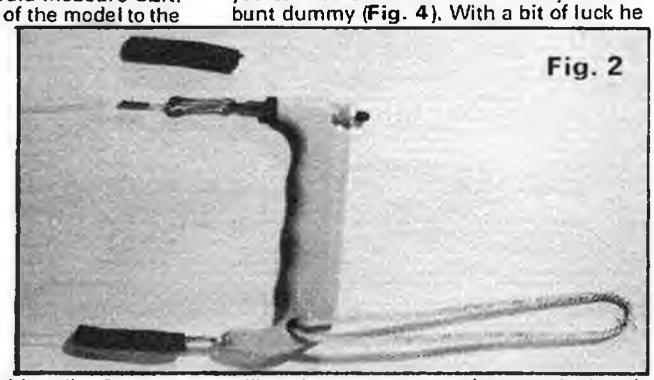


Fig. 2 Control line handle fitted with a strong wrist strap. Note the rubber tubing used to clean up line connections and avoid tangles with opponent's lines.

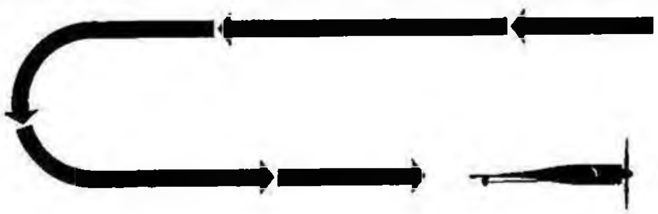


Fig. 3. The half-bunt

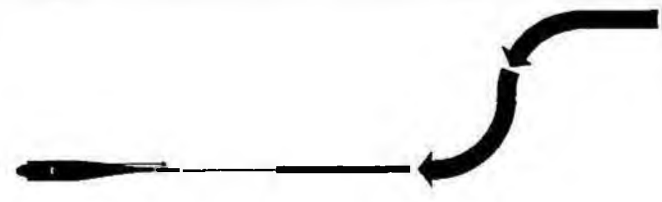


Fig. 4. The half bunt dummy

to get a cut. So when you are following his model you should stand as close to him as you can and try to keep your handle next to his.

Sooner, rather than later, you will get into a line tangle. The first thing you should do is nothing — just try to stay behind his model and get cuts. Anyway, he may know how to get out of it, so follow him. If one model is following the other then you can both try flying consecutive loops or bunts until your lines become free again. If you get into a hopeless mess then remember *Golden Rule No. 3* 'Always fly down-wind in bad line tangles, pull consistently hard on your control handle, fly large loops and bunts, keep highish and hope that he crashes first.'

When you are chasing your opponent's model you must not rush to get cuts. Take your time, and just concentrate on following him. You will find that you automatically get closer and will finally get the cuts. If you attack like a 'mad bull' you will probably cut off all of his streamer in one and then you will most likely lose. So take your time, and try to get small cuts.

As your flying skills improve you will find that you want better equipment. To win major competitions you now need better models, better engines, a good pit crew, good preparation of models and sundry equipment, and you will need to know the rules inside out. All of these things will be covered in later articles.

Once you have learnt to fly diesel combat to a reasonable standard you may want to progress to FAI which is just the same but faster. If you have already learnt all the basic skills then you just need to speed up your reactions. But if you change to FAI before you have learnt these skills it will take you a lot longer to acquire them in the long run.

So stick to your diesels for a while, have a lot of fun, fly aggressively and remember that if you are a good loser then you probably won't win!

GLEN ALISON reports

'Tips from Experience'

To aid beginners and novices in the exciting field of control line Stunt and to avoid some of the pitfalls which tend to discourage progress, I have itemised some of the things which have caused trouble for me in the past, and also asked some of Britain's top fliers for their tips.

Pushrods from bellcrank to elevators

Traditionally they were always made of piano wire but it is springy and tended to bow when in compression. This meant that when flying in windy weather, the elevators could be 'blown back' with resultant loss of control. You may have your handle at 'full up' but the movement is not transmitted to the elevator with crashing results!

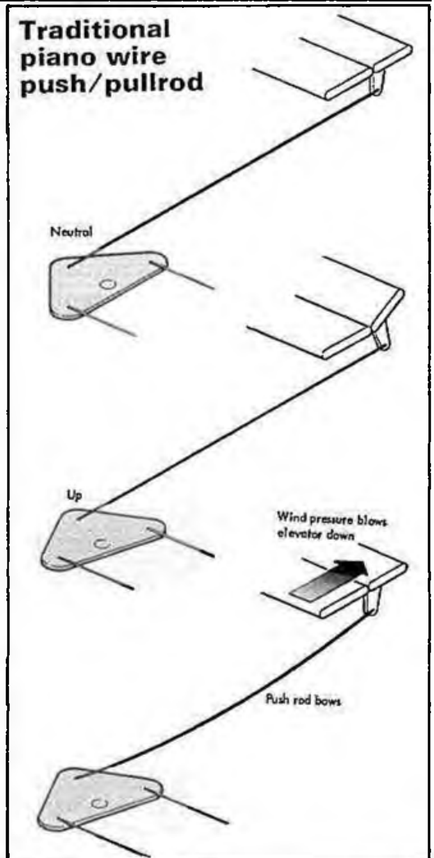
The stiffness of the pushrod can effectively be increased by installing guides in the fuselage to prevent this bowing, but always seem to suffer from friction. Far better to use a stiffer pushrod and I use 6mm dia. aluminium tubular arrow shafts.

Pete Tindal's tip was to choose a standard proven design. The basic priciples of stunt model design were established 30 years ago by George Aldrich with his famous 'Nobler'. Make no mistake, this is still a competitive model and has the added advantage that it is available as a kit in both original and Gieske variants. Also Pete advises that having finished your wonderful creation, get an expert to fly it for you to assess any major trim problems that might be present.

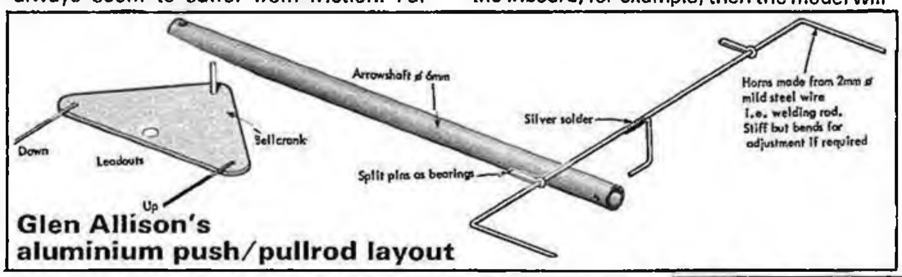
The main problems likely to be encountered on the first flight of a new model are:

(a) Centre of Gravity Position. It is either going to be too far forward which is at least, fairly safe or too far rearward which will make the model extremely sensitive to the slightest elevator movement. However beware of stiff or sticky controls, they can imitate either of the above conditions.

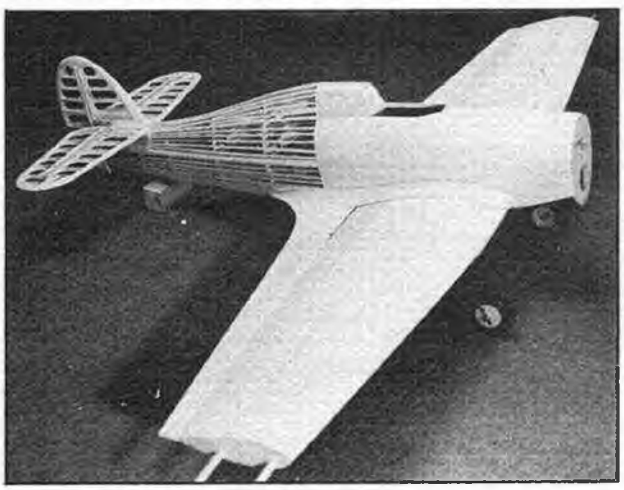
(b) Roll Trim. This shows up as either an inboard or outboard bank as the model flies level. If the outboard wing is higher than the inboard, for example, then the model will

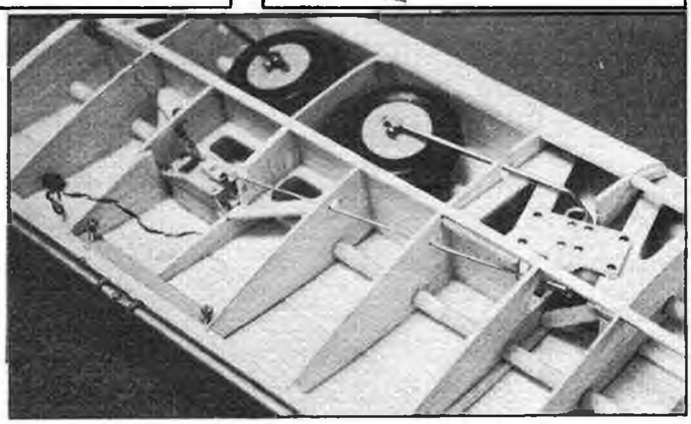


Traditional piano wire push/pullrod

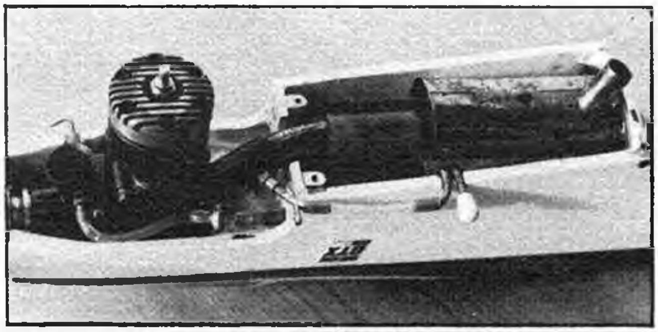


Glen Allison's aluminium push/pullrod layout

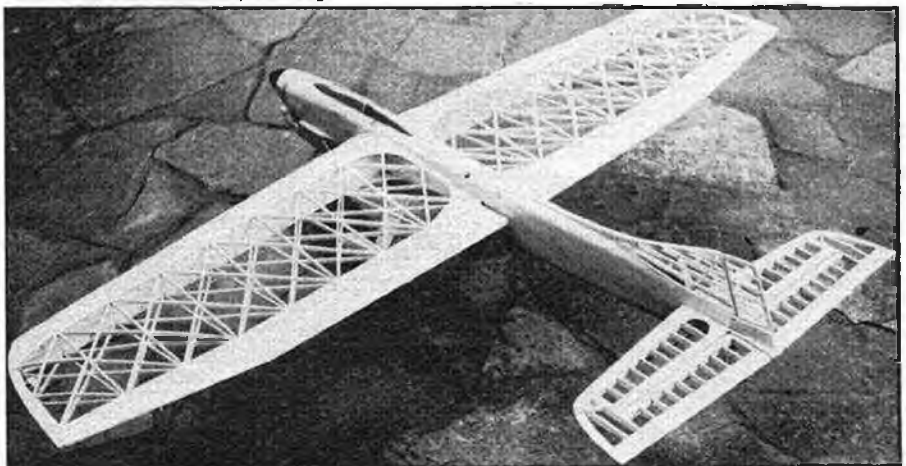




Glen Alison has spent most of last Winter building this beautiful control line stunt Hurricane. Glen tells us he has followed Al Rabe's ideas so as not to lose too much scale or stunt performance. Has retracts, throttle and a Red Shift 61 S power plant.



Above: the latest model from French stunt flyer Yves Fernandez called 'Stratos'. Uses HP40 which as can be seen has neat internal silencer. Below: own design by Brian Dyke called 'Dominator' which has some interesting features. The engine (Merco 61 or 49), wing, and tailplane features. The engine (Merco 61 or 49), wing, and tailplane are on a common centre line in an attempt to get equal turning characteristics. The geodetic wing structure uses straight strips of balsa: the end result, a very stiff wing.



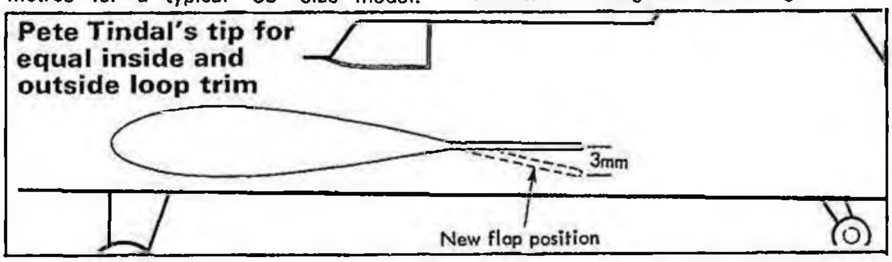
lose line tension when performing inside loops, and vice versa of course. To the novice, line tension is the most important factor in flying confidence.

(c) Uneven control response to 'up' and 'down'. This is usually the result of constructional alignment errors between wing and tailplane, but the effect can be adjusted out by bending the control surfaces appropriately. For example — model is more sensitive to 'up' then 'down' — small inside loops and large outside loops for a given control input. Experience has shown that the best way to do this is to get an assistant to hold the leadouts securely at the wing tip whilst you carefully bend the flaps down equally on both sides about 3mm. The effect of this is to make the elevators less effective on 'up' whilst giving improved down response. Fly the model again and judge the effect obtained. More or less adjustment may be required. It can take up to twenty flights to get the trim fully satisfactory for competition performances.

Jim Mannall thinks that a common mistake many newcomers make on entering the competition scene for the first time is to try to emulate certain experts who do very big impressive manoeuvres on long lines. This can lead to control difficulties in certain windy conditions and therefore it is advisable to stick to lines no longer than 17 metres for a typical '35' size model. Controllability will be improved and this helps to impart accuracy to the stunts which, after all, is the name of the game.

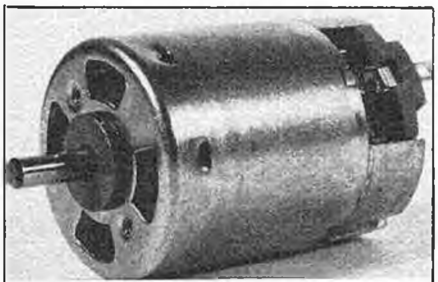
Bill Draper advises not trying to achieve the 'ultimate' model, built down to the very minimum of weight and full of gimmicks. What you want, he says, is a solid conventional design with no frills, forget about detachable wings, wing mounted undercarriage, Schneurle engines with 3 blade propellers, etc. He recommends nylon covering and fuselage mounted undercarriage (to absorb the inevitable heavy landings). Do not make it too small, have at least 400sq. in. wing area, with a 'standard' 35 engine (for example Fox, O.S. or Enya) and a nylon propeller. Bill believes the nylon propeller can reduce vibration problems. He feels the whole object is to achieve a reliable and consistent airframe/engine combination so that you can concentrate on learning to be a good pilot. It will be some time before the contest results are limited by the model rather than the pilot!

Pete Tindal's tip for equal inside and outside loop trim



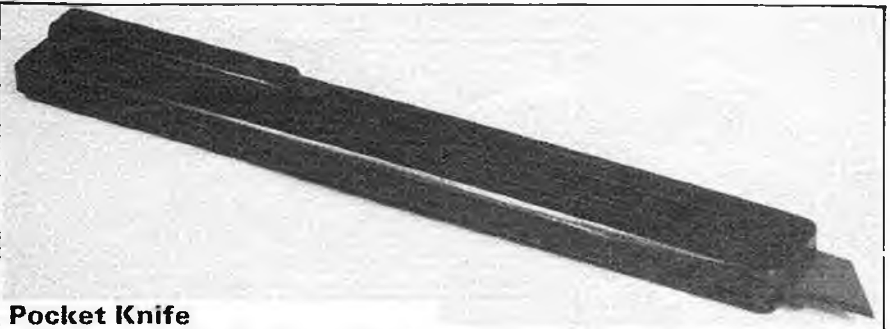
SHOP TALK

The latest in products for the modelling scene



Johnson Electric Motor

How about a very large electric powered model! This 12v 7 pole motor is now available from Ripmax, weighs 1lb. ½oz. and draws under 1½amps. It measures 70mm in length plus the shaft which is 18mm long by 6mm in diameter. Catalogue No. M-JM1 price £8.95.



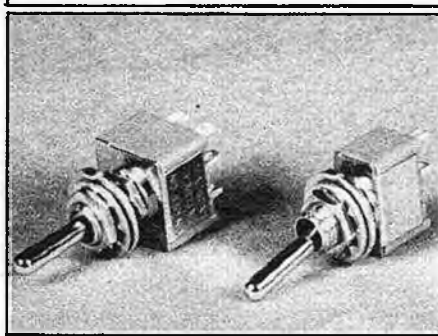
Pocket Knife

Plasplugs Ltd., Sheridan House, Vernon Street, Derby DE1 1FR, produce a range of DIY tools which include this useful modelling knife with retracting blade. There is also a spare blade contained in the handle. Price 59p including VAT.

Mini Bandsaw

Toolmail are offering the Burgess Powerline Mini Bandsaw for £59.50 including VAT and delivery. This super tool will cut alloy up to about 10swg and wood around 1in. thick. A fret saw attachment is also available.

Another useful item available from Toolmail is a Hobby Service Case for storage of small tools and components. The case has 16 clear styrene drawers, each 5½in. × 2¾in. × 1½in. and one larger drawer of 11in. × 5½in. × 3¼in. The whole unit is fitted in a brown vinyl outer case with carrying handle, price £29.95 including VAT and delivery. Both items are available direct from: Toolmail Ltd., Parkwood Industrial Estate, Sutton Road, Maidstone, Kent ME15 9LZ.



Midget Toggle Switches

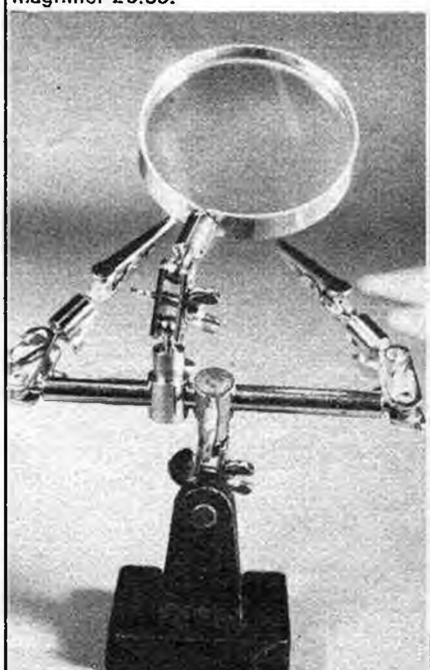
A new range of midget toggle switches, ideal for electric flight or R/C application, are available from Fieldtech Heathrow Limited, Hantavia House, 420 bath Road, Longford, Middlesex VB7 0LL. The two shown are: MS550 HB double pole change-over type size 12.5mm × 12.5mm × 10mm rated at 3A 125V AC/1A 250V AC price 51p, and the MS550 KB 12.5mm × 8mm × 8mm single pole change-over rated at 3A 125V AC/1A 250V AC price 32p.

Can Gun

A simple idea, but effective, is this polypropylene spray gun handle. The unit clips on to any aerosol can and will depress the spray nozzle via the trigger to give a more accurate control. Produced by Silleck Mouldings Ltd. and available price 99p in DIY shops.

Helping Hands

If you have ever tried soldering three or four components together you will realise the value of this tool! Called the 'Helping Hand' it has two arms equipped with crocodile clips, which are capable of holding small objects in a variety of positions. There are eight ball and socket joints, two of which articulate a magnifying glass to enable small work to be done. Available direct from Bi-Pack, P.O. Box 6, Ware, Herts, or at their shop at 3 Baldock Street, Ware, Herts. Order No. T402. Price £7.45, including post and VAT, or without magnifier £6.55.



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Vintage Model Engines, kits and magazines for sale, and wanted, anything considered S.A.E. for lists to 'Hailwood', Heron Way, Banbury, Oxon. GHI

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tmd
the modellers' den

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Model or full size? It's hard to tell — until you see the wings are held on by rubber bands and the prop is a Topflite nylon! It's a model built for **flying**, not just for looking at. And the high-wing cabin layout is the classic formula for easy-to-fly scale models — both free-flight and radio control.

The majority of aeromodelling enthusiasts **start** with flying scale, but often make the mistake of choosing the wrong sort of prototype, or too small a model size. To make matters worse, they also dress up the model with a full colour paint scheme — and end up drastically overweight. Keep scale models for sports flying simple and light. They can still look most realistic — and will fly better.

The bigger the model the better, too, for ease of flying. But don't start with a quarter-scale giant. That can leave you with transport and flying site problems — plus quite a large bill for materials and a matching engine.

Speaking of engines, model weight and engine size required is related by a simple ballpark calculation. Allow at least 1cc of engine size per ¾-pound of model weight. For example, if you are using a 4.75cc (0.29 cu. in.) engine, model weight should not exceed $\frac{3}{4} \times 4.75 = 3.6$ pounds, say 3½ pounds. Or if you want to work it out the other way round, allow 1.2 pounds per 0.10 cu. in.) of engine size for estimating maximum model weight.

As we have said before, model weight is an important factor. Keep it down to a minimum safe figure — then your model will fly better, land less heavily. Utilise balsa construction fully for light weight with high strength. And make sure that the strength is right by using only top quality balsa throughout. Solarbo Balsa is your answer here.

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