

MODEL AIRCRAFT

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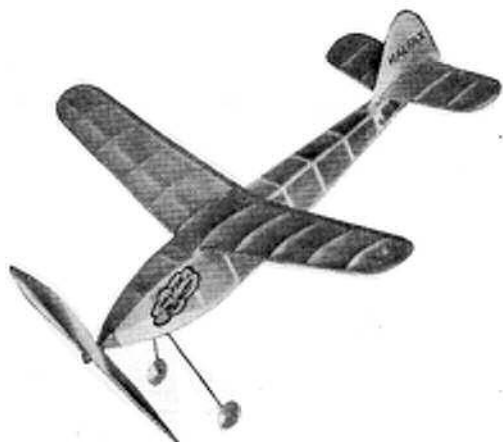
JANUARY,
1947
Vol. VI, No. 1

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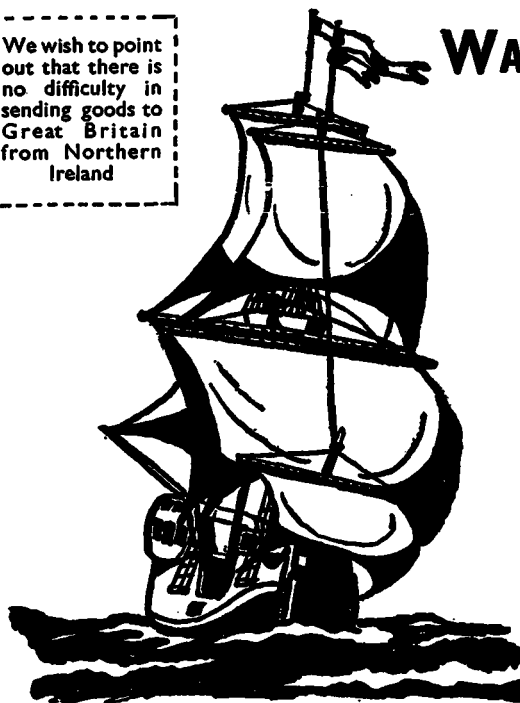
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MODEL AIRCRAFT

The Journal of the Society of Model Aeronautical Engineers

JANUARY 1947
Volume 6. No. 1



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A.F.R.A.S.

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A PERCIVAL MARSHALL PUBLICATION



The Italian Grand Prix and Arno Cup

An Italian power-driven model constructed by Cattaneo, of Milan. It uses a "Novo D-2" diesel engine. Most Italian power-driven models appear to follow the American formula, but are somewhat spidery to our eyes.

The sailplane designed by Macera, of Livorno. This machine is the holder of the Toscan Championship in its class and is a fine example of high-performance sailplane design. Its beautiful lines are in strong contrast to those of the power-driven model above.



Some of the competitors at the control table having the characteristics of their machines checked to ensure they comply with the rules of the contest. Some nice examples of design and craftsmanship are evident.

The Italian Grand Prix for motor-driven models and the contest for the Arno Cup, both rubber and sailplane categories, were held on the Airport of Florence on September 28th and 29th.

Photos by courtesy of the Journal L'Aia.



NEWS

2

Review

Cover Story

Our cover picture this month was taken at Baildon Moor by W. Titterton on the occasion of the second Northern Area Rally and it shows Tony Lanfranchi launching his petrol model under the watchful eye of his famous father, Silvio.

It typifies the increased interest taken in model flying by the youth of the country; an interest which it will always be our desire to foster, since the youths of today will be our designers of tomorrow and the sound basic knowledge of the requirements of aircraft which are obtained from model flying are the soundest possible foundations to work upon.

New Year Topics

This issue of MODEL AIRCRAFT marks the commencement of another year of issue, and we would take this opportunity of thanking our readers for the encouraging support which they have given us during the past twelve months and to assure them that their comments and criticisms are always appreciated, together with any suggestions for the improvement of the journal.

While the paper restrictions are still with us we are unable to increase the number of pages per issue, but we will contrive to provide our readers with even better material than before, and particularly with details of the more prominent machines which make their appearance in competitions.

In this issue we are giving details of Mr. A. H. Wilson's Bowden Trophy winner, which has distinguished itself by registering several additional successes during the season. We also provide you with details of G. W. W. Harris's Wakefield model, which has proved a consistent performer during the competition season.

In response to many requests, we have established a full-size working plan service in connection with the models described in our pages which includes those presented during the past year. Details of these will be found on page 26, and this service will be appreciated by those who have neither the time nor the facilities for carrying out this essential preliminary to construction.

It has been noted during the past season that many of the designs which are produced by later recruits to the movement possess weaknesses of construction which display a lack of appreciation of the fundamentals of structural design, and we propose to deal from time to time with this important aspect of model design.

The Editor will endeavour to provide you with up-to-date news and articles of special interest during the coming year, and takes this oppor-

tunity of wishing all readers a pleasant and prosperous new year.

Italian National Contests

Results of two important Italian contests have just come to hand. They are the Gran Premio Italiano Motomodelli (Italian Grand Prix for Petrol Models) and the Arno Cup for sailplanes and rubber-driven models, both of which were held in Florence in September, the power contest on September 28th and the sailplane contest the next day.

These two contests were organised by the Italian aero magazine *L'Ala* in conjunction with the firms Aeropiccola, of Turin, and Fram, of Milan, both manufacturers of compression-ignition engines for models.

The power contest was run on the usual basis of duration on a limited engine run, which in this particular instance was 20 sec. maximum, and an interesting feature is the fact that flights of under 45 sec. duration were considered "no flight," enabling the contestant to have another attempt, three such attempts being allowed. The contest was divided into three classes: Class "A" for models with engines having a capacity between 0.1 c.c. and 3 c.c., Class "B" for models with engines between 3.01 c.c. and 10 c.c. and Class "C" for control-line models of any displacement up to 10 c.c.

All classes were limited to a span of 3.5 metres as a maximum and Classes "A" and "B" had to comply with the fuselage formula $L^2/200$. In the control-line category the models had to complete five circuits with a control-line length of 20 metres and speed attained was the basis of the final placings.

It is interesting to compare the results with those obtained in the recent power duration contest held at Leicester, although it must be borne in mind that the points were allotted on the basis of the order of placing in each round,

something after the style of our Plugge Cup points and that consistency of performance was therefore of importance.

GRAND PRIX FOR POWER MODELS Class "A"

Competitor	Engine	Club	Points	Best flight min.	sec.
1. R. Pavenello	Giglio	Florence	9	2	26
2. P. Gnesi	Delta	Milan	13	2	31
3. L. Rossi	Movo	Milan	15	1	42
4. P. Frillici	Delta	Viterbo	21	1	44
5. P. Raggi	Movo	Milan	24	2	5
6. R. Pavenello	Giglio	Florence	24	1	22

Class "B"

1. I. Maina	Elia	Turin	10	3	45
2. G. Garlato	Osam	Venice	15	4	9
3. E. Servadei	Osam	Edera Forli	18	3	5
4. C. Presenti	Presenti	Florence	19	2	11
5. A. Ghezzi	Ghezzi	Milan	26	3	21
6. V. Pecorari	Pecorari	Monfalcone	26	2	6

Class "C"

Competitor	Engine	Club	Time for 4 circuits sec.	Speed. Km/h.
1. A. Lazzari	Osam	Bologna	23.3	86.04
2. A. Carretto	Osam	Bologna	24.2	74.988
3. L. Tosi	Osam	Bologna	24.4	74.987
4. G. Pelegi	Baby Cyclone	Genoa	25.3	72.0
5. A. Elia	Elia	Turin	26.2	69.84

ARNO CUP Sailplanes

Competitor	Club	Points	Best flight min.	sec.
1. G. Barbiera	Turbine Parma	24	33	54
2. M. Riosa	Trieste	30	2	39
3. E. Morandi	Arsizio	36	2	28
4. G. Naldi	Edera Forli	37	3	3
5. A. Mauri	Monfalcone	38	2	36
6. A. Pelati	Milan	41	3	32

Rubber-driven Models

1. F. Conte	Turin	11	8	9
2. L. Nustrini	Florence	12	7	7
3. S. Gagliotta	Naples	17	18	52
4. A. Castellani	Cremona	18	9	26
5. R. Giua	Florence	24	3	14
6. R. Pavanello	Florence	26	3	46

From the above it will be seen that the performances are of a high order and quite comparable with those obtained in this country. Judging from photographs received of the event, it was blessed with sunny weather, which probably accounts, in some measure, for the high performance recorded, particularly the 33 min. 54 sec. of the winning sailplane.

It is also interesting to compare the entries with some of our own. For instance, there were 107 entries in the Grand Prix and 150 in the Arno Cup, both good figures for a country just emerging from defeat in a total war. From a perusal of the engines which powered the

winning machines in the Grand Prix, it would appear that the production of model internal combustion engines has progressed more rapidly in Italy than it has here and some nine different makes of Italian engines appear in the list of the first six winning machines in each class, the only "foreigner" being a solitary Baby Cyclone in the U.-control class.

We do not appear to be getting away as fast as we should with our own post-war manufacturing programme, somehow!

Equipment and Demonstration

In these days of intensive investigation into the mysteries of low-speed flight, every additional investigation is a step forward in revealing its hidden problems. For this reason we are publishing in this issue particulars of a simple wind tunnel which can be made from everyday materials and which lends itself admirably to club construction.

Clubs will be well advised to consider the construction of such a tunnel to instruct their younger members and give their older members the opportunity to indulge in some useful research work and settle their arguments in practical fashion.

We are indebted to the L.S.A.R.A. and its Palestine member, Dr. F. J. Piatelli, for providing us with the details and permitting us to publish them.

Publishing Date

Commencing with the January issue MODEL AIRCRAFT will, until further notice, be published on the 10th of the month and not on the 1st of the month, as heretofore. When the 10th falls on a Saturday or Sunday the nearest convenient publishing date will obviously be chosen.

This step has been taken in order to increase the topicality of the news included in the pages of the journal and simplify its production.

The I.M.A.E. Annual General Meeting

In accordance with the present constitution of the Society the Annual General Meeting will take place at the Waldorf Hotel on Feb. 23rd, 1947, at 11 a.m.

As there are a number of important matters relating to the future of the Society to be settled at this meeting, it is of importance that all those interested in its welfare should attend. Keep this date open!

"RICH MIXTURE" By "C.E.B."

Compression Ignition Reflections

I HAVE the following diesels in my stable at the moment, and therefore feel justified in forming some conclusions, because I also had Army experience of full-sized diesels, which gives a "diesel background" as well.

The diesels that I have been testing, playing with, and flying are: The German Eisfeldt (the largest of the bunch), the French Micron 5 c.c., the British Myes 2 c.c. (specially built for me, but now on the market in limited quantities), the B.M.P. 3.5 c.c., an Owat 5 c.c., a midget $\frac{1}{2}$ c.c. diesel designed by Mr. Colyer, and an 8 c.c. diesel built by Mr. Bagent, also a Mills 1.3 c.c. diesel. The "Owat" and the "Mills" are now in production, and a few B.M.P.s. are being sold, I believe. These engines make quite a representative little bunch, and I am expecting to add to the collection soon with an 8 c.c. French Micron and any other really interesting types that I come across.

Now all this is not just a collector's urge to grab hold of any diesel, for, in fact, I have rejected several chances that did not interest me. It is because I want to *know about the flying capabilities* of diesels, and see what the snags of operating and design are, in order to help fellow aeromodellers with carefully weighed up advice on operation methods—and because I like it!

I have therefore chosen a series of engines of different types and sizes.

Do not let any aeromodeller imagine that I have lost enthusiasm for model *petrol* engines. They scream and roar just as lustily in my den and outside, but I have added to the complication of life by the slightly less exciting note of diesels too! In spite of the lesser howl of a diesel exhaust, the little blighters produce more power per c.c. than petrol engines do. As we know them at the moment, they produce this power at slightly lower r.p.m. The petrol engine gets its power at a higher r.p.m. range. For instance, the little $\frac{1}{2}$ c.c. engine I mentioned above, which powers a rubber-driven "Wakefield" sized model weighing 8 ozs. complete and climbs it like a rocket, swings an 8 $\frac{1}{2}$ in. propeller. Now I am certain no $\frac{1}{2}$ c.c. petrol engine could do that, apart from the fact that the weight of the ignition gear would put up the wing loading of the model and spoil its performance for such a baby model. I have got a 2 c.c. diesel in a hard-chined planing model speedboat, and also I have a little diesel in a race car coming along, not mentioned in the list of aero-diesels given above.

There is no doubt in my mind that model diesels have come to stay and will have a very



Fig. 1. Colonel Bowden's little monocoque model fitted with a 1.3 c.c. Mills diesel engine. This model is very stable in flight and has a wing span of 42 in. with a central chord of 10 $\frac{1}{2}$ in. on an elliptical wing. Wing-tip slots are fitted.

great in-
crease in
marketing
generally.
There are
individual
flavorists
who make
a craft of
them, and
there are
also some
big opti-
mists that
say it is
that they
will use the
petrol en-
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plenty.

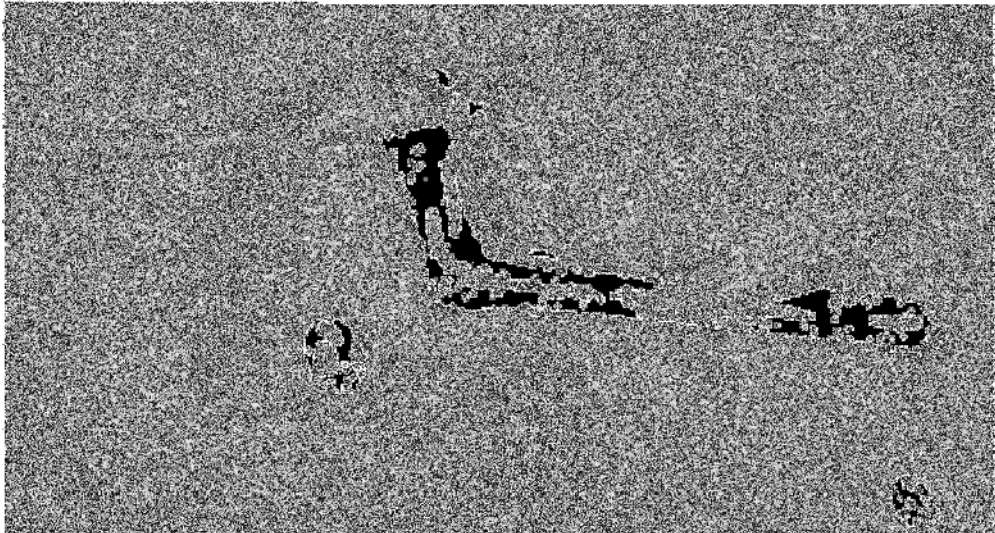


Fig. 2. A new type of engine for use in a small aircraft. It is a new type of engine for use in a small aircraft. It is a new type of engine for use in a small aircraft.

engine which are, in my opinion, correct. The diesel is exceedingly fascinating because of its simplicity and because it cuts out the chemical ignition gear that habitually does harm the engine, making it black of smoke, experienced by the average motorist who becomes nearly wild to power. I suppose at least 50 per cent. of the difficulties center themselves in ignition function due to bad timing or contact-breaker adjustment, not forgetting the quaking plug electrodes and adjustment.

The diesel makes a neat compact power unit for internal combustion engine flying boats and airplanes, at present, of the smaller type. The diesel cuts out all the troubles of cheap chemical ignition gear, the heavier battery and long heavier leads, hastening around the operator's knees which spoil his balance, clanking and rattling when trying to launch his child from the uncertain platform and confined area of a full-sized airplane or sailing boat.

They "at present, of the smaller type of diesel," because there are not any really large diesels on the market or produce the great surge of power power as necessary to get a large flying boat to rise on its own and take off.

This reminds me that I have recently been flying my first open "Wing Coach" flying boat that was shown at the Royal Airplane Exhibition, near Farnborough, was powered by the large Cummins diesel I have already mentioned. The only fault was all noise, with this engine when there is sufficient diesel to make and also when there is a popple on the water. The diesel like the world in general style when once in the city, and all I take down with me to the

area of flying in a machine made of fuel and a filling device. There is not even the necessity to take a spare to replace parts, because parts do not break in water, even if the world ends in disaster. At least, I have never yet known one doing any of my aquatic adventures. Incidentally, I would be most interested to hear from anyone if they have flown a diesel engine flying boat before November, 1931. If not, when must have been the first boat to fly with this form of power.

I have stated that the diesel, in my opinion, has come to stay and become very popular, but will not completely sweep the flying field clean of its petrol brother. Why? Well, the modern petrol engine has a wonderful bark, and people love noisy engines! They are curious. The fact is that both types of engine have their own personalities and peculiar characteristics that are attractive.

The diesel is not absolutely perfect in operation, in spite of its simplicity. It does need understanding as we know it today. It may be developed into something as near perfect as "diesel"; I do not know. The question then will arise, will it be popular? About people like a new bit of a problem child, provided the work dealing with it is not too much for them. They like a bit of a challenge. Fig. 1 and 2 show two diesel-powered models. Fig. 1 shows a small diesel engine model made by myself, driven by my 15 h.p. diesel. This is a very simple and elementary type with reasonably direct appearance, and the general dimensions and make up may interest the budding diesel model designer.

(Continued on page 49)

Blackpool Rally



Above is shown Sergeant G. M. Booth, of Wallasey, tuning-up his petrol model for the power event, which was won by R. V. Bentley, with the "Cloud-Dozer" described in this journal.

On the left, B. Haisman, of Merseyside, is seen receiving the Daily Despatch Senior Championship Trophy from the Mayor of Blackpool.



The Blackpool Rally organised by the Northern Area in conjunction with the Daily Despatch, was a well-attended function, as can be seen by the active preparations in this corner of the competitors' pens.

My 1946 Wakefield Type Model

By Gilbert Harris

FOLLOWING my usual practice when embarking on fresh designs, I laid down two sets of plans for two streamlined Wakefields, similar except for certain details which were considered factors worthy of experiment from the practical point of view.

I find the idea of designing, building and flying two machines at a time has much to be said for it.

An important point in favour of two models of mainly similar design is that both can be taken out on a calm day or evening when it is considered that thermals are non-existent and the two machines flown in such a way that comparisons of performance can be made.

The results, I find, are usually very interesting and informative. If, for instance, one model is performing better than the other then we will want to know why. You may suspect the air-screw, in which case a check can be made by changing over the airscrews of the two models and further test flights made. Again, a check of the rigging angles may reveal a difference sufficient to warrant re-rigging the inferior machine. Maybe your two machines have different mainplane aerofoil sections, in which case it should not take you long to decide which gives the best results for that design.

Considering that these models have had but little time devoted to them for purposes of trimming and that the rubber used has not been all that could be desired, they have acquitted themselves reasonably well in contests. MK1, for instance, was entered in the following competitions, with the results given:—

International Contest for Wakefield Models (held at Eaton Bray)—2nd place.

Reading Club Gala Day—1st place (open).

Brentford and Chiswick Gala Day—1st place (open).

MK II was entered in the Gutteridge, and 11th place was secured.

Construction of Model

I cannot claim this model is easy to build; in fact, to be candid, it is more difficult than most and is not a beginner's model.

Fuselage

The formers are made on the laminated system by winding the requisite number of

turns of $1/32$ in. \times $3/32$ in. balsa round $1/8$ -in. birch three-ply former plates. The apex of each former plate is rounded off a little and each turn of the $1/32$ in. \times $3/32$ in. is forced round the bend by pressure of the fingers.

Actually, a slight crack sometimes results locally, but it does not matter, for when the glue sets it unifies the broken fibres. It is important to soak the balsa strips thoroughly before attempting to bend them.

I boiled the strips I used very slowly in a large saucepan by coiling them around the interior of it and keeping the water level well above the wood. Casein glue must be used. Be sure to scrape off any surplus glue before it sets.

The former plates were spaced along a $1/2$ in. \times $1/2$ in. hardwood rod in the usual way and the four master stringers fitted first; these were followed up by a few intermediate stringers equally spaced and allowed to dry. The jig rod and former plates were then removed.

I should have mentioned the necessity of easing off the formers from the former plates before assembling on to the jig rod.

Next fit the wing centre section and under-carriage attachment tubes, and complete by fitting the remaining stringers. Note: instead of filling in the nose bay with sheet balsa, as is the usual practice, additional stringers are fitted; this saves a little weight.

The tail end of the fuselage is made by first making up the former complete with the motor hook and slotting it for the three master stringers. This former is then temporarily cemented on to fuselage former (15) and the three master stringers fitted and very carefully lined up. It can be left in position until the tail plane has been fitted, after which it can be prised off and completed. The top fin should then be made up and checked for fitting and alignment.

Main Planes

The form of construction has a number of good points, such as (a) high torsional rigidity, (b) the aerofoil section is faithfully preserved throughout the span of the wing, (c) high strength to weight ratio.

Also the wing panel joining dowels will break before the wing structure in the event of a "prang"; an important consideration in

RUBBER TUBES - 45" LONG
12 STRANDS 1/4" x 24" (BLACK)
TOTAL WEIGHT - 8.2 OZ. IN FLYING TRIM

Full size working drawings of this model are obtainable from our publishing office at 6/- each. Post free.

contest flying. The use of these dowels also help to save the fuselage from damage.

The sharp edges of the ribs are best cleaned up after the wing panels have been assembled. The 1/64-in. thick leading edge covering was glued on to the spars first, allowed to dry, and then pulled down to the leading edge. The edges of the sheeting can be sanded down to a fine taper over the main spar so as not to spoil the aerofoil section.

Tail Plane

This should be assembled on the building board and fitted to the tail end of the fuselage when completed.

Use hard grade balsa for the leading edge and medium for the trailing edge.

Covering and Finishing

The fuselage of MKI was covered with one layer of jap tissue, while MKII was double covered with the grains of the two layers crossed. Experience to date shows that double covering is worth the extra work, and the slight increase in weight. In the long run there is less work spent on repairs.

The fuselage coverings of MkI and MkII were treated with one coat of clear dope,

followed by one thin coat of banana oil.

Cover the main plane panels with one layer of tissue, grain running chord-wise. One coat of clear dope and one coat of thin banana oil.

Cover tail plane as main plane panels, but apply one coat of dope only, likewise top and bottom fins.

Flying

It is advisable to fit a sliding weight for final trimming—see drawing.

The model should balance at 50 per cent. of the main plane chord near the roots.

Adjustment of the tail plane angle can, if required, be made by inserting strips of paper.

When the best trim has been obtained the packing strips can be cemented in place.

When correctly adjusted the model should take off smartly and climb in a large turn to the right; the diameter of the turn will decrease as the model climbs until, if your fin adjustment is correct, the motor run ceases; the model should be gliding in circles of about 120 ft.

The machine is very stable; it has shown no tendency to spin or climb too steeply. No wash-out is used on the wings, neither is any wing warping required.

"Rich Mixture"

(Continued from page 6)

because the model, when fitted with a finer pitched prop than that supplied to me with the engine, flies very steadily and prettily like a full-sized machine. If the reader wants one of these American and unrealistic rocket climbs, he should make a slightly smaller model of the balsa stick longeron and paper-covered type. My little monocoque model has a fuselage planked with 1/8 in. thick 1/4 in. wide balsa planks to an oval and streamline shape. The main plane is an elliptical one of 42 in. span and a lovely wide central chord of 10 1/4 in., thus giving a really light wing loading. I have fitted wing-tip slots. The tailplane is of elliptical shape, 18 1/2 in. span, 5 3/4 in. chord. Total length of fuselage 30 in. There is a small ring-type aluminium engine cowling, but I do not fly with it because it is a nuisance and I did not take it with me when I had the photograph taken whilst I was spending a holiday in Somerset. However, anyone can fit such a cowling. The other model, Fig. 2, is surely the weirdest model one has seen for some time, and yet it is fascinating in its conception, form and performance. It is a "control liner" for training novices! It flies tail first and is also powered by a Mills engine

of 1.3 c.c. The model was built by Dr. Thomas, who works at his profession in Wales, and is one of the most practical and enthusiastic control line exponents I have met in this country. He says that the model in question flies with absurd stability and is therefore most suitable for beginners. It seems to me to present great possibilities for development as a free-flying canard design as well. What about having a go at one, my readers? It looks good to me.

Having read this, you may ask, am I safe in buying a diesel at this stage of development? My answer is definitely yes, provided you get an engine built by a reputable manufacturer and provided you understand how to operate a diesel with its little peculiarities. I hope to help readers in this direction in my next month's "Rich Mixture." When I first started acquiring diesels, I did have a little trouble myself, but I now have them eating out of my hand, and it is interesting to note that of the quite large bunch of diesels I have mentioned in my "first clutch" as being in my stable they all fly models. Some are better starters than others, but I cannot draw comparisons, I fear, or I shall be accused of favouritism! But they all go!

The 1946 Bowden Trophy Winner

By A. H. WILSON

THE high-wing monoplane which won the Bowden International Trophy this year demonstrated its reliability by subsequently winning the Bournemouth Reliability Contest ; placing second in the Frost Trophy ; and also placing second in the Eaton Bray Rally. Consistency of this nature is no fluke and indicates sound fundamental design. The model can therefore be recommended to those requiring a model of unquestionable reliability.

Construction

The fuselage is constructed from oval formers cut from $\frac{1}{8}$ -in. birch three-ply notched for 16 spruce stringers $\frac{1}{8}$ in. square. The tail extremity of the fuselage is built in unit construction with the tailplane and detachable. It is held in position on the fuselage by two sets of rubber bands on each side and correctly located by a rectangular ply spigot engaging the similar rectangular aperture in the terminal former of the fuselage proper.

As it is not possible to use a central rod for building up the fuselage, some form of cradle is required to ensure accuracy of the finished structure. This may take the form of a series of blocks of equal height (approximately 5 in.) attached to a suitable baseboard and arranged between the formers to support the centre stringers while one half of the fuselage is completely stringered. The fuselage can then be removed and the remaining stringers fitted.

An alternative method is to make a cradle from a piece of wood about $\frac{1}{8}$ in. thick and 3 in. deep, slotted at the correct intervals to accept the formers, which should be a fairly tight fit in the slots. The slots must, of course, be cut to the correct depth to give the accurate fuselage contour. When all formers are accurately located on the cradle the stringers can be applied as far round the fuselage as possible ; it is then removed and completed.

The fuselage frame is now completely planked with $\frac{1}{8}$ -in. sheet-balsa strips.

A false bulkhead of $\frac{1}{8}$ -in. thick three-ply is glued and screwed to the front fuselage former to take the engine mount.

The centre formers of the tail unit extend upwards to form the anchorage for the tail plane spars and the fin attachment tubes. See that the rectangular ply spigot on the face of the tail unit front former is an accurate fit in the aperture in the rear fuselage former and

properly aligned to ensure that the tail is parallel with the wing on attachment.

The portions of the tail unit forming the tail end of the fuselage are also planked with $\frac{1}{8}$ -in. sheet-balsa strips.

The tailplane follows orthodox construction, and should be covered with silk and doped.

The fin is constructed separately and plugs into the paper tubes provided.

The wing mount consists of a cabane structure made from $\frac{1}{8}$ -in. square birch struts, with diagonal brace, as shown on the drawing. Note carefully when building that the correct angle of incidence is built in and that the cabane is true and free from warps. Note also that the struts are faired off with $\frac{1}{8}$ -in. balsa sheet and that the joints are reinforced with 1 mm. ply gussets which have their edges sanded to blend smoothly with the struts.

The wing is in three pieces. A parallel centre section with built-in dihedral, and two outer wings attached to the centre section by duralumin tubes and dowels. The outer wings are set at an angle to the centre section to give a polyhedral angle and they are held in position by rubber bands passing over hooks.

The wings are provided with supporting struts which are anchored to the same hooks and attached to the rear undercarriage struts at their lower end. The wings should be covered in silk and doped.

The undercarriage is straightforward and plugs into duralumin tubes. The struts are fitted at their upper ends with stop washers and wire hooks to take retaining rubber bands passing under the fuselage to those on the other side.

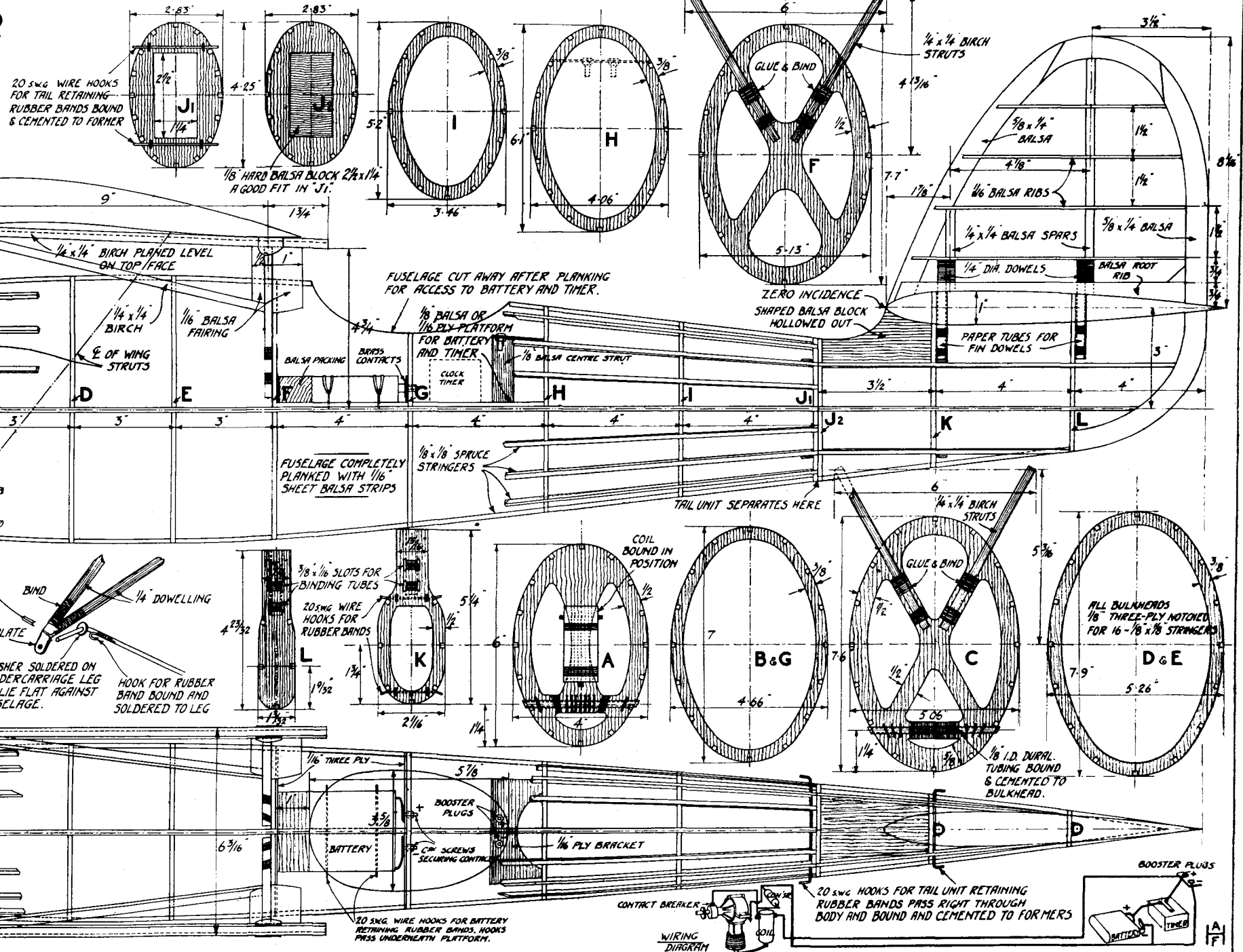
The engine mounting is made from 16-gauge duralumin sheet to the dimensions given. This will suit most engines, and it should be positioned on the false bulkhead in the correct position to give the desired thrust line. This position will, vary with different engines.

All wiring should be carried out with stranded wire in protecting sleeving and all joints should be soldered when possible. The run of the wires will be followed from the wiring diagram given, which is semi-pictorial. The battery is located on its platform by wire hooks passing under the platform and retaining rubber bands, with a soft balsa packing block to keep its terminal strips in contact with the brass contacts on the ply fence.

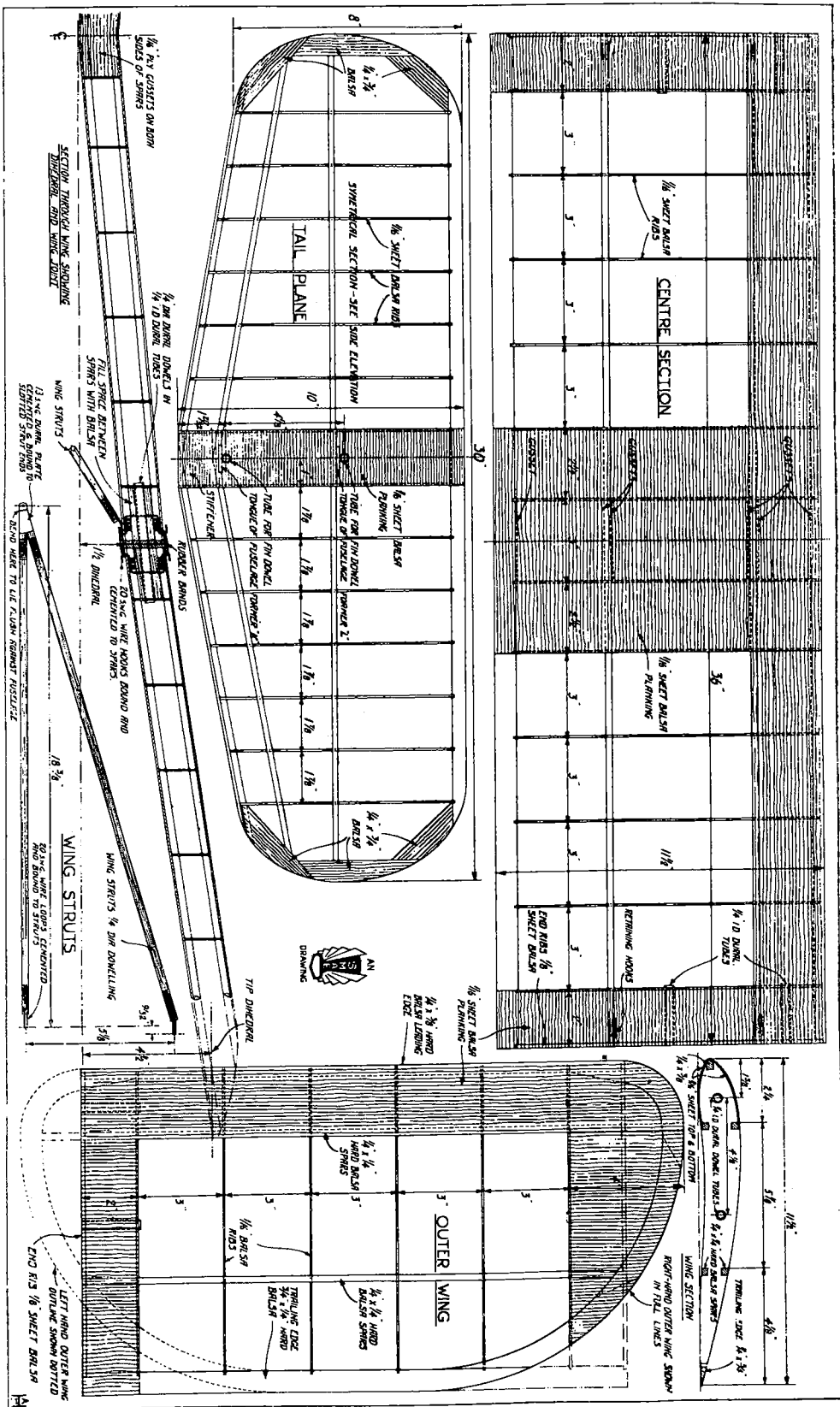
by A.H. WILSON

ENGINE MOUNT MADE IN
16 S.W.G DURAL SHEET

POSITIONED ON BLANKHEAD
TO SUIT THE ENGINE
YOU ARE USING. ENGINE
USED INVERTED ON
PROTOTYPE.



Full size working drawings of this model are obtainable from our publishing office at 15/- the set of two. Post free.



SCALE EFFECT

By P. R. PAYNE

"SCALE effect" is probably the most talked about aspect of model aerodynamics, and never has it been more in the limelight than at the moment. Just recently the L.S.A.R.A. has released details on a series of "laminar flow" aerofoil sections which would

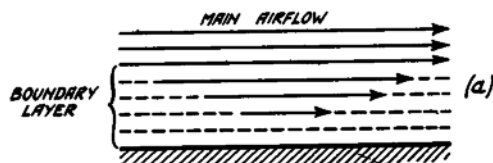


Fig. 1.



appear to possess outstanding performance, whilst on every hand theorists theorise, and wind tunnels spring into being with mushroom-like rapidity. But whilst theory has been going on from strength to strength the great majority of aeromodellers have been figuratively scratching their heads and wondering just what all the fuss is about, and it is hoped that this article will clear the air for them.

The crux of the matter lies in the Boundary Layer, which is the name given to the small region of air next to the surface of a wing. Let us explain. Consider Fig. 1 (a). Although air is flowing over the surface, a thin layer in contact with the surface adheres to it and is stationary. The thin layer next to this is moving very slowly; above this, the next layer is moving a little faster, and so on, until we reach the last layer, which has the same velocity as the surrounding mass of air.

Due to the viscosity ("stickiness") of air, the action of these layers sliding over one another gives rise to very high shear stresses, which are largely responsible for the drag of an aerofoil. Thus, although the total depth of the layer is only a few hundredths of an inch, it plays a very important part in aerofoil theory.

Now for the purposes of studying scale effect, the boundary layer (B.L.) in future can be regarded as a single layer, in which the airflow is quite independent of that outside. So long as

it adheres to the surface of the wing, it can be regarded as an integral part of it, and we can best illustrate it as in part (b) of Fig. 1.

Lastly (and this may at first seem a contradiction in the light of what we have already said about sliding layers of air) there are two distinct types of B.L.

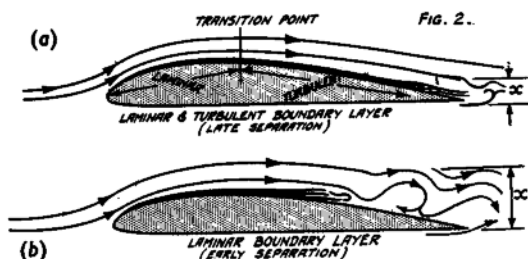
- (a) *Laminar*—in which the airflow is perfectly smooth.
- (b) *Turbulent*—in which the airflow is turbulent, as the name implies.

The Laminar B.L.

This is always present over the front portion of any orthodox aerofoil, and when the airspeed is fast enough, becomes turbulent near the maximum thickness/chord ratio point on the chord, as in part (a) of Fig. 2 when very low speeds are encountered, however (i.e. speeds associated with small and medium sized models), the B.L. does not become turbulent, but breaks away from the upper surface as in part (b), and thus the main airflow breaks away, resulting in increased drag and reduced lift co-efficients. This, then, is the reason behind the poor performance of small models.

The Turbulent B.L.

If a model wing is moving through the air at a fairly low speed, and therefore possesses a



purely laminar B.L., the L/D ratio will be low, as we have already seen. Now, supposing it is accelerated, it will eventually reach a speed when the B.L. will become turbulent instead of breaking away at the transition point. The main airflow will now be adhering over most of the wing, and the lift and drag coefficients will be increased and reduced respectively.

VI Ratio

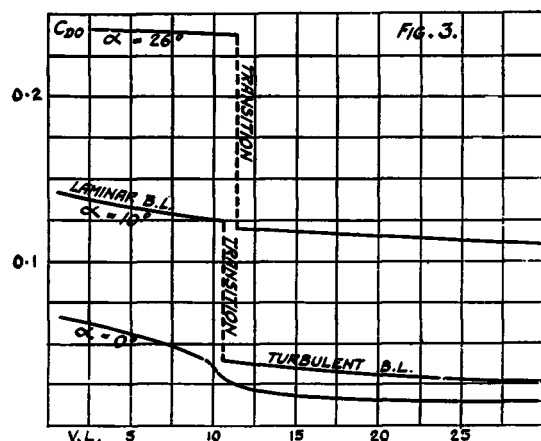
So far we have talked about scale effect in terms of velocity: this is only half the picture, however, and in practice it is the relative velocity which matters and to define this we use the expression:—VI

where V = velocity in ft./sec.

and l = chord of the wing in ft.

Thus the lift coefficient C_L for a wing of chord 6 in. and velocity 20 ft./sec. is exactly the same as that for a geometrically similar wing of chord 12 in. and velocity 10 ft./sec. It follows that for a given VI value the coefficients are always the same.

Now we are in a position to study experimental evidence on the nature of scale effect. Consider Fig. 2. The turbulent air behind the



aerofoil is known as the "wake," and the profile drag of the aerofoil is directly proportional to the depth of this wake ("x" in the diagram). Thus the reason for the high drag associated with a laminar B.L. is obvious.

The lift is proportional to the proportion of wing area over which the B.L. adheres to the surface, and thus again the reason for the low efficiency of the first aerofoil is obvious.

The experimental translation of these facts is shown clearly in Fig. 3. It should be noted particularly that the transition from purely laminar to turbulent boundary layer conditions is not gradual, but in the form of a sharp jump, and since we are frequently operating our models in this region it is important to make sure that their VI is such as to ensure that they are operating on the right portion of the wake.

Modern Development

Modern research workers in this field have followed two lines of development.

- (1) The development of "laminar flow" aerofoils as mentioned above. This approach to the problem is almost entirely due to the L.S.A.R.A., under the guidance of N. K. Walker, B.Sc., and the function of these sections is to delay as far back as possible the separation of the laminar B.L. Broadly speaking, this is achieved by so designing the profile that the pressure gradient is constant, i.e. increases regularly towards the T.E.
- (2) The development of aerofoils with a very low "critical VI," so that at normal flying speeds they are operating with turbulent B.L. In part 2 of this article we shall go more fully into this aspect and give complete research data on a typical section of this class.

MODEL AND FULL-SIZE

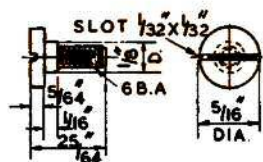
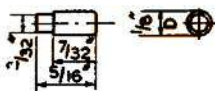
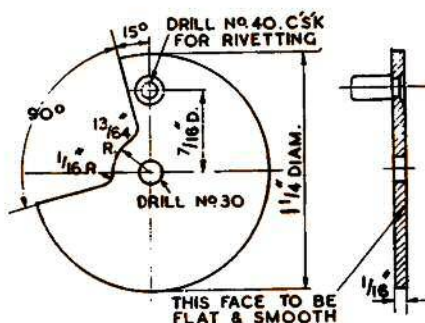
HERE is a new light on the old controversy as to whether a model aeroplane should look like a full-size aeroplane, or not. The conclusion is absolutely sound—although it is a matter of doubt whether or not it will be generally accepted.

A model aeroplane is, by definition and inference, a miniature and should, therefore, bear a close resemblance to a full-size aeroplane. A certain amount of licence is permissible in design to meet the slightly different aerodynamic requirements and the changed structural problems.

The duration type, on the other hand, is not a freak, but a *full-size aeroplane*.

The duration-type machine is designed to a certain specification. For example, a Wakefield is designed to a fixed size and proportions established by the rules. Experience (and calculation) fixes the other proportions and features not covered by the rules and the model is designed to that full specification—part fixed by the rules and part fixed by the designer. The same process applies to any duration type—rubber-driven or glider.

Now the machine built to this specification is *full size*—it is certainly not built half the size or double the size required! Also, by its function, it is undoubtedly an aeroplane. Hence a duration "model" is not a model, but a *full-size aeroplane*. Let the scale fans stick to their model aeroplanes—the duration enthusiasts will build full-size aeroplanes!—R.H.W.



Rotary-valve and pivot screw.

Edgar T. Westbury continues on the "ATOM MINOR" MARK III 6 c.c. Engine

that the crank disc will rest against it. Clamp the shaft temporarily in place, and run a $\frac{1}{8}$ -in. drill down through the hole in the crankpin to "spot" its position on the steel plate. Next remove the crankshaft, and make a spigoted plug to fit the hole in the plate, with a hole tapped to take a $\frac{1}{8}$ -in. screw in its centre. This is used to attach the rotary-valve disc to the plate, after which a $\frac{3}{32}$ -in. or No. 42 drill is used to follow through from the marked position on the plate. The drilling should, of course, be carried out with a reasonably accurate drilling machine, or against a tailstock pad in the lathe, to ensure that it is square with the surface of the plate; and in locating the position of the valve disc, the angular position of the cutaway section should be properly adjusted. Countersink the driving-pin hole on the working face side, and rivet in the pin, which is turned from mild steel, the shank being quite an easy fit in the hole, and well rounded or chamfered on the end to facilitate engagement with the crankpin on assembly. Take care not to distort the plate in riveting, and file the projecting part of the pin dead flush with the surface of plate.

The working surface of the plate is finally lapped on a piece of plate glass with fine carborundum paste, until it shows an even matt surface all over. Similar treatment should be applied to the seating face on the crankcase endplate, but in this case, a more mild abrasive such as brick-dust, should be used, and great care taken to remove all traces of it afterwards.

Should it be desired to run the engine at very high r.p.m., balancing of the rotary-valve disc is desirable, and this may be carried out by riveting a piece of $\frac{1}{32}$ -in. plate near the lower edge of the cutaway, checking the balance in the usual way, by mounting the disc on a mandrel and rolling it on knife edges. This treatment is not necessary for engines running at working speeds not exceeding 6,000 r.p.m.

The pivot pin on which the valve disc runs is turned from mild steel and case-hardened. Note that the plain part under the head is a working fit in the centre hole in the disc, and its length should be such that when screwed fully home, the head of the screw will clamp

THE rotary valve may be cut from steel plate, the most suitable material being the grade of carbon steel known as gauge plate, which has a ground surface, and may generally be relied upon for true flatness; but ordinary mild-steel plate may be used, providing that it is initially flat and is not distorted in cutting out or in subsequent handling. Within limits, the thinner the disc is the better, but as very thin metal may be difficult to true up, and liable to distortion when riveting in the driving pin, it is not advisable to make it much thinner than $\frac{1}{16}$ in., as shown on the drawings. After cutting the plate roughly to shape, it may be trued up on the edge by clamping it against the faced end of a piece of bar held in the chuck, using a $\frac{1}{8}$ -in. screw through the centre hole to hold it in place. The angles of the cutaway sector should be checked by means of a protractor, or by some form of indexing gear in the lathe.

It is most important that the radial position of the pin should be correct, so that it will engage the crankpin freely, without introducing any tendency to force the valve off its seat; one of the most important factors in the success of the rotary valve is that it should "float" freely with no constraint whatever from the crankshaft. The simplest way to ensure this is to make a simple drilling jig, by drilling and reamering a hole in a piece of steel, to take the main journal of the crankshaft, countersinking it slightly so

the disc against its seating. Slacken it back just sufficiently to allow the disc to rotate freely, and lock the screw by means of a nut on the outside of the endplate.

It should be noted that the drawing of the rotary valve shows the working face side, arranged for anti-clockwise engine rotation. Should it be desired to run the engine in the opposite direction, reverse the valve from left to right—which may be done by simply putting the pin in from the other side—and also reverse the endplate to bring the carburettor on the right instead of the left, looking from the rear end. It should also be observed that the engine body is also reversible, as previously explained.

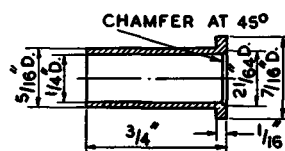
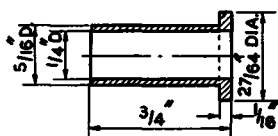
Main Bearing Bushes

These should be turned from a medium-hard bronze or gunmetal, and if length allows, may be machined all over at one setting and parted off. If only short pieces are available, drill and reamer the bores first, and mount them on a mandrel for turning the outside. It will be seen that the two bushes are identical except that the inner one is slightly countersunk at the flange end to clear the fillet of the crankshaft journal. The outside diameter of the bushes should be about $1/1,000$ in. larger than the holes, with a slight taper on the end to assist entry, and should be pressed home in a mandrel press, or the vice will serve if no press is available. As the bores will contract slightly, a reamer should be passed through the bushes after insertion, to clean them up finally, and ensure a smooth working fit for the shaft.

No oil grooves are necessary in the bushes for engines of normal duty. The bearing surface they provide is much greater than that in most commercial engines, and they will have a very long working life if properly fitted in the first place. After four years of really hard work, the original engine of this type shows no perceptible bearing wear.

Cylinder Ports

This operation has purposely been left till last, because it will give an opportunity for a final check on all essential dimensions, and allowance for any possible errors which may arise. The engine should be temporarily assembled, and rotated to ascertain that all moving parts are working freely. It is possible that the connecting-rod may be fouling either



Main bearing bushes.

the crank web, the rotary-valve pivot screw, or the cylinder skirt, and may need easing slightly on the sides or edges; but if the discrepancy is very great, there is obviously something radically wrong with the setting out or machining of the parts. The rod may possibly bind sideways through incorrect end location of the crankshaft, or insufficient end float between the gudgeon-pin bosses; these errors can be corrected by machining away the side faces of the rod eyes or the flange of the inner main bush.

Assuming, however, that the working parts are all in order, the crank should be put on bottom dead centre, and the position of the piston checked; if this is found to be correct, the ports may be drilled in the positions indicated in the detail drawings of the cylinder barrel; but should there be any discrepancy, the reason for this should be sought, and, if possible, corrected before proceeding further. The effect of slight errors here and there have already been referred to, including the influence of the connecting-rod length, and in my experience, these errors are rather the rule than the exception. But should it be found difficult or impossible to correct them, the ports in the cylinder may be drilled in such a position as to ensure their correct timing, which is one of the most essential factors in the success of any two-stroke engine. The port positions should be such that the exhaust ports are fully uncovered at bottom dead centre.

The reason why drilled ports are specified in this engine is because many novices appear to lack confidence in their ability to mill or file ports in the correct place, or of the correct size, and it is generally simpler to mark out and centre-punch a position for a drilled hole. But if the constructor prefers to do so, slots may be formed instead of round holes, and will have the effect of providing greater port areas, giving a much snappier exhaust note, though making little difference to performance at normal working speeds. The transfer ports should in any case be elongated sideways a little, as seen in the cylinder details. Should piston rings be used in the engine, wide port slots are impracticable, and round or squared-out holes or ports, sufficiently narrow to prevent the rings being trapped, are essential.

(To be concluded)

A SIMPLE WIND TUNNEL

The Design and Construction of Tel Aviv Smoke Tunnel—No. I

By Dr. F. J. PIATTELLI

A DESCRIPTION is here given of the smoke tunnel built for the Aeronautical Exhibition, Tel Aviv, Palestine, in February-March, 1946, by the Experimental Centre of the Aero Club, as it is felt that it is of a size suitable for construction by interested individuals or clubs. Details are given of the research work carried out during its construction and operation, and the positive results obtained, as far as steady flow, low turbulence and simplicity of operation are concerned.

(1) Introduction

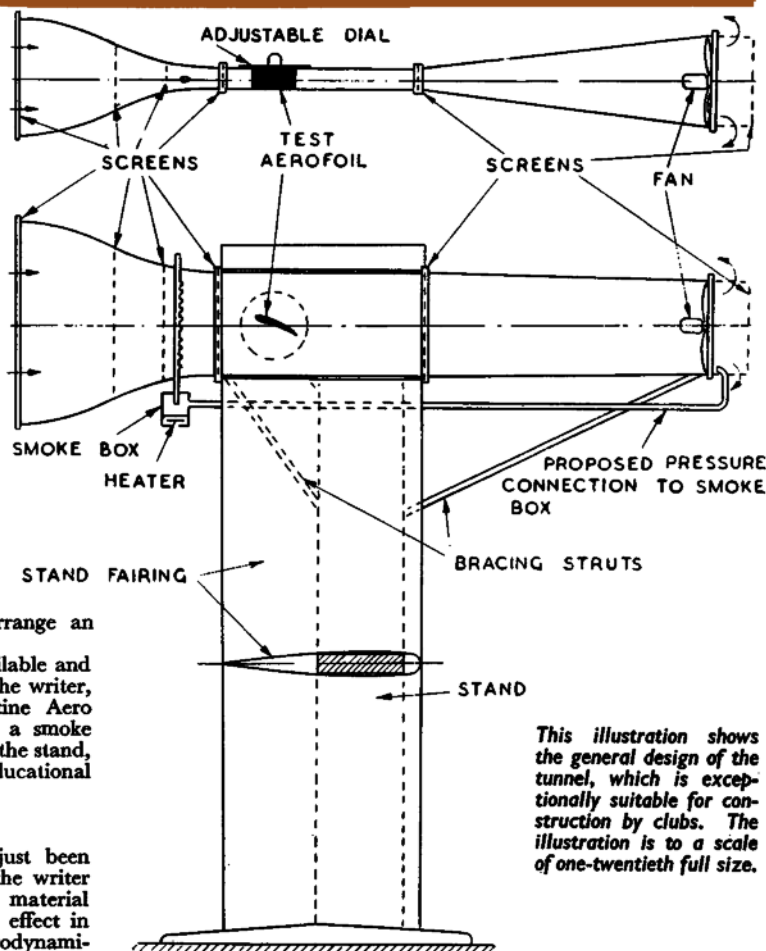
During the first week of February 1946, the Council of the Palestine Aero Club decided to arrange an Aeronautical Exhibition in Tel Aviv.

In spite of the very short time available and pressure of other preparation work, the writer, as general instructor of the Palestine Aero Club, decided to design and build a smoke tunnel to serve as a central exhibit of the stand, because of its high instructive and educational value.

(2) Construction of the Tunnel

L.S.A.R.A. Report No. 11 had just been received, and its study encouraged the writer to consider cardboard as a suitable material for construction. It also had some effect in discarding a table-base tunnel as aerodynamically inefficient, and directing his thought towards a completely independent apparatus.

The tunnel is built up of three main sections and a stand. The working section, of flat type, as in the well-known Lippisch smoke tunnels, is rectangular in shape, being 2 in. deep, 10 in. high and 20 in. long. A 10 x 20-in. window-glass pane makes the front wall, the rear wall being of plywood, $\frac{1}{4}$ in. thick. Upper and lower walls are strips of $\frac{1}{4}$ -in. white wood, with suitable slots for edge lighting. A circular piece of plywood is cut from the rear wall, backed with a slightly larger wooden disc acting as an air seal, and provided with a handle for easy turning. A steel wire spring holds this turning plate in place and suitable reference marks are painted on the plate, to check angles of incidence of the model wing under test. The plate had been originally provided with a fixed demonstration wing section, of 6 in. chord and, of course, 2-in. span, of highly-cambered thick profile. It has later been found advisable to have two interchangeable turning plates, to which different models may readily be attached (by means



This illustration shows the general design of the tunnel, which is exceptionally suitable for construction by clubs. The illustration is to a scale of one-twentieth full size.

of rectangular pegs), so as to test the whole series of available models during a demonstration.

The working section is screwed and braced to a vertical stand (an old sailplane centre-section spar with suitable wooden feet) so as to be at eye level. The stand is covered and faired with a sheet of cardboard, so as to offer a thin, symmetrical wing section. The result is a very clean apparatus, from the aerodynamic point of view.

To the main section, a cardboard entry and expansion cone are attached. All three components are provided with external wooden frames, or flanges, and may easily be assembled or dismantled by means of a few screws, so as to make transportation easy. Care has been taken to ensure that no internal steps occur at the connection of the various cardboard sections, glass window, etc.

The entry section is built up of four pieces of cardboard, connected at the ends to rectangular frames and jointed at the edges by glued fabric strips. The corners have been

carefully filleted inside with long triangular pieces of cardboard and covered with paper. It is 20 in. long, and its intake opening is 12 in. by 20 in.

Experience obtained by the writer in testing small-scale preliminary models of the Guidonia wind tunnels (in 1931) has induced him to design a double curve, high contraction inlet, to obtain steady and low turbulence flow. The tangents to the walls are, in fact, parallel at both up-wind and down-wind end sections of the entry. No difficulties have been found in obtaining steady and parallel flow.

The cardboard expansion tube is, of course, 2 in. by 10 in. rectangular at the working section flange, and 8 in. circular at the fan end, to fit the propeller. This necessitated a small reduction in height, together with an increase in width, but had no adverse effects on the flow, as will also be mentioned later. The cone has been braced to the stand by means of an external strut, to carry the weight of the motor and is 30 in. long.

The whole tunnel has been entirely painted a dull "instrument" black inside and out, the model wings being painted a matt-white on the window side section to give contrast.

(3) Motor and Fan

A Wood's Propellair Mark V fan has been adopted as the standard suction power, because of its smooth running and general efficiency. The motor is of the totally enclosed type, thus protected from adverse effects from the smoke. The original fan, with $7\frac{1}{2}$ in. diameter blades (four blades), has been used, because of its sturdy and carefully balanced construction. With a speed of 1,200 r.p.m. at 25 watts, 50 cycles, 220 volts, a.c., two-phase supply, the exhaustor is rated for a displacement of 250 cu. ft. per min. if attached to a wall without appreciable static pressure difference between the sides. The blades are, however, designed to function efficiently in differences of pressure capable of reducing the displacement to 160 cu. ft. per min. Thus, theoretically, a speed of just over 9 ft. per sec. should be experienced in the working section. No pitot tube tests have been made yet for lack of suitable apparatus, but tests with intermittent smoke production have shown the speed to be between 2 and 3 ft. per sec. in the centre section, according to the number of screens included in the air stream. In general, the lower the speed the better the visibility and smoothness of flow, so that there has been a tendency to add screens at both ends during the tests.

The difficulty mentioned in L.S.A.R.A. Report No. 11 of the air being pushed backwards inside the tunnel by the central portion of the fan blades has also been experienced here. The author had already found similar difficulties with the existing blower of the Experimental Centre, for which special blades had been designed, and also in the past with other tunnels, and did not even attempt to improve the situation acting in the region of the fan blades. He believes that a long expansion cone, and suitable screens placed *after* the working section, are sufficient to damp out any back-flow influence of vortices, which are very difficult to avoid near the motor and fan. Tests with smoke streams without models have shown that the streams are satisfactorily straight and parallel up to the end of the central window, i.e., for the 20-in. length of the working section.

(4) Screens

Ordinary cotton gauze screens (medical gauze) have been used throughout, except at the exit, after the fan, where a sackcloth (jute) screen has been adopted. Three screens (two before and one after the smoke tube, just at the entrance of the working section) have been placed upstream from the beginning, with a fourth large screen at the inlet opening added later. Another gauze screen is placed at the end of the working section, as mentioned in §.

Screens are not mounted on frames, but glued to the

cardboard walls of the outboard sections, to avoid any steps or discontinuity inside the tunnel.

(5) Smoke Production and Control

The original idea for smoke production was to have a comb of very long pointed glass tubes reaching from the inlet to the test chamber and each holding a lighted cigarette outside the tunnel. Tests have shown that the pressure gradient between the two sections is sufficient to draw smoke through the tube, but not in such quantities as to make visibility practical.

It was soon decided to build a distribution tube capable of delivering smoke streams, and several streamlined tubes have been built and tested before reaching satisfactory results. A fairly close pitch between holes has been found desirable, the present arrangement consisting of a streamlined metal tube with $\frac{1}{4}$ in. diameter holes evenly distributed ($\frac{1}{2}$ in. between centres) at the trailing edge. The tube is connected to the lid of a metal smoke-box.

The present smoke-box has a single large hole in the bottom and a metal plate at mid height that can be heated by an electrical resistance. Kerosene is dropped on the plate from outside through an aluminium tube and funnel (not shown in the drawing). Little resistance is opposed to the air, which coming from the lower hole and passing in the annular space between heated plate and box walls is loaded with fumes and sucked into the upper tube and tunnel. The operation is entirely automatic and a single operator can work the push-button connections (on the stand) and drop the liquid, while addressing the onlookers and changing the plates and sections as required during the lecture. Once the smoke-box has been adopted, the first screen could be fitted.

It has been noted that blowing air in the box somewhat improves the visibility of the fumes, which become rich and white in colour. It is now proposed to build a cardboard pressure tube to the smoke-box, taking air under pressure from a cylindrical extension of the expansion cone after the fan, the end screen of which should be removed. A fraction of the air would thus be recirculated. Good lighting, however, greatly improves visibility and may render this added complication unnecessary.

(6) Lighting

Slots had been provided in the upper and lower walls of the chamber, for the installation of the two electric bulbs for edge lighting. During the exhibition no special lighting devices have been installed, the contrast between white smoke streams and black walls being quite sufficient for display purposes. Tests with strong bulbs, however, have shown the great advantage, for scientific research, of intense edge lighting, showing fine details of turbulence and any small imperfection of flow, leaks (if any), etc. Lighting from the entrance cone by means of a projector has also been tried, but the best arrangement is that originally planned, with two (upper and lower) bulbs in the emplacements already provided. The bulbs should be mounted so as not to light the back wall at all, but only the smoke streams. Two bulbs are necessary to avoid shadows from the stub wing.

(7) Conclusions

With very simple means, the materials being mainly scrap wood and cardboard, apart from the electric fan, an efficient and inexpensive smoke tunnel has been built and satisfactorily tested. Its value is mainly in the educational and display fields, but accurate comparison qualitative tests are possible in the hands of competent research workers. Inspection of flow patterns three or more chords long, even for the biggest models used, is possible, with spectacular effects when Karman street, oscillating motion of wake, stalled flight, etc., are shown. The apparatus is neat and easily transportable, practical for school or club work, and may be developed in dimensions and scope to a real and useful research equipment.

CORRESPONDENCE

The Editor takes no responsibility for the views expressed by correspondents, who express their own viewpoint. Publication does not indicate that the Editor agrees with the views expressed.

PETROL MODELS

DEAR SIR,—I have read with great interest the letter from Mr. W. A. Dean in the October issue of *MODEL AIRCRAFT*, and I am afraid that I cannot agree with all he says. I shall take his points in the same order.

(1) I fully agree with the first part (hand launch or R.O.G.) but I think that the three-minute rule would be best left as it is. Who wants to go to a competition 30 miles away to see only two hours' flying? (This from the spectator's point of view.)

(2) I do not agree with the question of having a variable motor run, as a competition man wants to fix his timer at one certain value, say 20 sec., and not to touch it again. This procedure avoids any twiddling about.

(3) I fully agree that any repairs should be allowed.

(4) In my opinion there should be no restriction on weight, as if we are scared of injury to spectators, why make the models have a minimum weight? Surely a maximum wing loading would be best.

The point of fixing the minimum weight to comply with the prevalent weather conditions would, to my mind, be unworkable, to say the least. Also the limiting of balance weight to be added. A man does not want to take his light-weight petrol model to the competition to find that he is barred from competing merely because the addition of 5 per cent. of the original weight is not enough. The fuselage formula quoted would be satisfactory, but why not make it completely open?

Mr. Dean then remarks that a minimum loading rule would automatically rule out the flimsy type of model. But surely the flimsy type of model is the safest from the spectator's point of view. If a model is likely to come to pieces it would be quite safe.

Regarding "freak" designs. Is any design a "freak" after it has been in use for a bit? The monoplane was a freak when every plane was a biplane, and so is everything until it loses its novelty.

To sum up. Why should a model not be light? It's quite easy for a light model with a small engine to beat larger and heavier companions. D. STOLLERY.

TAILPLANE TOPICS

DEAR SIR,—It pained me to read in the August journal that lifting tailplanes are considered much inferior to flat plates. The trouble is, that despite the contrary advice of theorists, most modellers fit a wing at 3 deg. incidence and the tailplane at zero, while the maximum power factor for the section used (usually R.A.F. 30 or Clark Y.) is around 8 deg., and then they trim the model with a minimum of weight in the nose to get a slow, gentle glide with minimum sinking speed, i.e. with the wing at 8 deg. angle of attack. Thus, if the incidence (the angle with the fuselage datum line) is 3 deg., the fuselage must be at 5 deg. to the line of flight, and the flyer will believe his tailplane at 0 deg. angle of attack, whereas it is at 5 deg. Thus, if a lifting tailplane were in use, it would stall shortly after the wing and also, being at 5 deg., would give a powerful —oe moment (using Mr. Payne's notation), i.e. it would be critical and uncontrollable, as Mr. Payne says, is found in practice. The flat plate gives only a moderate —oe moment which makes it controllable,

but in this attitude it gives plenty of drag, as does the fuselage (Fig. 1). Now, if we put the wing at about 6 deg., or as near the angle for max-power factor as is safe, and a lifting section (usually Clark Y. type) around zero incidence, when trimmed as usual, the line of flight will be parallel to the datum line, and the angles of incidence and attack will be identical, or nearly so. The tailplane will provide lift to help the wing, and its —oe moment will dispense with a considerable amount of the trim weight in the nose, while, being at 0 deg., initial correcting moments will not be large, since the lift curve will not have a steep slope around here, i.e. it is not critical and uncontrollable; also it will not stall till long after the wing; the tailplane and fuselage will be in a low drag attitude, while removal of nose weight reduces the moment of inertia, further improving stability (see Fig. 1).

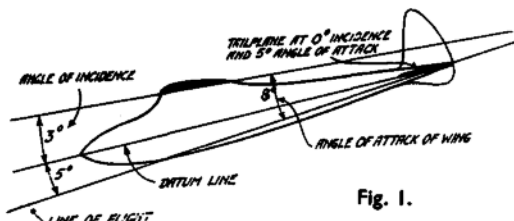


Fig. 1.

I recently modified a "Plover" glider, increasing the incidence from 3 deg. to 6 deg. and altering the wing section from Clark Y. to a heavily-cambered one. The flat plate tailplane I left unaltered. I trimmed it to fly at low sinking speed, near the stall, requiring a large addition of lead weight, the nose now being relatively short. It flew O.K. at first but, after a bit of wear, instead of pulling out of the inevitable slight

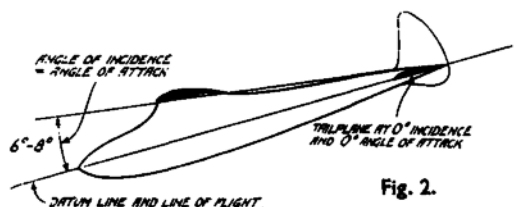


Fig. 2.

stall on release, the oscillations gradually built up. Applying the usual remedy—a little weight in the nose—had no effect. Another ounce or more made it worse instead of better (no doubt because of the increased moment of inertia). The tailplane moment arm and area were ample, and I then realised that weather or wear had produced a slight warp somewhere unnoticed, so that the wing was stalling before the tailplane could give any effective correcting moment. I put a little packing under the wing T.E. whence, after removing a little weight, the plane flew as originally, except that it was slightly more nose up. I built a new tailplane of Clark Y. type section, and on testing the machine it was found to have a slight dive. After removing over 1 oz. of the original trim weight, a good slow glide was re-obtained, and the model was far less critical than with a flat plate.

M. TOMLINSON,
Press Sec., Aireboro' Grammar School M.A.C.

THE FROG "175" PETROL ENGINE

THE advent of the Frog "175" petrol engine marks an important step in popularising power-driven model aircraft flying, as it combines low initial cost with sound design and the engine is at the same time of sufficiently small dimensions to appeal to those who have not the space nor the desire to produce machines of large size.

Possessing a bore of 0.5 in. and a stroke of 0.55 in. with a cubic capacity of 1.75 c.c., it is the smallest petrol engine at present available on a quantity production basis, and at the moderate price of 75s. complete with coil, condenser, and an interesting plastic propeller, it is remarkable value for money.

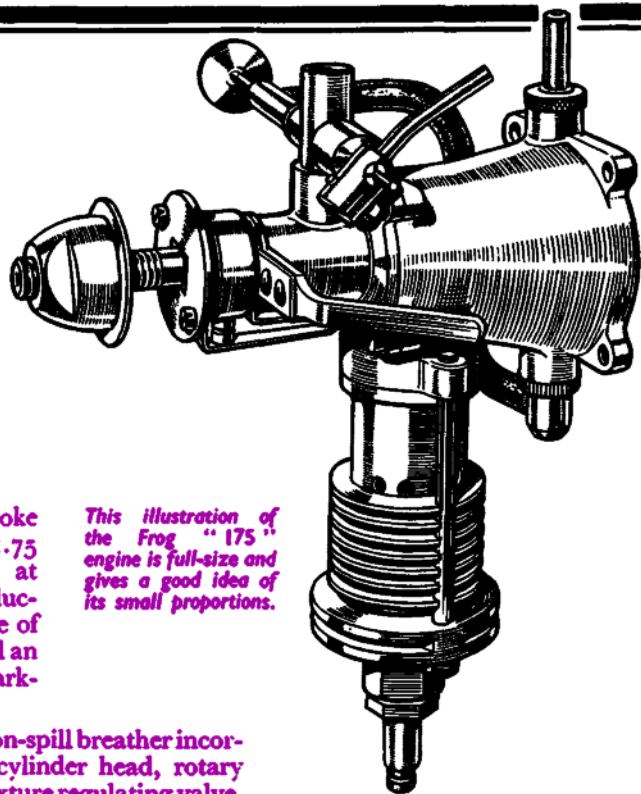
The integral petrol container, with non-spill breather incorporated in the filler-cap, detachable cylinder head, rotary admission valve, lever control for the mixture regulating valve, special plug for clearing jet, convenient location of air intake, hardened and ground cylinder and piston, and simple contact-breaker design, are some of the more important features of the engine. It can be run either in the upright or inverted positions by simply reversing the locations of the filler cap and petrol outlet union.

It is arranged for simple bulkhead mounting by the flanged end of the integral petrol tank "a la Bowden" and its running weight is 6 ozs. With the standard 9-in. diameter airscrew supplied, a static thrust of 0.75 lb. is claimed by its manufacturers at the maximum revolutions of 6,000.

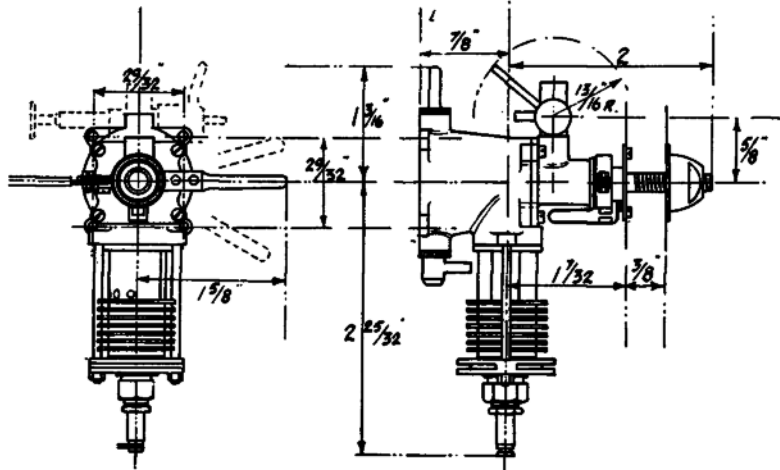
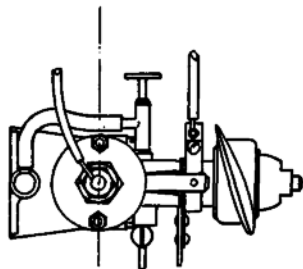
A well conceived design, it should become extremely popular with all classes of modellers.

Every engine is bench tested by the manufacturers before despatch ensuring that they are capable of a good performance if properly handled.

The installation drawing on the right gives the principal dimensions and details required when arranging for its incorporation in your design. If you do not wish to design your own machine, the makers have prepared one for you, available in kit form, known as the Frog "45."



This illustration of the Frog "175" engine is full-size and gives a good idea of its small proportions.



NEWS *from the* S.M.A.E. and CLUBS

Some members of the Coventry and District M.A.C. taken at a recent indoor meeting, from which will be seen that they are well in their stride with R.T.P. models.



MINUTES OF THE PROCEEDINGS OF A MEETING OF S.M.A.E. AREA DELEGATES Held at the Golden Lion Hotel, Leeds, on November 3rd, 1946

In the Chair: MR. A. F. HOULBERG.

- Agenda: 1. The development and organisation of areas, including the adoption of a constitution.
2. The basis of financial assistance to areas.
3. The duties of area officers.

The meeting was opened by the chairman stating that the delegates were present to discuss the basic principles of area administration which should operate in 1947.

He mentioned in connection with the item on the agenda dealing with finance, that as the result of the increased affiliation fees, payable as established at the last annual general meeting, the proportionate amount for allocation to area councils was £65 os. od., if we were to divide this between areas already established, and also those just formed, it would mean these area councils receiving about £10 os. od. each.

Mr. Jeffreys (London), was asked to inform the meeting as to the approximate cost of administering his area, which comprised the greatest number of clubs. He replied that for the last full year, (1944), this would be about £20 os. od. The Midland and North-Western delegates agreed that a minimum of £20 os. od. was needed.

Mr. Rushbrooke (Midland), considered that to date areas had been formed haphazardly, and, to avoid multiplicity, clubs should be directed to join a specified area by the S.M.A.E. Council. At present non-affiliated clubs were included in certain area councils, and Mr. Walker (hon. secretary), wished to ascertain how this point would be overcome under the new scheme. Mr. Jeffreys stated that he believed that this problem would solve itself, since these clubs would realise the benefits accruing from the area scheme.

The chairman mentioned that in view of the Society's greatly increased business and finances, the matter of forming the Society into a Private Limited Liability Company was desirable in order to protect the interests of all members. This matter will have to tie-in with the proposed revised S.M.A.E. constitution.

Mr. Rushbrooke proposed:—"That consideration be given to the Society being formed into a Limited Liability Company and the whole matter be discussed at a delegate meeting to be called at the earliest opportunity." This motion was seconded by Mr. R. F. L. Gosling (vice-chairman) and carried unanimously.

In connection with the above proposition, Mr. S. W. Smith (Midland) requested that notice of meetings should be issued twenty-one days before the date of the meeting.

The Midland and Northern delegates suggested that the area councils be responsible for the collection of all affiliation fees and in turn pass on the correct proportion to the Society. All delegates were in agreement that area councils should take over certain duties to relieve the Central Council.

Mr. R. Lawton (North-Western) then proposed:—"That the officials of the area councils be responsible for the administration, conduct and general management of their specified area and shall forward to the central body 50 per cent. of all affiliation fees collected." Mr. Rushbrooke seconded this proposition, which was carried.

In order that areas already constituted should be able to continue their work on a sound financial basis, Mr. S. W. Smith proposed:—"That the S.M.A.E. Council instruct the hon. treasurer of the Society to pay such sums to the area councils as were covered by the resolution passed at the A.G.M." This proposition was seconded by Mr. Jeffreys and carried unanimously.

It was agreed by the delegates that all clubs upon paying fees to the area councils would automatically become affiliated to the Society, thus area councils would be responsible for the acceptance or rejection of applications.

Following this decision to transfer increased authority and responsibility to the area councils, Mr. Rushbrooke suggested that the interests of the Society must be safeguarded and therefore he wished to propose:—"That the S.M.A.E. Council reserve the right of access to all area books and records as occasion demands." Mr. S. W. Smith seconded this motion, which was carried.

Among other suggestions discussed by the delegates was one for the publication of a geographical map showing clubs and indicating area boundaries. It was mentioned that country membership fees must be adjusted by the sum of 13s. 6d., which was the cost of the twelve issues

of MODEL AIRCRAFT received by these members, thus 7s. 6d. should be taken as the operative figure.

Mr. R. F. L. Gosling then proposed :—" That all such items as badges, transfers, etc., shall be paid for in cash by the area treasurers to avoid unnecessary book-keeping." This was seconded by Mr. R. Lawton and carried.

The chairman then outlined a possible new chain of organisation. This was fully discussed by the delegates and Mr. S. W. Smith put forward the following recommendation :—" That the S.M.A.E. Council shall, under the new constitution, be known as the Executive Committee dealing with international and national matters of high policy ; an area committee consisting of delegates from areas shall deal with contest rules, dates and running of contests, area matters of a general and inter-area nature ; area councils consisting of delegates from clubs to deal with area administration, area competitions, rallies, etc." Mr. Jeffreys pointed out that the Area Committee was not necessary, since its composition was practically the same as the Executive Committee therefore he suggested that this could be deleted. After some further discussion the delegates agreed.

The present draft constitution for areas was carefully perused and various amendments to wording were agreed.

Mr. Jeffreys proposed :—" That an additional officer known as the Press and Publicity Secretary, shall be included in the list of officials as shown on the draft area constitution." This was seconded by Mr. Rushbrooke and carried.

Mr. Rushbrooke then proposed :—" This draft constitution should be adopted as standard, with slight modifications to suit local conditions to be approved by the Executive Committee." Mr. R. Lawton seconded this proposition, which was carried.

Mr. Rushbrooke stated that he had always considered the terms of office of the S.M.A.E. Council were wrong because they did not allow for any continuity of policy, a complete new council could be elected each year which would not be conversant with the working of the Society ; this was not an ideal situation. Therefore he proposed :—" That the officers of the Executive Committee be elected for a period of two years, half of which should retire each year." This proposition was seconded by Mr. R. Lawton and carried.

This terminated the business of the meeting and in conclusion the chairman thanked the delegates for their attendance, which would enable the Council to develop its plans.

A " vote of thanks " to the Chair was carried.

THE LONDON AREA NEWS

The 1946-47 L.A. R.T.P. Draw

Competition secretary, A. R. Parker, writes :—" The fact that I received ten entries for this contest gave me an immediate headache ! "

As ten is not equally divisible by three or four, it was necessary to have two " boxes " of five. Fortunately, there are five clubs North and five clubs South of the Thames. Each club in the following arrangement has two home and two away contests.

December 1st-21st :

N. Kent v. Zombies.
Chingford v. N. Heights.

Blackheath v. Streatham.
Harrow v. Hayes.

December 29th-January 18 :

Blackheath v. North Kent.
Harrow v. Chingford.

Croydon v. Streatham.
Brentford v. Hayes.

January 19th-February 8th :

N. Kent v. Croydon.
Chingford v. Brentford.

Zombies v. Blackheath.
N. Heights v. Harrow.

February 9th-March 1st :

Streatham v. Zombies.
Hayes v. N. Heights.

Croydon v. Blackheath.
Brentford v. Harrow.

March 2nd-29th :

Streatham v. N. Kent. Zombies v. Croydon.
Hayes v. Chingford. N. Heights v. Brentford.

Note.—Home teams named first. Team of two. Two flights each. Results to be forwarded to Competition Secretary within four days of contest. Contest decided on total aggregate. So if an away team fails to arrive, the home team should make their four flights and forward the results.

A North of Thames v. South of Thames final will take place as soon as possible after final round, the " North " team with highest aggregate meeting the " South " team with highest aggregate.

The Competition Secretary's address is 3, Eversley Avenue, Barnehurst, Kent. (Telephone : Erith 3170.)

REPORT OF LONDON AREA A.G.M.

(November 16th, 1946)

Before the business of the meeting commenced, the Keil Trophy was received by Mr. Taylor on behalf of the winner, Mr. Gunter, Bushy Park. The *Daily Dispatch* R.T.P. Cup, wrested from the North, was received by Mr. S. Mayo on behalf of Mr. J. Wingate, Streatham, who captained the London area team.

After the minutes had been read, and outgoing officers had given their reports, Mr. E. F. H. Cosh brought to the notice of the meeting the death of Miss Houlberg, daughter of the chairman of the S.M.A.E. Sympathy for Mr. and Mrs. Houlberg was expressed, and a letter of condolence was instructed to be forwarded.

The Council notified the meeting that an E.G.M. would be called in the near future to review the proposed changes in the S.M.A.E. and area constitutions.

Blackheath M.F.C. proposed that individual clubs be restrained from holding their own open days, rather than they combine and have four large open days per year within the area. Feeling was strong against this proposal, but it was passed with a majority of four.

Mr. Cosh proposed that a 5 sec. margin must be obtained to win a London area team contest. Mr. Gregory put forward an amendment that 15 sec. replace 5 sec. Mr. Cosh withdrew his original proposal in favour of the amendment. Voting took place and the 15 sec. margin passed.

It was proposed that petrol duration models be added to the types of models required in the London Area Challenge Cup contests. This proposition was lost.

A centralised indoor meeting was suggested and agreed to. This will include free-flying microfilm models.

The following persons were elected as officers for 1947 :—

Hon. Chairman : Mr. E. F. H. Cosh.
" Vice-Chairman : Mr. A. G. Bell.
" Secretary : Mr. R. Jeffreys.
" Treasurer : Mr. F. J. Johnson.
" Comp. Sec. : Mr. A. R. Parker.
" Publicity Secretary : Mr. E. J. Buxton.

Members of Council : Miss M. A. Green, Messrs. S. Mayo, R. Rock, J. Marshall, D. Gordon and M. White.

Auditors : Messrs. Copland and Drake.

The meeting concluded at 5.40 p.m. with a vote of thanks to the Chair.

NORTHERN AREA NEWS

The Northern Area is arranging for an indoor R.T.P. rally again this year. This event will take place in the Houldsworth Hall, Manchester, on February 9th, and in addition to Class " A " and Class " B " R.T.P. contests ; a speed contest and a team contest for the *Daily Dispatch* challenge trophy will be held.

It is also hoped to hold a contest for free-flying models as well.

Keep this date open !

THE MIDLAND AREA COUNCIL OF THE S.M.A.E.

The annual general meeting will be held at the Bristol Street Council School, Bristol Street, Birmingham, on Sunday, January 12th, 1947, commencing at 11 a.m. All clubs within the area are requested to send one delegate. Voting will be carried out under Rule No. 5(d) of the area constitution. The agenda is:—

1. Minutes of the previous meeting.
2. Hon. Secretary's report.
3. Hon. Treasurer's report.
4. Hon. Competition Secretary's report.
5. Resolution submitted by the area committee "That a Publicity Officer be added to the list of officers and that the title "Delegate to the S.M.A.E." be altered to read "Area Executive Committee Member."
6. Election of officers.
7. Notices of motion.
8. Area competition programme for 1947.

The first four items on the agenda need no explanation. In dealing with item 5, your committee wish to bring to your notice that if this resolution is adopted it will bring our constitution in line with the proposed new constitution of the S.M.A.E., which will be circulated to all affiliated clubs in the near future. Mr. Rushbrooke and Mr. S. W. Smith recently attended an area committee meeting in Leeds. The purpose of the meeting was to discuss certain details of the proposed new constitution.

Please note that under rule 4(d) nominations must be sent to the area secretary and although no time limit has been given, I would suggest that this is done so that the area secretary may send out a list of the nominations at the same time as particulars of notices of motion are sent, i.e. not less than ten days before the meeting. (See rule 9(d)).

Item 8. The S.M.A.E. competition programme is now to hand and from this you will notice that two area semi-centralised contests are to be held on April 13th and another two on September 14th. An area rally could be arranged for each of these days and suggestions as to further rallies and offers of flying grounds would be welcome.

Indoor Rallies

The committee is at present negotiating the hire of a suitable room for indoor flying in the Birmingham area, and as soon as this is settled notices will be sent out; meanwhile if any club has suitable premises and would care to offer use of same for the purpose of holding an area rally, then would they please write to Mr. Cook, Hon. Competition Secretary, 190, Tessall Lane, Northfield, Birmingham 31.

The programme for the first rally will include contests for free flying, 1-oz. and 2-oz. R.T.P. and speed R.T.P., so get your models ready.

By the way, the meeting will be held on a Sunday and will commence at 11 a.m.

NEWS FROM THE CLUBS**COVENTRY AND DISTRICT M.A.C.**

Members have now got well into their stride for the indoor season, and some good times have been put up. This season we have obtained the use of a school hall, so more free-flight models are to be seen at our meetings.

The Class "A" R.T.P. record has been raised twice already. First by C. A. Barr, who put it up to 2 min. 48 sec., and then by R. Toms, raising it to 3 min. 23.5 sec. His model was a low-wing microfilm-covered job. This member also has put up the highest time for free-flight jobs, with 1 min. 32 sec.

The Junior record for R.T.P. models has also been raised, by the previous holder, R. Roberts, to 2 min. 2 sec.

The Club is planning for a Social and Dance to be held late in January; details from the Secretary, A. J. BARR, 29, Foster Road, Radford, Coventry.

ILFORD AND DISTRICT M.A.C.

The committee are drawing up a complete programme for next year, starting with a big rally at Easter on our aerodrome at Fairlop, Essex, which will last two days. Public Address equipment, catering, etc., will be provided.

The Club will also take part in all the National competitions next year.

Membership now stands at 111 (50 per cent. seniors). Mr. A. G. Goudge has presented a cup for the best Wakefield class model in the club. A pantomime is being arranged for the end of January, the players being club members. By this means it is hoped to supplement club funds.

Luton and District M.A.S. Indoor Programme 1947. S.M.A.E. Rules

Jan. 16th—Open Contest. Max. span 30 in.

Jan 30th—S.M.A.E. R.T.P. Flights.

Feb. 13th—Flying Scale Contest. Duration.

Feb. 27th—S.M.A.E. Contest Flights. R.T.P.

Mar. 13th—Speed Contest (S.M.A.E. Rules).

MERSEYSIDE M.A.S.

The main event recently has been an inter-club contest, the visiting team being the St. Helens M.A.C. Each club was represented by a team of four; two Class "A" and two Class "B." In the first round, for Class "A" models, both clubs were equal with five points each. In the Class "B" event, however, Merseyside took the lead, scoring seven points as against St. Helens' three, and therefore winning by twelve points to eight. Everyone enjoyed the evening, and it is hoped that we shall soon have the opportunity of meeting these fellows again.

A series of talks and a quiz have been arranged, and "miniature exhibitions" (for want of a better description) are to be staged. These will be informal, of course, and should prove beneficial to everyone, the idea being to give members the opportunity of seeing what the other fellow is doing.

NORTHAMPTON M.A.C.

The outstanding event during the past month has been the holding of the Club's first dinner, in the Town Hall on November 21st, which was attended by nearly 100 members and friends. It proved to be a very successful event, which we hope to hold annually in future.

The president, Mr. Howard Boys, occupied the chair, and amongst those who were present was the Mayor of Northampton (Councillor Percival C. Williams), the Chief Education Officer (Mr. H. C. Perrin), the vice-president of the Club (Mr. Cowper Barrons), the chairman of the S.M.A.E., and Mr. G. W. Smith, the Midland Area delegate of the S.M.A.E.

Proposing a toast to the Mayor and Mayoress of Northampton, Mr. Howard Boys mentioned that the Club was started in 1932 and since that time had never looked back.

In his reply, the Mayor disclosed that he himself had been a maker of model aircraft for some time, though his models could not compare with the modern products on exhibition that evening. He was gratified to learn that the Northampton M.A.C. was making such good progress, and promised his support and interest throughout his term of office. Had not models been made from balsa wood he

doubted whether we should have seen the wartime marvel of the wood-framed Mosquito.

Proposing a toast to the S.M.A.E., Mr. Barrons pointed out that the Society offered members a great opportunity and possessed a great mission. Model makers were, in a true sense, the back-room boys of an aeronautical age, and he admired the people who had both the patience and knowledge to make splendid models such as those on display.

Paying a tribute to Mr. A. F. Houlberg for his labours on behalf of the S.M.A.E., he said Mr. Houlberg was a pioneer in model aircraft, having been a constructor for forty years and chairman of the S.M.A.E. since 1932. In that time model aircraft had developed from the kite-and-string stage to the rubber motor, the petrol motor, the compression-ignition engine and latest of all—the rocket stage.

In his reply, Mr. Houlberg said the Society was in the process of becoming affiliated with the Royal Aero Club, which would shortly be its official address. The Society had recently been honoured by his election as President of the Model Commission of the F.A.I. He was glad to see so many young members present and gave them encouragement by pointing out that he was only fourteen when he broke the world's record for duration. The reason why he was still able to take effective part in model building and flying was the fact that he started young.

In proposing the toast of the Northampton M.A.C., Mr. S. W. Smith pointed out that the Club had the largest membership of the forty or fifty clubs in the Midland area, and he hoped that an exhibition would be held in the Midland area, where the Club could show its wonderful collection of models.

Mr. F. Mason, chairman of the Club, in reply, said that the Club intended to go ahead with the movement, both nationally and internationally. He paid tribute to the work of Mr. N. Pettitt, the secretary.

Mr. H. C. Perrin, a vice-president, proposed a toast to the visitors, which was followed by the presentation of the Club prizes, won during the year, by the Mayoress and several items of entertainment.

Altogether a very good evening.

ST. ALBAN'S M.A.C.

The weather has now finally put a stop to outdoor contests, so the Club is beginning to venture a little R.T.P. flying.

On October 23rd, enthusiasm was plentiful, but models few for our first competition of the R.T.P. type. First place was gained by B. Barnard, aggregate for two flights, 86.3 sec. Second was D. Newhouse, with 81.6 sec. Incidentally, the Club record is held by F. Maiden, with a flight of 61 sec. r.o.g.

The last outdoor meeting of the year was held on November 10th and organised by the Radlett M.A.C., in which Potters Bar and St. Albans participated.

The results were:—*Rubber Duration*—(1) N. Peck (St. Albans), 6 min.; (2) R. Seabrook (St. Albans), 4 min. *Glider*—(1) J. Bond (Potters Bar), 3 min. 21 sec.; (2) J. McMorro (St. Albans), 2 min. 6 sec.

On November 13th a lecture was given by J. Greening, our president, on "Wing Forms—in Bird and Aeroplane." Lantern slides, kindly lent by the R.Ae.S. were used to illustrate this.

SALE A.C.

J. M. Holbrook is the first member to build an indoor microfilm job. The design follows closely the lines of Copland's well-known indoor microfilm model.

The performance averages between 1½–2 minutes.

Unfortunately, Mr. Holbrook has now had to leave us to join the R.A.F., where we all wish him success.

CHANGES OF ADDRESS AND NEW SECRETARYSHIPS

Chingford M.F.C.: The Hon. Secretary is now Mr. A. Hand, of 169, Normanshire Drive, South Chingford, London, E.4.

Eastbourne M.F.C.: Hon. Secretary, L. Downer, 5, Cavalry Crescent, Eastbourne.

Whitefield (Youth Movement) M.A.C.: New Secretary, Mr. N. Wakefield, "Minden," 100, St. Ann's Road, Prestwich, Manchester.

NEW CLUBS

Ampleforth College M.A.C.: Hon. Secretary, R. A. Twomey, St. Bede's House, Ampleforth College, York.

Belfairs M.A.C.: Hon. Secretary, M. A. King, 156, Marine Parade, Leigh-on-Sea.

Finchley M.A.C.: Hon. Secretary, L. Bridges, 20, West Avenue, Finchley, N.3.

Greenford and District M.A.C.: Hon. Secretary, J. A. Pallett, 63, Hodder Drive, Perivale, Greenford, Middlesex.

Weston-super-Mare and District M.A.C.: Hon. Secretary, M. Wells, "Lyndale," Milton Park Road, Weston-super-Mare, Somerset.

Worthing and District M.A.C.: Hon. Secretary, R. Pearson, 9, Terringes Avenue, Tarring, Worthing.

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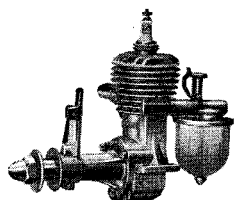
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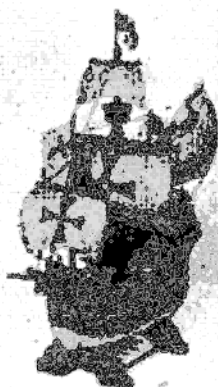
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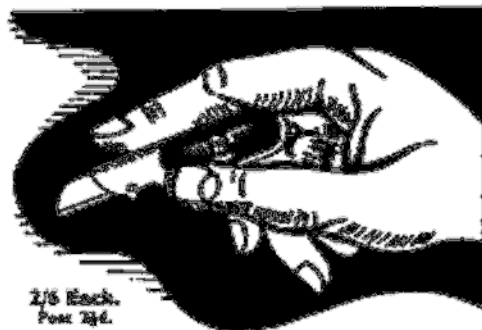
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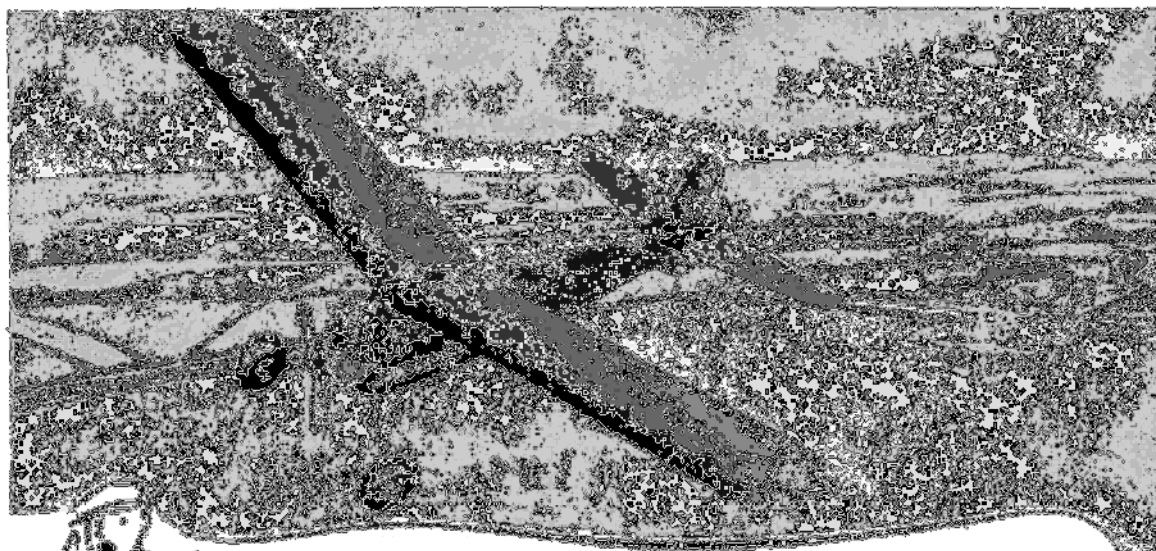
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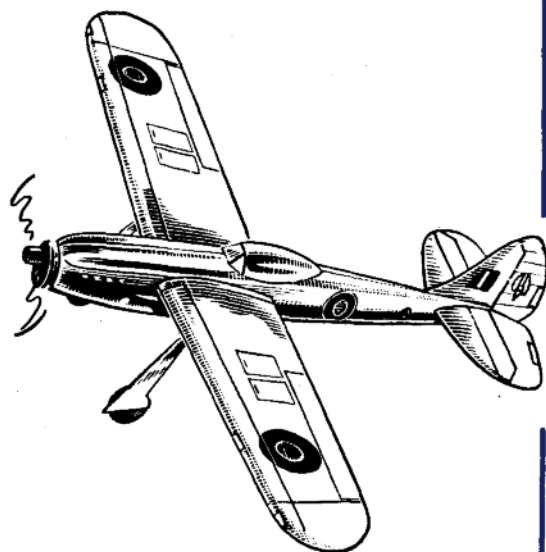
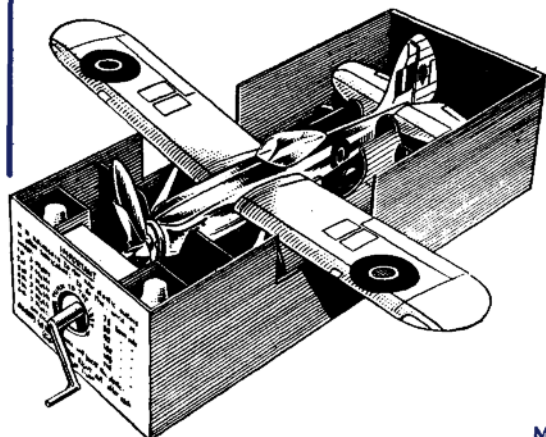
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