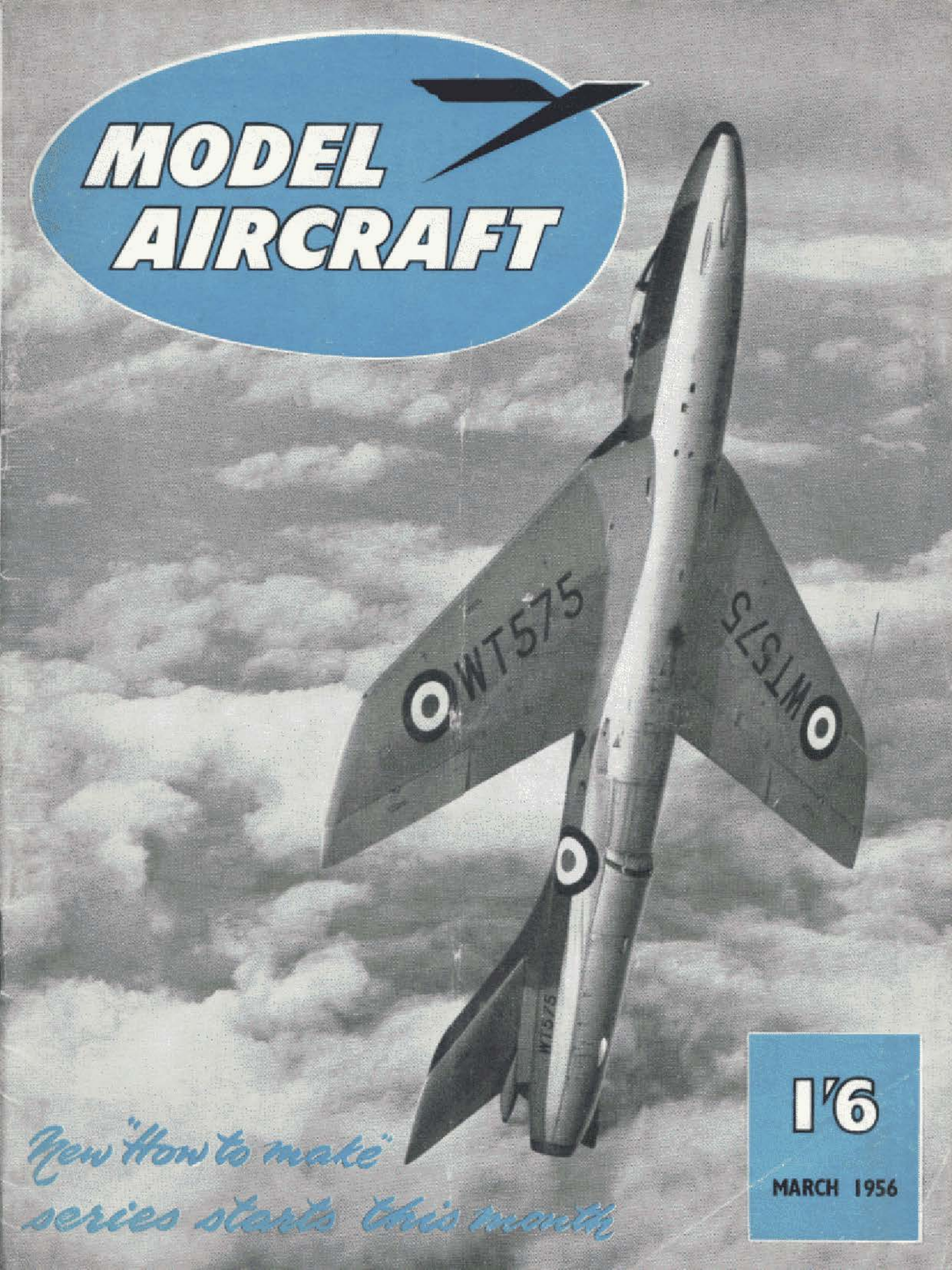
MODEL AIRCRAFT



New "How to make" series starts this month

1'6

MARCH 1956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The Skyleada
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Rubber-powered
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It's EASY
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TO TRIM
TO FLY
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SKYLON

38 inch wingspan

12/9

The last word in modern free-flight power design. Kit contains plans and parts for either a short nosed (Allbon .5, E.D. .46, Frog 50) or long nosed (Mills .75, Amco .87, E.D. Bee) version.

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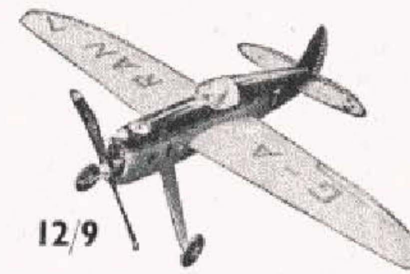

12/9

RANGER

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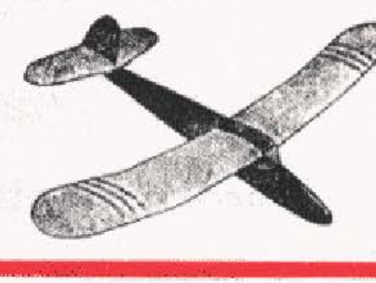

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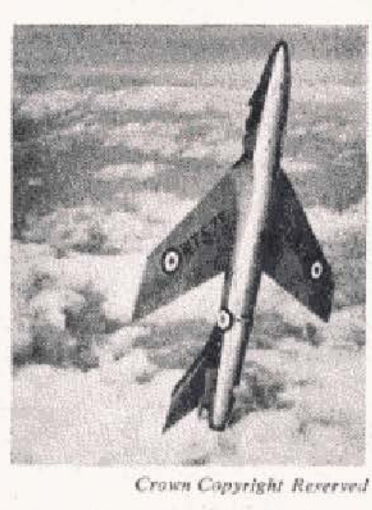
MARCH 1956 No. 177. VOL. 15

Contents

Cover Story

Although beset by difficulties early on in its career, the Hawker "Hunter" is now entering squadron service at a steady rate. Almost certainly it will prove as ubiquitous as its famous ancestor, the "Hurricane", and an assessment issued by the U.S. Defence Department rated the "Hunter": 'The best day interceptor in Europe.' Having seen the "Two-seat Hunter"—featured in our scale plan—perform at Farnborough last September, we don't doubt Hawker's claim that it is Britain's fastest dual-control aircraft.



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THE JOURNAL OF THE SOCIETY OF MODEL AERONAUTICAL ENGINEERS

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Letters TO THE EDITOR

Two wheels or three ?

Dear Sir,—Re "TRIKES FOR TEAM RACERS" (Readers' Letters, Jan. issue), I wonder if Mr. Falconer has ever used a trike undercart on any small high powered models, let alone a team racer ?

If his answer is no, I suggest he tries one; I think he will be surprised at the result.

The conventional two wheeled type is quite efficient if applied in the correct manner

A couple of years ago I carried out considerable research into this problem with class "A" racers. The result was an undercart that gave good ground behaviour on any surface. This undercart was of 12 SWG. wire and mounted about $\frac{3}{4}$ in. in front of the C of G. with the legs swept forward so that the axles are $\frac{3}{4}$ in. behind the plane of rotation of the prop. with a track of 6 in.

Also I think the behaviour of the majority of team racers at low speed leaves much to be desired. More attention should be given to the wing section instead of just butchering a piece of wood haphazardly. Large elevators are a great aid at low speed and should be of the horn or mass balanced type. All this does produce a reliable team racer which is very manoeuvrable and just as fast.

In two years I have produced some half dozen racers, all Oliver-powered of various designs and none of these have shown any trace of bad ground behaviour.

I hope Mr. Falconer will see my point.

Yours faithfully

S. Robinson.

Glow has no go !

Dear Sir,—With regards to the gloplug fitted to your Sabre 35 test engine (Engine Test, October issue), you say that the plug didn't last long, but using the same make of plug, we rarely get more than *one* start. This is most noticeable in a Sabre 29-powered 'B' Team racer, with 25% nitro methane. If you could, would you please print this letter, as it might enable the manufacturers to effect improvements.

Yours faithfully,

Mildur, Australia. R. Wood,

F.A.I. RULES PROTEST

The recently announced alterations in the F.A.I. Competition Rules are being severely criticised by contest flyers and not, we feel, without justification. The chief complaint is that insufficient notice was given by the F.A.I. Model Commission to enable the rule changes to be discussed by the S.M.A.E. Clubs and Area Committees.

In fairness to the S.M.A.E., it should be made clear that this view was put forward at the recent Paris F.A.I. Meeting but unfortunately only one other country's delegate joined us in supporting the proposal to refer the matter back to the Aero Clubs for further consideration. We understand that the majority of the delegates present stated that they had full powers to decide upon the new rules—presumably in their countries the flyers have no say in these matters and have to obey instructions issued by their Aero Clubs—or else !

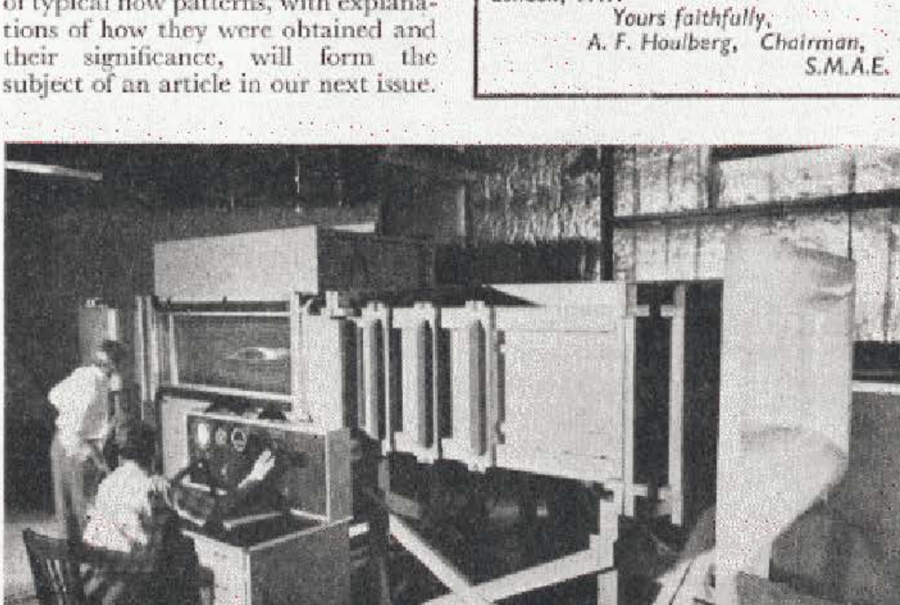
At the last S.M.A.E. Council Meeting it was unanimously decided to forward a strong protest to the F.A.I., and to take steps to have the new rules reconsidered before they are put forward for ratification at the meeting of the F.A.I. General Assembly, to be held at Vienna in May.

TUNNEL RESEARCH

Older modellers will remember Dr. Lippisch of Germany as an ardent model enthusiast and also a full size glider designer of note, with a particular enthusiasm for deltas. Younger readers may know him best as being largely responsible for the design of the wartime Messerschmitt Me 163.

Since the war Dr. Lippisch has been living in the United States, and is now an American citizen, working for one of that country's leading manufacturers of electronic equipment. Amongst other things he has been responsible for the design and construction of a smoke tunnel for demonstration and research purposes, and we have been fortunate enough to obtain a selection of photographs from the Collins Radio Company showing typical airflow patterns over wings at near model speeds.

The tunnel is shown in the photograph with a typical wing section on test. Photographs of a large number of typical flow patterns, with explanations of how they were obtained and their significance, will form the subject of an article in our next issue.



CONTEST FUND

We are pleased to print the following letter from Mr. A.F. Houlberg. Writing on behalf of the S.M.A.E., he stresses the importance of support from all modellers if this year's International Power Meeting at Cranfield is to repeat the success of its predecessors.

Dear Sir,—As a result of the magnificent performance of our team in the 1955 World Championships held at Weisbaden, which resulted in Great Britain winning both the individual and team World Championships for power driven models, the S.M.A.E. has the honour to run these two World Championships in this country in 1956.

The date, August 4th to 6th, has been fixed on the F.A.I. calendar for this event, which will be held at Cranfield. The Society is looking forward to the opportunity of welcoming a record entry for this event and repaying in some measure the welcome which has been extended to our teams when they have travelled abroad in recent years.

Based on previous experience the running of this contest will involve the Society in an expenditure in the neighbourhood of £1,000, which is considerably beyond the normal resources of the Society. Thus it becomes necessary to appeal to all interested in the sport and development of aeromodelling for help in raising the required funds. All avenues for raising money should be exploited by clubs and individuals without delay.

Let us show the rest of the world that we are not behind in organising ability and that we can at least match their hospitality.

Subscriptions to the Contest Fund should be addressed to the Hon. General Secretary of the S.M.A.E., Londonderry House, 19 Park Lane, London, W.1.

Yours faithfully,
A. F. Houlberg, Chairman, S.M.A.E.

CALCULATORS WANTED

Since our article "Summary of Recent M.A.R.P. Reports" appeared last month we have received a letter from Maurice M. Gates. He tells us that publication of the complete test results—which involve nearly 10,000 readings—is considerably retarded by the lack of spare time of the project members making the calculations.

Consequently Maurice would be pleased to hear from modellers prepared to help with the calculation work. In return they would receive copies of M.A.R.P. reports—those issued so far include glide testing, theoretical aerofoil work, and wind tunnel tests. At present the reports are not for general release.

Modellers who have carried out research work of their own are also requested to contact Maurice Gates at the following address: 27 Inglis Road, Ealing, London, W.5.

Model Found

We have repeatedly stressed the importance of attaching name and address labels on models, usually in conjunction with a note on a lost model. This time a model has been found, but needless to say it bears no label. The following details will perhaps assist the owner in identifying his model: Fuselage colours: dark green and yellow; Wings: red and yellow with black leading edge. The engine is a Frog 150 with a nylon prop. The fuel tank bears the inscription "Slipstream Products."

The model was found in Kent, and if any reader has lost a model of this description, he should write to the Editor of Model Aircraft stating where and when it was lost, *and the model's name.*

THEN and NOW

We were interested to receive from a reader recently a handbook published by Percival Marshalls way back in the twenties. Entitled "Model Aeroplane Making for Beginners" it it also contained a chapter on "Kites and Kite Flying." After an introduction to the hobby, successive chapters dealt with aviation terms, why an aeroplane lifts, three drawings of model planes with building instructions, and a few general hints on "constructive details".

Although, no doubt, the models illustrated were the "latest thing" in their day, to eyes accustomed to sleeker lines, they would appear to precede even Col. Cody's experiments!

Material prices too, were an eye-opener. For instance, a 24in. span 'A' frame model could be built for a total cost of 4s. 9½d., which included such items as an egg beater for winding (6d), aeroplane nails (1d), and proofed silk (1s). Among the other items listed as being necessary for the completion of this model are "a soldering iron—with means of heating same", and 'broken glass for scraping wood'!

"Model Aeroplane Making for Beginners" was published at 9d. and had 32 pages, containing six fairly large line drawings and a few small sketches. In contrast, its counterpart of today—"How to Make Model Aircraft" by P. G. F. Chinn—contains 80 pages and over 220 illustrations printed on high quality paper and sells for only 3s. Its contents range from choosing a kit to making your own fuels, with comprehensive chapters on the many other facets of model aircraft construction and flying. Now in its third reprint, this best-seller by world-authority Peter Chinn is approaching a 50,000 sales figure.

But just as the present "How to Make" book has helped so many to surmount the inevitable problems that arise, we feel sure that its predecessor did, in its own modest way, help create a hobby that, like Topsy, "just growed."

A DYING ART?

Material selection, it appears, is no longer as important as it once was in modelling. Apart from the new 1957 F.A.I. power specification, there is no model specification which places a premium on first class *lightweight* construction. Building light, yet strong enough, has been the secret of high performance models right from the earliest days. Too many people when they build light models use the wrong wood, so that they end up with a *weak* model as well. And too many people fool themselves into believing that because they have built a heavy model it must be that much stronger. More often than not it merely means that it will hit the ground that much harder!

Quite contrary to the present trend, we believe that the *lightweight* radio control model might be the answer to a lot of current problems (no pun intended!). It should be less prone to lose height in turns, recover from any manoeuvre more quickly and, despite what has been written about "penetration," could be made to fly *faster* than a heavier model of the same size.

FILM SHOWS

Film shows at club meetings will almost certainly guarantee a "full house" and the latest catalogue issued by the Petroleum Films Bureau covers subjects from Aviation to Agriculture. Copies of the catalogue can be obtained from the P.F.B. at 29 New Bond Street, London, W.1.

In common with other periodicals MODEL AIRCRAFT is affected by the present dispute in a section of the printing trade.

Every effort is being made to overcome the difficulties with which we are at present faced and apologise to our readers and advertisers for any inconvenience caused to them.

ERIC FEARNLEY presents his latest scale model

for

2.5 c.c.

Engines

The HOLSTE BROUSSARD

THE development of a good flying scale model follows full size practise in that as much as possible is done on the drawing board to produce the perfect areoplane, but it is only after one or more prototypes are built, tested to destruction, and modified perhaps in fifty ways that the final satisfactory result is produced. Those who study full size design and construction can learn quite a lot from a model, as many of the same problems of stress and strength versus weight are encountered. The scale model has problems such as getting strength in the cabin without blocking windows, etc. with braces, exactly as in full size design. While the odd model may fly off the drawing board, most modellers will agree that a good model is the result of much testing under working conditions.

In presenting the Holste *Broussard*, the writer is confident that it is built to last. No less than three cowls were fitted before enough strength was found to withstand a head-on crash under power. My new car carries a streak of Britfix dope across the roof where the model flew into it—without any damage to the fuselage, and only one fin torn off; this with an AM25 diesel! Several mods. have been made to the structure, and two tails fitted. It has been spun down with full E.C.C. radio installed with the rudder locked over, and lived to fly again. Two pairs of airwheels have been burst with runway landings. Sounds tough! And the price for this? Careful choice of wood, plenty of building time; plenty of cement in the right places, and the will to attempt a piece of model engineering, without being side-tracked by the latest space travel quickie marvel half way through. Definitely not for the man who builds scale models as a " relaxation " from " more serious " aspects of aeromodelling, whatever that may mean.

I will not bore readers with too much of the obvious building instructions. Unless you are sufficiently advanced to read the plans and follow them, the model is not a suitable choice for a first attempt. Less experienced modellers are very well taken care of elsewhere.

Fuselage is a basic box, to which formers are added and the whole effort sheeted up with sixteenth. Plywood forms the front fire-wall, to which the cowl is bolted with four 6 b.a. bolts. The reason for this is to allow packing to be added for side or down thrust by loosening the bolts through the front cowl. Note that the undercarriage is bound well to the hardwood cross piece. This member is fitted across the fuselage, and locked in place with sixteeneth ply plates either side. Make sure that the tube carrying the legs is free before fitting, or the whole lot will turn.

The motor bearers are fitted to the two three-ply cowl formers. Blocks are added, and the front laminations, also the side sheeting. The size of the bearers will depend on the engine used. The model has flown with an Elfin 1.49, and an Allen Mercury 25, the latter giving a good reserve of power. If a 1.5 c.c. is fitted, weight will have to be watched. The size of the cowl front does not enable a small prop to be fitted, so the smaller engines are at a disadvantage. In any case, a prod with good tip area is advised as much of the inner thrust will be wasted.

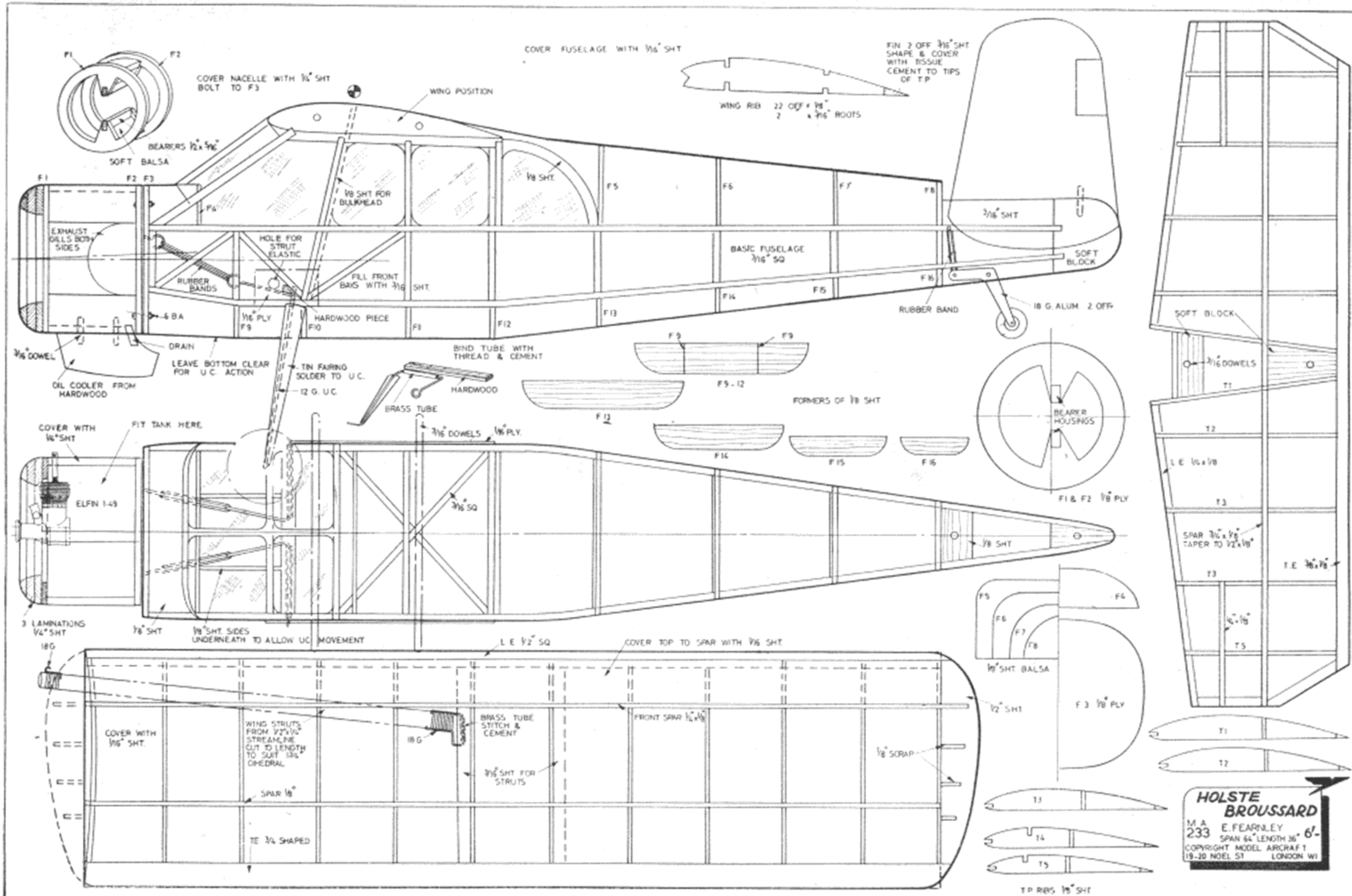
The wings are very strong, and this always makes for accurate building, so there should be no snags. The location of the wings on the fuselage sides calls for the greatest care. Adjust the wing dowels until both wings are dead true before cementing. There is a great wing area, and a little error here will cause a lot of trouble when trimming.

The tail structure is simple, but again, get the fins dead true before fitting the locating dowels. Stand about fifteen yards away to check the alignment of the twin fins. Balance exactly where indicated.

If sufficient care is taken, the model should fly straight away. My model insists on flying to the right on power, and tends to spin on a sharp LEFT turn, but will go after it's own tail as tight as a control line job to the right without losing height This is opposite to normal characteristics, and had me puzzled for quite a time before I caught on.

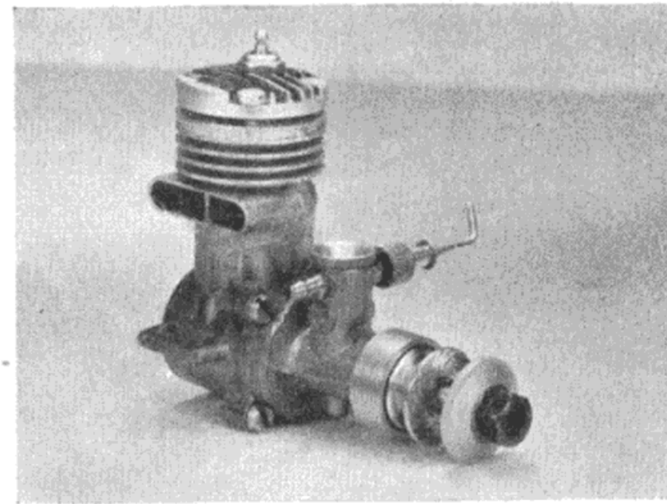
Trim the model for the perfect straight glide, and add side thrust until a straight power flight is obtained. Like any strongly built scale model, let it fly fast, and don't let it glide in too sharp circles, or it may loose height faster than is wanted.

If you build this model, you won't have wasted your time. It takes off, and looks like an aeroplane in the air. You may find these qualifications rather unique in these days of functional designs.



FULL SIZE WORKING DRAWINGS ARE OBTAINABLE FROM YOUR LOCAL DEALER, OR BY POST FROM THE "MODEL AIRCRAFT" PLANS DEPARTMENT 19-20, NOEL STREET, LONDON, W.1, 6s. POST FREE

MA Engine Tests



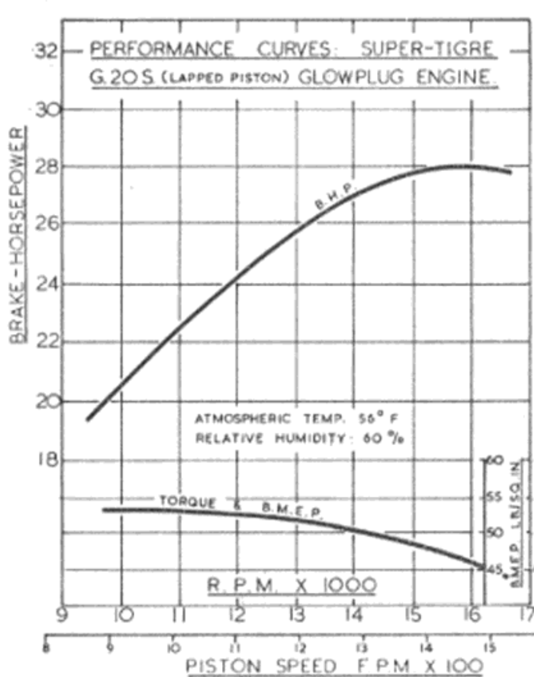
No. 83. Supre Tigre G.20s 2.5 c.c.

One of the world's outstanding competition engines at the present time is the Italian Super-Tigre G.20S. This engine is undoubtedly among the top two or three " International " class production motors and, in fact, is regarded in some quarters as the best 2.5 c.c. unit currently available for contest work.

The G.20S is built by the Micromeccanica Saturno of Bologna in Northern Italy, one of the largest and oldest established engine manufacturers in Europe. The writer's own experience of Super-Tigres extends back to 1946, when, in Italy, he tried out early Super-Tigre diesels and, since that time, we have tested some nine different production types. The Garofali-designed Super-Tigres have always been interesting units, of good performance, soundly engineered.

G.20 powered models have achieved many contest successes and have held many records, not only in the model aircraft world, but also in model car and boat work. The engine has proved itself to be of high performance, particularly at ultra-high speeds, dependable and reasonably robust. It has been developed through several different versions during the past few years and, since 1954, has been following the current trend away from aluminium pistons with rings in small racing engines by using, instead, a lapped piston. The lapped-piston version costs 1,000 Lire more (about 11/6d) than the standard ringed-piston model, but is certainly worth the extra in terms of performance and handling characteristics.

Our test unit is one of the latest models, identical to those so successfully used by the Italian team at last year's World Speed Championships in Paris, and embodies certain further small refinements, particularly to the all-important piston and cylinder components. The cylinder liner, which is an excellent push fit in the crankcase/cylinder-barrel casting, now has the transfer and exhaust ports radiused at the extremities. The exhaust port occupies approximately 160 degrees of the cylinder circumference and is divided by a single vertical bar approximately 1.5 mm. wide. The transfer occupies 120 degrees of cylinder circumference and extends below the crown of the piston at b.d.c. to promote a less abrupt change of direction to gas flow.



The piston is excellently finished, with a deep relieved section which produces a lapped surface 5 mm. wide at the top and, in addition, a lapped skirt section just under 1.5 mm. wide at the bottom. The full floating gudgeon pin, now solid, is a first-class fit in both the piston and the new connecting-rod, and big-end and small-end float, in terms of free rotational movement of the crankshaft at t.d.c. or b.d.c., are virtually eliminated. The piston retains one feature of the ringed-piston G.20. This (unusual in a lapped unit) is the large circular skirt port which registers with a similar port in the cylinder liner at b.d.c., to assist the transfer of the charge from the crankcase to transfer passage.

The engine has one of the best rotary valve designs seen on a shaft-valve unit. The rectangular crankshaft port, giving an induction period of some 210 degrees of crank-angle, is of exceptional length and, fed from a vertically placed intake, is sensibly positioned towards the centre of the crankshaft journal. As is becoming increasingly popular with high-speed glowplug engines, the carburettor is fitted with a removable choke. In racing trim, this is combined with a separate, open, jet, the choke being suitably tapped to accept the threads of the jet and needle-sleeve. For operation at lower r.p.m. a separate choke is provided which is drilled out to take a spray-bar type needle-valve assembly. Both chokes (now of machined aluminium instead of the plastic mouldings used on previous models) are of 6.5mm. bore, which is as large as that generally found on 5 c.c. units.

Specification

Type: Single-cylinder, air-cooled,

loop-scavenged two-stroke cycle, glowplug ignition. Shaft type rotary valve induction with supplementary sub-piston air induction. Baffle-piston with matched cylinder-head and offset glow plug.

Swept Volume: 2.474 c.c. (0.151 cu. in.)

Bore: 15 mm. (0.5905 in.) Stroke: 14 mm. (0.5512 in.) Stroke/Bore Ratio: 0.933 : 1.

General Structural Data.

Pressure diecast aluminium alloy crankcase and cylinder barrel with integral exhaust duct. Pressure die-cast aluminium alloy front bearing housing attached with four machine screws. Lightweight lapped piston with relieved skirt, full floating gudgeon-pin, and running in ground and lapped nickel-iron cylinder liner. Forged aluminium alloy connecting rod. Chrome-nickel steel crankshaft, with integral crescent counter balance, blued against corrosion and running in dual ball-journal bearings. Finned aluminium alloy cylinder-head, with copper gasket, secured with four screws. Alloy prop driver fitted on tapered split-sleeve brass collet. Interchangeable choke inserts for spraybar or open jet type needle-valve assemblies. Beam mounting lugs.

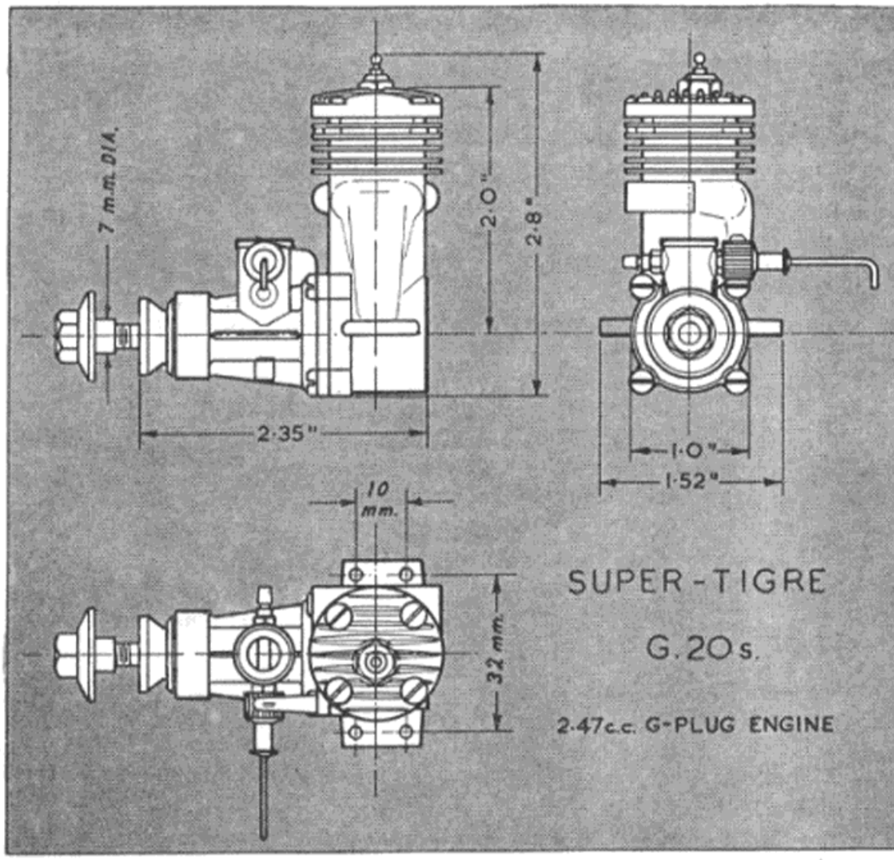
Test Data.

Ignition equipment used: Micro-meccanica Saturno glowplug. 1.7 volts used to start.

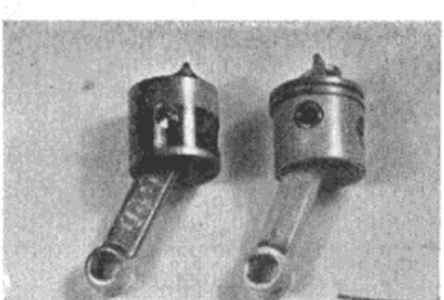
Fuel used: 50 per cent Blending Methanol, 25 per cent B.D.H. Nitromethane, 25 per cent Duckham's Racing Castor-oil. Total time logged: two hours.

Performance.

For running in, a 70/30 mixture of methanol and castor oil was used.



The main differences between the current G.20 and the earlier models are to be found in the piston and cylinder assemblies. Below, left: 1956 lapped piston with new conrod and solid gudgeon-pin; right: 1952 type ringed aluminium piston with domed crown and tubular gudgeon-pin. Both pistons feature skirt transfer ports.

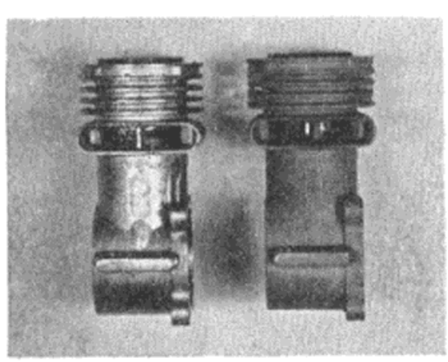


The engine started readily after priming through the exhaust port and would re-start quickly when warm, after two choked flicks of the prop. With the racing type choke and jet assembly it was found necessary to use a gravity fuel feed on the test engine as the fuel suction obtained, even at speeds in excess of 12,000 r.p.m. was marginal and was just insufficient to prevent the engine from starving when operating from a normal tank installed below jet level.

In its latest form, the Super-Tigre G,20 is a potent, yet pleasant handling engine. It has much improved torque over the earlier ringed piston unit (especially at the more " moderate " speeds of 10,000-13,000 r.p.m.) which is evident in a maximum b.m.e.p. of approximately 53 lb/sq. in. The high efficiency of the aspiratory system is demonstrated by a peaking speed of *circa* 16,000 r.p.m. where 0.28 b.h.p. was recorded on test. This is the highest figure thus far registered for a 2.5 c.c. glowplug motor.

Power/Weight Ratio: (as tested) 1.07 b.h.p/lb.

Specific Output: (as tested) 113 b.h.p./litre.



Above, left: 1956 cylinder crankcase casting with new type liner having radiused ports; right: 1952 type with multiple squared ports.

The NEW M.A. BEGINNERS' COURSE

P. G. F. Chinn, author of the best seller "How to make Model Aircraft," here presents a brand new series which will follow the design, construction, and flying of model aircraft.

Every year, the hobby of building and flying model aeroplanes attracts thousands of newcomers and, every year, the range of different model types gets a little bigger and a little more bewildering to the beginner.

Just a generation ago, a model aeroplane was simply a " model aeroplane " and was easily recognisable as such, and its functions easily understood. It usually consisted of a wing and a tail-unit on a simple fuselage, propelled by a rubber motor. One simply wound it up and heaved it into the air and, with a little luck, it would fly, after a fashion, for perhaps twenty or thirty seconds.

Nowadays, our model aeroplane appears in a score or more of different guises. Its rubber motor has given way in most instances to an internal-combustion engine: it may be propeller driven or jet propelled; it may weigh just a few ounces or several pounds; it may span ten feet or less than one foot; it may fly at 15 m.p.h. or 150 m.p.h.; it may remain in the air for a minute or an hour; it may perform elaborate aerobatics under full control or it may lift a payload several times its own weight; it may be a scale model of some full-size aircraft or a strictly functional machine designed to do one particular job in the best possible manner. Finally, it may be flown free, or tethered or under radio control. No wonder beginners find the sheer scope of the hobby a little overwhelming and have difficulty in discovering where they should start.

We propose, therefore, to first describe and differentiate between the many types of aircraft now being built.

One thing we must make clear at the outset is the fact that, in spite of their impressive appearance, the sort of models shown in some of the accompanying photographs are *not* the work of genius. Model aircraft is not a hobby for the dullard or the featherbrained, but, given a reasonable amount of patience and commonsense, anyone can build a successful model and, with further experience will be capable of constructing quite advanced machines. This is because the material largely used in model aeroplane construction—balsa wood—is exceedingly quick and simple to work with, while the construction methods adopted, especially the widely used system of assembly over a full-size drawing, make for easy and accurate work.

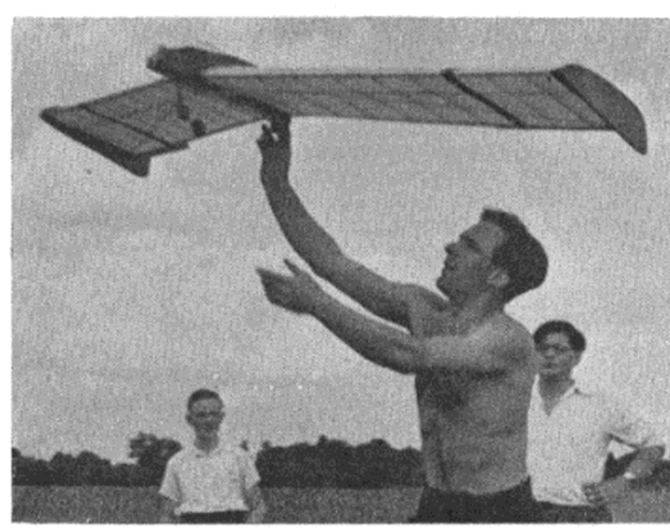
It is difficult to divide all types of model aircraft into precise groups because many of these overlap one another. Basically, however, we have three distinctly different groups, namely:

1. Free-flight models.
2. Control-line models.
3. Radio-controlled models.

The first includes all types of models which are flown quite " free ", depending upon their own good flying characteristics to maintain stable flight.

The second includes all models which are flown in

A typical modern rubber-driven competition model. Note the folding propeller. Built by Czechoslovakian enthusiast, V. Kutil.



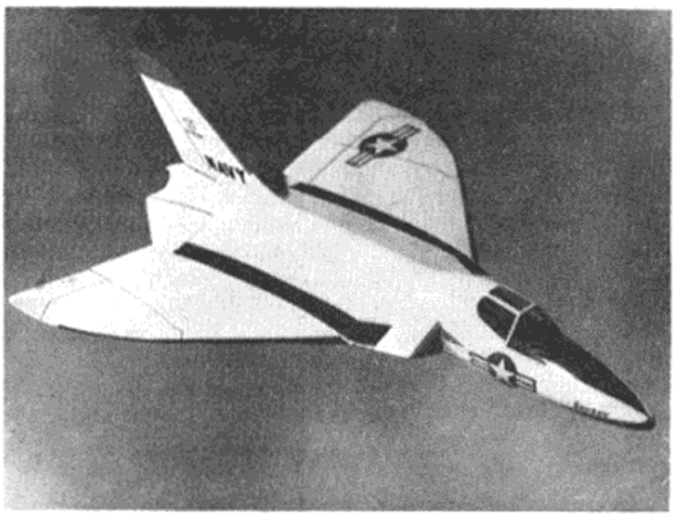
A free flight tailless power model being hand launched; note the tip fins and tricycle undercarriage.

a circle, tethered by means of a pair of thin control-lines. These lines are attached to a special handle held by the operator, while, at the aircraft end, they are coupled by means of a simple linkage to the elevators of the model. Thus, in addition to keeping the model captive, the control-lines, through movement of the control handle, serve to keep the model in stable level flight or, alternatively, to guide it through various manoeuvres, such as loops and inverted flight.

The third are essentially free-flight models in conception, but carry radio receiving equipment by which means they can be controlled by a transmitter operated from the ground.

Free-flight Models

(a) *Gliders.* Gliders, which are sometimes known also as sailplanes or soarers, are, of course, motorless aircraft. They can be launched by various means: by hand-launching from a suitable hillside, by catapult, by a winch and long towline, or by a running towline launch. The latter method is the most popular, a 50 metre (164 ft.) thin nylon or fishing line being most commonly used, which



An attractive free-flight scale model of the U.S. Navy Skyray fighter. It is powered by a Jetex 50 motor and is available as a prefabricated kit.

allows a medium sized model to attain an altitude of around 150 ft. before release.

A popular glider of high performance is the International A2 type, which usually spans 5 - 6 ft. and weighs 14½ oz. For a first model, however, the beginner is recommended to build something smaller, i.e. of 2 - 3 ft. wingspan.

(b) *Rubber-driven Models.* Once the mainstay of the hobby, the rubber driven model has now been superseded in popularity by the engine driven model, but still has a place in international competition, where the Wakefield Trophy contest attracts some of the world's most capable model-builders. Rubber-driven models include, also, small, lightweight duration types and simple scale models.

(c) *Power-Duration Models.* The power-duration model is one of the most popular types of model aircraft. Seldom having much resemblance to a full-size aircraft, it is designed to climb to as great an altitude as possible in a given time (usually not more than 15-20 seconds) and to then glide for as long as possible. A typical contest type is the " International " class, limited to engines of 2.5 c.c.

Model flying is encouraged in the R.A.F. Here is Leading-Aircraftman Lock with his fine free-flight model of the well-known Tiger Moth R.A.F. trainer.

capacity. Some of these models climb faster than many full-size aircraft.

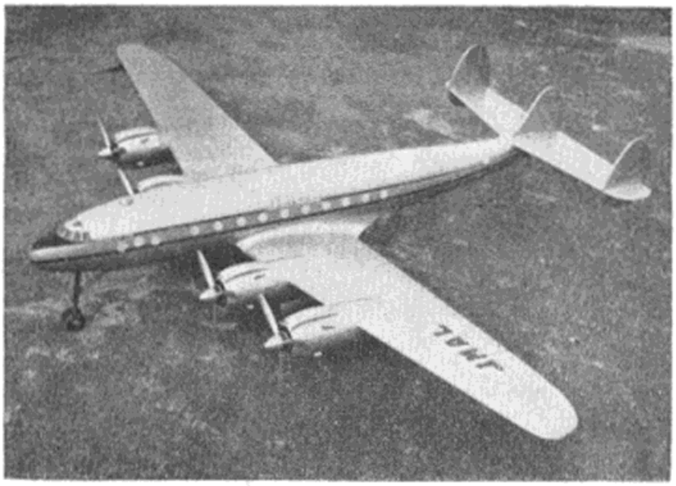
A development of the power-duration machines is the PAA-load type, built to a competition specification laid down by the Pan-American Airways. In this type of contest (for which P.A.A. award handsome prizes) the model is required to lift a regulation " payload " and a further development is the " Clipper-cargo " model, in which the winner is the model which can take-off and fly with the greatest possible load. A model powered by an engine of only .049 cu. in. (0.8 c.c.) capacity has, in one of these Clipper Cargo contests, lifted more than seven times its own weight.

(d) *Free-Flight Scale Power Models.* These are models accurately scaled from full size aircraft, generally to a scale of 1 in. or 1½ in. to the foot, producing models of 3-5 ft. wingspan and powered with motors of .5 c.c. (.03 cu. in.) to 2.5 c.c. (.15 cu.in). They are not recommended to the beginner, because they are more difficult to build and fly.

(e) *Beginners' Power Models.* There are now a number of non-scale, non-competition types of free-flight power models which are more suitable to the beginner than either of these previously mentioned types. Usually of semi-scale appearance, and easy to build are powered with motors of the " Half-A " class (.049 cu.in.) or up to a maximum of 1 c.c.

(f) *Jetex models.* The " Jetex " motor, which is available in several sizes, is a small type of jet or rocket motor. It burns a solid fuel pellet and is very suitable for small

Pictured against a background of full-size aircraft, at a Norwegian airport, is this attractive free-flight model powered by a 2.5 c.c. engine.



A fine example of a multi-engined scale controlline model. Built by a Japanese enthusiast, this impressive Lockheed Constellation airliner has four 5 c.c. engines which deliver a total of nearly two horsepower.

scale models (up to about 20 in. span) of modern jet aircraft or for lightweight duration designs.

(g) *Miscellaneous Types.* In addition to the previously mentioned models, there are many related and unorthodox types. For example, most free-flight power driven models can be equipped with float gear for rise-off-water flights. Alternatively, where one has access to smooth stretches of open water, the model flyingboat is a great attraction. Among the less conventional types are to be found helicopters, tailless and delta-wing aircraft, and almost every type of unorthodox full-scale aircraft has also had its counterpart in the model world. Such models are to be seen at most model meetings.

Control-line Models

(a) *Trainer Models.* The simplest controlliner can be built from solid balsa wood because all control-line models are heavier and faster-flying than free-flight types. Such models are quick and simple to build and easily repaired if damaged, and are therefore ideal for learning the rudiments of flying a C/L model. These models have a wingspan of 20-24 ins. and may be powered by an engine of up to 1.5 c.c. or .09 cu. in.

(b) *Stunt Models.* The aerobatic or "stunt" model is designed to perform quite complicated manoeuvres, such as loops, outside loops, inverted flight and vertical and overhead figures-of-eight. A typical modern American stunt model flies at 65-70 m.p.h. on 60-70 ft. long steel control-lines and weighs 2-2½ lbs. It is generally powered by a glowplug-ignition engine of up to .35 cu. in. displacement (5.8 c.c.) developing about 0.5 horsepower. Its wingspan is generally about 50 inches and it can be recognised by its relatively large wing area and short fuselage. European models are mostly of somewhat smaller dimensions due to the smaller capacity engines available. Very considerable skill and judgement are exercised in successfully flying a stunt model through an elaborate pattern of manoeuvres.

An excellent example of the scale modeller's art: an accurate and beautifully finished model of the American Sabre F.86F jet fighter with authentic markings.

(c) *Combat Models.* A popular development of the stunt model, usually of simpler design, is the combat machine. Two combat models are flown by their pilots in the same circle, each trailing a paper streamer, and the object is to pursue one's opponent and to cut as much as possible from his streamer with one's airscrew. Over-enthusiasm on the part of the pilots sometimes leads to spectacular mid-air collisions, and a model which is easy to repair, therefore, has much to commend it.

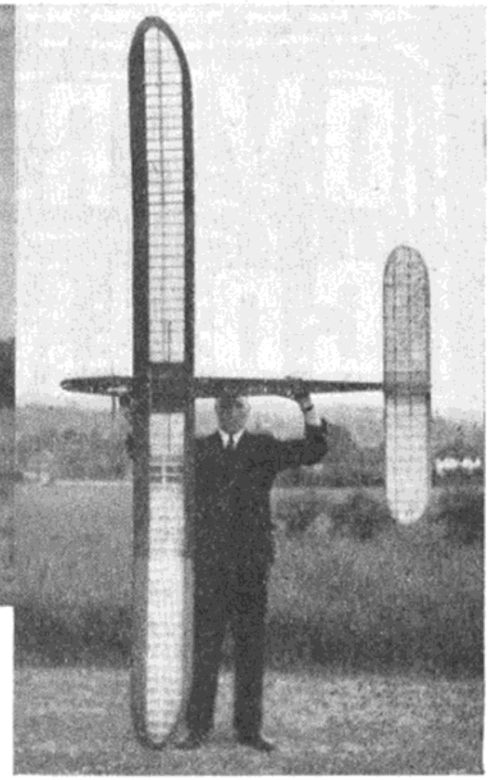
(d) *Speed Models.* Speed models are flown in various classes according to engine size. The most powerful are the 10 c.c. or .60 cu. in. engined models which achieve speeds as high as 160 m.p.h. from engines running at 16,000 to 18,000 r.p.m. and developing in the region of 1½ horsepower. Even tiny "Half-A" (.049 cu.in.) models have, however, now reached 100 m.p.h. Models built to

A true scale model of the Grumman Cougar jet fighter. Powered by a Dynajet pulse-jet engine of 4 lbs. static thrust, it weighs 3½-lb. and has a speed of approximately 80 mph.

the F.A.I. World Championship specification have 2.5 c.c. engines and reach over 120 m.p.h. Speed models are quite small, even the largest being seldom more than 18 in. span. Much depends on reducing air drag to the minimum and to this end, a special mono-line system of control has been developed.

(e) *Team Racers.* In team racing, two, three, or four models are flown in the same circle simultaneously, the object being to cover a given number of laps (equal to five or ten miles) in the shortest possible time. Pure speed models, however, are not eligible for this type of event, as models have to fulfil certain minimum dimensions, be of scale appearance, and are permitted only a limited fuel tank capacity, which entails refuelling stops about every 40 laps. "Pit crews" refuel and restart the models during the race and with smart pit work, a fast .29 engined model will cover a ten mile race in less than 8 minutes, averaging 75 m.p.h. including the two refuelling stops required.

(f) *Scale Controlliners.* Scale control-line models are among the most impressive model aircraft. All types are constructed, from single-engined fighters up to four-engined airliners and bombers. Since control-line scale models can be so much heavier than their free-flight counterparts,



All types of aircraft are tackled by enthusiastic modellers. Here a successful power-driven model helicopter makes a flight over the Osaka baseball stadium in Japan. Centre: The "combat" model is designed for manoeuvrability and speed, rather than appearance. Here, Cpl. Godfrey of the R.A.F. displays his colourful model powered by a 5 c.c. engine Right: With a wingspan of more than 11 ft., this radio-controlled model represents many months of work.

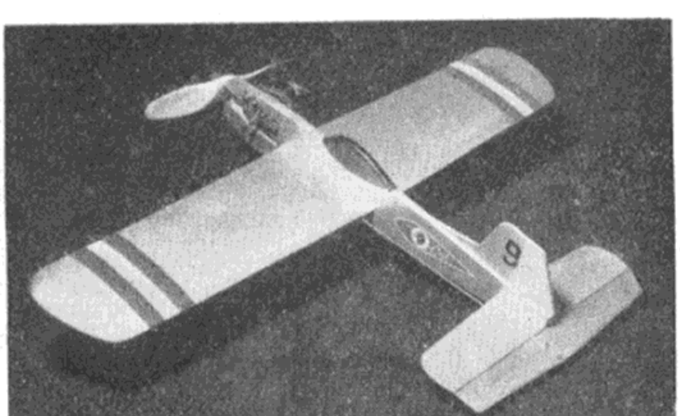
these models are often highly detailed, with working retractable under-carriage, etc. Such models are often in the super-scale class may be covered entirely with metallised paper, which gives an exceptionally realistic finish.

g. *Pulse-jet Models.* The pulse-jet is a powerful and extremely noisy power unit based on the principle of the German wartime V.1. "buzz-bomb". Speeds approaching 180 m.p.h. have been reached with models so powered, but the most useful application of these engines is, undoubtedly, in scale models of modern jet fighters. In most countries, the use of these engines is restricted to control-line models.

Radio-Controlled Models

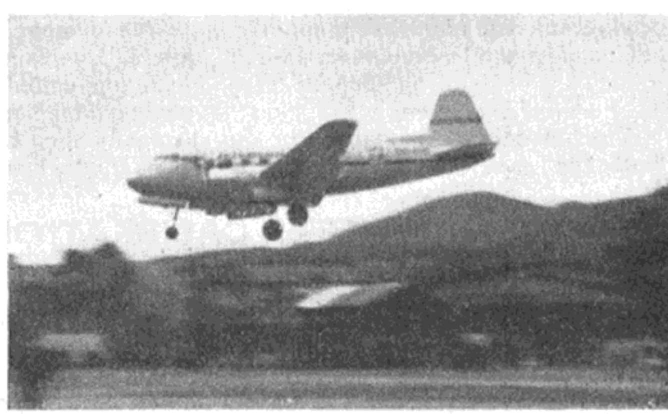
The radio controlled model is regarded by many as the ultimate in model flying and, without doubt, there is tremendous satisfaction to be gained from watching a model, flying at several hundred feet, respond to one's signals from a ground transmitter.

A simple 20 in. span all-balsa controlline trainer designed by the author for a range of American engines. Such a model can be built in a matter of four or five hours, and is the ideal type of machine with which to commence control line flying.



Radio models are divided into two types for competition purposes; (a) those having a "single-channel" control, which usually operates the rudder only, and (b) the "multi-channel" models in which engine speed and/or the elevators are also included in the control system. Miniature radio-control equipment for this type of model flying can be bought ready-made or one may build one's own transmitting and receiving equipment. In most countries the authorities have allocated special frequencies for the use of the radio-control enthusiast.

Looking just like a full-sized airliner about to land, is this twin-motor controlline scale model of a SAAB Scandia of Scandinavian Airlines.



To sum up, then, the model builder has an immense range of types from which to choose. While the majority of enthusiasts become so engrossed in their own particular sphere that they have little time for other types, it will be seen that there is, in fact, always something new to try, such is the scope of this fine hobby.

OVER THE COUNTER

First of the new 'large size' rubber driven flying scale models by Keilkraft will be the *Seamew*; wing span is 28 inches. This kit should be appearing on the market very soon and will be followed by numerous other types to establish the Senior range.

Keilkraft, incidentally, report record business for last year—more kits sold than ever before. Most popular items, in numbers, have been the small flying scale designs. Many new designs are in the offing for 1956, but none has yet got to near-production stage at the time of writing. A number of these are, we know, control liners, and we gather that a lot of intensive development work has been done to produce a really stuntable design for half c.c. motors. But not all Keilkraft's interest is in the small models. The new Junior 60 sold out its initial production run remarkably quickly, as forecast in our test report on this kit.

* * *

A set of calibration curves for an "off the shelf" specimen of the Ripmax universal test meter (described in a previous issue) is given in the accompanying diagram. Accuracy on all scales is commendably high, particularly for such a low priced instrument. Both the voltage scales tend to read slightly high, although the maximum error is only of the order of 2-3 per cent. The milliamp scale tends to read fractionally low above mid-scale position.

* * *

Contest Kits have recently installed machinery to undertake all printing necessary with the production of model kits—plans, balsa printed sheet, etc. Strangely enough this is the exception rather than the rule in the trade. Most manufacturers, even the largest ones, put out most of their printing jobs.

* * *

The average customer is perhaps apt to associate the name Skyleada with low-priced basic-type kits, appealing largely to the younger element. Actually they have, during the past year, introduced some very fine designs and standardised on a pictorial method of conveying step-by-step building instructions which should be invaluable to the less experienced modeller. Most of the new models have been of scale prototypes, but the A-1 glider *Albatross* and the *Husky* rubber duration (shortly coming out) show that performance fans have not been neglected. Spindle-moulded wings are a feature of their recent *Spitfire* solid (with elaborate five-view plan), and on the *Three-Footer* all-balsa towline glider. Next model scheduled for production in the flying scale range is the Bristol *Bulldog*, prepared from actual works drawings. If you haven't tried a *Skyleada* kit recently, we think you could be in for a pleasant surprise.

* * *

A 19½in. wingspan beginners' control line model is the latest kit released by Davies Charlton. Called the "Wimpie" is sells at 9s. 11d. Further details in a later issue.

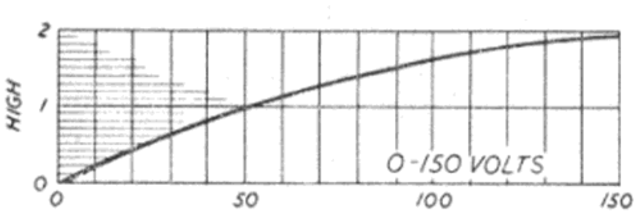
* * *

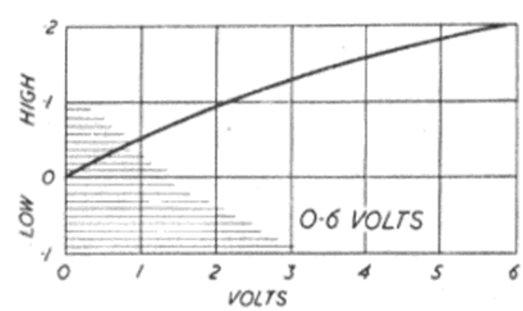
Expect several new International Model Aircraft lines on their stand at the British Industries Fair. No details available, as yet—just a promise of things to come.

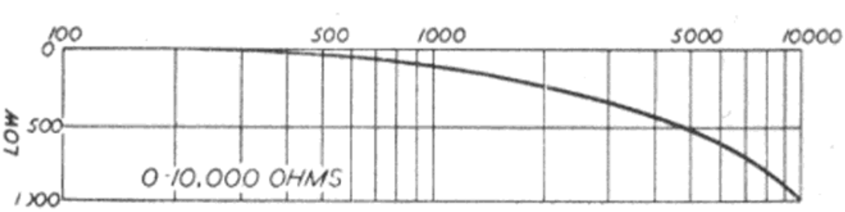
* * *

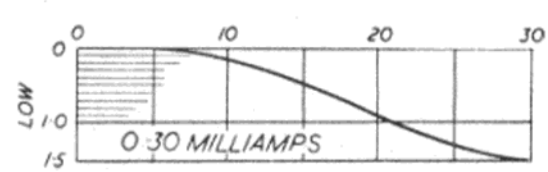
A note to kit and engine manufacturers. Simmonds lock nuts *are* available in 6 BA size. They are not available to the ordinary chap who wants the odd one or two, so why not help him out by including them in your products? A lock nut is the complete answer to engine vibration, and for control plate pivot assemblies. Seven or eight years ago one could buy them packaged in half dozens in the model shop. Why not now?

RIPMAX TEST METER CALIBRATION CURVES



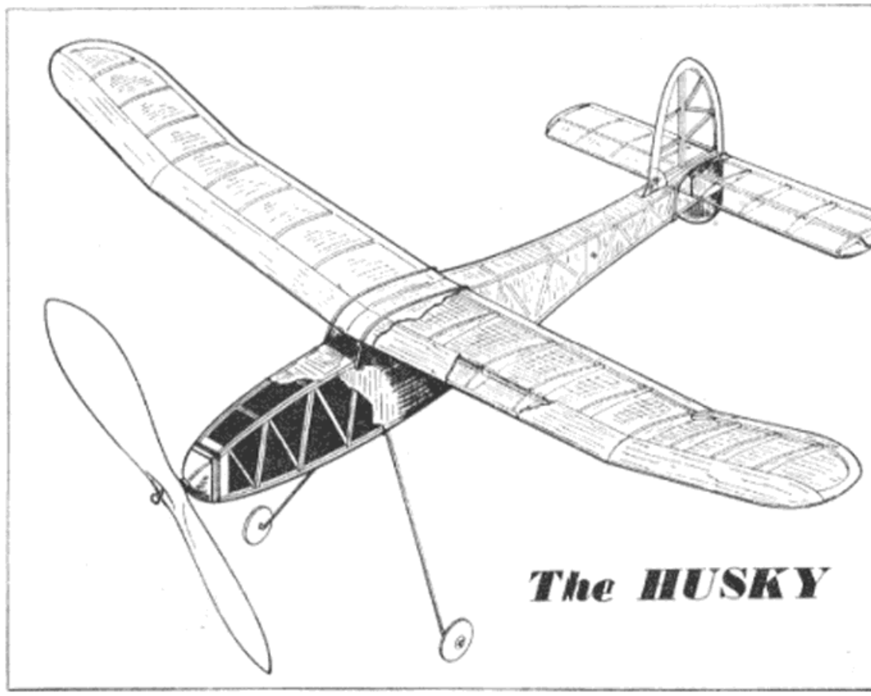






OVER THE COUNTER KIT REVIEWS

SKYLEADA HUSKY



At the time of writing, British Model Aircraft had only a mock-up kit available for review, but the first production kits should be reaching the shops shortly after the appearance of this issue.

Basically, the *Husky* is a conventional cabin-type rubber model proportioned on duration lines and of the right size for high performance. We were actually able to borrow the prototype models for flight testing—still undamaged, incidentally, after a lot of flying—one of which was fitted with a 15 in. diameter propeller and the other a 14 in. prop. What the model with the larger prop. gained in climb and a slightly longer power run, it lost on the glide. So the smaller size has been adopted.

We had no difficulty at all in getting two minutes out of both models in still, damp air. Most likeable was the really excellent stability and non-critical response to adjustment. Less experienced flyers will find this a very good point.

B.M.A. want to make a near-finished propeller a feature of this kit, incidentally, again to obviate any difficulty a beginner might have in producing a first class fly-able model with real performance. Nor should the beginner have any difficulty over the construction for every stage, including covering and making up the rubber motor, is covered by step-by-step drawings with captions.

Building follows conventional practice, although the fuselage side spacers are arranged in Warren-girder form. The wing has a single top spar and is sheeted between the spar and leading edge with 1/32. The section is thin and cambered, thus making it imperative to stick down the bottom wing covering to each rib. Ribs are cut from printed sheet.

By present standards this is a big rubber model kit and we particularly welcome this, since size and performance usually go together in this class. Span is 33 in. and wing area 150 sq. in. Keep the weight down and you will have a first class duration machine which is still rugged enough for 'sports' flying. The wood sizes are amply strong enough throughout.

MERCURY THUNDERBIRD

This is an extensively prefabricated kit in the best Mercury tradition—a model which still needs "building", but with all the hard work done for you.

Actually the *Thunderbird* is little more than a put-together job. The fuselage is a built-up sheet box, with all parts cut to shape. The wings are sheet, already finished to aerofoil section just the edges need a little sandpapering), tail parts are cut out, and so on. We could not fault any of the parts—they were all to dead size—and the quality of the wood was matched in density throughout. Nor was this a selected kit. This one came right off the shelf behind the counter.

We passed the kit over to an eleven-year-old boy to make up. We found he needed a little bit of help on several of the stages, despite the step-by-step illustrations, and we had to install the control hook-up for him. But in the end he turned out a very fair model indeed.

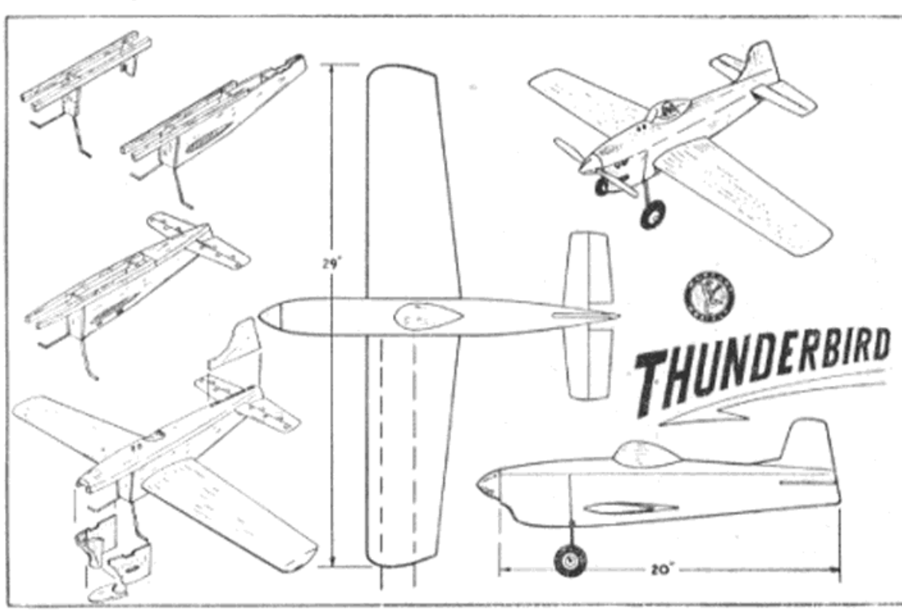
Specific points we would make are—we would like to have seen one or two dimensions on the plan, just as a check, —we, personally, hate building in an engine and then carving and sanding round it, and welcome the way this is unnecessary on the *Thunderbird*—but the tailskid as fitted wouldn't last a minute in our hands! Bind it to a bit of hardwood or ply cemented in the fuselage.

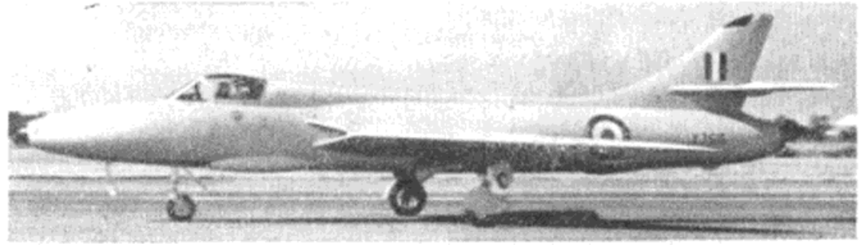
Data—for those who want facts and figures—Span: 29 in.; length overall: 21 in.; wing area: 133 sq. in.; tailplane area: 22 sq. in.; weight: 22 oz. (complete); Power: 2.5 to 5 c.c. motors.

The prototype, in the hands of designer Sid McGoun, has done an official 105 m.p.h.

Building time for the kit (less painting and finishing)—approximately 3 hours.

Rating: Top marks throughout, both for the method of kitting and the quality of the materials.





The TWO-SEAT HUNTER

Britain's Fastest Dual Control Aircraft

AS the future mainstay of Fighter Command and the N.A.T.O. forces in Europe, the Hawker *Hunter* will undoubtedly be seen in many guises—already we have six marks, plus the *Two-Seat Hunter* which we have chosen for our scale plan. Thus, early on in its career, the *Hunter* gives a fair idea of its development potential. Variants of the Rolls Royce Avon and Armstrong Siddeley Sapphire power different marks of *Hunter*, and even the addition of drop tanks and underwing racks for bombs or rockets has done little to affect its performance.

The two-seat *Hunter*, or the Hawker P.1101, despite considerable modification from the F.4, is still well up in the performance stakes. Forward of the wing, the fuselage has been broadened to accommodate the side-by-side seats, but aft of the air intakes the P.1101 is identical to the *Hunter* F.4. An increase in length of 2 ft. 11½in. has been added to the nose section, which gives the P.1101 a much leaner appearance in the side view. Dual control is fitted and both crew members have ejection seats. The cockpit canopy is hinged at the rear and thus lifts upwards.

The two-seat Hunter's longer lines are apparent in these two photographs of the first prototype XJ 615.

This close up of Neville Duke climbing in beside fellow test pilot Frank Bullen also gives some idea of the capucious cockpit and its seating.

Armament consists of two 30mm. Aden cannon mounted in blisters on the underside of the fuselage.

So much for the visible changes—which all tie up with the first announcement of P.1101's existence in March last year, which foresaw a trainer with Mach 1 capabilities. However, the prototype (XJ 615) is now undergoing intensive development which, Hawkers say, "is intended to open up opportunities for even wider tactical roles. . . . Performance matches that of Avon-engined Service aircraft, and the virtually unaltered *Hunter* airframe will enable the P.1101 to follow the continuous improvement of the single seat marks."

Although a carefully worded statement, it is obvious that the two-seat *Hunter* is being considered as an all-weather and night fighter, but then there arises the problem of stowage for the large amount of radar gear now necessary. But whatever its ultimate role, there can be no doubt that the P.1101 is an outstanding aeroplane, obvious even from its brief daily appearance at Farnborough last year. Although not supersonic in level flight, it can easily surpass Mach unity in a shallow dive.

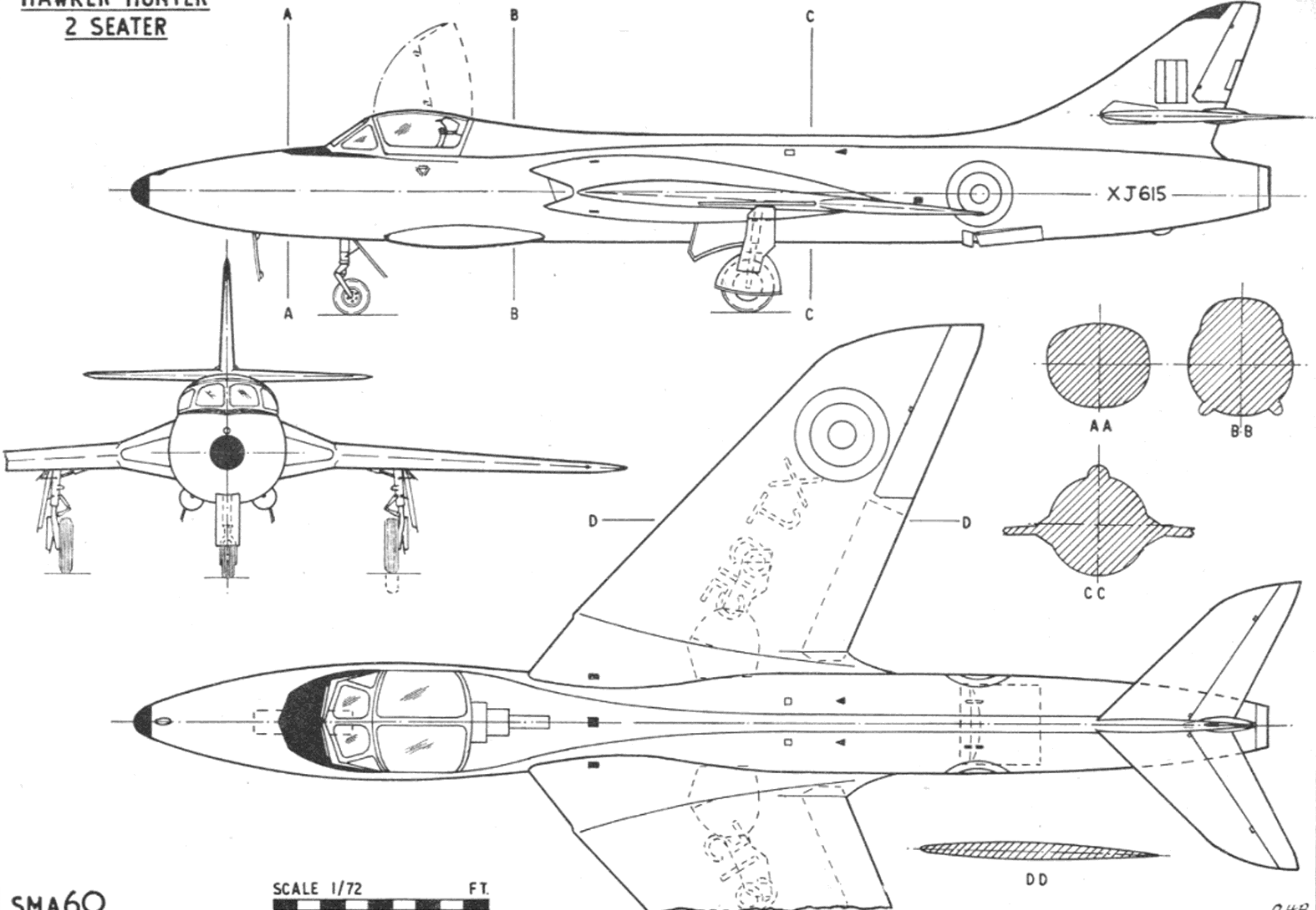
The first prototype, serial number XJ 615, is coloured Duck-egg green overall and carries the usual R.A.F. roundels.

Data.

Type: Two-seat conversion trainer or all-weather fighter. Dimensions: Span, 33ft. 8in.: length, 48ft: 10½in.; height, 13ft. 2in.; wing area 340 sq. ft. Engine: One Rolls-Royce Avon turbojet. Armament: Two 30m.m. Aden cannon. First flew: July 8th, 1955.

No further details available for publication.

HAWKER HUNTER
2 SEATER



SMA60

Ron Warring writes on

THE NEW F.A.I. RULES

POWER loading increased to 400 grams (approx 14 oz.) per c.c. and Wakefield rubber weight reduced to 50 grams ($1\frac{3}{4}$ oz.). These are the two major changes in the F.A.I. International specification for 1957 and they would appear to call for a complete revision of existing ideas on design layout.

Take power models first. The increase in power loading is obviously intended to 'kill' the climb and in this respect should certainly succeed. From experiments with PAA-load models, climb definitely begins to taper off once a power loading of more than 10 oz per c.c. is used. Thus with models getting less height under power, improving the glide seems to be a major feature.

Glide performance is largely dependent on wing loading and so the first reaction is to proportion the new model to produce the minimum wing loading permitted under F.A.I. rules—3.93 ounces per sq. ft. total area. To simplify this, let us assume that we are standardising on a 40 per cent tailplane area, when the required minimum *wing* loading works out at 3.82 ounces per 100 sq. in *wing area.*

Now draw up the model of the required size to match the minimum weight given by the new power loading rule. The sketches for .5, 1, 1.5 and 2.5 c.c. engines are to the same scale with the span appropriate to an aspect ratio of 8 to 1.

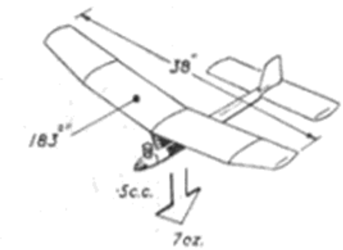
Any of these models, to the weight specified, should have about the best glide performance possible, within the F.A.I. specification. But there are several major snags. In the first place the model sizes are far larger than we are normally used to for their respective engine sizes, and it would be extremely difficult to build them *down* to these weights. Also, being large models, their drag will be high under power, further detracting from climb performance.

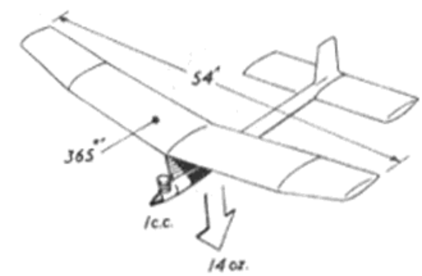
Due to scale effect, for the same fixed loadings the larger the model the more efficient its performance. But apart from the increased cost in time and money, large models are more vulnerable and present difficulties in transport. Thus few people are likely to be attracted to a 7 ft. span model for a 2.5 c.c. motor.

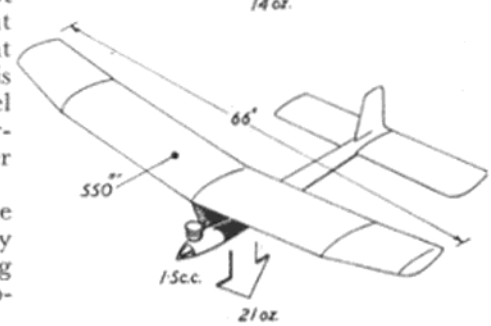
The curved line on the graph summarises 'average' model weights for different wing areas—typical, that is, of previous contest-type models. Even these weights are not particularly generous and need careful wood selection to achieve. Thus if we adopt that 550 sq. in model for a 1.5 c.c. engine on the basis of getting down to F.A.I. minimum wing loading, its total weight is more likely to work out at 32 oz. or so instead of the 21 oz. required, and we are up to a 6 oz. wing loading. Only in the very small sizes does it appear readily possible to adopt standard construction and come out with a model of the desired weight for minimum wing loading. On this basis, then, the half c.c. model appears to be a pretty good "international" size, despite its lower aerodynamic efficiency.

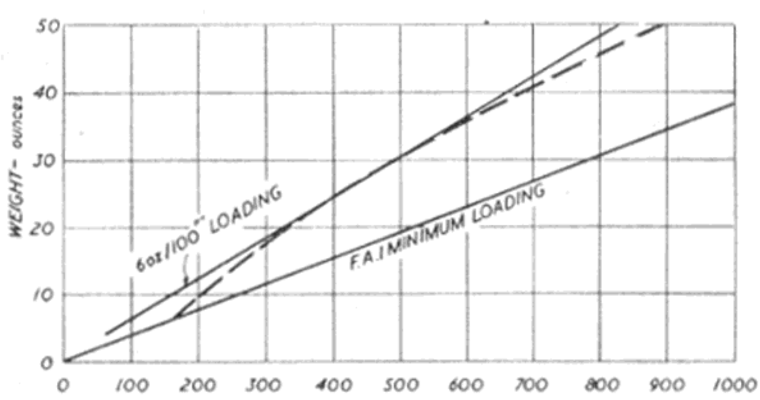
Actually, for all other engine sizes, designers will almost certainly have to adopt a higher wing loading than the minimum possible. Provided this does not exceed 6 oz. per 100 sq. in. wing area, glide performance should still be quite good, so the final size of model will work out somewhere between the limits given by the two curves, depending on how much it is possible to cut down structural weight and get away with it.

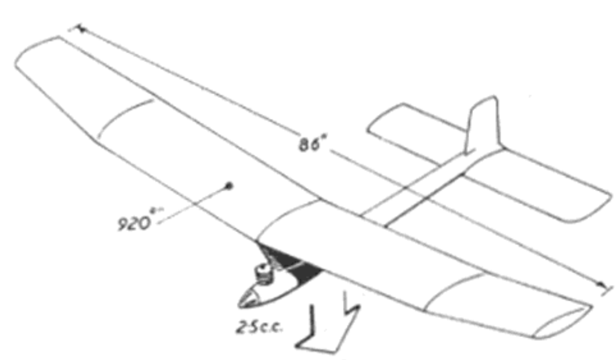
Thus, with average construction, our 21 oz. *desirable* total weight for a 1.5 c.c. engine corresponds to a wing area of something like 330 sq. in. —just on the 6 oz. loading limit for preserving glide; in fact, a model of just about the same size as that required for a 1 c.c. motor for *minimum* wing loading. But, of course, in this case the wing loading will be 50 per cent higher.







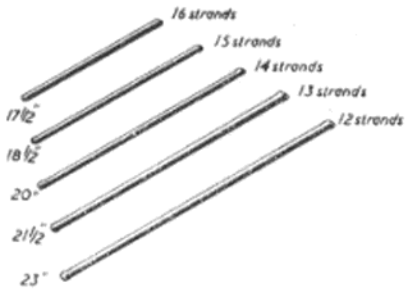


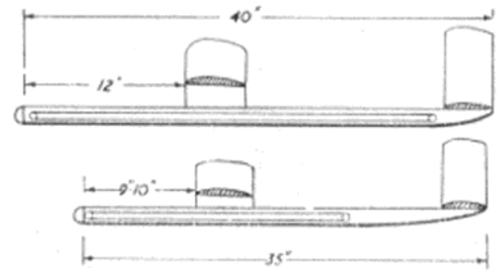


This seems to leave the field wide open. A model designed to a 6 oz. wing loading to get down to minimum total weight required under the load-rule; a very light, flimsy model of relatively large size but the same total weight, or some compromise between the two. The first method should produce a model with a good climb, at the expense of a not-so-good glide. The second model will probably have a poor climb, but could be quite a 'floater' on the glide. The third model could have characteristics anywhere between the two.

Frankly, although the larger model is the better theoretical solution, provided it is made really light, almost certainly the popular choice will be for the smaller size, both in model and engine. The larger the model, undoubtedly the more it will have to be made to 'climb on its wing', probably resulting in thin, flat bottomed sections to cut down drag, so it may not gain out all that much in glide performance. But one thing is fairly certain—the engine with the best power/weight ratio becomes the logical choice in any size.

By restricting rubber weight to a maximum of $1\frac{3}{4}$ oz., a complete re-arrangement of model *layout* appears to become necessary with new Wakefields. As the diagram shows, the distance between hooks on the weakest motor (12 strands of $\frac{1}{4} \times 24$) normally used is appreciably lower than that hitherto employed. Bringing the rear anchorage forward is no solution for the wing will be too far back on the present layout for balance (unless dead weight ballast is added to the tail end). The functional length of the fuselage now becomes quite short and to preserve a desirable moment arm, an extension rearwards in the form of a tail boom would appear to be a necessity.



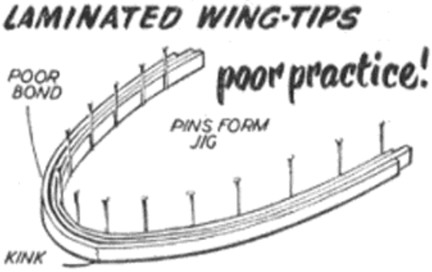


About the best size for Wakefield flying with 18 in. diameter propellers, and larger, is 13 strands of $\frac{1}{4}$, and presumably this will still remain a common choice. The only way to get a long motor under the new rules would be to reduce propeller diameter, even going down to 12 or 14 in. diameter. But this would not give a better overall performance than the larger/propeller with a more powerful, shorter motor.

The Wakefield, in fact, now appears to have become something of an oddity rather than a serious performance model. Motor run has been cut to something like 25 to 35 seconds and average maximum performance looks like being somewhere around the 2 minute mark, whichever way you go about it. Certainly it has lost all its original appeal when, under the original rules, motor run alone often exceeded this figure.

DESIGN TIPS No. 13

LAMINATED WING-TIPS



Laminated construction is an excellent method of making lightweight curved outlines for wing tips, fin outlines, fuselage formers, etc. Most laminations are built up from 1/32 in. strips to the number of four, five or more, depending on the thickness of section required. The method is straightforward, but many poor examples of laminated construction are frequently to be seen.

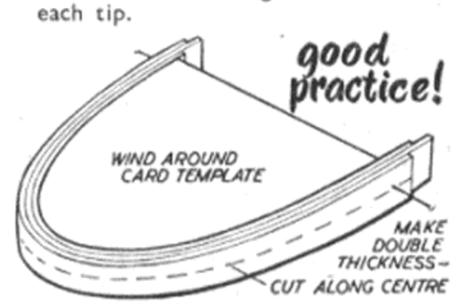
Making a jig of the shape required by sticking pins around the inner drawn outline and winding the strips against the pins is a frequent cause of faulty laminations. Strips are unsupported between the pins, cannot be pulled round uniformly, and frequently kink. Other common faults are a poor joint between individual laminations (particularly around the sharpest bends) and kinking in the finished outline.

The first step in making good laminations is to select 1/32 in. sheet stock which will readily bend. Stiff sheet is quite useless, so is "dry" sheet, which will crack readily. It is generally best to strip off a sample length and check that it can be bent round the required outline, then strip the required number of lengths for the complete lamination from the same part of the sheet.

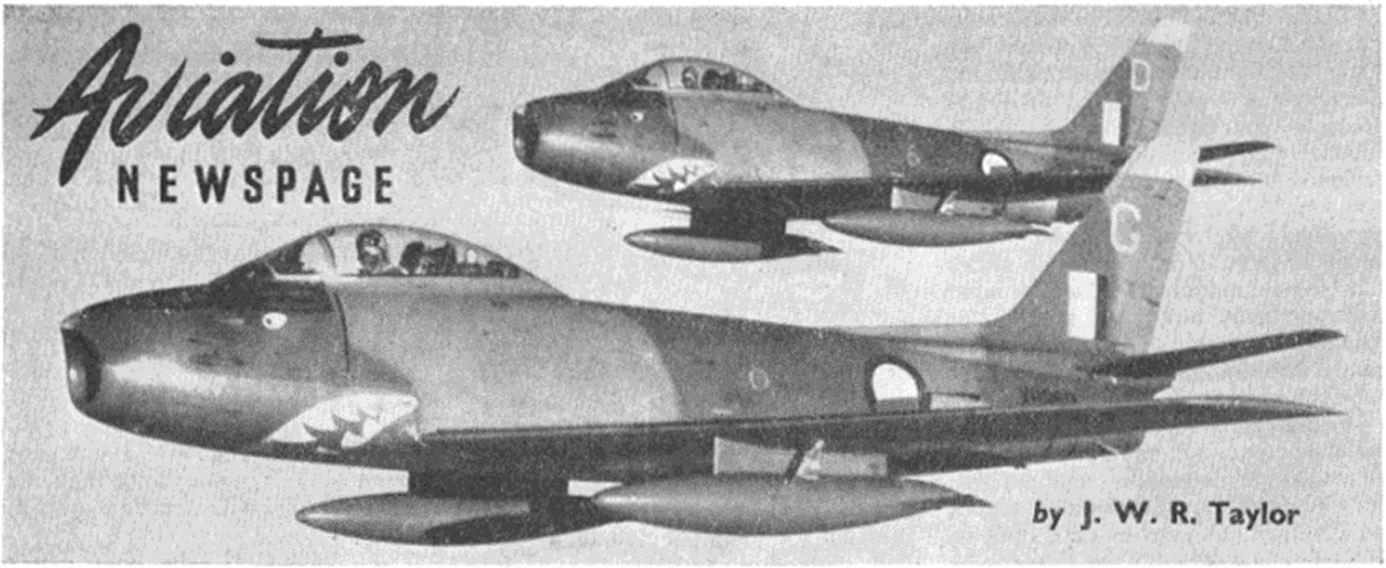
It should never be necessary to moisten the laminations to get them to bend to the required outline, but all bend radii should be as generous as possible. A template of the exact (inside) shape required should be cut from thick, rigid card and the edges waxed by rubbing with a candle. Make sure that each of the laminations is of the necessary length and quickly coat each, both sides, with balsa cement, except the first and last strips, which are coated on one side only. Set up one on top of the other in a pile and transfer to the start on the template. Pin through securely to the template and then apply firm pressure all the way round from this point, forcing the laminations to bend round the template and at the same time keeping them pressed close to each other and to the card outline. Pulling as well as pressing the laminations will make them flow readily to the template shape.

You will inevitably get your fingers coated with excess cement as this is squeezed out, but this is a small inconvenience. In fact, it is just about impossible to make a good lamination without getting smeared with cement—such a state of affairs will indicate that you have not coated the individual strips generously enough in the first place!

Another point frequently overlooked is that in making up wing tips, cut the individual strips double the required width—i.e. a generous allowance over twice the required tip thickness when finished. After winding and allowing the lamination to set, sand down perfectly flat on each side, then cut down the centre to produce two identical tips—the sanded surfaces being the bottom of each tip.



Aviation NEWSPAGE



by J. W. R. Taylor

FIERCE-LOOKING SABRES above belong to No. 112 Squadron, serving with the 2nd Tactical Air Force in Germany. In view of the Squadron's fine fighting record in North Africa during World War II, it has been given special permission to retain the red and white shark-tooth insignia carried then by its *Tomahawk* and *Kittyhawk* fighters, instead of having to conform with the usual Air Ministry insistance on staid rectangular markings on each side of the fuselage roundels.

* * *

Turning to **CIVIL AIRLINE MARKINGS,** there will be quite a lot of new ones to watch for at London Airport this summer. Iraqi Airways, who used to fly *Vikings* to the U.K., are returning with their three *Viscount* 735*s*. Misrair Egyptian Airlines will operate the same number of *Viscount* 739*s* between Cairo and London; and Middle East Airlines, based in the Lebanon, will also put in an appearance with the three *Viscount* 732*s*, taken over from Hunting-Clan Air Transport.

B.E.A. have not yet decided on their **NEW TAIL MARKINGS** and several different designs are being tried out on *Viscounts* and *Pionairs*. For simplicity and beauty, they will have difficulty in beating the Iceland Airways insignia carried by the *DC-4s* "Gullfaxi" (TF-ISE) and "Solfaxi" (TF-IST). This consists of bands of the red, white and blue Icelandic national colours along the fuselage and fin, and on the propeller tips; blue winged horse badges on the nose and fin; and blue "Flugfelag Islands" and red "Iceland Airways" on the white cabin top.

* * *

Having sampled recently one of Pan American's 71-seat tourist class *DC-7Bs*, in a flight designed to demonstrate its manoeuvrability and power rather than its undoubted straight and level comfort, I am quite certain that the even-better *DC-7C* will be a winner, in the best Douglas tradition.

Weighing 140,000 lb. at take-off and with de luxe seating for 62 passengers, the "Seven Seas" is one of the cleanest, fastest air liners entering service this year. Douglas claim that its parasitic drag is no more than that of a 2.2 in. dia. cylinder the same length as the wing span of 127 ft. 6 in. With a total take-off power of 13,600 h.p., the four Wright Turbo-compounds give the

The Douglas 'Seven Seas'

DC-7C a top speed of 406 m.p.h. and a genuine all-the-year-round non-stop transatlantic range with full payload.

* * *

American reports say that the Saunders-Roe SR.53 **ROCKET INTERCEPTOR** will have rocket primary power and a small turbojet for economical cruising, rather than mere rocket boost. Appearance of a Saro H.T.P. refuelling tender at the last S.B.A.C. Display suggests, therefore, that the combination may consist of a D.H. Spectre liquid-fuel rocket motor, which is known to burn H.T.P., and a Viper or Orpheus turbojet, depending on the amount of thrust required.

Unless Britain is neglecting entirely the alternative rocket boost layout, it would be logical to expect the

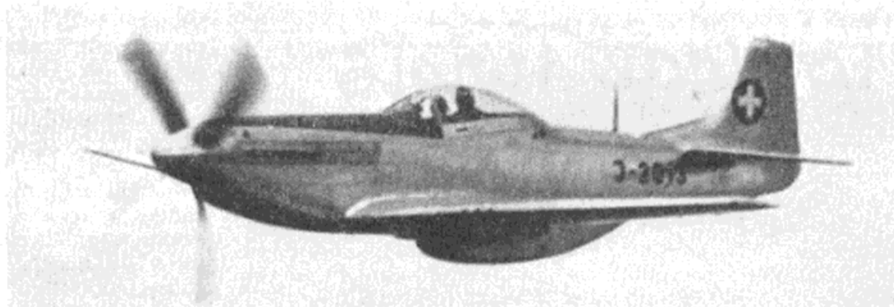
Spruce-looking DC-4 in this picture belongs to Iceland Airways and is registered TF-ISE.

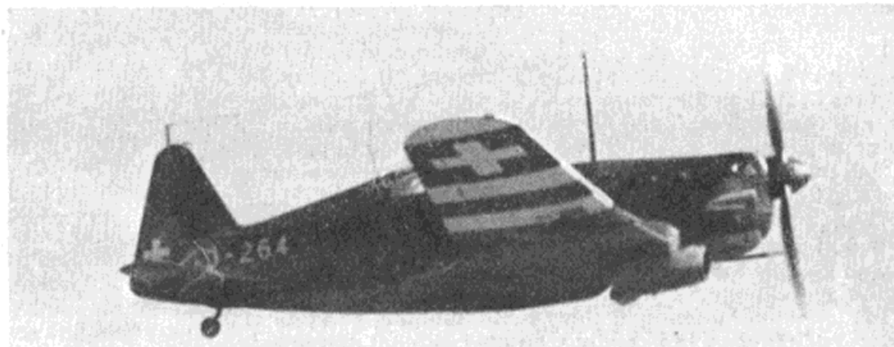
English Electric *P.1* to appear in due course with an external rocket pack. The result would increase usefully both its top speed and all-important operational ceiling.

* * *

LITTLE-KNOWN FIGHTER still in service with the Swiss Air Force is the single-seat *D-3801*, a licence-built version of the pre-war French Morane-Saulnier *M.S.406C*. Powered by a 1,000 h.p. Hispano 12Ys-1 engine, it has a maximum speed of 335 m.p.h.

Other types used by the Swiss Air Force include *Venom F.B.50*, *Vampire F.B.6* and *P-51 Mustang* fighter-bombers, Federal *C-3603* attack two-seaters, *Ju-52* transports, Fieseler *Storch* observation and tug aircraft, *Hiller* 360 rescue helicopters with external litters, and a variety of training and communications aircraft including the *Vampire*, AT-16 *Harvard*, Pilatus *P-2* and *P-3*, Bucker *Bu-131 Jungmann*, *Bu-133 Jungmeister* and *Bu-181 Bestmann*, Piper *Super-Cub* and *Me-108 Taifun*.





Two old faithfuls flying in Swiss Air Force colours are top, the "Mustang" and below, the French Morane-Saulnier M.S.406c. Switzerland acquired the licence to build this French plane in 1938.

* * *

FINAL OPERATIONAL SORTIE by a "Mossie" was made on 15th December last by a *Mosquito PR.34A* (serial RG314) of No. 81 Squadron. Based at Seletar, Singapore, it flew a photo-reconnaissance mission over a terrorist target in Malaya before being retired, to make way for the *Meteor PR.10s* with which No. 81 is being re-equipped.

Altogether 7,781 *Mosquitos* were built, of which some 7,200 were delivered to the R.A.F. They dropped 26,867 tons of bombs with Bomber Command and destroyed about 600 enemy aircraft and 600 flying bombs with Fighter Command. Used for almost every other conceivable duty, they were the last of the R.A.F.'s famous wartime piston-engined landplanes used on active squadron service. Now, only *Sunderland* flying boats still remain operational; although a few *Mosquitos* will continue in service in various training roles.

* * *

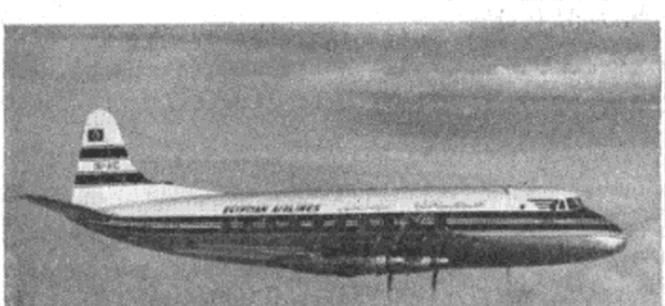
The U.S.A.F.'s two YC-131C **TURBOPROP TRANSPORTS** get little publicity, although they have completed successfully some 2,000 hours of semi-scheduled operation on the M.A.T.S. routes from Kelly Air Force Base in Texas to Andrews AFB, Washington and Travis AFB, California. Despite the 150-hour overhaul life of their 3,750 h.p. Allison YT-56 turboprops, the *YC-131s*, which are based on the commercial Convair-340, have logged a daily average in one month of nearly eight flying hours, with a record 19 hr. 35 min. by one of them in a single day. Flown by pilots of the 1700th Test Squadron, they normally cruise at a true airspeed of 320 m.p.h. at 21,000 ft.

* * *

MACH 4 AIRCRAFT, as well as their pilots, will "sweat" if a scheme suggested by Republic Aviation chief aerodynamicist C.E. Pappas is adopted. At this speed—about 2,640 m.p.h. at height—aircraft surfaces would be heated by air friction to 900 degrees Fahrenheit in about one minute. This would cause the metal so soften if no efficient heat reduction system were available.

Pappas' idea is to build in a perspiration system, which would force water through pores in the skin at high speeds. The water would go out as steam, carrying off a good deal of the heat caused by air friction.

Left: With "Viscounts" in service with so many airlines, they can be seen in a considerable variety of colour schemes. This photo shows a Viscount 739 of Egyptian Airlines. Right: America's first twin-engined turboprop aircraft, the Convair YC-131C, in service with the U.S. Air Force as a military transport.



Topical Twists

Getting the Bird.

We are incredibly informed that the first tailless model was a Javanese Cucumber; a primitive form of vegetable life which engages in a sort of Quatermass aeronautics to ensure, in Nature's benevolence, that the Javanese peasant, however impoverished will never go short of a pickled gherkin.

Anyway, it is obvious that the modeller could learn a lot by a study of Nature's aeronauts. Admittedly, my first tailless model flew about as well as the solid, or non-flying, species of cucumber, but birds and bees, we are told, are enlightening subjects to follow. Ideas from this source are not uncommon, and might well be the reason why so few young men now take up modelling. Take bees, for instance. Probably man's first attempt at airborne travel followed a sharp and painful attack from one of these busy creatures. Birds also provide a fruitful field of study, once the main difficulty of spelling ' ornithology ' is overcome.

It is, I think, fortunate for bird lovers that their feathered friends do not, in turn, study our primitive model life. Apart from the decimation that might result from the copying of our crude trimming techniques, there is the shocking prospect of a bird society modelled on our own international movement. All the high power/weight performers would soon have their wings clipped. Eagles and suchlike would be obliged to carry a suitable payload in the form of a lead weighted dummy lamb; Starlings etc., would be limited to the wing power equivalent of 1.7 ozs of rubber; and gulls restricted to 50 ft. cliff tops.

Then, again, imagine the plight of our home based ornithopters. Sparrows, starlings and other active wing beaters would be asked to cough up three times the amount of birdseed than duck, geese and the other associated varieties of less strenuous fowl which secretly detest flying and prefer to waddle around looking pompous. In course of time, entries for the annual Trafalgar Square Open and the Nelson's Column Spot Event would dwindle to nothing. Then, upon them being dropped from the Comp. Calendar, a great quacking of protest would arise from the Ducks, who will claim that they had always intended to enter the events, if only they were held over Clapham Pond.

Shady Treatment.

One enterprising American modeller was recently disqualified for entering a flying lampshade in a contest. In the absence of any standard by which to judge it, it was out-ruled by the neo-realists,who argued that it did not look sufficiently like a model plane.

The idea behind the flying lampshade creation was a courageous attempt to solve the home storage problem. Family members do not usually posess that developed aesthetic taste which finds deep fulfilment in the functional beauty of a pylon job dangling artistically from the picture rail. Nor are our objects d'art always dusted with that loving care which bespeaks the true dilettante. In fact, we must face the bitter truth that the qualities of the model machine as a domestic adornment are not widely appreciated.

What better idea, then, than to produce the model plane in the form of some useful household ornament such as a lampshade? The snag is, of course, that the family, besieged and encompassed by a clutter of balsa lampshades, might become even more hostile. You would then perhaps get bewildered and start turning out lampshades that look like model planes.

In the severely furnished home of to-day, the introduction of a little variety by way of a jet propelled What-not, an airworthy antimacassar, or a rubber driven aspidestra, is out of the question, but what about something nifty in the carpet line—just in case the World Champs. are ever held in Persia ?.

Vagrant Thoughts.

I see that our globe trotting friend, Bill Dean, is back in the old country for a spell; enlivening the correspondence columns with a spirited defence of the crumpled (but yet undefeated) flannel bag in the International arena. On this subject, Mr. Dean is, of course, an acknowledged authority, having graduated from a rather vagrant line in reach-me-downs, which earned him the quaint appellation of ' Gypsy ' back in his model flying days, to his present well groomed and natty appearance. In making his stand for the unkempt individualist, whose cleaning up propensities are directed more towards the contest prizes than personal enhancement, it is perhaps a sad comment on the too fastidious model world of to-day that he should be hard put to find even one grubby handful of such characters. Even among the examples he gives, Mike Gaster can be excused his crumpled flannels, although a soiled pinafore would be more appropriate to one who spends his days over a hot ' Gastove ', and as for the ' Stoo ' pantaloons, which recent tests have established an oil absorbency rate of 30 c.c's per lap, they have become an institution quite indispensable—but almost not so on one or two lap chasing occasions.

We are a well shaven lot, too, these days, and lovers of the stubbled chin are often disappointed to learn that the apparent week old growth on the face of one prominent character is in fact a bona fide form of beard. A variation on the popular Van Dyke, it is known as the Holland Fringe.

Back in the old days things were different. We were proud to be known as a byword in unabashed scruffiness, and never more than when our opponents invoked the Vagrancy Acts against us. Indeed, were any flyer to present himself on the flying field in a state of washed and shaven virtue, heads would nod in gloomy despair over the imminent departure of yet another good man from the hobby. It was, in fact, possible to measure the degree of keenness by the order of scruffiness, and it says much for Mr. Dean's early enthusiasm that he should have earned such a meritorious nickname.

Higher Education.

In response to the Northwick Park request for knowledgable modellers to give club lectures, I offer to them, free of purchase tax, the famous series of Pylonious Talks. They are available either for immediate delivery or on a ' wrap up ' and take away basis. Firearms strictly prohibited.

Problems of Inertia (T.V. versus Model Building).
Your Next Step in Radio Control (Boat Designing for the Beginner).
In Pursuit of the Best R.N. Figure (A Study of the Wren in Flight).
Structural Problems of the 1960 *F.A.I. Power Model (First steps in sheet lead work).*
How to Make Friends.

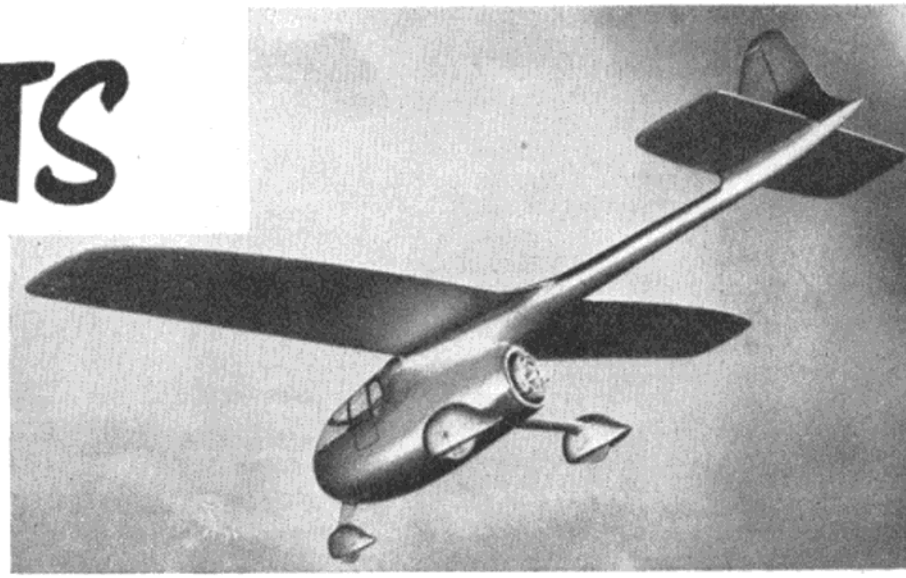
On the subject of lectures I notice that some editorial wag has prophesied that, in 1956, I shall be delivering a lecture to Kit Manufacturers. (Thinks—Not a bad idea ! If I say a few nice things about kits I might get invited to next year's trade bun fight. Extra Think—What nice things can I say about kits ? Blank Think—Ah well, I'd have had to get my monkey suit out of hock anyway—Unthinks.)

Pylonius

JET PROPULSION——————*and the MODEL*

PART THREE

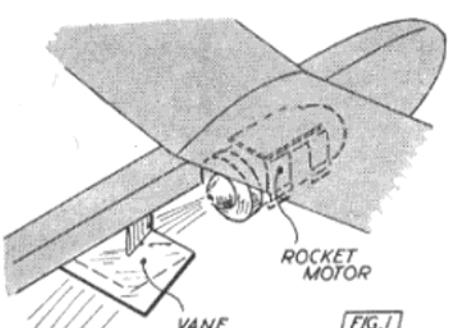
ROCKETS

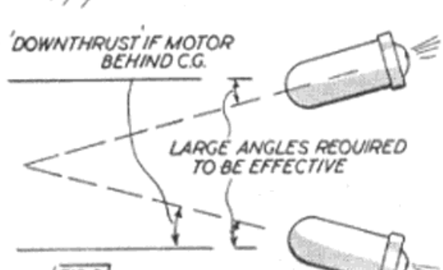


An original all balsa R.T.P. model powered by a Jetex 100.

Last month the pulse jet engine was discussed, and in this latest article we deal with rockets, both liquid and solid fuel burning. The commonest form of rocket power for models is, of course, the Jetex unit, the possibilities of which are here fully explored.

THE rocket engine is unique in that it is a true constant-thrust unit, irrespective of airspeed, which also implies that it cannot be 'throttled' or controlled. The effect on the performance of a rocket-powered free flight model is puzzling to many people. A model which may appear, when launched, to be underpowered, rapidly builds up speed and quite often ends its power flight in a series of high-speed loops. It seems, in fact, that the rocket motor has built up increasing *thrust*, whereas in actual fact the thrust has remained constant. What has happened is that the *efficiency* of the rocket has increased with increasing speed and hence its power or rate of doing work has increased, power being the product of thrust and speed.





A similar effect is when free-wheeling downhill on a bicycle. The thrust force in this case is gravity, and is constant. But your speed keeps on building up all the time down the slope until, if the hill was long enough, you would eventually reach a constant speed where the gravity force was exactly balanced by the resistance of the bicycle and rider.

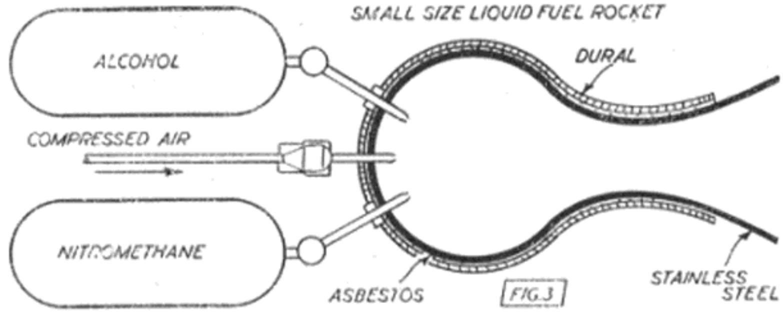
In the case of a model powered by a rocket motor developing, say, 1 oz. thrust, the model will keep on accelerating up to the airspeed equivalent to a total model drag of 1 oz. and from then on the model would fly at this constant speed. In many cases the power run is too short for the model ever to reach its "balancing speed," and so it accelerates throughout its power flight.

What this really means in practice is that trimming a rocket-powered model is different from that of most other models. It is similar, but rather more severe, than that of a high-powered prop-driven duration model in that the nose must be held down for high speed power-on flight. The power-off or glide trim needs to be quite different, nose up and near stalling for maximum glide duration.

This can be arranged by mounting the rocket engine so that it imparts a definite nose-down force to the model —e.g. the thrust line comes above the centre of gravity—absorbing the power build-up by trimming for a tight spiralling climb; or by using an exhaust-controlled elevating vane.

The latter is a device which was once widely used in Germany in connection with their early rocket experiments. A vane is mounted directly in the exhaust of the rocket, angled to give the required compensating pitching force—Fig. 1. The angle can be adjusted, as necessary, to suit any particular design. Being small in size, the effective force produced by the vane is negligible once the rocket has burnt out and so it has no effect on the glide.

This works quite well on some models, but is very rarely used, a similar effect being achieved by

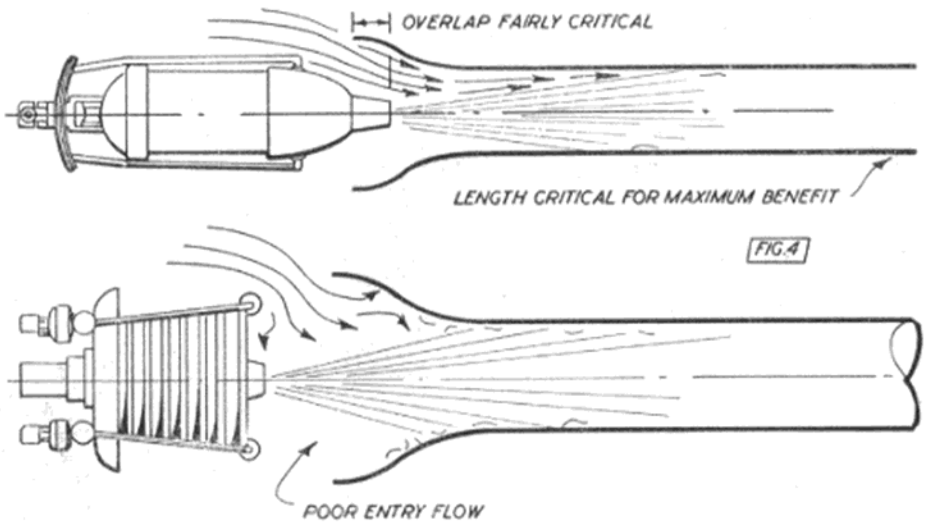


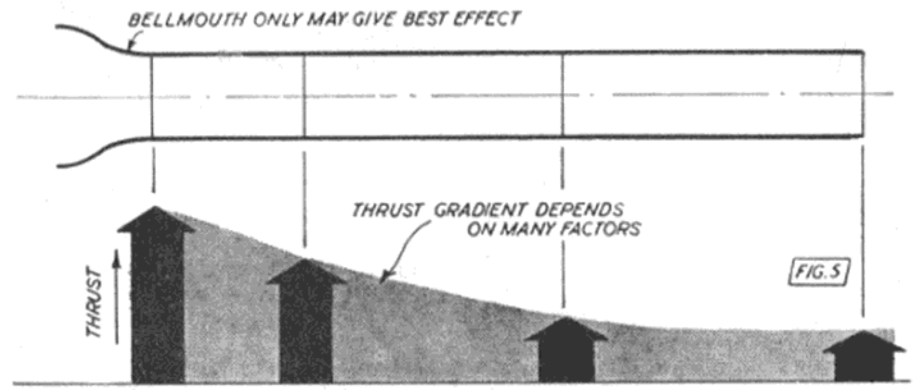
angling the thrust line of the rocket—Fig. 2. Downthrust is distinguished from upthrust in that the former brings the thrust line *closer* to the centre of gravity if the unit is *below* the c.g. (thus reducing its moment about the c.g.), whilst the latter is opposite in geometry, and effect. The position is reversed if the unit is mounted *above* the centre of gravity.

One disadvantage, however, is that the rocket motor is nearly always mounted near the c.g. of the model and thus large angular settings are needed to produce the required trimming effect.

The constant-thrust characteristic of a rocket motor merely represent a trimming problem, and not a limitation. All rocket motors do, however, suffer from a number of major limitations, the chief of which are a high rate of fuel consumption and the corrosive nature of the exhaust gases. Neither of these can be overcome, whereas the fact that the rocket engine builds up comparatively high pressures within its casing is merely a matter of engineering design to make the casing strong enough to withstand the pressures, and/or incorporate safety devices to allow excess pressure to blow off harmlessly. At the same time it must be appreciated that high pressures are strictly necessary within the rocket motor combustion chamber in order to achieve a high exhaust velocity.

Rocket motors may employ either solid or liquid fuels. In the latter case fuel and oxidiser, both in liquid form, are stored in separate chambers and sprayed into a combustion chamber, where they are mixed and burned, and then ejected through the exhaust nozzle—Fig. 3. Pressure in the combustion chamber is usually of the order of 300 pounds per sq. in. and although they can be made to work down to comparatively small sizes, and have the advantage of being controllable in that they can be switched on and off at will, they are generally expensive and somewhat dangerous to experiment with. Unless just right, a liquid rocket motor is very prone to explode.

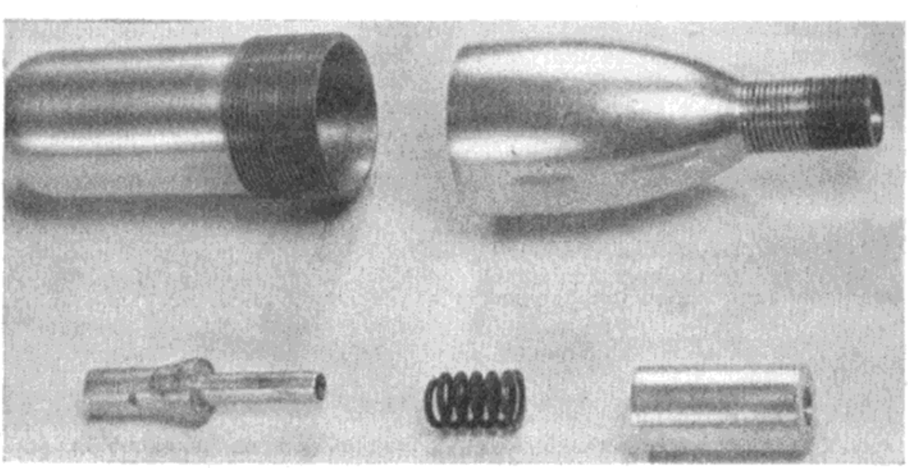




Thus, apart from a limited application of small liquid-fuel rocket motors to 'dynamic' free flight test models used by some of the full size aircraft companies, rockets for model work are invariably of the solid fuel type.

The requirement is a slow-burning propellant which does not develop excessive heat or pressure—striking the right compromise between thrust attainable and burning time. To date, the only material which has met this specification is guanidine nitrate, manufactured by Imperial Chemical Industries, Ltd., and which is the fuel employed in the Jetex series of rocket motors. This fuel burns evenly and relatively slowly for a propellant, at a reasonably low temperature, and is also readily ignited, having an ignition temperature of about 350 degree F.

The secret of design is largely a matter of providing the optimum escape path for the gases from the combustion chamber—the shape and volume of the free space between the burning charge and the jet, and the diameter and form of the jet itself. It is possible further to improve performance by ejecting the gases into a bellmouth entering into a tailpipe—called an augmenter tube—although again this is only effective if the shape and size of the augmenter is properly proportioned to the rocket



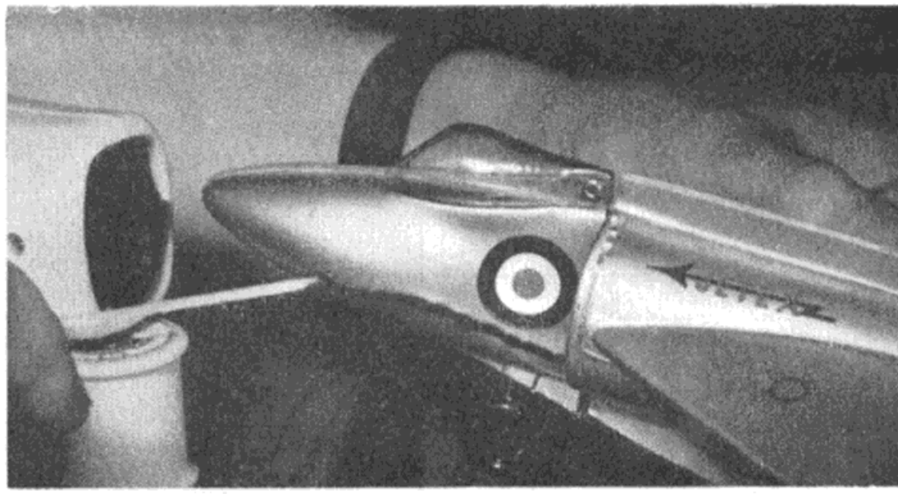
This photograph shows a hand-built rocket unit for solid fuel charges made by W. Ball.

motor unit. Generally speaking, it is necessary that the 'exit' end of the rocket unit be shaped to provide a convergent path for the air entering the augmenter—Fig. 4 A divergent entry allows the incoming air to slow up and thus tends to nullify any beneficial effects gained by collecting and and accelerating the jet exhaust through the augmenter. The length of the augmenter is another critical factor. Usually the maximum gain is obtained with a short tailpipe. A long tailpipe produces deceleration of the gases through friction—Fig. 5.

With normal Jetex fuel, a thrust/charge ratio of about 5 is achieved. That is to say, the charge is capable of producing a constant thrust of the order of 5 times the weight of the charge, through the appropriate jet nozzle. Nozzle sizes have been determined as the result of extensive experimental work and can be assumed as the optimum for each particular size of unit. Altering the size of the jet nozzle, either by accidentally reaming out oversize when cleaning, or leaving partially blocked, will generally result in appreciably reduced performance. Unless the fuse wire protruding from the nozzle is blown out—or pulled out immediately the charge has fired—a serious loss of thrust is usually experienced.

Charge performance can also be expressed in terms of thrust × duration, which can vary from as low as 3 up to as high as 45 or 50. The lower figures are appropriate to the smaller sizes of Jetex unit and the higher to the 200, 350 (with single charges) and Scorpion.

Burning time is directly dependent on the volume of charge, but apart from the increased cost it is not possible to go on increasing the size of the charge without affecting its efficiency. Free volume within a combustion chamber increases as the charge is burnt up. It is, however, readily possible to increase the thrust obtainable from any unit, *within the same thrust-duration figure*, simply by increasing the rate of burning. In other words, the thrust/charge ratio is dependent on burning time, but the thrust-duration figure is appreciably constant for any given set-up. The latter can be improved by the fitting of an augmenter, or reduced by gas leakages, blockages, etc.



Jetex motors demand a cooling airflow to prevent overheating. The photograph shows a wool tuft and hair drier being used in an elementary wind tunnel test to investigate airflow into the intake.

A typical Jetex charge burns for about 10-14 seconds, Fig. 6 showing a characteristic thrust-time curve. There is an appreciable delay between lighting the fuse and the sudden build-up of pressure which marks the beginning of the thrust run proper. This initial 'explosion' is normally in excess of the rated pressure of the case, lifting the end cap on its safety springs, allowing it to re-seat immediately. Thrust output over the nominal power run is then appreciably constant but building up into a sharp peak right at the end. This peak is, in fact, a characteristic of purely cylindrical charges and so in this respect the Jetex is not a 'constant thrust' unit. Alternatively a similar peak can occur at the beginning of the run. It seems to depend on the design of the combustion chamber and head.

'Peaking'—at either end of the run—can be eliminated by hollowing out the charge, reducing the cross sectional area, and thus equalising the pressure within the combustion chamber. Thus a conical depression is moulded into the bottom end of the charges in the Atom 35—this type of unit having a characteristic end peak—and in the top or igniting end of the Scorpion charge—here to eliminate an initial surge.—Fig. 7.

(Continued at foot of next page)

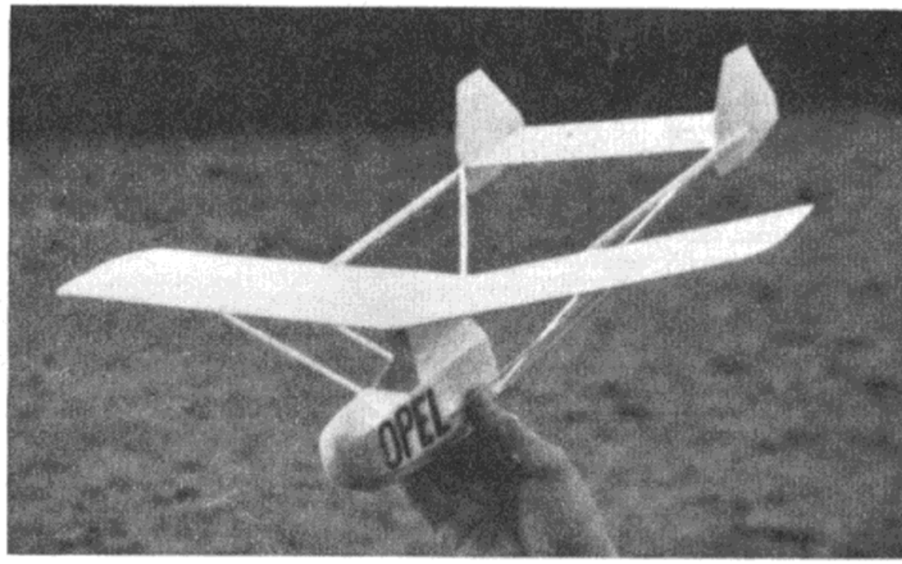
JETEX PERFORMANCE TABLE

Unit	Weight (loaded) oz.	Weight of charge	Average thrust oz.	Effective square up Duration	Charge Weight %	Thrust/ Weight Ratio	Thrust/ Charge Ratio	Thrust × Duration	Charge efficiency = Thrust x Duration / Charge Weight
ATOM '35'	1/4	3/32	1/2	6-7 secs.	37.5	2.0	5.3	3.0 —3.5	31—36
50 B	21/64	7/64	5/8	12-14 secs.	33	1.9	5.7	7.5 —8.8	68—80
100	7/8	1/4	1 1/4	12 seconds*	29	1.4	5.0	15	60
JETMASTER	15/16	1/4	1 3/4	10-12 secs.*	27	1.9	7.0	17.5— 21	70—80
200	1 9/16†	5/16†	2 3/4	10 seconds†	20	1.8	8.8	27.5	88
350	2 3/4†	3/8†	4	11 seconds	14	1.45	10.6	44	117
SCORPION	2	3/8	5	9 seconds	19	2.5	13.3	45	120

* Red spot fuel   † ONE CHARGE

Build a model of the world's first jet

the OPEL HATRY



The Opel Hatry is an ideal Jetex model for beginners, with a good performance.

ON September 30th, 1929, at Frankfort-on-Main, observers had the unique experience of watching what appeared to be a secondary glider, mounted on a launching ramp, belching smoke from the end of its nacelle and slowly gathering speed—just airborne at the end of the ramp, then accelerating rapidly to reach a final height of 50 ft. They had, in fact, witnessed the first piloted jet aircraft to fly, with Fritz von Opel at the controls.

The aircraft was a special design—not a converted glider—built by Ernest Hatry. Professor Sander designed and made the rocket motor, consisting of five separate units fired one after the other. Flight duration was short but the machine flew, even if Opel did have difficulty in keeping it under control as speed built up to a maximum of 90 m.p.h.

Construction of this authentic scale model is extremely straightforward. Use light wood throughout, except for the booms. These were hard quarter-grain stock on the originial. If your prefer you can use larger material (e.g. $3/16 \times 3/32$), but keep the total weight of the model down as much as you can.

First job is to scale up the plan, using the $\frac{1}{2}$ in. grid for reference. The wing is built flat over the plan, cracked at the centre and cemented to the correct dihedral. The tailplane is flat, without dihedral.

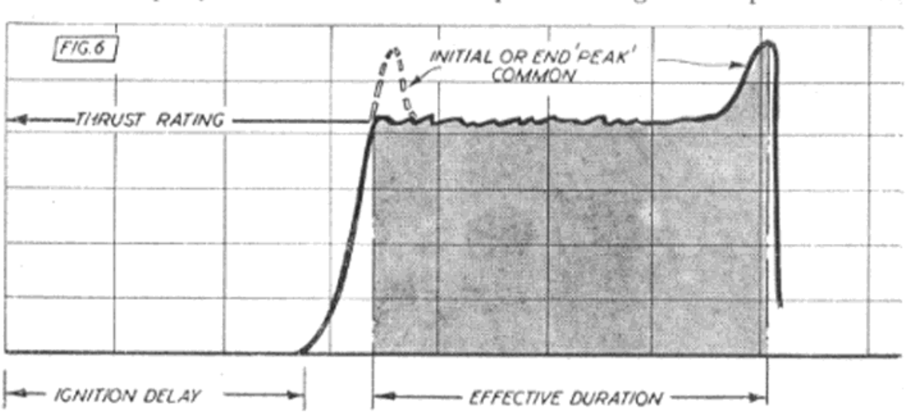
The fuselage nacelle is assembled by cutting two sides from light 1/32 in. sheet and cementing to the formers. Then complete the top and bottom sheeting, also the sides of the cabane. The noseblock is carved from solid balsa.

Mount the Jetex unit on a $\frac{1}{16}$ in. sheet carrier which engages in rails cemented inside the open end of the nacelle. Be prepared to cut these out later as you may have to tilt the Jetex for trim, e.g. raising the rear of the unit to stop the model from looping under power.

Tissue cover the tailplane on the top surface only. Cement on the two top booms. With the wing flat on the table, prop up the leading edge of the tailplane $\frac{5}{16}$ in. and cement the booms to the two $\frac{1}{16}$ sheet wing ribs. This packing will ensure the correct difference in rigging between the wing and tail. Now cover the wings with tissue, top and bottom, waterspray, and dope. Cement to the fuselage cabane and then add the bottom tail booms and wing spars.

Balance the model just behind the wing spar with an unloaded Jetex unit in place. Glide should be fast and flat, and straight. Climb should be straight at first, developing into an upward spiral. Provided you keep the model light, good durations should be possible.

To increase the thrust, at the expense of decreasing the duration, the charge must be encouraged to burn more rapidly. This can be done by cutting notches along its length—Fig. 8. Any free air path down the side of the charge is conducive to more rapid burning. To promote the fastest possible rate of burning, the notched areas can be ignited simultaneously by wrapping with fuse. It is claimed that this treatment will result in up to 5 oz. thrust being produced by a Jetex 50 unit, exhausting through an augmenter tube. With a normal charge a figure of .75 oz. thrust can be obtained with a "50" unit and augmenter, giving a thrust-charge performance of about 10. The corresponding duration with a 5 oz. thrust could therefore not be sustained for any longer than 2 seconds.



The same is largely true of the "hotter" rocket motor fuels made,

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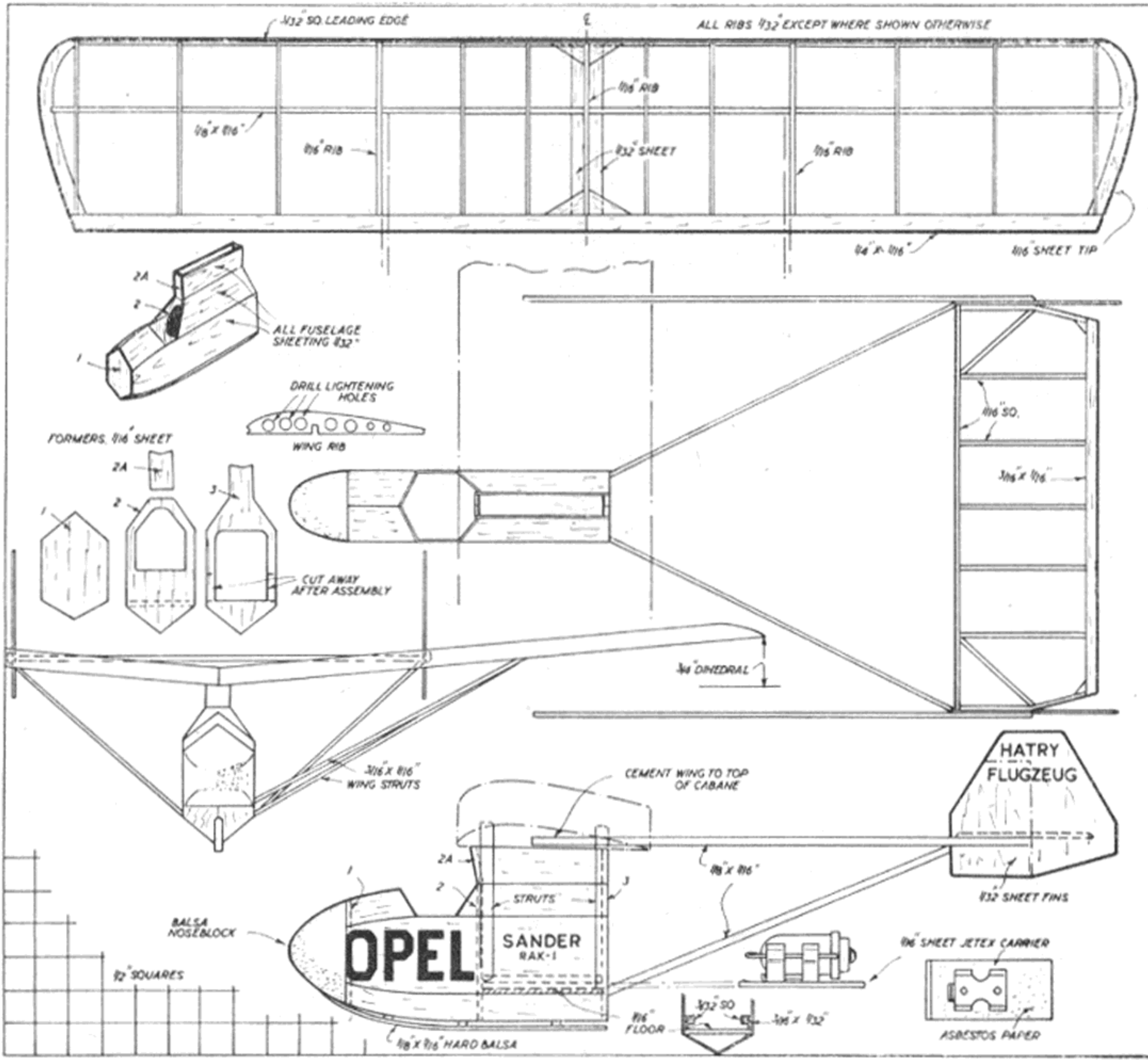


even better thrust being possible at the expense of reduced duration. In fact, in the light of experience to date, guanidine nitrate appears to

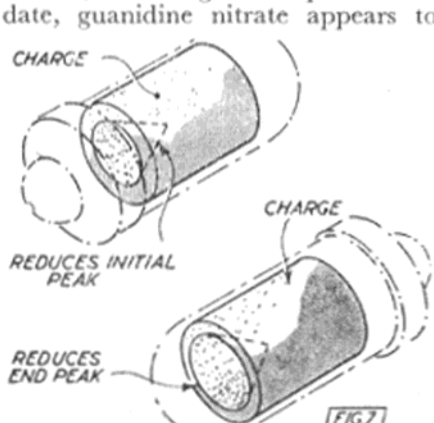


FIG.7

be the most satisfactory fuel for solid fuel model rocket motors. It is not, however, a perfectly consistent fuel in that its performance may vary somewhat from batch to batch. Also it is hygroscopic, meaning that it readily absorbs moisture. Unless protected, charges readily get damp and, in this state, may fail to ignite or give a reduced performance. Warm Jetex charges definitely give a better performance than cold, damp ones. But the Jetex has reduced the solid fuel rocket to a practical, safe form for model work. It has the same overall characteristics as other model items, however, in that the smaller you make it the lower the efficiency. The Scorpion, for example, is some three times as efficient as the Atom 35 with the same fuel, expressing overall efficiency as thrust × duration divided by the weight of charge.

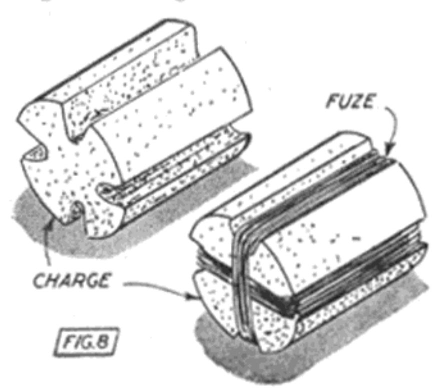
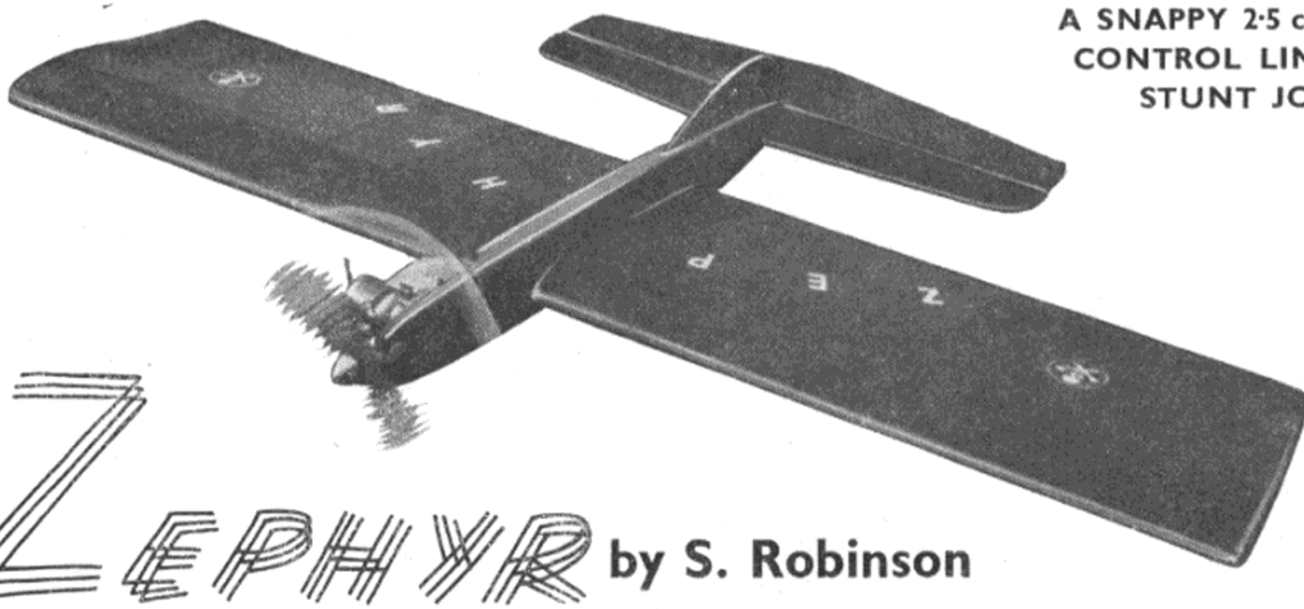


FIG.8

A SNAPPY 2·5 c.c. CONTROL LINE STUNT JOB



Zephyr by S. Robinson

Here is a combat model worthy of the designation. Of simple yet strong construction, it should easily withstand the rigours of this branch of control line flying. *Zephyr* has a number of successes to its credit, including a first, with an E.D. Racer powered version, at the London Area Control line meeting held at Heston. As a matter of interest, it also has a good speed performance having been timed at 83.6 m.p.h. over 20 laps using a 9 × 6 polished Stant propeller and powered by a modified Oliver Tiger.

Wing

Start by cutting out wing ribs, not forgetting the slots in the port wing ribs for leadouts (note rake on leadouts). Carefully pin all the ribs together and mark off, cut the main spar slots and L.E. slots, then remove outer ribs and cut slots in centre seven ribs for hardwood spar.

Designer S. Robinson holding the Oliver Tiger powered Zephyr.

Next, pin the bottom spar on the plan and cement ribs in position, then fit top spar, ensuring the ribs are upright and square; then cut and add trailing edge, holding in place with clothes pegs until dry. The next step is to fit L.E. and hardwood spar, cementing well. Cut ply bellcrank mount, drilling small lead holes for the woodscrews and screw in place and also apply cement liberally.

Add sheeting and capping strips and wing tip blocks carved to shape, then sand all over. Add wing tip weight and leadout tubes.

Fuselage

Cut centre lamination of $\frac{1}{2}$ in. balsa to dotted line and cement rear half in place in the centre of the wing, making sure that it is square in all directions. Now fit bearers in position with clamps and mark off position of engine bolt holes. Drill these and carve away bearers where necessary to accommodate crankcase, then bolt engine in position. Now cement bearers in place, adding front half of centre lamination. Cut the two outer laminations and slide into place over wings, and cement well. Then cut the slots for the fin and tailplane.

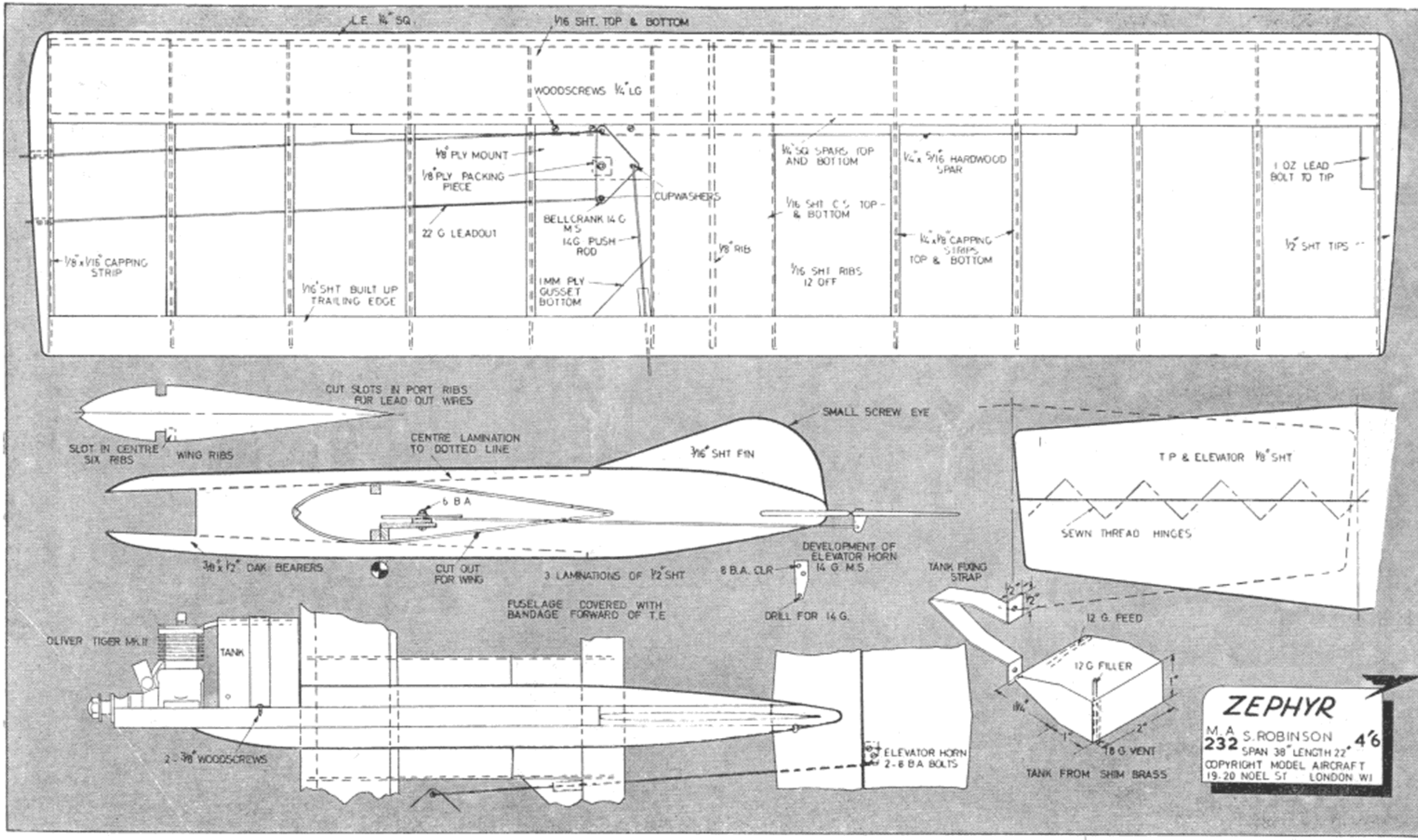
When completely dry remove the engine and carve the fuselage to shape, taking off as little of the bearers as possible. Sand smooth all over and cover top and bottom with bandage soaked in cement; also apply bandage round fuselage in front and behind wing. Now cut and fit fin. Cut tailplane and elevator and sand to shape, cover with lightweight tissue and sew elevator on, applying a blob of cement at each needle hole to prevent splitting. Now fit to fuselage with plenty of cement, making sure it is square with the wings.

Cut bellcrank and elevator horn from 14 s.w.g. m.s. (aluminium may be used but does not last very long). Drill holes and bend horn to shape. Drill hole in bellcrank mount and fit ply packing piece, tighten up bolt and smother with cement. Bolt elevator horn in place, first soaking wood with cement. Now fix the elevator at neutral and fit pushrod in horn. Hold bellcrank at neutral and bend push rod over and cut off surplus. Now fit leadouts, looping ends to your particular liking and solder all connections using cup washers on pushrod and leadouts. The movement should be completely free.

The tank shown on the plan is ideally suited to an Oliver Tiger, but any tank may be fitted to suit a particular engine.

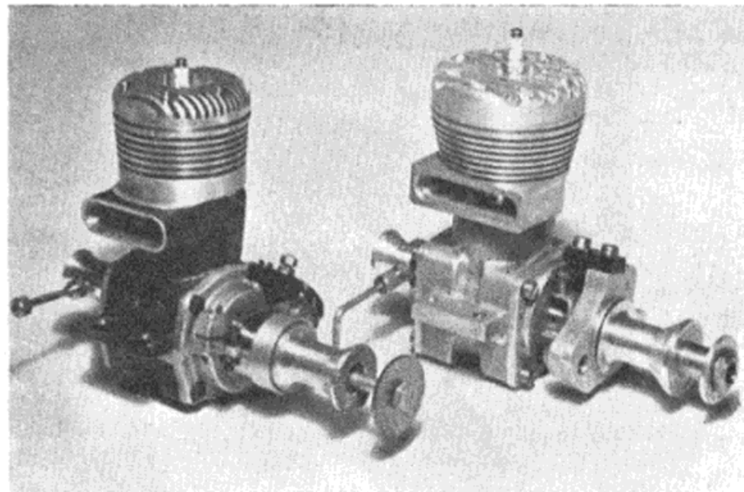
Cover with heavyweight Modelspan or parachute silk to your own colour scheme and add two or three coats of thinned, clear dope.

Before flying, check that the c. of g. is in the correct position as shown on the plan, as this is very important for maximum performance. Fit a 9 × 6 in. plastic prop. The model should lap at 70 m.p.h. plus, on 50ft. lines, according to the engine (the prototype does 80 m.p.h. on a re-worked Oliver).



FULL SIZE WORKING DRAWINGS ARE OBTAINABLE FROM YOUR LOCAL DEALER, OR BY POST FROM THE "MODEL AIRCRAFT" PLANS DEPARTMENT 19-20, NOEL STREET, LONDON, W.1, 4s. 6d. POST FREE

EXIT THE RACING ENGINE?



Two British attempts in the racing engine field were the Nordec (left) and the Rowell. The Nordec was modelled on the original McCoy but, by the time it reached the market, its performance was overshadowed by the vastly improved McCoy Series 20. The Rowell, of somewhat better performance, was mainly for car work and suffered a severe weight handicap.

The withdrawal (temporary or permanent, we do not yet know) of the famous Mc Coy 60 from the market in America, serves to emphasise a trend which has been apparent on both sides of the Atlantic for some considerable time: the decline of the classic racing engine.

In 1948, we remember, at least eight different racing engines were offered on the American market in the 10 c.c. class alone. Competing with McCoy for top place were the newly introduced Dooling 61 and the well-established Hornet 60, followed by various lesser-known or less successful designs among which enthusiasts will recall such names as Ball, Fox, Hassad, Bungay and Orr. Now, all these names have disappeared with the exception of Fox who, however, now manufactures an entirely different type of engine.

The same applies elsewhere, although nowhere did the big racing engine reach such popularity or develop so rapidly as in the U.S.A. Two engines of typical design were put into production in Britain, the Rowell and the Nordec, and there was also promise of others (such as the Z.N.,E.D. and Conqueror), which either did not materialise in production form, or quickly fell by the wayside in their inability to compete with established standards of performance.

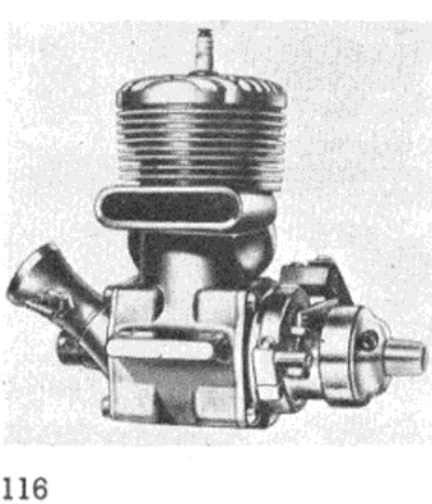
ACCENT ON POWER
by
P. G. F. CHINN

Now, in 1956, there are, throughout the Western world, two, and certainly no more than five, 10 c.c. class racing engines still being built. The exact number cannot be established with any certainty because one or two of these makers are still listing such units, but are producing them only in occasional small batches, each of which batch may very well be the last.

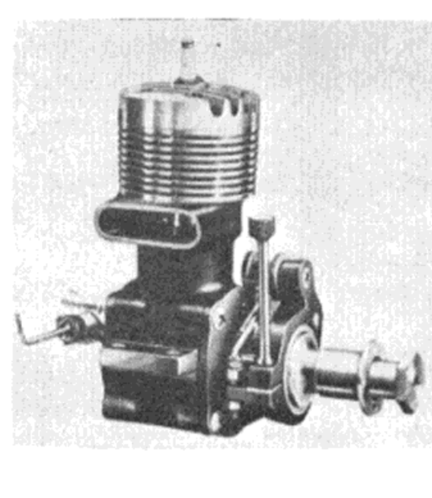
A similar situation has also developed in the smaller racing engine classes such as the .29 and .19 cu.in. categories. In America the McCoy Red Head .29 is still listed, the sole survivor of the .29 racing class although the development of the cheaper shaft-valve, plain bearing " Super Stunt " .29 model to a point where its performance is only slightly below that of the Red Head, may presage the eventual withdrawal of the latter. In Britain the Eta .29 racing unit remains on the market " as and when available " from the makers.

Many of us regret the passing of the racing engine. Some of these power units—and we say " some " advisedly because there have been a lot of poor imitations—have, by their remarkable performance, been an eye-opener to people concerned with full-scale i.c. engines. The Dooling 61, for example, was nominally rated at 1.5 b.h.p. at 16,000 r.p.m. It was, however, capable of even higher performance with further tuning as has been amply demonstrated by the steadily increasing performance of Dooling powered model racing cars

The most famous of them all, the Dooling 61, Rolls-Royce of model racing engines. Now out of production, it has been tuned to produced outputs approaching 2 b.h.p.



The 1946/47 McCoy Red Head 60. After many successes in speed models, it was developed into the Series 20 model with which the majority of top performances in the model aircraft world have since been achieved.

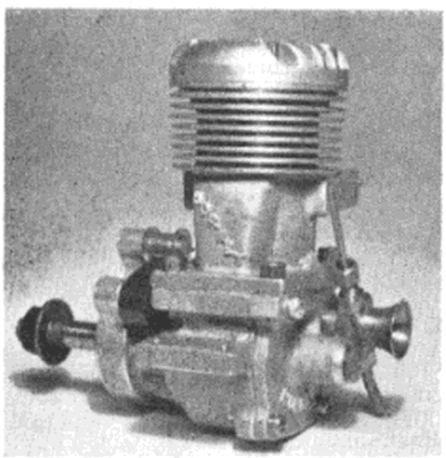


in the years since the engine itself went out of production.

Independent tests have credited the Dooling with 1.8 b.h.p. at peak speeds of around 17,500/18,000 r.p.m. and, with car speeds now reaching 150 m.p.h., it is fairly certain that some enthusiasts must be realising around 2 horsepower from this remarkable design. This, equal to 200 b.h.p/litre, is well in excess of the specific outputs thus far realised by designers of full-scale normally-aspirated racing engines.

To what must we attribute the decline of the racing engine? Undoubtedly, many factors have been

The pioneer racing engine, the Hornet, which first appeared some fiteen years ago. The Hornet set the pattern for racing engine design for many years to come.

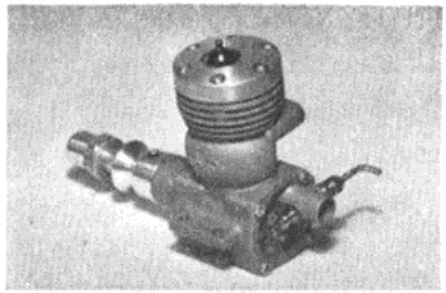


responsible, yet many of them are inter-related. We would put the reasons as follows:

1. The decline in the popularity of control-line models in general, since 1949-50, and of model car racing, particularly during the years 1949-53.

2. The steady expansion of power modelling to include vast numbers of younger members, for whom the small cheap engine has proved an attraction. Thus the more specialised engines have had a smaller proportion of the market each succeeding year, while prices of popular engines have dropped.

3. The high cost of producing a highly developed engine to sufficiently rigid production standards to ensure consistently high performance among



On its introduction, two years after the 61, the Dooling 29 proved to be another outstanding design, with a higher potential than any other 5 c.c. unit.

production units.

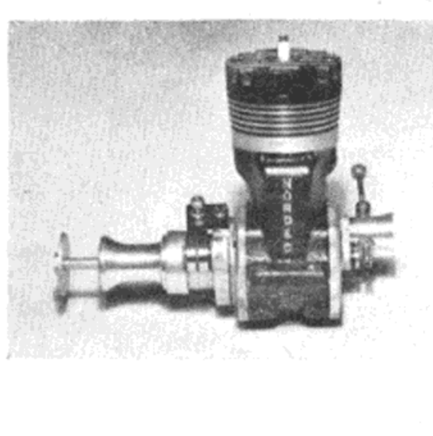
4. The consequent attraction of the specialist engine manufacturer to the popular-engine market, or alternatively, to other spheres of precision engineering.

5. The adoption by the F.A.I. of the smaller classes (first, 5 c.c. and then 2.5 c.c.) as the official World Championship classes and, more recently, the general adoption of the 2.5 c.c. unit for competition purposes.

6. The development, in the case of the smaller capacities, of simpler designs of equivalent or superior performance to the classical racing engine layout.

The first commercially produced model racing engine was the American 10 c.c. Hornet which appeared fifteen years ago. With its big ports, disc induction valve, advanced combustion chamber design, lightweight ringed piston, ball-bearing shaft and rigid construction, it set new standards of model engine performance and became the stock installation for model car racing and for speed model aircraft.

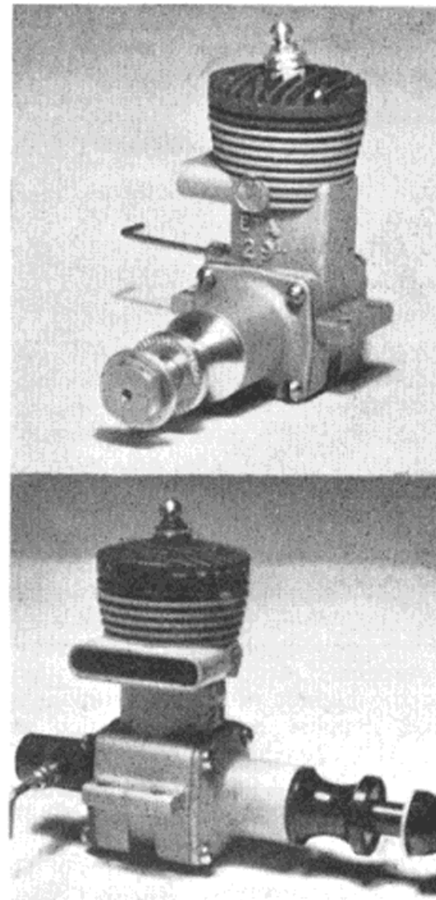
Immediately after the war, a new name began to make inroads on the monopoly of contest wins established by the Hornet. This was Dick McCoy's Red Head Super 60. Although originally designed, like the Hornet, for model car work, it was



In December 1949 an improved model Nordec was introduced. It was not, however, a great success and was soon replaced by an entirely revised model, The Nordec-Special Series II.

in the control-line speed model aircraft that the McCoy engine began to achieve its greatest successes.

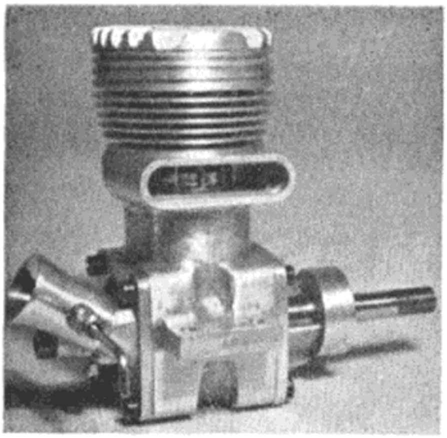
Meanwhile, the Dooling Brothers, who had produced some highly successful model cars for the Hornet engine, were developing their own power plant. The outcome of their experiments, which occupied two years' intensive work with over thirty different designs, was the Model 61 and immediately this engine estab-

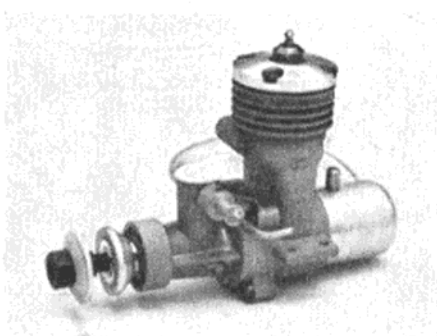


In the 5 c.c. class, the British Eta, introduced late in 1948, had an excellent performance. Shown (above) is one of the first production units, while, below, the engine is seen in its latest developed form.

lished itself as by far the most powerful model i.c. reciprocating engine produced to date.

Although the Doolings' research had taken them well outside normal single-cylinder two-cycle engine practice and involved experiments with four-stroke, two-cylinder and supercharged units, the 61 was, in general, orthodox. Where it scored was in the attention that had been paid to details: the development of the porting to an hirtherto un-



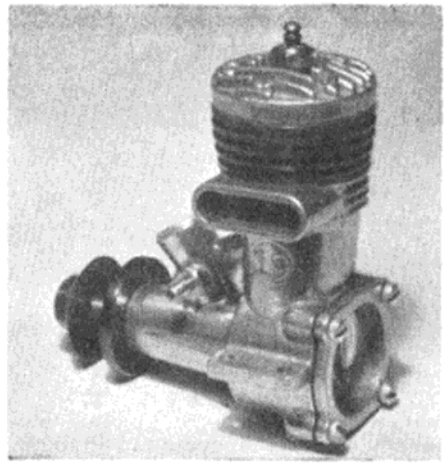


Top: The Rowell 60 in its final developed form showed many improvements. This version, modified by R. G. Cameron, has also been lightened. Below: The first application of racing engine principles to a 2.5 c.c. production engine was in the early model Super-Tigre G.20.

approached degree, strict attention to the highest production standards and detailed refinements, such as the roller-bearing big-ends.

The Dooling cost $35.00 at a time when most engines had cost up to this figure but were gradually being reduced. The Dooling was never reduced; moreover, dealers selling this engine obtained only a 15% discount as against 40% on most other American engines. In other words, the factory price was about twice that of most other racing engines and 5 - 10 times that for which popular engines are produced today; which is one very good reason why Dooling qualities have never been bettered.

Both speed model aircraft and model car contests were largly dominated by these three engines, the Hornet, McCoy and Dooling. However, in car racing the Hornet failed to maintain its earlier prominence and, after the introduction of the Dooling, quickly lost ground to the latter, while in the air, the new McCoy 60 Series 20 model consolidated the gains made by the earlier McCoy 60. A set of conversion parts for the Hornet to bring its



A death-knell for existing small specialised racing units was sounded when the unpretentious looking K.& B. 19, with its plain bearings, shaft valve and lapped piston, demonstrated a marked superiority of performance over the classical racing engine layout.

performance more into line with modern requirements was made available and, so equipped, a Hornet powered model aircraft was the first to exceed 150 m.p.h. but this pioneer racing engine had had its run and was withdrawn from production soon afterwards.

Meanwhile, in Britain, two new engines had appeared: the Rowell made in Scotland and the Nordec which was produced in both spark-ignition and glowplug versions, by the North Downs Engineering Co. Ltd., in Surrey, makers of the Marshall- Nordec supercharger for cars.

The Rowell was a typical design and quite a good engine, but, designed for model car use, it weighed some 19 oz. and was not, in consequence, viewed with much favour by the model aircraft fraternity.

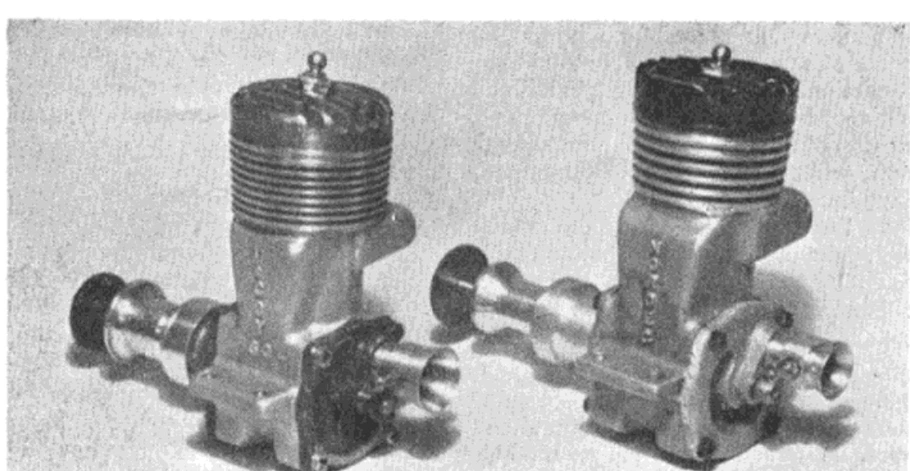
The Nordec was similar to the early McCoy 60 but with some modifications which, however, were not over-successful. The glowplug model gave a little over 0.6 b.h.p. at 12,000 r.p.m. The following year the makers introduced the Nordec-Special, in which the combustion chamber design was improved, but porting was still restricted and a few months later the Nordec-Special Series II appeared, (an entirely fresh design based on the McCoy Series 20) which was a tremendous improvement. We had the prototype on test, at the time, for the makers and obtained 1.23 b.h.p. at 15,200 r.p.m. Regretably, the makers had, no doubt, found that racing engine demand was diminishing and the Series II did not continue in production.

Another British hope which failed to get into production was the Z.N. This was engineered by E. P. Zere of Z.N. Motors Ltd., and was undoubtedly a most promising design. A test was made by a N.P.L. official on the prototype which showed an output of *circa* 1.5 b.h.p. However, with the imposition of purchase-tax, the price would have been increased to around £22 and production plans were abandoned in consequence.

Apart from the U.S.A. and Britain, production racing engines have been made in France, Italy, Holland and, of course a few odd non-production ones in many other countries. The French Micron 60 at one time held the world 10 c.c. record at 231 km./hr., a creditable effort indeed, and

Continued at foot of next page.

In the spring of 1950, the Nordec-Spl.II appeared. Generally similar to the Series 20 McCoy (left) it had an excellent performance, the prototype, tested by MODEL AIRCRAFT, giving 1.23 b.h.p.at 15,200 r.p.m.



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Reviews of current aviation literature

ROTORCRAFT. By Capt. R. N. Liptrot & J. D. Woods. Butterworths. Price 32s.

As we have repeatedly lamented the slow development of the model helicopter, we welcome such an authoritive work as this which, although dealing with full-size rotorcraft, should prove a useful scource of reference to the modeller confronted with the fundamental problems of helicopter design.

But apart from the chapters dealing with the technical aspect, there is also much of interest to the general enthusiast. An historical resumé—in table form—gives a year-by-year report on rotorcraft progress from 1483 onwards, and is backed up by illustrations of early projects. For those wondering what went on in 1483, Leonardo da Vinci's sketch of an 'Aerial Screw' was the first recorded design for a helicopter. A chapter on "Specifications" contains over 40 pages of photographs, sharp line drawings, and detailed information on the world's rotorcraft.

To students engaged on full-size helicopter work this book should be of considerable assistance, as while no attempt has been made to introduce advanced theory or practice, the authors have presented the basic principals of rotorcraft engineering in an easily understood manner.

A PENGUIN IN THE EYRIE. By Hector Bolitho. Hutchinson & Co. Price 18s.

The name Hector Bolitho is perhaps more widely associated with historical writings of the Queen Victoria era rather than such a contemporary force as the R.A.F. But as an Intelligence Officer in the R.A.F. from 1939-45, we can think of no one better qualified to record the day-to-day activities of the airmen and their service during the war years, which after all, have a rightful place in history.

The author describes himself as "A Penguin in the Eyrie" because he did not fly in combat with the 'birds of prey', Nevertheless, as an Intelligence Officer he was in a unique position to collate the experiences of the men who flew with Coastal Command.

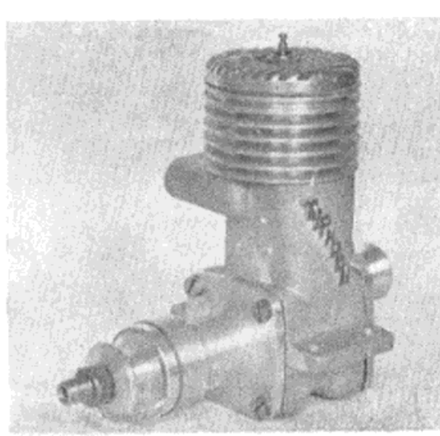
Sub-titled "An R.A.F. Diary 1939 to 1945" that is just what this book is—starting from when the author first joined the service, went into the Air Ministry, and subsequently moved among the squadrons of Coastal Command who fought the U-boats. Consequently there is no shortage of incidents or personalities—which make all the difference between a dry-as-dust chronicle and a book that brings alive the spirit of the wartime R.A.F.; undoubtedly Hector Bolitho has hit just the right note.

---

some local successes have been enjoyed by the Dutch Super-Typhoon and the Italian Super-Tigre G 24.

Until 1951, there was only one formula for racing performance in the smaller (.19 and .29 cu.in.) classes and that was the same as for the big jobs: ball-bearings, disc-valve, ringed aluminium piston, an aluminium cylinder barrel and crankcase, with inserted liner, and the plug offset in the head. Then the K. and B. Torpedo 19 arrived. It had a plain bearing, shaft valve, lapped piston, a one-piece cylinder and, as though to finally debunk the classical layout, the plug was fair and square in the centre of the cylinder-head. All this would not have mattered (no one labelled the K. and B. as a "racing" engine) but for the fact that it then proceeded to clean up all the .19 class speed contests and also a few .29 events as well. The repercussions of this remarkably well balanced design have been felt ever since. Gradually more and more glowplug engines have abandoned disc valves and ball-bearings. Yet the "classic" layout may not be dead, even in the small sizes. For evidence we have only to look to Sladky's 1955 World Speed Championship winning 2.5: ball-bearings, disc valve, ringed aluminium piston, the mixture as before, but gingered up a little.

Though the Czechs would not divulge full details of their motors, the output was obviously appreciably higher than any currently available 2.5 c.c., and the time when such a motor will be commercially available in this country is eagerly awaited.



Among the few racing engines still available are the Dutch "Typhoon" models. The 10 c.c. model is shown here in its latest revised form,

MODEL AERODYNAMICS No. 14

A common fallacy quoted by people who have no time for control line models is that they operate like a brick on a string and do not really need wings. This is based on the well known fact that a weight attached to a line and swung in a circle will fly, in that it will whirl round supported, at a certain level, by centrifugal force.

On the same principle a control line model without wings could fly—Fig. 1—providing its own propelling force instead of having to be whirled round, like the weight. But, like the weight, its altitude must inevitably remain below the horizontal through the line centre.

The smaller diagram shows the force arrangement. The actual 'flight' angle achieved, relative to the horizontal, is the angle θ and this can readily be calculated. The sine of θ is given by dividing the weight by the centrifugal force operative. Centrifugal force, in pounds, can be found as follows—

$$\text{C.F.} = \frac{\text{weight (lb)} \times (\text{speed})^2}{32.2 \times \text{radius of circle (ft)}}$$

the speed is measured in feet per second.

It is instructive to calculate just how much greater is centrifugal force compared with weight, particularly for high speed and small circles, so that the angle θ can be quite small indeed.

It is generally acknowledged, however, that for maximum performance a control line model should be trimmed out so that it is virtually flying itself around the circle, with the wings providing lift to balance the model weight. Generated lift is, in any case, essential if the model is to be flown above the horizontal—Fig. 2.

The speed control line model is usually balanced well forward, either on the leading edge or perhaps even in front of it. Wing lift is *behind* the balance point and so, ignoring any stabilising effect of the lines, the tailplane must contribute negative lift or a download to trim the model out for level flight—Fig. 3. The actual value of lift required is easily calculated from the formula given, knowing the wing and tail moment arm lengths.

In the case of a 13½ oz model with a 50 sq. in. wing, tail moment arm being 10 ins., and wing centre of pressure 1 in. behind the balance point, wing lift required is 15 ounces—Fig. 4. At 100 m.p.h., or approximately 150 ft. per second, this corresponds to the wing operating at a lift coefficient of 0.1, the elevators being trimmed out to impart a 1½ oz download at the tail.

This means that when flying at maximum speed—in this case 100 m.p.h.—the attitude of the model must be such that the wing angle of attack is that equivalent to a C_1 of 0.1. This will vary considerably with the wing section, and the characteristics of the wing section will also affect the total wing lift required.

In the case of the cambered section with a flat undersurface—Fig. 5—a C_1 value of 0.1 may be generated at a negative angle of attack, around —1 degree as a typical example. Thus the model trims out nose-down at this speed, with the fuselage at a small angle to the flight path (the angle is exaggerated in the diagram).

With the bi-convex section—Fig. 6—a C_1 of 0.1 is realised at zero angle of attack and so the model trims out in a level attitude. But with the symmetrical section wing—Fig. 7—the wing needs a positive angle of attack of 1 degree to generate a C_1 of 0.1.

Thus the three different sections applied to the same basic model give it three different trim attitudes. Strictly speaking the 'parallel' arrangement is to be preferred, which would mean setting the flat-bottom wing at a rigging angle of —1 degree initially, and rigging the symmetrical wing at plus 1 degree. Then in each case the model would fly with the fuselage parallel to the flight path.

The centre of pressure will also be in a different position on these three sections and, in fact, the symmetrical section wing will have to generate nearly one ounce more lift to trim out satisfactorily, with a corresponding increase in tail 'down' load. Of the three, therefore, the first section appears the better.

Since the operating speeds of control line models are such that the aerofoils are operating at fairly high Reynolds numbers quite an amount of published aerofoil data is applicable. A 3 in. chord wing at 80 m.p.h. is operating at a Reynold's number of 185,000 ; a 4 in. chord at 120 m.p.h. at an equivalent R.N. of 370,000 ; and a 5 in. chord at 150 m.p.h., at a R.N. of 550,000.

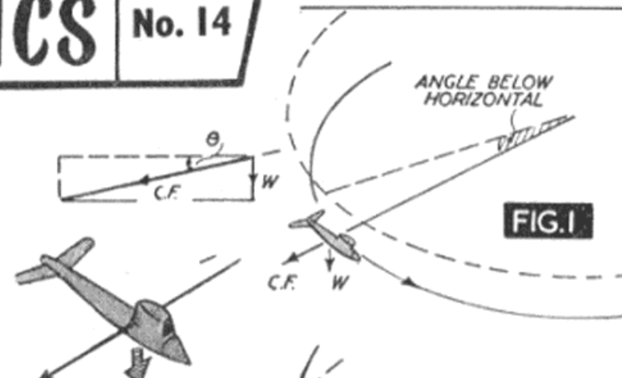


FIG. 1

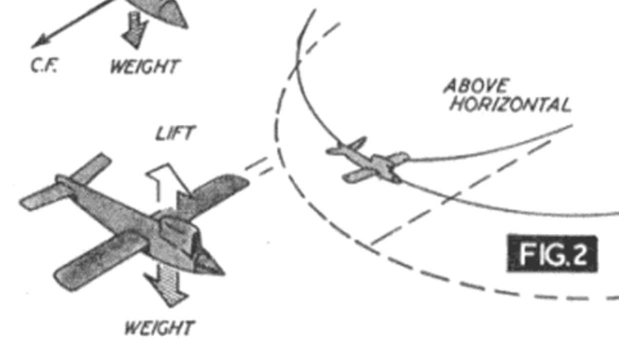


FIG. 2

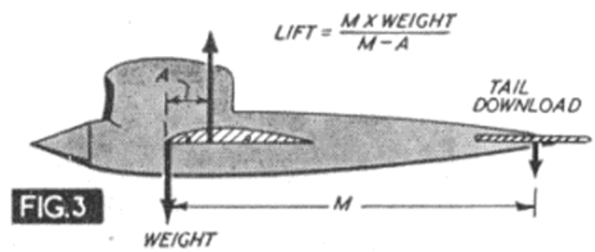


FIG. 3

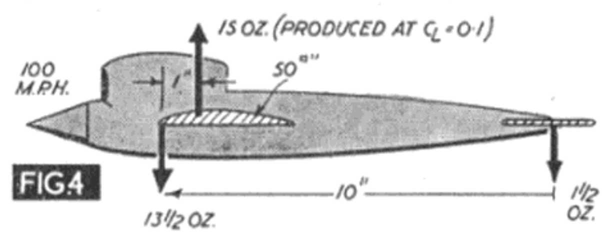
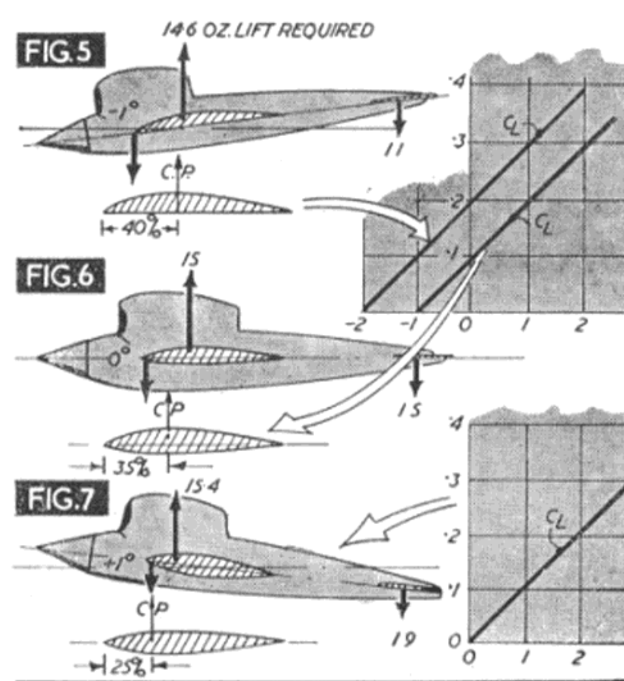


FIG. 4

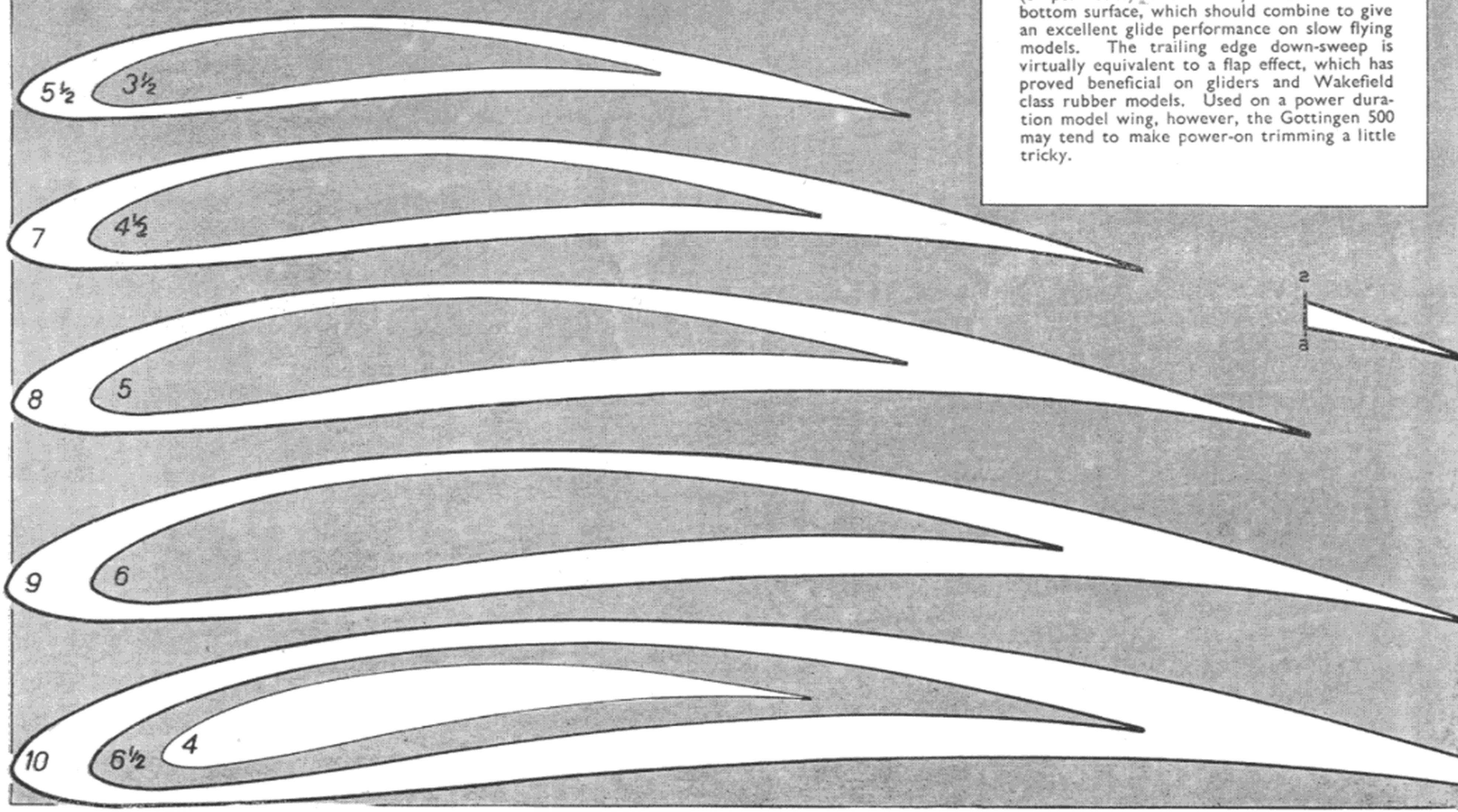
FIG. 5 FIG. 6 FIG. 7



STATION	0	2·5	5	10	20	30	40	50	60	70	80	90	100
UPPER	2·05	5·0	6·3	8·2	10·5	11·6	11·65	11·05	9·85	8·1	5·85	3·1	0·0
LOWER	2·05	·45	·10	·05	·7	1·8	2·4	3·0	3·3	3·15	2·45	1·45	0·0

GOTTINGEN 500

One of the lesser known of the Gottingen sections, the 500 has a very generous camber (6 per cent) and heavily under-cambered bottom surface, which should combine to give an excellent glide performance on slow flying models. The trailing edge down-sweep is virtually equivalent to a flap effect, which has proved beneficial on gliders and Wakefield class rubber models. Used on a power duration model wing, however, the Gottingen 500 may tend to make power-on trimming a little tricky.



Club News

AND NEWS FROM THE S.M.A.E.

NORTH EASTERN AREA

The year 1955 was, on the whole a very good one. A great improvment in all aspects of the sport was shown by North-Eastern aeromodellers. The highlight of the year was the Northern Area Rally at Croft which this area organised. One unusual aspect of this meeting was the fact that every contest was finished on time and every winner received his prize a very creditable accomplishment.

FORESTERS (NOTTM.) M.F.C.

The club attended their first contest of 1956 at Heanor, and duly returned with a first in class "A." Hugh Ward, in his first competition, came second in Combat and was also top junior.

The organisation at this 'do' was first rate—apart from the weather, and we look forward to next year's contest when we hope that conditions will be more favourable.

BLACKHEATH M.F.C.

For the the Bill White Cup & Winter Glider contest, held on Epsom Downs on the January 8th 1956, the weather was cold & visability moderate; snow fell during the afternoon

There were 106 entries—22 in the Bill White Cup, and 84 in the Glider contest. Two well-known fliers from Australia who are staying over here entered the Bill White Cup, which was won for the second year in succession by J. O. Donnell after a fly off with J Marshall of Hayes. The contests finished by 3 o'clock when most of the competitors had completed their flights.

BILL WHITE CUP 1956
1. J. O'DONNELL WHITEFIELD 8 : 30
2. J. MARSHALL HAYES 7 : 30
3. D. PARTRIDGE WHITELEAF 5 : 28

BEST JUNIOR PRIZE
1. A. SYME NORTHWICK PARK 4 : 51

WINTER GLIDER CONTEST
1. M. KING THAMESIDE 5 : 49
2. *B. EDWARDS FARNBORO.* 5 : 31
3. R YEABSLEY CROYDON 5 : 26

CAMBRIDGE M.A.C.

Heated arguments at the A.G.M. recently resulted in a six months old ban on junior new-comers being lifted.

"Let us not split the club into two sections" said Peter Firman, an ex-chrmn and one of the club's "old hands".

Model shop manager, Maurice "Mon" Reynolds agreed. "The seniors can help to keep the youngsters in order" he suggested.

Another furious argument resulted in year old proxy flying ban being lifted, but a move to prevent "airfield litter-bugs" from using club flying fields for a short period as a punishment was defeated.

Comp sec, George Webb reported a disappointing year with only three of possible eleven contests being flown. A much brighter review of the Club's "financial season" came from Derek Crankshaw, who reported a strong bank balance in spite of fewer members.

NORTHWICK PARK M.A.C.

Several members braved the elements and travelled to Epsom for the Blackheath Winter Gala, but the only success was that of Andrew Syme, whose 4 : 51 in the Bill White won him the prize for the best junior competitor. Unfortunately he lost his week-old rubber job, the seventh of a series, and has yet to hear of its whereabouts.

While the cold weather has stopped most of the weekend flying, the winter programme of talks and discussions got off to a good start in January. Malcolm Young of the Northern Heights club gave an extremely interesting talk entitled "Model Aircraft Fly in Circles." This talk, dealing with the airflow conditions and forces acting on a model in circling flight, enlightened many and promoted a good deal of discussion among members—at least one having to think again about his latest design project.

SEAHAM & DISTRICT M.C.

At the club's annual general meeting the following officer's were elected or re-elected;-Chairman (& treasurer): T. U. Oliver; Vice-chairman; J. Henry; Secretary & Comp. secretary, Bill Hume; Junior representative: J. Seth; Committee member: G. Wylie.

We have had a very good year though disatisfaction was felt about the location of the S.M.A.E.'s contests. To make up in part for this we have had regular team-racing meetings with our very good friends Thornaby Pathfinders M.F.C. These meetings take place every three weeks and we would like to warn High Wycombe & Co. that Thornaby are becoming pretty hot stuff. Our own racing efforts too, are improving. Jack Armes's new racer *Count Ivan* is gobbling up the laps at a speed close on 85m.p.h. He has a later developement which shows promise of doing even better. This is his Stormtrooper. Another Oliver Tiger-powered racer nearing completion is Bill Hume's, "Jabberwocky" This is Mk.XV.

For the first time for many years our junior membership exceeds our senior. Many of them are becoming remarkably good modellers. There are *Phantoms* by the dozen staggering around our racing pitch. One of the juniors, 'Gussie' Gustard, came third in our distance championship, flying an *Ivory Gull*. This trophy was won by Bill Hume, and T. Oliver was 2nd. The latter also won the distance championship—all this on top of his recently becoming a father of a budding aeromodeller.

Microfilm is catching on. We are to hold a number of indoor meetings this year. These will include Jetex 50 RTP scale speed, helicopter duration, unorthodox RTP as well as more standard contests.

CARDIFF M.A.C.

The club is becoming increasingly C/L concious particular interest being shown in class "A" racers. Three Oliver Tiger jobs and numerous A.M. 25 and flutter E.D. Racer-powered models are going the rounds at speeds which the wise old men of the club previously thought impossible.

Interest in R/C has dropped off for the time being but no doubt when the warm weather comes the three members interested will again start twiddling tuners.

EASTBOURNE M.F.C.

Now nearing completion, the first flight of Ron Moss's C/L Boeing B17 *Flying Fortress* is eagerly awaited by all: power is intended to be four E.D. 2.46 c.c. Racers. Two other C/L scale jobs on the way are Bill Coomber's *Seamew*, and Robin Lansdown's Hawkey *Fury*, the latter from Model Aircraft plans. At least two team racers, one "A" and one "B," are on the way.

It is hoped to give a C/L demonstration at nearby WILLINGDON in June. A good way ahead, but it should give plenty of time for organisation.

A good possibility for a permanent clubroom has been discovered by our treasurer, Johnny Banks. New members of all ages, whether they have built a hundred models or none at all, are very much wanted, and will receive full use of our *two* flying fields and all the assistance they need. Anybody interested please contact our secretary, T. Parris at: 13, Bradford Street, Old Town, Eastbourne.

HAYES M.A.C.

The club turned out in force (all five of us) for the Blackheath Winter Comps. at Epsom. J. Marhsall was the most successful, placing

Czech Wakefield flyers Scheuter and Mužny with their models. The machine held by Mužny is that with which he placed 7th in the 1955 World Championships and features a pine propeller carved to 1/24in. blade thickness.

second to J. O'Donnell after a fly-off. No-one else had any particular success. E. Welbourne did, however, manage a max. in glider - with the wrong tailplane.

We are pleased to record that Jim Baguley's consistent flying of his A/2s during 1955, has won him the London Area Junior Glider Cup. This rounds off quite a successful year for Jim.

Any prospective members should contact the secretary, J. Marshall, 43, Keith Road, Hayes, or come and have a word with one of us on Sundays on Hounslow Heath.

BRIGHTON D.M.A.C.

The Boxall brothers braved the inclement weather to make the annual pilgrimage to Epsom for the Bill White and Blackheath Glider Cups. Reg managed a max with his A/2 on the first flight, but despite a prolonged search in a snow shower, the model could not be found and he could only manage 85 secs. on the second round.

The new F. A. I. rules have not been at all well received by members on the ground that the new rules will be useless for open work and this will tend to limit entries at the Eliminators and discourage the younger members from building international class models.

CHEADLE D.M.A.S.

At the club A.G.M. the committee remained substantially as before. The only notable change was in the post of Competition Secretary, the lucky holder of this job being G. Evans whom we welcome back to the club after his National Service hibernation in Singapore.

That other highlight of the club's social season, the annual dinner, saw the following trophies presented by our chairman Mr. Archer: Rubber Championship, G. Seymour; Power, F Pass. Glider, G. Evans.

A film show of general interest followed the prizegiving, and thanks are due to Mr. Nield for much hard work put in for the success that the dinner proved to be.

Having disposed of the winter recess we look forward to a brilliantly successful new competition year and we wish our much respected neighbours, Whitefield, the same.

WHITEFIELD M.A.C.

The club recently enjoyed a "get-together," with a film show by E. Horwich. Ample refreshments were supplied.

A new member of note is Henk Toersen a '55 Dutch Wakefield team-member. J.O.D. made his usual pilgrimage to Epsom Downs to win rubber with 2 maxes and a 3 min. flyoff.

After hearing the new F.A.I. Power Rules for '57, the power boys are thinking of reinforced-concrete fuselages.

HEANOR DISTRICT M.A.C.

In spite of the cold weather our Control Line Rally was well supported. We should like to thank all clubs who came along, and those who started out but were forced back by the snow. We hope to see you all again next year.

The winners were: Class 'A'—1st, Howard—Forresters; 2nd. Bailey—Burton-on-Trent. Class 'B' 1st. Lawton—Heath Aeromodellers. Combat. 1st. Grimmett—West Bromwich 2nd. Ward—Forresters.

The top junior prize was a tie between A. Jackson of Derby, who piloted his Combat model against some stiff opposition, and H. Ward of Foresters whose entry came second in Combat.

BRADFORD M.A.C. & LEEDS M.F.C.—

The announcement of the new rule changes for International-class models proposed by the F.A.I. was greeted first with consternation, and second, by an outburst of righteous indignation, by members of both clubs when Silvio gave us advance news on his return from the S.M.A.E. A.G.M.

Many have, in fact, stated categorically that they will cease to take part in F.A.I. contests, and general opinion is that, whilst the abolition of the R.O.G. rule was long overdue, it was only forced on the F.A.I. due to the new power loadings !

However, as there is still one round of eliminators left in which the intelligent development of models can obtain results, our keenest fliers are making the best of things and getting ready for the opening of the new season.

"Creeps" are still to the fore, and Arthur Collinson has completed a new one for the Torp .15 equipped for V.T.O.; but Silvio, clinging doggedly to the Swiss Miss, has produced a new high-aspect ratio version with slightly increased areas. Biggest shock, though, to those who know him, is that Brian Eggleston has at last realised that glo-plug engines are easier to start and has bought a Torp. 15 too !

NOVOCASTRIA M.A.C.

Club badges have now been purchased and most of the members are sporting them on their flying jackets.

Accent for 1956 is to be on contest flying, and should any club like to have a friendly effort, we will be only to pleased to oblige in F.F. power, rubber, and combat, at any reasonable venue. Once again Novocastria won the Area K.O. by a good margin.

Club president Sqdn/Ldr. James Rush A.F.C. the King's Cup winner is to provide a trophy for a contest (which is yet to be decided) to be flown annually.

LONG EATON & DIST. M.A.C.

In its first year of existence, the club has proved a great success; 75 per cent. of the club is F/F, with the accent on A/1s, A/2s and power duration but not forgetting our one Wakefield expert, Ernie (Prof) Thorpe. The rest are control line enthusiasts.

The club is fortunate in having a good flying ground clubroom, with facilities for film shows and RTP flying. We have our own insurance scheme for lost planes, for which members pay 1d. per week; and we also have a library If any readers in our locality would like to join our 35 members, they can be assured of a warm welcome any Friday night at Community House

DERBY M.A.C.

Our juniors have brought us the first success this year with Allen Jacksons—top junior in Combat at Heanor the prize will almost buy him a new crankshaft !

The carnage was terrible, but we kept on throwing in new models—and sweeping out the bits. We were finally routed in the semi-finals after our last remaining contestant held the fort with a junior's stand-by model powered by an Oliver held in place on 1½ bearers.

Vibration took its toll and the Oliver made its exit, with the bearers, only seconds from the whistle.

We wish to congratulate Heanor club on their first effort and hope their next is as successful.

WORKSOP AEROMODELLERS

We held our annual Boxing Day meeting in bad weather for the first time since the meeting was inaugurated in 1948, and for once no threats were needed to collect jet starting crews !

Pat Farnsworth and "George" Coggan, notorious in these parts, ran true to form in the combat final, George getting the final chop on this occasion. The speed handicap had most entries and was won by Pete Russell's 1949 jet, dead on the 130m.p.h. target speed. The Forresters, who had been bragging about their 95m.p.h. team racers, were given this as their target speed, but did 90for second. John Wynch (R.A.F. Fassberg) was third.

CRYSTAL PALACE M.A.C.

The services, feeling that Alan Graysmark would be more useful to them since the latter part of 1955, caused Mike Blanc to act as secretary until the annual general meeting, after which he stood down.

Fred Moore was elected chairman, John Rodgers treasurer, and Mike Ballentyne comp sec, as last year.

After a year of marriage and settling down, John Baggett agreed to stand for secretaryship, and was successfully elected. No one else wanted the job of P.R.O., so Ron Chivrall was returned unopposed. Reg Bench is junior representative on the committee.

With the inevitable drain of senior members to N.S. and Ron Pledge recuperating after illness in Co. Durham, (come back soon Ron) we welcome the return of Bob Nunn and Bill Rice, ex R·A·F.

CONTEST CALENDAR

The following list of contest dates has recently been issued by the S.M.A.E. The complete MODEL AIRCRAFT contest calendar will appear as soon as the remaining dates are finalised.

March	25	GAMAGE CUP U/R Rubber. Decentralised.
		PILCHER CUP U/R Glider Decentralised.
April	8	S.M.A.E. CUP 2nd Glider Elim.
		*FARROW SHIELD Team Rubber
		WOMEN'S CHALLENGE CUP U/R Rubber/Glider Area
		JETEX CUP Jetex
,,	15	AEROMODELLER TROPHY Radio Control. Cent.
,,	22	*WESTON CUP 2nd Wakefield Elim.
		ASTRAL TROPHY. 2nd Power Elim. Area
April 29—May 2		CRITERIUM D'EUROPE. C/L Brussels
May	6	HAMLEY TROPHY U/R Power. Decentralised
,,	20-21	**THE NATIONALS**—R.A.F. Waterbeach
,,	20	†THURSTON CUP Glider
		DAVIES TROPHY Team Race "A"
		SHORT CUP 2.5 PAA-Load
		GOLD TROPHY C/L Stunt
		S.M.A.E. TROPHY Radio Control
,,	21	†SIR JOHN SHELLEY CUP Power
		†MODEL AIRCRAFT TROPHY Rubber
		DAVIES TROPHY Team Race "B"
		BOWDEN TROPHY Precision Power
		SUPER SCALE TROPHY Power Scale
		TAPLIN TROPHY Radio Control
		LADY SHELLEY CUP Tailless
August	4-6	**WORLD POWER CHAMPIONSHIP**—Cranfield

* Plugge Cup events.

† These events will decide the Area Championship

Aeromodeller Trophy will be used as an Eliminator for any competitors wishing to take part at their own expense in the contest for the King of the Belgians' Cup on 15-18 June at Antwerp.

It is hoped the Trials will take place not later than 10 June.

SOUTH BRISTOL M.A.C.

At present, our main concern is the impending loss of Lulsgate airfield. A complete ban exists in Bristol on all forms of power flying, and the Council shows no signs of relenting its previous decision not to allow us even a small space for C/L, which is our main interest. However, we are persevering with our claim, and have not yet given up hope.

Twenty members braved the journey to Lulsgate one cold Sunday for a belated Christmas competition. High winds and a snow shower made things difficult, but a good time was had despite these conditions.

SECRETARIAL CHANGES.

CARDIFF M.A.C. K. Horlock, 33, Conway Road, Canton, Cardiff.
HALIFAX M.A.C. K. Attiwell, 149, Turner Avenue, Illingworth, Halifax.
LANARK M.F.C. D. Black, Woodview, 6, Lake Avenue, Lanark.
MONKSPATH M.A.C. R. Nailer, 9, Slater Road, Bentley Heath, Knowle, Nr. Birmingham.
TYNEMOUTH M.A.C. R. Pollard, 31, Donkin Terrace, North Shields, Northumberland.
Cambridge M.A.C. Clive King, Cambridge Road, Waterbeach, nr Cambridge.

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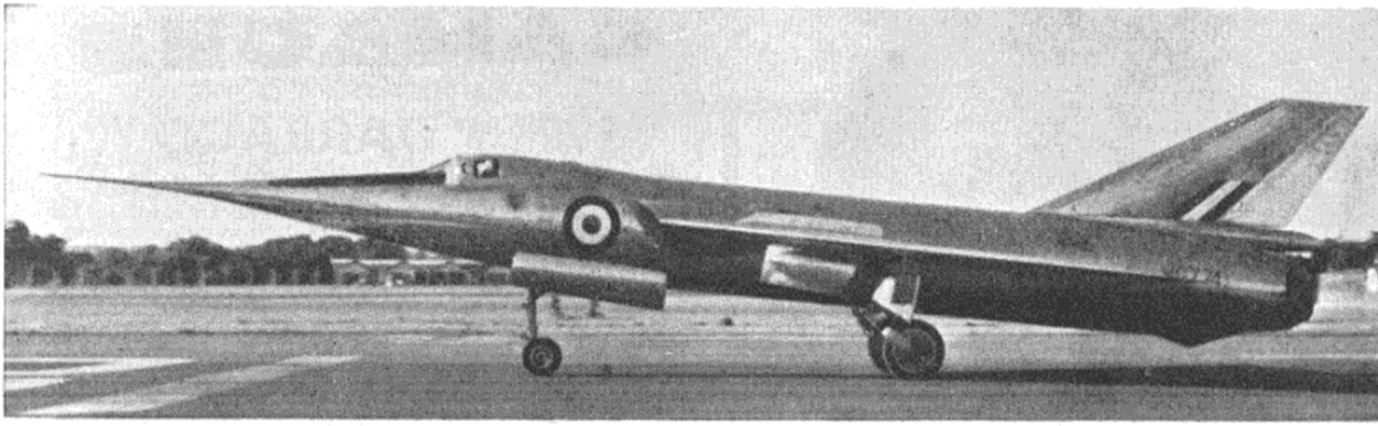

FAIREY DELTA FD2 - DATA

TYPE: *Single-seat delta wing experimental research aircraft.* DIMENSIONS: *Span, 26 ft. 10 in.; length, 51 ft. 7½ in.* ENGINE: *One afterburning Rolls-Royce Avon.* FIRST FLEW: *October 6th, 1954. No other details available for publication.*

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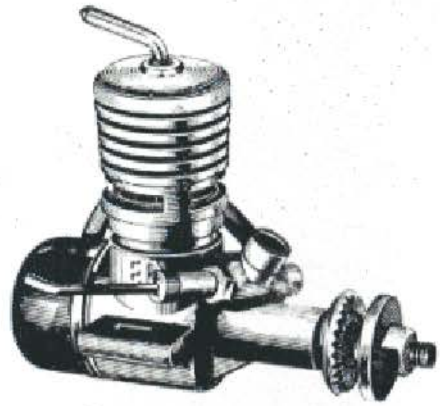

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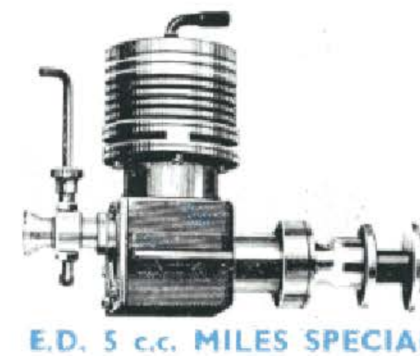

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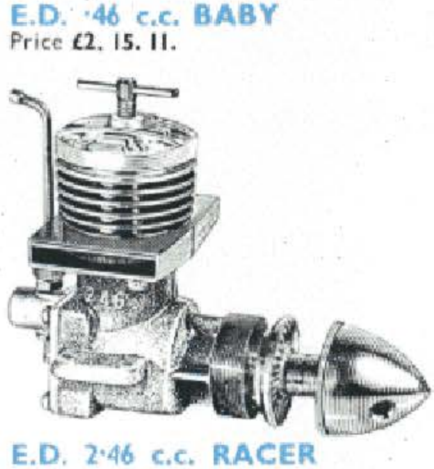

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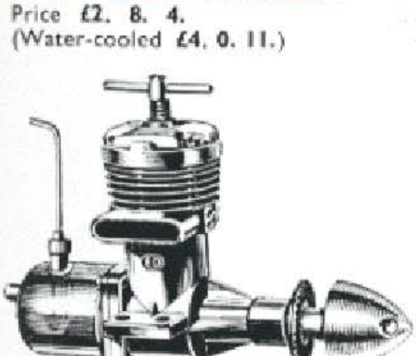

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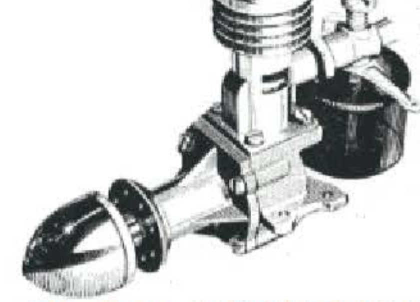

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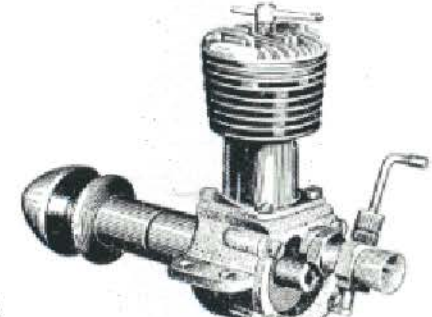

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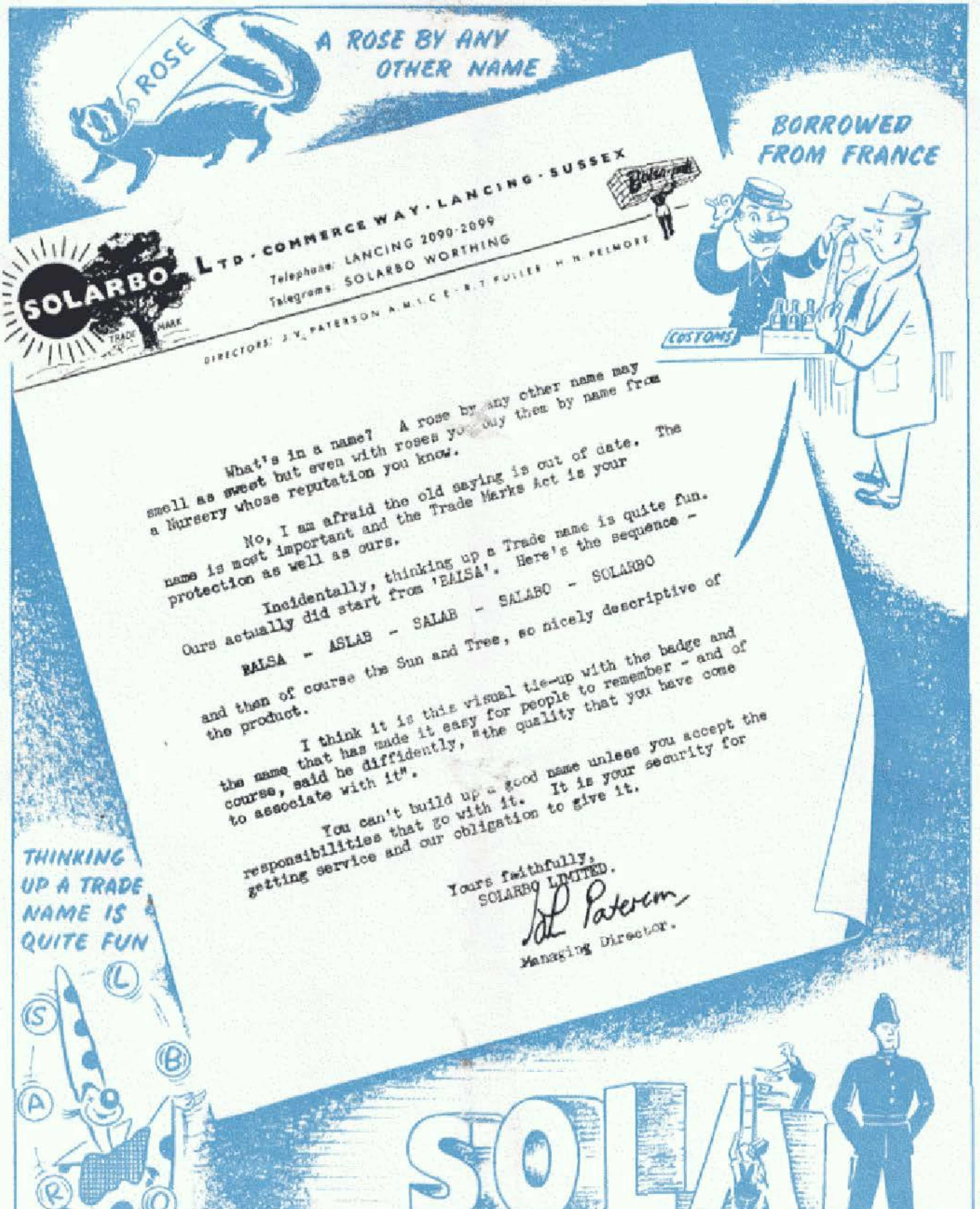
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