AERO MODELLER

VOL. 6. No. 62.
JAN-1941.
NINEPENCE.

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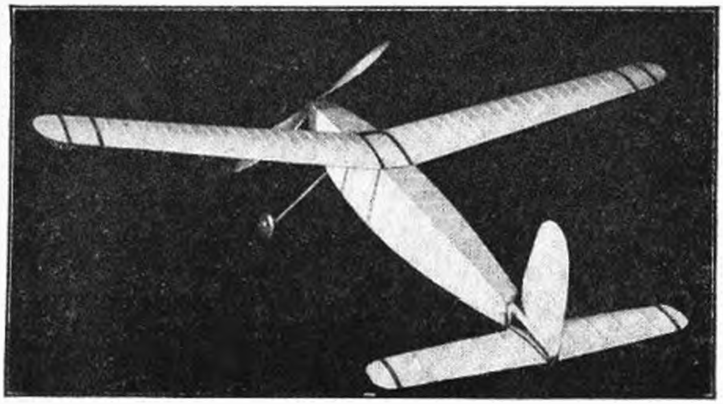

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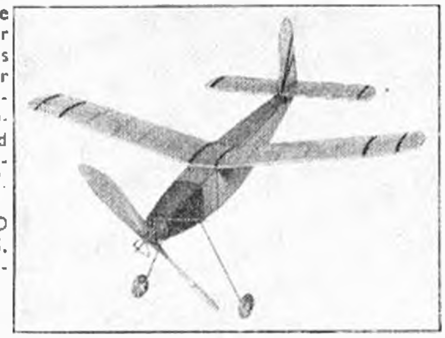

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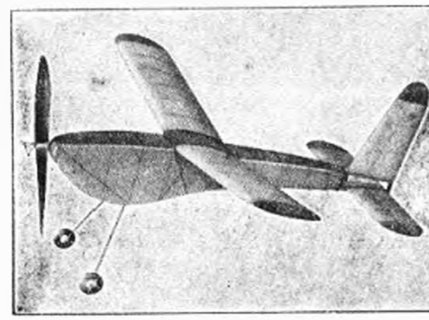

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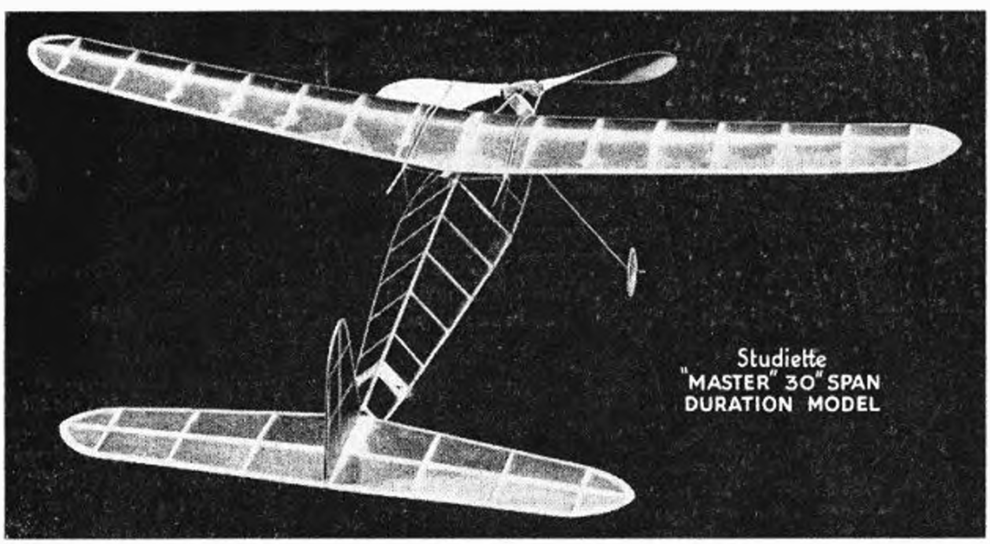

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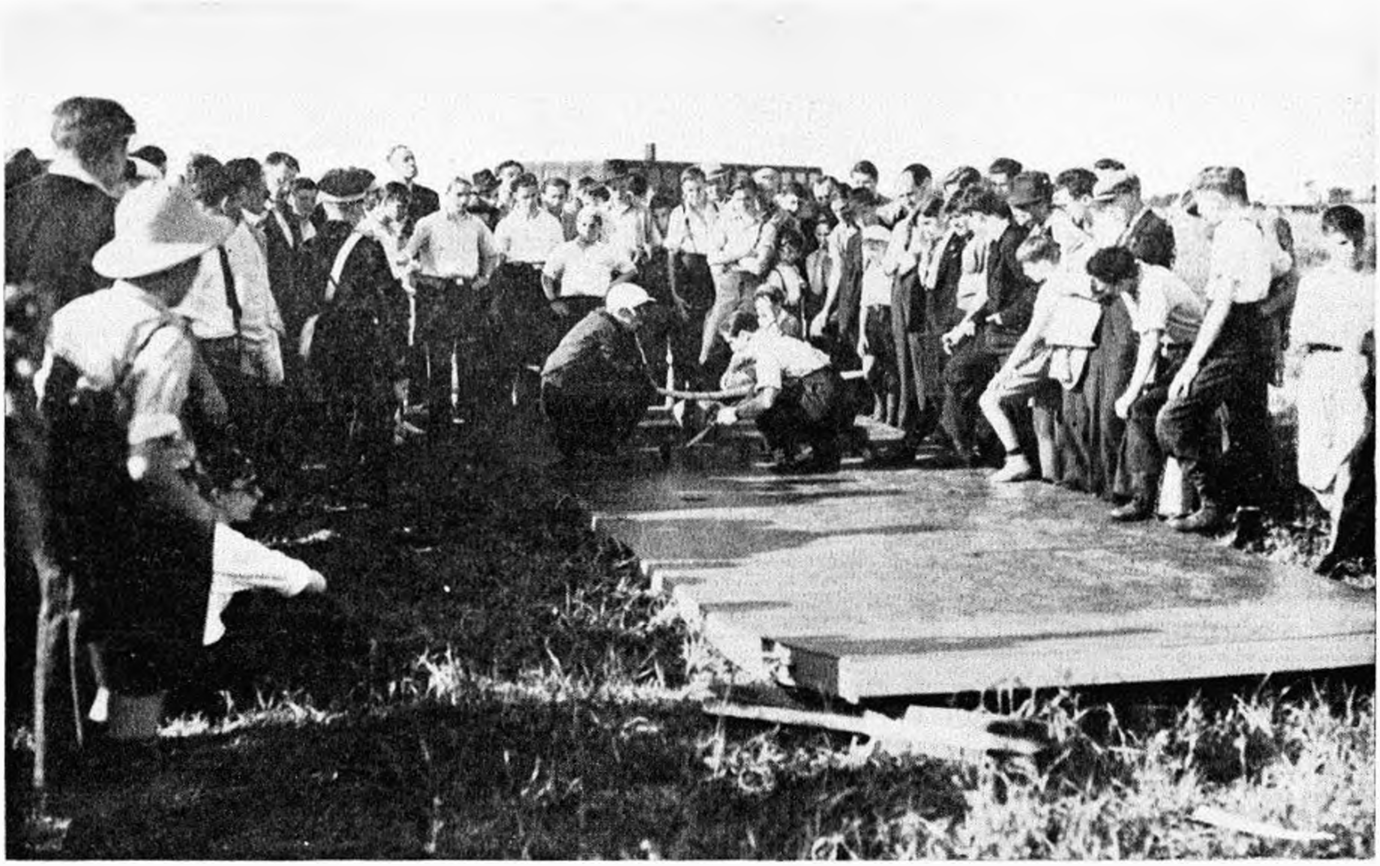
JANUARY, 1941

"CANADIAN CAPERS"



Activity in Montreal. A contestant adjusting his "gas-buggy" prior to a flight at one of the large meetings held in this centre of aero-modelling in the Dominions. (Note the raised end of the take-off board, presumably to assist those models which fail to "rise to the occasion.")

The AERO MODELLER

INCORPORATING "THE MODEL AEROPLANE CONSTRUCTOR"

JANUARY - 1941
Vol. VI. - No. 62

Tel. Leicester 65322

Editorial

TO the considerable number of readers who have congratulated us on our Christmas Double Number, we extend our thanks and modestly say, "We told you so." The price increase has been well received, and it is a pleasure for us to know that, having made a frank statement on the position, it has been so well understood, in all parts of the country. The Christmas issue was entirely sold out to a record print of twenty-seven thousand copies, and our distributors could easily have sold another thousand copies if they had been available. We are sorry for those who were disappointed, but can only emphasise the point we have before stressed, that it is *essential* under war-time conditions that orders for a regular delivery of this journal should be placed with a local newsagent.

Air Defence Cadet Corps.

On pages 45-46 we publish the second of Mr. Rippon's monthly articles, written especially for Air Cadets, and on pages 49-50 we publish an article, also by Mr. Rippon, which will be of great interest to "round-the-pole" flyers.

We regret that, owing to the Christmas issue so quickly selling out, it was not possible to send copies to squadron leaders, as had been promised, but copies of *this* issue are definitely being distributed.

As announced in our Christmas issue, we are proposing to organise another competition for Air Cadets, and this time by popular request it will be for single cadets and not for a squadron team.

This contest will be for solid model aircraft, built to the popular 1/72 scale. The first prize will be a handsome solid silver trophy, plus £5 cash, and there will also be a number of other cash prizes. An exactly similar contest will be run for readers of THE AERO-MODELLER, *other than those who are members of the Air Defence Cadet Corps*, and again there will be cash prizes in addition to a solid silver trophy for the first-prize winner. Full particulars of both competitions and a list of prizes will be published in our February issue, on sale January 20th.

"Aero-Modeller" Plans Service.

Certainly we "struck the right note" in offering coupons with a cash value to be traded-in when purchasing plans under our "Plans Service" Scheme. Within a few days of publication of our Christmas issue we were inundated with orders, and sometimes received as many as over two hundred by one post. We foresee a "boom" in model building to the designs which we are publishing, and trust that as the models are built we shall receive a number of photographs, some of which we shall hope to publish in "Clubman's" report.

We would remind readers that our offer to accept these coupons remains open until January 31st, after which date these coupons will not be acceptable.

We should here like to point out that so far we have received just over one hundred coupons with accompanying Postal Orders, but on each of which the name and address of the senders has been omitted! Now it is no good folk writing in complaining that our Plans Service is not a "Service" when they do this sort of thing! We can do nothing about this other than make this announcement, and say that those aero-modellers who have not yet received their plans but who have kept the counterfoils of their Postal Orders, should write in giving their numbers. Others who have not kept their counterfoils should also write in, and we will endeavour to pair up their coupons with their letters by comparing the handwriting. We hope by this means to identify all the incompleted coupons. If there are any that we cannot deal with, the Postal Orders will be cashed, and the proceeds passed on to the S.M.A.E. Fighter Fund.

We would particularly ask readers to pay attention to this very elementary point when completing their coupons, as apart from the delay and disappointment caused in the non-delivery of the plans, we are involved in a considerable amount of office work in trying to sort things out.

We must also point out that this service, as is clearly stated, is a *Plans* Service, and not a *Kits* Service, as some bright optimists seem to think! Several readers have sent a sixpenny coupon, ninepence in stamps, and expected to receive a Copland's Wakefield kit in return!

The "Jones-Maxwell" Controversy.

On pages 38 and 39 we publish several very interesting letters received in connection with this "controversy." From time to time we have published interesting and controversial letters from our readers, but not before have we had so much interest shown. This is gratifying, and we trust that after readers have studied these letters, and the further article by

Mr. G. W. Jones himself, which is also published in this issue, we shall receive some more letters.

For the moment we refrain from expressing any opinion on any of the matters under discussion, but in a month or two we may "step in where the experts fear to tread" and offer a few observations! Possibly we shall get an even larger inflow of correspondence following this, but we can take it!

The S.M.A.E. Fighter Fund.

On page 55 we record the latest additions to this Fund, and are pleased to note a useful increase, although it certainly is nothing like big enough yet.

We have before us as we write a current copy of the *Gazette* published by the Air League of the British Empire, sponsored by the Air Defence Cadet Corps, from which we note that already they have collected over £3,500 for their Spitfire Fund.

Now there are about twenty thousand Air Cadets in the country . . . how many more thousand aero-modellers are there?

The Speed of A.A. Shells.

Our article, "Where Did That One Go To?" published in the last issue, and dealing with bombs and A.A. shell splinters, seems to have interested a considerable number of readers. We have one correction to make, and that is in regard to the "formula" for calculating the time taken by a shell in reaching a certain height.

Now this "time" to reach any given height will vary according to the muzzle velocity of the gun and its angle of inclination . . . obviously, if it is pointing vertically upwards the shell will reach a given height sooner than if it has to travel through a curving arc, subtending at some 50 or 60 degrees to the horizontal.

Plainly, no single calculation could give an *accurate* "time" unless these two factors were known.

One correspondent has put forward the formula

$$t = \frac{V \sin \theta - \sqrt{(V \sin \theta)^2 - 2gh}}{g}$$

where V = muzzle velocity
θ = angle of elevation of the gun
and $g = 32{\cdot}2$ ft./sec.^{2}

Suggesting that the muzzle velocity of the gun is some 1,400 feet per second, our correspondent's formula then shows a "time" of 12·5 seconds to a height of 15,000 feet, assuming that the gun is firing vertically upwards.

We do not *know* at what average angle A.A. guns are fired at, but do suggest that it is nearer 60° to the horizontal than 90°. If the angle was 45°, then the "time" would be 30 seconds, as we had suggested. Our correspondent bases his muzzle velocity of 1,400 ft. per second on an *assumed* maximum height of 30,000 feet. As A.A. shells are fused to burst at a predetermined height (*and for the purposes of article we were taking a height of* 10,000 *feet*) we feel that there would be little point in firing a shell fused to burst at 10,000 feet, with a charge capable of sending it up to 30,000 feet. Assuming, therefore, that for a bursting height of 10,000 feet a correspondingly smaller charge would be used, we suggest that a correspondingly slower muzzle velocity would result, with a correspondingly longer time taken to reach the given height. So what?

Realising that few of our readers would wish to delve into trigonometry, or even simple ballistics (about which we know nothing!) we carefully omitted the formula submitted by our correspondent and endeavoured to put forward a simple one that would give a "fair approximation."

Well, it doesn't . . . neither does our correspondent's . . . although we do not think that our suggestion—that an A.A. shell, if fired at an angle of about 50—60 degrees to the horizontal—will take about 25 seconds to reach 10,000 feet height about the ground, is far out.

D. A. R

INCLUDED IN NEXT MONTH'S ISSUE—

A WINDER WITH GEAR-DRIVEN TURN COUNTER .. .. *By S. F. Butterworth*
A CO-AXIAL DRIVE UNIT WITH AUTOMATICALLY DISENGAGING CLUTCH .. *By G. Woolls*
A CONSTANT SPEED AIRSCREW FOR MODEL AIRCRAFT .. .. .. *By J. S. Brooks*
GADGET REVIEW .. .. *By C. A. H. Pollitt*
CALLING ALL AIR CADETS .. .. *By C. A. Rippon*
QUESTIONS AND ANSWERS .. .. *By The Editor*
PETROL TOPICS .. .. *By Dr. J. F. P. Forster*

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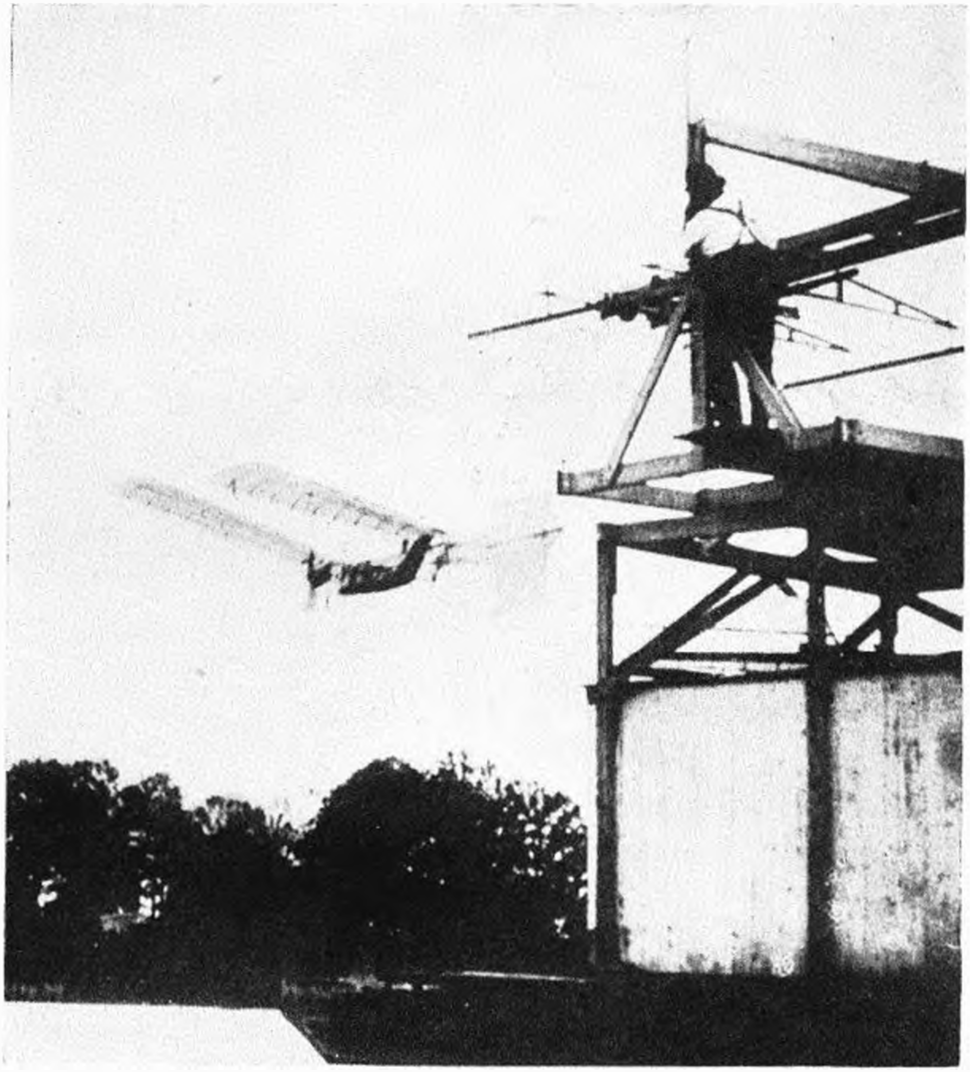
THE "SUNBUG"—A 20 in. span Super Light Duration Model .. .. *By J. S. Brooks*
A 50 sq. in. SPAR-TYPE INDOOR COMPETITION MODEL .. .. *By J. H. Maxwell*
THE "CRIMSON STREAK"—A 15 in. Long Rubber-Driven "Cable Buggy"
(See page 603 of the October, 1940 issue)

LANGLEY'S EARLY 'PLANE MODELS

Described by

E. R. YARHAM

Photos published by courtesy of the Smithsonian Institute, U.S.A.



SOME of the most remarkable and successful early models of aeroplanes were those of Samuel Pierpont Langley, the famous American inventor. They are now in the Smithsonian Institution, Washington, the most celebrated foundation of learning on the American continent, and of which Langley was secretary for some years.

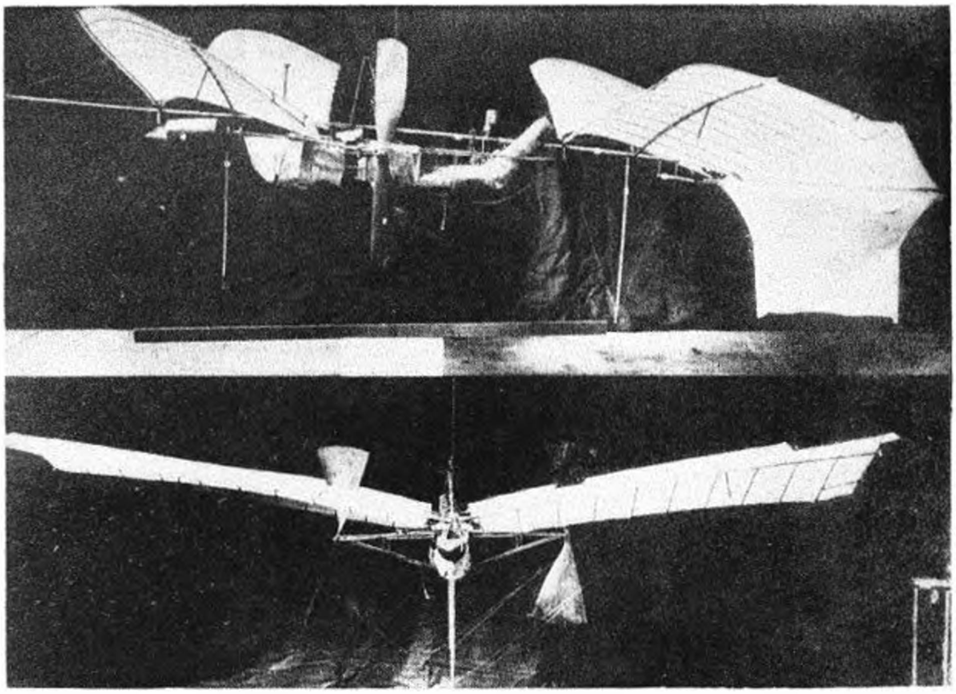
For some reason or other his is a name unjustly neglected in the history of aeronautics. "My life's work is a failure" such were the heart-broken words of Langley when over 70 years of age. Yet he had made one of the most epochal discoveries in the history of the world how to construct a power-driven heavier-than-air machine that could fly and carry a man.

He died without knowing of his success, but his pioneer work was by no means fruitless. For his writings greatly encouraged and influenced the Wright brothers. His cry of despair was uttered in 1903, when his efforts to launch into the air a man-carrying "aerodrome" (as he termed his machines), met with failure and were greeted with a chorus of ridicule and attack from an unsympathetic Press. Later it was discovered that failure was merely due to wrong methods of launching, for eight years after his death in 1906 this notable pioneer's name was triumphantly vindicated.

In 1914 Glen Curtiss, the early American aeronaut, obtained permission to take the machine from the Smithsonian Institution, Washington, and, using exactly the same engine and propellers, the only radical difference being the fitting of floats to enable it to take off from the water, the pilot tested it out on Lake Keuka, in New York State. At the first attempt the machine rose and flew with perfect grace and stability, and demonstrated its wonderful ease of control. When it is remembered that the Wrights' first flight lasted only 12 seconds the significance of the above achievement can be appreciated. Later the machine was fitted with an 80-horse-power engine and further flights were made.

It is an interesting historical fact that the official observer correctly diagnosed the reason for Langley's failure to get his machine to fly trying to launch the heavy machine from a platform just as he had done his small-scale models. Before a machine could be got into the air some other method of launching was necessary. Yet in passing one remembers that nowadays catapulting is practised both on liners and battleships.

Here is an extract from the official report of the representative of the American War Department, Major M. M. Macomb: "On the 17th October last everything was in readiness, and I witnessed the attempted trial on that day at Widewater, Va., on the Potomac. The engine worked well and the machine was launched at about 12.15 p.m. The trial was unsuccessful because the front guy-post caught its support on the launching-car, and was not released to give free flight, as was intended, but, on the contrary, caused the front of the machine to be dragged downwards, bending the guy-post and making the machine plunge into the water about 50 yards in front of the house-boat. The machine was subsequently recovered and brought back to the house-



The two photographs on the left are of the 13 ft. span " petrol 'plane " built by Langley, which, powered by a 1 h.p. motor, first flew on May 6th, 1896. The photo at the commencement of this article shows the designer launching the model, whilst our front cover design, by Rupert Moore, A.R.C.A., pictures the scene on that epoch-making day in 1896.

boat. The engine was uninjured, but the four wings and rudder were practically destroyed by the first plunge, and subsequent towing back to the boat-house. . . .

" On the 8th December last, between 4 and 5 p.m., another attempt at a trial was made, this time at the junction of the Anacosta with the Potomac, just below the Washington Barracks. . . .

" The launching-car was released at 4.45 p.m., being pointed up the Anacosta towards the Navy Yard. . . . The car was set in motion and the propellers revolved rapidly, the engine working perfectly, but there was something wrong with the launching. The near guy-post seemed to drag, bringing the rudder down on the launching ways, and a crashing, rending sound, followed by the collapse of the near wings, showed that the machine had been wrecked in the launching, just how, it was impossible for me to see. The fact remains that the near wings and the rudder were wrecked before the machine was free of the ways. Their collapse deprived the machine of its support in the rear, and it consequently reared up in front under the action of the motor, assumed a vertical position, and then toppled over to the rear, falling into the water a few feet in front of the boat."

The pilot luckily escaped with his life, but the machine was so badly wrecked that it would have taken a long time to repair it. In consequence, the War Department withdrew its aid. Only a few days later than Langley's unsuccessful experiment, on December 17th, Wilbur and Orville Wright made the first flight in the world, of 284 yards—an epochal event in human history. Langley was not jealous, for he was convinced that man would fly, and the principles he discovered have gained steadily in importance. His researches, indeed, have proved of enduring value, and they marked the beginning of exact aerodynamic science.

Samuel Pierpont Langley brought a brilliant mind to the study of aeronautics. He was born in Massachusetts on August 22nd, 1834, and was a genius of many parts, for during the early part of his life he was interested in architecture, physics, and astronomy, one of his inventions being known as a " bolometer," which is still one of the most remarkable instruments known to science. The most accurate types are capable of recording a change in temperature so inconceivably small as a one hundred millionth of a degree. All his work was marked by the greatest care and accuracy, and a determination to get to the root of a problem.

Hence, when he decided to investigate the problems of flight, he determined to begin with fundamentals. At the time many men were endeavouring to solve the same problem, and erroneous ideas were numerous, while several fantastic theories held the field. Lilienthal, the famous pioneer, Mouillard, and Chanute devoted their efforts to soaring flight, and, strangely enough, the Wright brothers said their sympathies were with them, " partly from impatience at the wasteful extravagance of mounting delicate and costly machinery on wings which no one knew how to manage, and partly, no doubt, from the extraordinary charm and enthusiasm with which the apostles of soaring flight set forth the beauties of sailing through the air on fixed wings, deriving the motive power from the wind itself."

In the end, of course, the Wrights had to adopt motor power. This was the phase of research to which Sir Hiram Maxim and Langley gave their attention. The latter started from the statement of Sir George Cayley (1774-1857), known as the " father of British aeronautics," that in order to fly one had only " to make a surface support a given weight by the application of power to the resistance of air." Langley determined to discover the principles upon which birds fly, and to do this he constructed a huge whirling or revolving table, with a long projecting arm, and then he carried out many experiments with a stuffed frigate bird, a Californian condor, and an albatross.

He propelled the table by mechanical means, and then substituted brass plates for the birds. When the arm revolved the plates swung through the air, and he was able to measure accurately the resistance offered to their progress and the amount of " lift " they obtained. Langley was surprised, for he found that the faster the arm revolved the less weight the plates registered, " until at a great speed they almost floated in the air." He tabulated much data, and asserted that what before had seemed impossible now began to look feasible; in his own words, " it was possible to construct machines that would give such velocity to inclined surfaces that bodies definitely heavier than air could be sustained upon it and moved through it with great velocity."

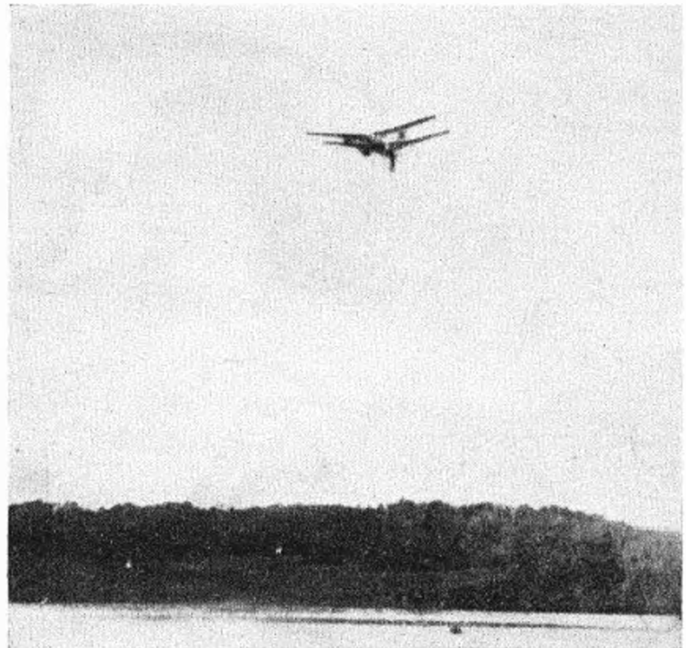
Langley's next step was to apply the knowledge he had gained in practical ways. C. L. Brown says, in "Conquest of the Air": "He had proved the efficiency of the plane as a lifting instrument when impelled through the air at a certain velocity. He had prepared statistical tables recording the effects of 'planes in motion through the air. He now set himself the definite task of proving that these properties of the 'plane in motion' could be employed to make a power-driven heavier-than-air flying-machine."

"This brought him into contact with a new set of problems, this time of a more practical kind. Firstly, there was the question of the 'prime mover,' the mechanical power which was essential to sustained flight; secondly, there were structural problems, of which the most vital was the need of stability. Obviously a machine must be properly balanced before it could make an effectual flight and hope to escape destruction. Langley considered he would have sufficiently succeeded in his object if he could build a model aeroplane of reasonably large dimensions which would fly safely under its own power."

This he was able to do. He built, between 1892 and 1896, over 30 small models, and on May 6th of the latter year he successfully launched No. 5 of his large models over the Potomac River (Washington, D.C.). It flew on two occasions for one and a half minutes. This was an epoch-making event in the history of flight: "Never in the history of the world, previous to these attempts, had any mechanism, however actuated, sustained itself in the air for more than a few seconds. He thus paved the way for others who have achieved success with man-carrying machines."

The machine, weighing about 26 lb., 16 feet long, and measuring between 12 and 13 feet from tip to tip, was launched from the top of a house-boat by catapult. It flew gracefully until its fuel was exhausted, and covered about two thirds of a mile each time. Langley was so excited by his achievement he had to withdraw into the neighbouring woods to hide his emotion. In November his next model flew about three-quarters of a mile at a speed of 30 m.p.h.

Dr. Alexander Graham Bell, the inventor of the telephone, was also interested in the problems of mechanical flight, and he took some historic photographs on May 6th, and left an interesting account of what happened. He recorded: "The machine, at a given signal, started from a platform about 20 feet above the water, and rose at first directly in face of the wind, moving at all times with remarkable steadiness, and subsequently swinging round in large curves of perhaps 100 yards in diameter, and continually ascending until its steam was exhausted, when, at a lapse of about a minute and a half, and at a height which I judged to be between 80 and 100 feet in the air, the wheels ceased turning, and the machine, deprived of the aid of its propellers, to my surprise did not fall, but settled so



softly and gently that it touched the water without the least shock, and was, in fact, immediately ready for another trial."

Langley did not intend to proceed any further than this, for he was getting on in years, and had brought to a successful conclusion that research into aeronautics which seemed specially his, viz., the demonstration of the practicability of mechanical flight. He was willing to leave the rest to others, but the War Department and President McKinley requested him to build, if possible, a machine capable of carrying a man. He was assisted by Charles M. Manley, and the experiments stretched over five years to 1903. The American engineering firms would give no assistance in the construction of a suitable engine, as they all dubbed flying a madman's idea.

The engine Manley and Langley devised was a remarkable one, light, but very strong. The machine was described by the latter as "built of steel, weighing, completely, about 730 lb., supported by 1,040 feet of sustaining surface, having two propellers driven by a gas engine developing continuously over 50 horse-power." The unhappy results of the attempts to launch the machine have been described, but that it was perfectly capable of flying, if it had been got into the air in a satisfactory way, was proved by the flights made by Glen Curtiss.

Langley deserves honour as a brilliant pioneer who laid the foundations of modern flight.

Fig. 1.

GADGET REVIEW —

QUITE recently I received a letter enclosing a gadget from a member of a certain club in the Midlands; his letter was brief to the point of being curt, and he not only failed to say what the idea was, but his sketch was so ill conceived as to be completely insignificant. Just what it is intended to be I have not even discovered. I never will.

This sort of thing is, fortunately, not too prevalent, though the general standard of the sketches I receive does leave a certain amount to be desired. I think the crux of the matter is that many chaps just don't take the necessary time and trouble in preparing their sketches, for I am convinced there is no lack of talent; on the contrary, some of my readers have sent me very attractive sketches, from time to time, though I regret they are few and far between.

Of course, no matter how poor a draughtsman a chap may be, his instructions usually explain the object of his idea, which is quite in order. But when a fellow sends in a sketch which is nothing more than an undecipherable scribble, with no instructions, or even a hint as to what it is intended to be—well, I ask you!

Fig. 1, this month, is a fair example of what can be done, and is an almost untouched reproduction of a sketch by Mr. A. Argent, of Wanstead, London. His idea is to use a damp—not saturated—scrubbing brush for spraying water on tissue; the spray is created by simply drawing a knife sharply across the bristles of the brush. I don't necessarily say this is a better method than the now celebrated scent-spray dodge, yet what could be more simple, particularly in an emergency, than this "brush" method?

A split and hinged noseblock has distinctly interesting possibilities. Mr. P. Heath, of Huntingdon, writes to tell me that he has for some time past been using one to advantage, both for bench tests, and also "on the field." The desirability of being able to remove a bent motor hook by the simple expedient of "opening" the noseblock, is too obvious for comment. Fig. 2 explains how this type of noseblock can be used in conjunction with a primary test rig.

A very accurate method of "building-in" wing dihedrals is to use a small jig, similar to the one shown in Fig. 3, and suggested by Mr. J. Harpin, of the Newcastle-under-Lyne M.A.C. There is a detail which I think has been overlooked here, and that is the need to keep the rib at the root of the wing perfectly vertical. This can be easily remedied by the introduction of a small stop in the form of a wooden block, as shown in the top right hand corner of the sketch. The greater the number of holes in the uprights of this jig the more useful it becomes.

Our undercarriage design is this month contributed by Mr. Stuart E. Garratt, of Manchester, who says that he designed it primarily for a 12½ oz. Wakefield job, with a spruce fuselage. Fig. 4 gives a clear idea of the fitting, and shows how the brass tube carrying the undercarriage is notched into a piece of wood glued to one of the fuselage formers. The two springs, which are in fact sections of an extending curtain rod, assist in taking the landing stresses, though I consider there should be some additional form of bracing to prevent the undercarriage pivoting forward.

As an alternative to the folding propeller which I discussed in last month's "review," Mr. A. J. Simpson, of Hitchin, suggests a fully feathering propeller. This, he

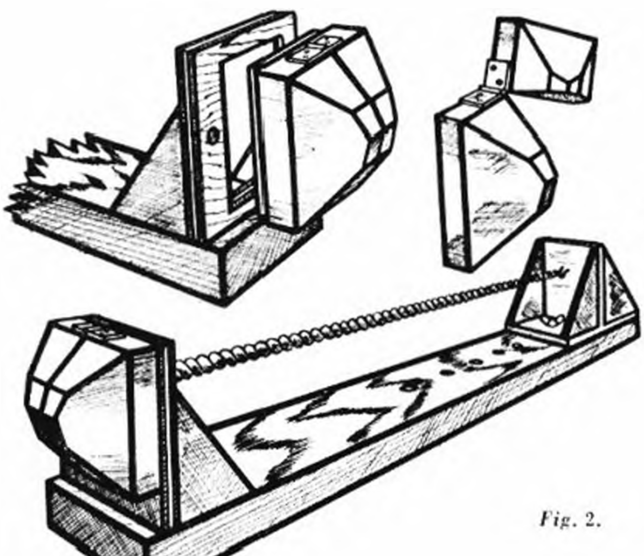


Fig. 2.

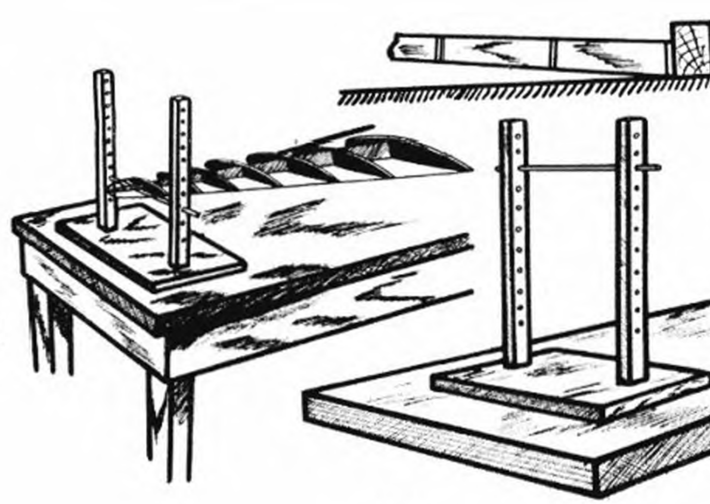


Fig. 3.

Conducted and Illustrated by **C. A. H. POLLITT**

claims to be stronger than the folding type, and to offer little more resistance. Mention of fully feathering propellers certainly brings us slap bang up-to-date. I recall seeing, about twelve months ago, a Fairey "Battle" that had been crash-landed as the result of the hydraulic system having packed up, while the propeller was fully feathered! This wasn't a production "Battle," by the way. The device shown in Fig. 5 incorporates a piece of music wire accommodated in a brass tube within the spinner, and about which piece of wire the propeller blade is free to pivot. A small piece of aluminium is recessed into the spinner and allowed to project, so as to form a stop for preventing too great a

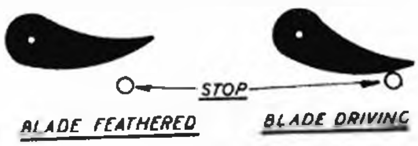
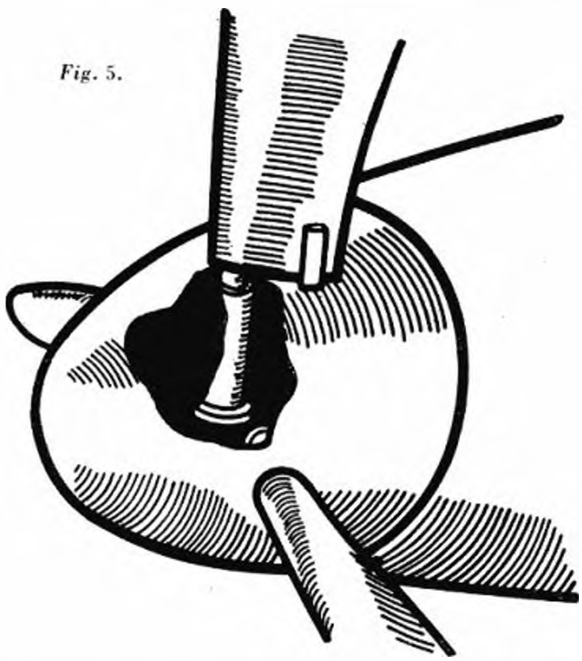


Fig. 5.



movement of the blades. When the propeller is revolving air pressure will force the feathering portion against the stop; when the motor has expended its energy the blade will automatically swing head on into wind, so feathering.

From Smethwick, Mr. S. C. Whitbread comments on the difficulty of obtaining small ball thrust races, and offers his suggestion for overcoming this difficulty. In Fig. 6 I have contrived to show how, by using two small discs cut from sheet metal and drilling six countersunk holes in each disc, so as to accommodate the six balls between the plates, as it were, quite an effective thrust washer is obtained. The enlarged detail on the right shows one of the countersunk holes and ball.

A possibly uncommon, though nevertheless useful adjunct, to a model workshop, is a small balance of the type shown in Fig. 7, sent in by Mr. Robert Burns, of Stewarton. The beam comprises a two-foot length of dowelling, or even a strong grade of strip wood, to one end of which a weight is rigidly fixed, so as to bring the new centre of gravity to

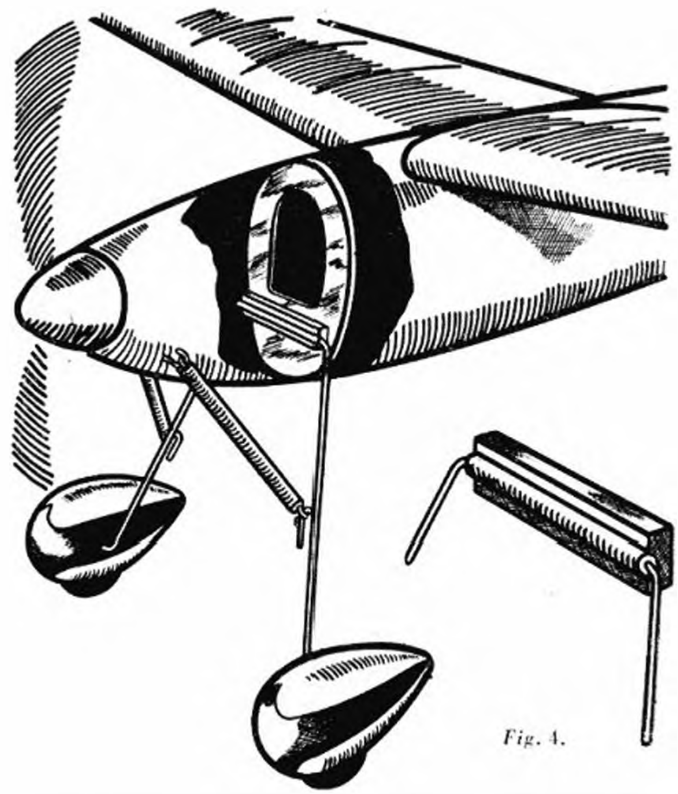


Fig. 4.

within six or seven inches of that end. Near this end a hole $\frac{1}{16}$ in. diameter is drilled, and the hook, marked A, fitted. A four-ounce weight is tied by string to the beam at a point about four inches from the heavy end, and a slider is fitted near the opposite extreme end of the beam. Next, while holding the beam by hook A, the four-ounce weight is slid along the beam until it is slightly on the light side; at this point the hole for hook B is drilled. The weight is now fitted to this last hook, and the slider adjusted to give exact balance. The position of the slider, when the beam

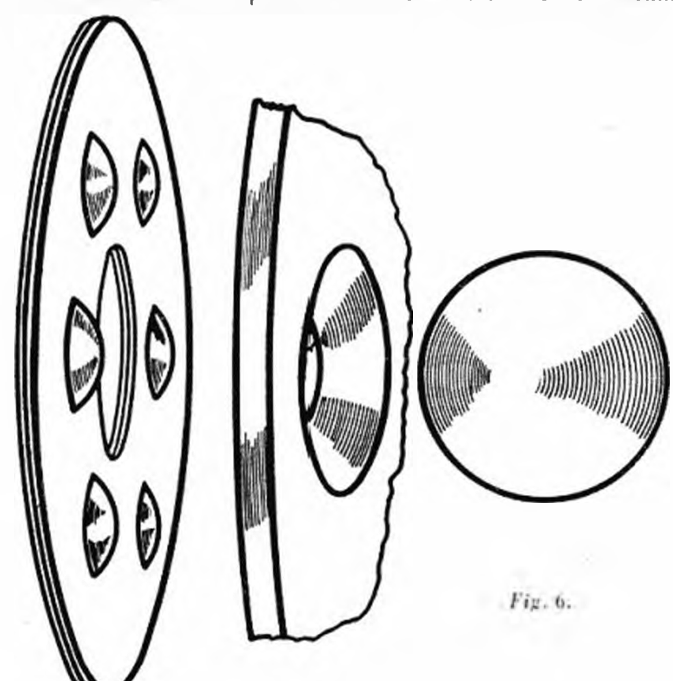


Fig. 6.

is balanced, should now be marked "4 oz.," and the procedure repeated, this time with the 2 oz. weight. The distance between these two marks is to be divided into twenty equal parts, the centre-most mark being the 3 oz. position. These marks may be continued towards hook A, the zero mark being near it, and on the opposite side from the centre of gravity of the whole gadget, without slider.

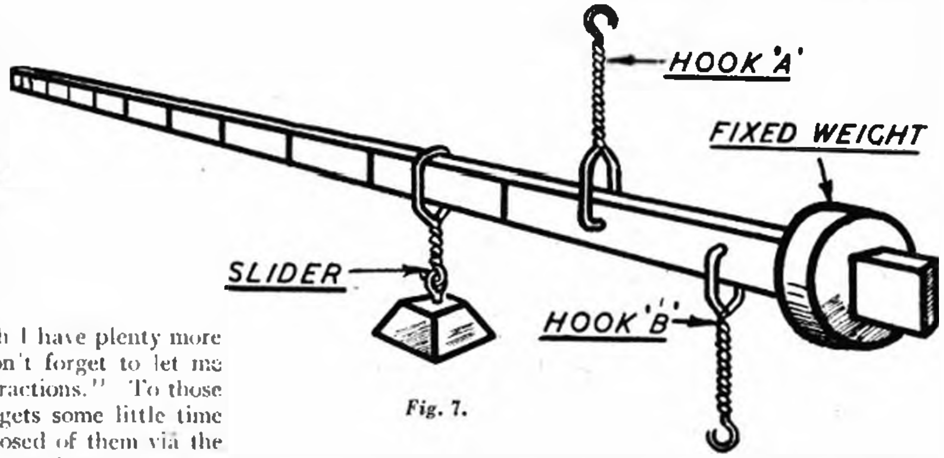


Fig. 7.

Well, chaps, that's about as much as I am able to deal with this month, though I have plenty more stuff coming along for next time, so don't forget to let me add *your* idea to the list of "coming attractions." To those of you who have, perhaps, sent me gadgets some little time ago, please don't think that I have disposed of them via the waste paper basket!—we don't do that there 'ere! The point is I receive upwards of fifty or so gadgets each month, and while *some* of them are not worth publishing *most* of them are. So you will see that it is just impossible to publish each month's consignment instantly. Also don't forget that I shall make payment of from 2s. 6d. to 7s. 6d. for all gadgets published, which, incidentally, should be addressed to me, c/o THE AERO-MODELLER.

MODEL AVIATION IN 1950 — By W. A. DEAN

WHEN one looks back over the past few years, the rapid strides model aviation has taken make one eager to see what new wonders our hobby will produce in the future. Perfection may have been reached with regard to the streamlined Wakefield model, but as most aeromodellers will agree the possibilities of the radio controlled gas job are unlimited.

Ten years hence should see some really startling achievements in this now comparatively new field. To my mind the 1950 radio-controlled model will be a scale reproduction of a full-size machine complete with controls for retractable undercart, flaps, and any other gadgets its big brother may have. May I even go further by saying that when a satisfactory method of control has been devised for the model the "pilot" will fly it by means of standard controls in a full-size cockpit. In other words, he will "pilot" it from the ground! Even as I write this I can almost hear you say that there are dozens of pitfalls to be overcome before we even dare think about this, such as weight of receiving set and innumerable other points.

But I must remind you this is ten years ahead, and not intended to be a "one man job." In fact, such a project should have most of the more experienced chaps in the club at work on it. Nothing under fifteen foot would be suitable, and therefore the cost would be very high for one person anyhow. The cockpit and controls alone would be a costly project. Also the whole will have to be on a pivot so as to allow the "pilot" to follow the model round.

With something like twenty people working on all the components, and devoting the entire club workshop to one of these miniature 'planes and radio equipment, there is no reason why such a venture should not prove successful, both from the point of view of cost and construction.

Think of the attraction of such a machine at the annual club competition day! Imagine the delight of the local lads on seeing a model skim along the ground until it becomes air-borne, then retract its undercart and go into a series of complicated stunts before dropping its flaps and coming down to a neat three pointer in front of them.

Am I wrong in assuming that a flying student could gain valuable instruction from such a device? I think not. No longer would the instructor have to give his pupil his first lesson in a grounded 'plane to explain the use of the controls. Instead of being told that if he pulls the stick back he will climb, he performs the required movement, and overhead the model obeys him. Every mistake he makes is reflected in the model above, until after constant practice he can make it slide smoothly through each revolution. The experience thus gained should serve him in good stead when he finally went aloft to go through the movements he practised on the ground.

I agree with C. R. Jeffries (Oct., 1939, "Petrol Topics"), that every gas job will have some kind of radio control soon after model activities can again be started. The ever-increasing aerial fights over England are making more and more people 'plane conscious, and those who, in pre war days, could not tell the difference between a Hurricane and a Flying Flea, now smile knowingly and stagger you with details of performance, etcetera, of the 'plane in question. Many of these people quite naturally have started to take an interest in our hobby, and so we find that instead of decreasing our numbers are ever growing. Granted many of them are, owing to the war, unable to devote much time to modelling, but all the same it is gratifying to know that at last the public is sitting up and taking notice of the many interesting possibilities model aviation has in store.

With the advent of almost universally radio-controlled jobs the Air Ministry will no doubt be an interested spectator. The first instance of State interest was in America, when the U.S. Army recently ordered nine such models from Reginald Denny as anti-aircraft targets.

So much for the future of our hobby, and I am sure those who share my views will join with me in saying "Roll on 1950."

Just one last reflection. Let us hope that the 1950 October AERO-MODELLER will read something like this. Imaginary extract from a club report:—

"The main attraction at Club 'X' gala day was the display of formation flying by nine of the club's radio-controlled 'Spitfires.' Also of great interest was the arrival of a seventeen-foot Ensign from Croydon, control being transferred between the two towns. The Ensign, our readers will remember, made its appearance just before the upheaval of 1939 . . ."

THE MECHANICS OF GAS ENGINES

II—THE ELEMENTS OF EFFICIENCY

By C. WILLIAMS

THERE are three things that to-day's gas engines are in need of. They are: Efficiency, efficiency, and more efficiency. The gas modellers, of whom there are thousands, demand more efficient motors, and what do they get? Sleepless nights (especially the one before the flying meet), grey hair (it does get bald if we worry too much!), and a great deal of anguish and gnashing of teeth (and models, too!). Then comes the day. The flying meet is on, and they're off! (Yeah, and after the contest some of the fellows really do go off!).

If they don't get heart-failure before the contest is over they'll start making excuses, becauses 'an stuff. Of course the trouble may not be due to the poor showing of the engine. Rather it may be due to the poor design or construction of the 'plane itself, but in the majority of cases it is because of the inefficiency of the motor. It is really surprising to see how a model which has had a tough time getting into the air can be made to say "uncle" by merely increasing the power.

Rubber-powered enthusiasts can vouch for this, and even you have probably noted this seemingly impossible being done. A model which just won't fly can be coaxed to doomsday, and still she will not get up. But add another strand of rubber and presto! you have success. Y'know, this flying barn-door business.

This applies to gas-jobs as well, unless you can emulate or even equal Vernon Boehle's ability to make a fifteen-foot crate fly with a Baby Cyclone engine. (I'll bet that guy was born with wings. I wouldn't trust him around any of my furniture. He might have a B.C. in his pocket, and well . . . .).

Getting back to our vital problem: How can we get more power out of these little engines? The answer is fairly simple. "Build them bigger," is what some of you may say. But the answer is nay, nay and nix. Try again. "Build them bigger than that." The answer is still ixnay. "Well how?" you shout, trying very hard to control your temper. "By the simple expedient of building them more *efficient*."

Now where in the name of the nine gods, the beard of

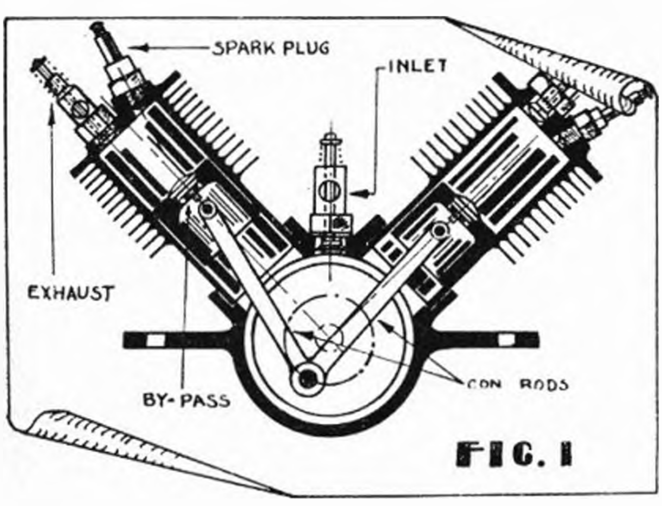
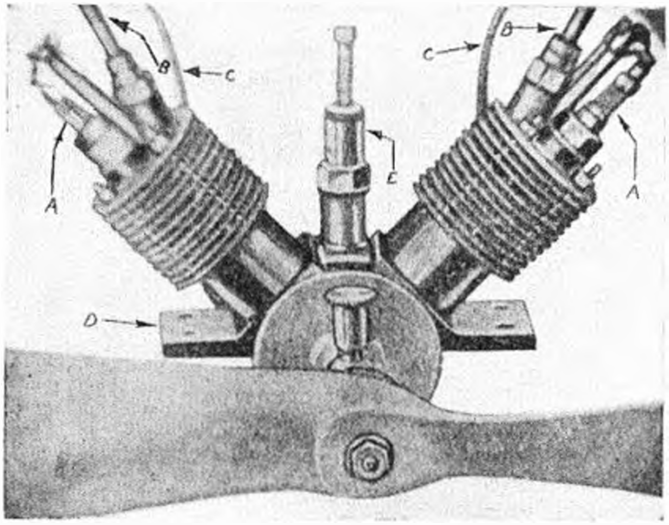


FIG. I



Santa Claus and Allah, have we heard that word *efficient* before? Oh yes, that's what started this blurb off.

Please excuse the verbosity on the writer's part, as it is not often that an author has the opportunity of beating around the bush, so if you'll be good enough and put those aspirins (or revolver) down and come out of your swoon, we'll put our shoulder pads on and dive right into the more serious part of this discussion on increasing the efficiency of our little "percolators."

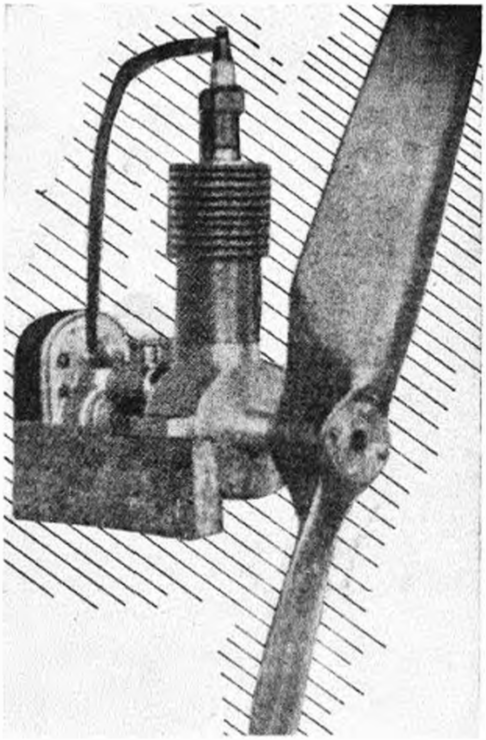
First off, we'll start by making those three fellows, whom we hope are reading this article, real good and mad.

There has not been very much in the way of improvement in the miniature gas engine field for many, many years. A fallacious statement? Nope. That's the honest truth, brethren. The performance of our little heart-throbs has not been increasing at all. In this day of miracles and scientific age (don't look at me!) the model gas engines are being sorely left in the rear. I can picture an avalanche of protests, "tain't sos," and time bombs rain down upon this humble scribe, but save your three cent stamps boys 'cause I'm going to prove it to you.

Let us first compare one of the very early engines with the fairly latest models. A chap I happened to know, and who was born in Germany, found some very rare photographs and let me have them. He lived in Germany (when Germany wasn't wandering all over the map), and was quite a model-builder in the days B.B. (before balsa). The pictures interested me, and should interest those three readers whom we hope are still bearing with us.

In Figs. 1 and 2 we have a two-cylinder V-shaped engine of four-cycle design. Although it was virtually impossible to obtain more information on the little engine, the photo ought to make some of you stand up and take notice. The details are: (*a*) Rocker arm and valve assembly; (*b*) sparking plugs; (*c*) ignition wire; (*d*) lugs for attaching motor to mount; and (*e*) valve. Figure 2 shows a very neat little two-cycle built in 1919. You can see for yourself what was being done 18 years ago, and wonder what the —— is the matter with our engines.

Let us look at this scandalous affair from another angle and be purely mathematical, and figure the whole thing out cold-bloodedly, so to speak.



This photo is interesting in that it reveals a magneto and not the more common coil and battery. The engine appears to be a "Brown Junior."

What is the efficiency of our two-cycle engines? Or what percentage of fuel is being used as actual energy? That is the problem in a nut-shell. Greater efficiency means that the engine will be able to run longer and give more power on the same amount of fuel. Simple, isn't it, until we try, then ——

There is a formula with which we can calculate the efficiency of a motor. Although the formula is the last word in simplicity there are a number of things we must know before we can use and understand it. After all, any fool can buy a gas engine and operate it by following instructions, but what's the use of having a hobby if we can't learn something from it that we already don't know.

Gas modelling is one of those hobbies from which you can really learn a lot more than the average person knows. The gas modeller can talk fluently about the operation and design of two-cycle engines. He knows more than a thing or two about them. He can discuss various problems about fuels, alloys, principles of internal combustion engines, not to mention the hundreds of things he learns from the 'plane itself.

Before we take off into our little journey through formulas, computations, and what-have-you, we are obliged to inform the cash customers, who are not already in the know, about certain definitions. So, let's try to be serious and throw facetiousness and Mr. Shaw (who really is funny) out of the window.

The following are certain principles which bear a definite relationship to gas engines:

Unit.

There has always been a great deal of misunderstanding, for beginners especially, trying to interpret the word "unit." Some of them have a vague idea somewhere in the back of their head, whilst in the majority of cases they grope in the dark, fumbling, fretting and fuming.

Some time or another you have probably picked up an article of a technical nature, determined to read and understand it, only to find that bogie " unit " crop up.

The dictionary gives the meaning for the word " unit " as a " selected amount by which others are measured." The dictionary may define words, but it also takes the opportunity of messing things up. That definition is about as clear as a dark, dark darkie, in a dark, dark night, with a can of dark, dark shoe polish 'er something. Anyhow, you can sorta grasp what I mean. Let's see if we can make it a little more explicit with the help of a few examples.

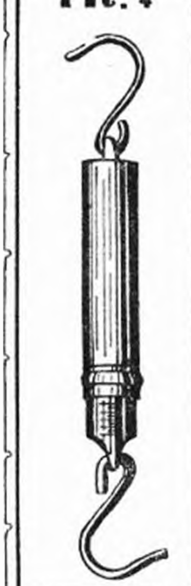
A unit is simply a name. That's all it is. Feet, tons, inches, drams, metres and ounces. They're all units. It would sound very foolish and rather silly to say that a 'plane weighs six feet. If we called 12 inches a pound it would be correct to say that a wing has a span of eight pounds. But we call 12 inches a foot, because, well, just because. We could call it a whale or an elephant for that matter (though it would sound kinda screwy, " gimme three strips of balsa, four elephants long "). If we classified people's names with regard to their height, and a five-footer was called a " twerp," and you were five feet tall, you'd be called a " twerp." Get the idea? Better remember it, as it will be used very often from now on.

Force.

It is usual to define the word force as something which tends to produce or alter the motion of a body. To the beginner this probably conveys very little notion of the nature of force, but the idea of a push or pull will be a sufficient conception of force. Familiar examples of force are to be found in the pull of a locomotive on a train, of a horse on a cart, and of a weight on a rope which supports it.

Measurement of Force.—All bodies can exert vertically downwards the force of their own weight, and forces are usually measured in pounds and ounces. The force you exert on the earth is equal to the weight of your body. The weights of bodies result from the attraction of the earth upon them, and vary slightly in different parts of the world and at different altitudes. We take the unit, a force of one pound, as equal to the weight of a standard pound mass in London; by standard pound mass we mean the quantity of matter in a certain piece of platinum carefully preserved by the Board of Trade.

FIG. 4



We can often arrange to measure a force by balancing it against the weight of a body or by some effect which it produces.

Effects of a Force.—If a force acts on a body which is at rest it may set the body in motion; but if the force is balanced by another equal and opposite one, no motion results, but the body may be strained, that is, altered in shape or dimensions. Thus a pull may stretch a helical spring, and the amount of stretch may be used to measure the force. It is upon this principle that the spring balance shown in Fig. 4 operates. This balance is used for measuring forces. The spring may be graduated by hanging different known weights on it and registering the amount of stretch of the spring; its accuracy may also be tested by hanging standard weights on it. So much for what force is.

Work.

When a force acts on a body and causes it to move against a resistance, the force is said to do work. If you move a heavy piece of lead you are doing work. If the force does not vary in magnitude, is in the direction of the motion, the amount of work done is equal to the product of the force and the distance moved, or:

Force × distance = work.

Unit of Work.—If the force of 1 pound acts through a distance of 1 foot, the amount of work done is:—

1 pound (force) × 1 foot (distance) = 1 foot-pound (work), and one foot-pound is called the unit of work. If a weight of 1 pound is lifted through a vertical distance of 1 foot, 1 foot-pound of work is done. If a weight of, say, 8 lb. is lifted through a vertical height of 6 feet, the work spent in lifting is—

6 feet (distance) × 8 lb. (weight or force) = 48 ft.-lb.

Other Units of Work.—Occasionally other units are used, for instance, the product of a force in ounces and a distance in inches gives inch-ounces of work; similarly, tons and feet give foot-tons, pounds and inches give inch-pounds, and so on, but the main unit is foot-pounds.

Example: How much work is done in raising 67 pounds through a distance of 75 feet?

Answer:

Height through which weight is raised .... 75 ft.
Weight lifted .... 67 pounds.
Work done in foot-pounds = 75 ft. × 67 lb. = 5,025.
Answer: 5,025 foot-pounds.

A CONTRA-PROP. GEARBOX — Designed by L. D. BULL

Described and Illustrated by C. A. H. POLLITT

THE Koolhoven F.K.55 single-seat fighter is one of the few military aircraft to be fitted with oppositely-rotating propellers, and significantly enough, has been described as being possessed of unusual performance. In contrast, the advantages claimed for a full-size aircraft of this type, as compared with a model similarly equipped, that is, with oppositely rotating propellers, are quite distinct and fall into two strangely differing categories.

Whereas, with the fighter referred to above, the use of two propellers does not afford any power increase, such is not the case with the twin-propeller arrangement shown here; in fact, the reverse is the case, since the design provides for the use of two motors.

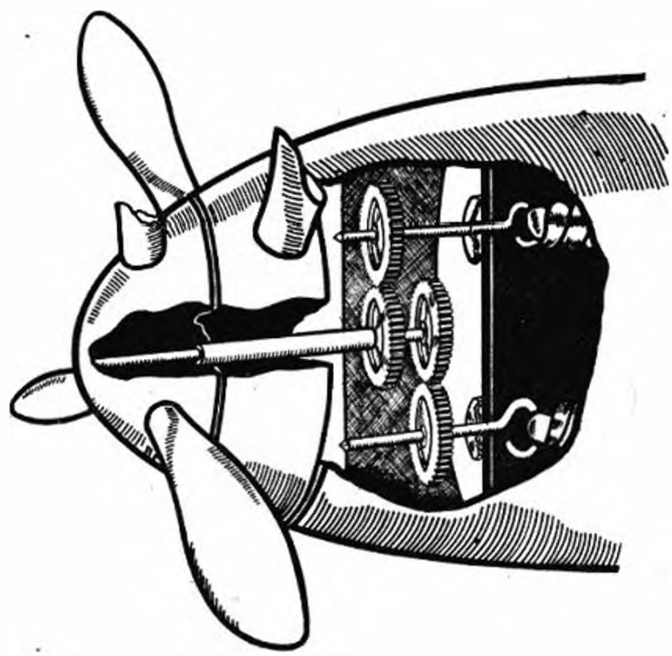
Similarly, in the case of the fighter, the use of two propellers driven by one engine means that the diameter of the propellers can be reduced to something less than would be the diameter of a single propeller, which in turn results in increased ground clearance. Advantage is taken of this latter gain by maintaining the original nominal ground clearance with the introduction of a smaller, and consequently lighter, undercarriage.

Relatively speaking, ground clearance is not such an important factor from the modelling point of view: Rather is it more desirable that the arrangement of gears should be as compact as possible, and from the accompanying sketch it will be observed that compactness of design is one of the strong points of this particular gearbox. The complete assembly is intended to be accommodated between the nose former and a second former closely spaced to it. This second former can be conveniently referred to as a face plate, and needs to be very firmly secured in position, since one of its major functions is to take the thrust of the motors. For this purpose two thrust washers should be fitted, one to each motor spindle, on the forward side of the face plate; ordinary plain collars are shown in the sketch.

It will be appreciated from the drawing that the centre spindle of the gearbox is telescopic, and that the near wheel on this spindle drives the front propeller, while the front wheel is attached to a length of aluminium tube, which drives the second propeller.

The shaft which drives the front propeller may be taken right through the nose of the spinner, and bent to form a suitable winding hook.

Reverting back to the question of ground clearance, I am



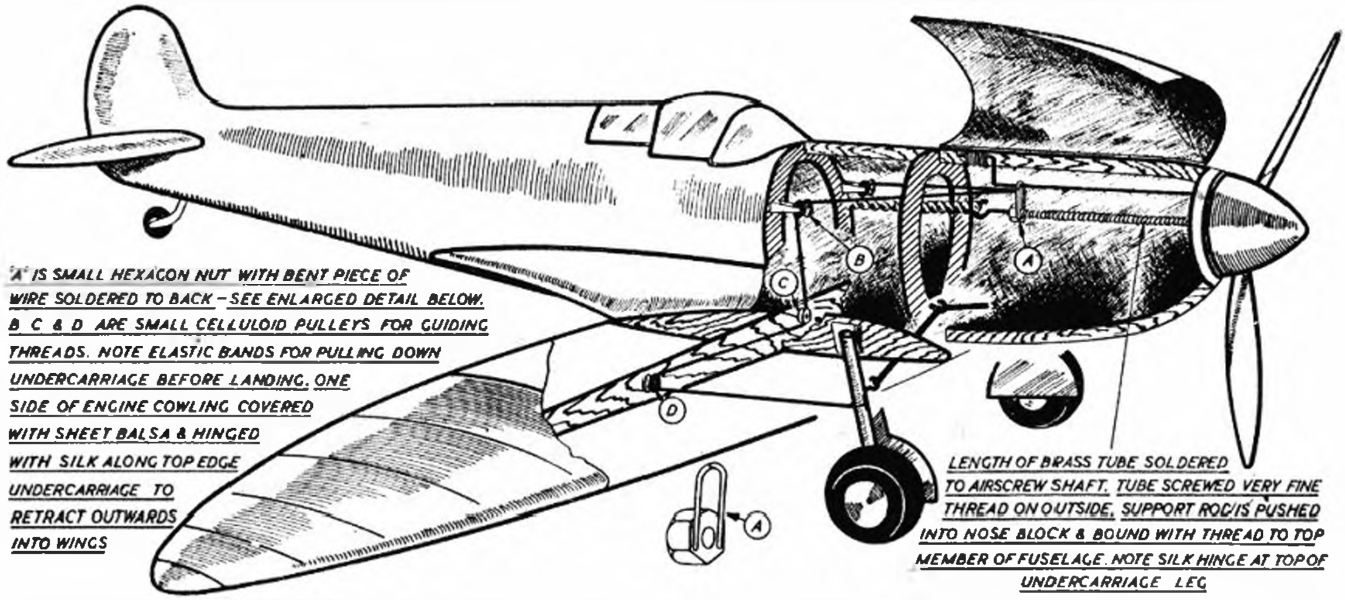
reminded of a rather interesting episode that occurred about a couple of years ago at a certain experimental aircraft station, where I was working at the time. Experiments were being carried out with a special "hush-hush" engine, installed in an aircraft which was never originally intended for the purpose, and the power of the engine was such as to necessitate the use of a propeller of no less than 14 feet diameter! When the machine was in the take-off attitude, that is, with the tail up, this particular propeller fouled the ground by a matter of inches, and the ground clearance was positively negative!

We explained the situation to the chief test pilot, who was to carry out tests with the aircraft, and reluctantly suggested that the test flights be postponed until such a time as the aircraft could be hurriedly fitted with a new undercarriage specially designed to give the required ground clearance. To this suggestion the pilot calmly replied that despite the propeller fouling the ground it would nevertheless be practicable to make the initial, and most urgent, test flight to schedule, and without the new undercarriage! Such an assertion seemed to be sheer foolhardiness, yet coming as it did from one whom we all knew to be a particularly highly skilled pilot, we could only conclude that he intended to use one or other of the many dodges of a pilot's stock-in-trade. On the appointed day that the first flight was to be made, a small party of us assembled on the tarmac and I remember one of the party joking with the pilot and solemnly assuring him that we would see to it that he had a respectable funeral!

However, we were all very intrigued to see the machine make quite a conventional take-off and to alight half-an-hour later in an equally normal manner. I wonder if any of our readers can explain how this was possible? Providing no one sends in a correct explanation I will reveal the secret in some of my future notes.

A RETRACTING UNDERCARRIAGE

Designed by **F. ROBERTS** —— Described by **C. A. H. POLLITT**



DESIGNING a retractable undercarriage for a machine with so thin a wing as the "Spitfire" is something of an exacting business. The use of rods or levers is essentially restricted; and in any case, if any degree of realism is to be attained, resort must be made to a comparatively large scale model, which fact is in itself a limitation.

I remember how one of my own early ideas for a retracting undercarriage featured an involved arrangement of levers and balance weights; the underlying principle relied on gravity operating a loaded ball crank as the model became air-borne, and an elastic band subsequently swung the wheels up into the nacelle. As I eventually learned, the pendulum arrangement of the undercarriage legs had, of necessity, to be so sensitive, that in the event of a premature "take-off" the undercarriage instantly folded up, before the model was really off the ground! Since that time I have always taken a keen interest in undercarriage retracting mechanisms, and one of the most recent ideas to be brought to my notice is a suggestion from Mr. Frank Roberts, of Southfields, who has just completed a 39 in. span "Spitfire," and fitted a retractable undercarriage of his own design.

The accompanying drawing will give some idea of the general arrangement, though it should be realised that it is only practicable to fit this mechanism to a low-wing monoplane, with a fuselage length of no less than 31 in., of which 1 in. is allowed for the rear motor peg, 20 in. for the motor itself, and 10 in. for the airscrew shaft. This abnormal length of shaft is one of the more conspicuous features of the design, and it plays an important part in the operation of the mechanism, of which the sequence of movements is as follows:—

The required number of turns are put on the motor, and the hexagon nut placed on the threaded tube, which thread, incidentally, should be as fine as possible. As the propeller is released, the shaft revolves, and the nut runs along towards the noseblock, while the control threads are in consequence pulled along, and the undercarriage folds up into the wings.

When the motor is unwound the nut should be an inch or so from the noseblock, and as the propeller revolves in the wind the motor is wound in the reverse direction. When tension is on the motor the airscrew rotates in a clockwise direction, and the nut runs back along the shaft and so releases the control threads. The elastic bands under the fuselage assist in drawing the wheels down, and also ensure a smooth and steady motion during the retracting process.

Mr. Roberts makes one or two interesting observations in his letter, and draws particular attention to two important features. Firstly, it is necessary that the motor, when unwound, should be taut between the front and rear hooks. And secondly, assuming the screw thread on the shaft to be $\frac{1}{16}$ in. pitch, the shaft to be 10 in. long, and the fuselage of the length previously mentioned, it will be found that the motor will only take 300 turns. However, if plenty of rubber is used—say 15 strands of $\frac{1}{4}$ in. flat—and an airscrew of large diameter, and coarse pitch is utilised, the 300 turns will suffice for a spectacular take-off and a good flight.

From JOURNAL OF THE ROYAL AERONAUTICAL SOCIETY, SEPTEMBER, 1940.

This is a second and vastly improved edition of a work which was originally published in 1937.

Many of the line diagrams have been redrawn and enlarged, which adds to their clarity and usefulness, and there has been added a considerable number of photographs of successful models which will stimulate the keen model flyer and constructor. Certain chapters have been enlarged and constructional details added which will simplify the task of the model aircraft designer. In particular chapters dealing with engines and engine-driven models (new chapters) will be seized upon avidly by all those who have ambitions to translate their flying times from seconds into minutes.

This is a book which should prove a gold mine of assistance to that great and growing band of air enthusiasts who start by building model gliders and end up, we hope, as pilots of ocean-going aircraft.

This book has been exceedingly well received by aero-modellers. Over 2,000 copies of this Second Edition have already been sold. The technical chapters have been re-edited and entirely reillustrated. The chapters on construction have also been re-edited so as to deal with the latest practice in model aircraft construction. The book is printed on fine art paper, thread sewn, and bound in full cloth with stiff covers. There are over 250 pages. Size is 8½ in. by 5½ in. The dust cover is printed in full colours.

CONTENTS

Airfoils. Airfoils and fuselages for Monoplanes and Biplanes. Drag. Control Surfaces. Aircraft Performance. Airscrew Design. Airscrew Performance. Rubber Motors. Testing Power - driven Airscrews. Wind-tunnel Testing. Wing Construction. Fuselage Construction. Landing Chassis, Tyres and Wheels. The Mounting of Engines and Accessories. Engine Testing and Tuning. Flying the Model.

From the Royal Air Force Quarterly, June, 1940.

" The author sets out in this book ' to provide a text book by the use of which an aero-modeller could work out the complete design and performance estimation of medium and large-sized model aircraft, both power and rubber-driven.' This mark has certainly been reached, and in a most thorough and interesting manner. Models involve the problems of the designer of a full-size aircraft to a great extent, and provide knowledge and experience in a number of those problems. Mr. Russell is very thorough and has obviously spared himself no pains to get to the bottom of things. He has built and flown a large number of models, mostly ' gas jobs,' and has gained tremendous experience of them . . . Here, then, is an enthusiast, with real ability and sound knowledge, passing on the fruits of his labours for the benefit of those who share his enthusiasm, but lack his experience and the means of obtaining his knowledge.

. . . Everything is here, notes on the shape and disposition of control surfaces, and a very interesting chapter on performance estimation . . . shows how, by means of simple formulæ, a number of performance figures can be quite accurately arrived at . . . deals briefly with airscrew design, performance and testing, and subsequently with tests carried out in a wind tunnel built to determine the airflow over and around different components—accentuating his extreme thoroughness and enthusiasm . . . hits another high-spot of interest in the two chapters on petrol engines, installations, the positioning of ancillary equipment, testing and tuning . . . is excellently produced, well written, very readable, and well illustrated with good photographs and drawings . . . amongst model aeroplane literature this book is outstanding."

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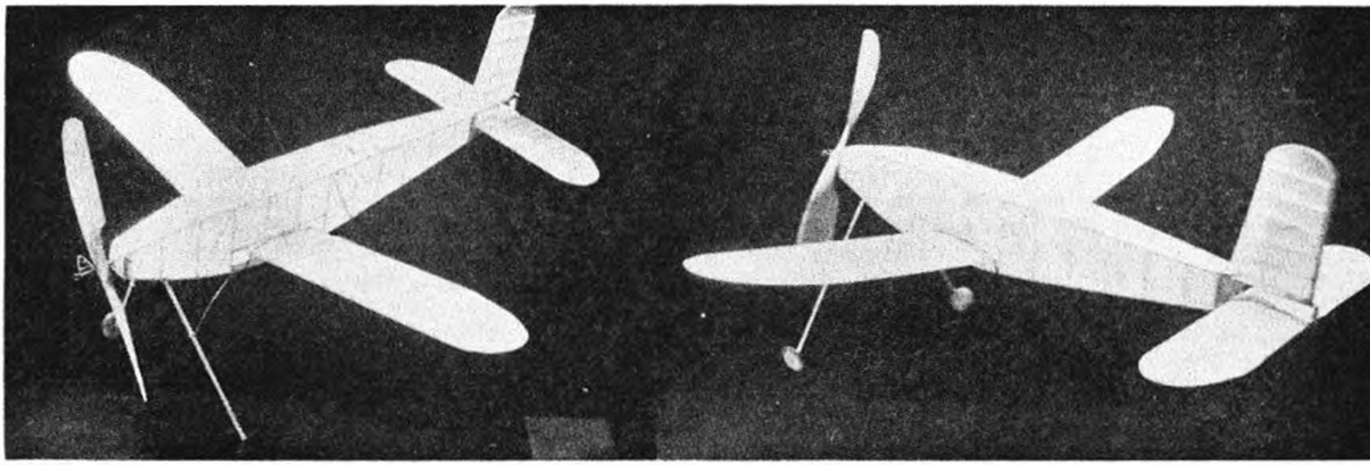
— FROM THE PUBLISHERS —

THE HARBOROUGH PUBLISHING COMPANY LIMITED. ALLEN HOUSE, NEWARKE ST. LEICESTER.

BUILD THE "COURIER," A GENERAL PURPOSE LOW-WING MONOPLANE

By **ARCHIE MILLAR**



ONE sees so many of the conventional high-wing monoplanes that the low wing, in spite of its slightly inferior performance, exercises considerable attraction. This model, which was intended for general knock-about use, was flown over a period of two years, during which time it proved to be more consistent than spectacular. The average of six flights made in succession was 92 seconds, no flight being shorter than 90 and no flight longer than 94 seconds.

While not intended as a "thermal catcher," it nevertheless turned in occasional flights rather above the average, 2 minutes 18 seconds being the longest timed flight, although this was undoubtedly exceeded in many flights which were not timed.

Construction.

The plans must first be drawn out full size and pinned to the building board.

Fuselage.—⅛ in. sq. balsa is used for the longerons, which must be held in place with pins while the ⅛ in. sq. uprights are inserted.

Note the extra wide piece at the rear, with a hole for the accommodation of the rubber anchorage pin. This is ½ in. wide, and is cut from ⅛ in. sheet A horizontal strip at the rear serves as a base for the tail-plane, with a small vertical member inserted beneath.

The slot for the wing is made by using a piece of ⅛ in. sheet balsa between two spacers six inches apart. The front end of this piece should be raised slightly. Leaving a space of ⅜ in. to allow the wing to be adjusted, a horizontal member may be placed in position above, and finally two shortened uprights. Two fuselage sides must be made, the second one immediately on top of the first without removing the latter from the board.

While the cement is drying, cut two tail triangles to the shape shown, also from ⅛ in. sheet. Remove the two sides and cement one of these triangles to the top and one to the bottom longeron at the tail. Next cement the other fuselage side to the triangles in such a manner that the two sides branch outwards, holding them for a few minutes with a clip peg.

Working along from the tail, bring the sides together, adding the spacers. As a plan view is not really necessary it has been dispensed with, but the sides should be 2¼ in. apart at the widest points, between the leading and trailing edges of the wing.

At the nose bring the two sides together, so that the nose is 1¼ in. square, and the nose former, cut from ·8 mm. plywood, may then be added. The platform for the wing is completed by cementing a small sheet of 1/32 in. balsa to the tops of the horizontal pieces of sheet balsa passing through the fuselage from one side to the other.

Undercarriage.—The legs are of ⅜ in. by 3/16 in. bamboo 7 in. long. Short lengths of 18 s. gauge wire, suitably bent, must be bound to the top of the legs, so as to slide into an aluminium tube bound in place at the junction of the lower longeron and the upright.

The 1¼ in. diameter celluloid wheels must be added at the bottom of the leg, and a shock absorber, consisting of another length of 18 s. gauge wire can be made to run from a point 3 in. from the top of the leg to another tube bound into the fuselage two bays to the rear.

Wing.—The rib section, Eiffel 400, is shown full size. The wing is made in two halves. After cutting a series of ribs from 1/16 in. sheet, they may be threaded on to the ⅜ in. by ⅛ in. mainspar. Secondly, add the trailing edge, which is ⅜ in. wide, and may be purchased ready made. Slots must be cut to a depth of 1/16 in. for the reception of the ribs.

Add the leading edge, which is of the commonly used U section, and must also be slotted. As the pieces which form the wing tip "jig-saw puzzle" seem to be somewhat troublesome to beginners, the tip has been drawn out full size. The two end ribs, it will be noticed, are slotted into one of the tip pieces instead of the trailing edge proper, and so they must be trimmed down slightly. The mainspar must also be tapered off to fit the tip.

Two opposite wing halves having been made, they must be joined together with each tip raised to a height of 4 in. Place them on a flat table and raise the tips by means of small stacks of magazines to the desired height, so that the mainspar extensions can be brought to meet each other. They should both be cut at an angle, so that the centre section ribs are 2¼ in. apart at the bottom. When this has been done add two sideplates of 1/32 in. sheet, one to each side of the spars to reinforce the joint, and lastly cut short lengths of leading and trailing edge to fit in between these ribs, completing the centre section.

Tail Surfaces.—The tail-plane is very easily made. The $\frac{1}{8}$ in. sq. leading and $\frac{1}{4}$ in. wide ready-made trailing edges, and the tip pieces, may all be pinned out on the plan, and the $\frac{1}{16}$ in. sheet ribs can then be added. The $\frac{1}{8}$ in. by $\frac{1}{16}$ in. mainspar may be inserted in the slots in the top of the ribs, being cracked and bent at the ends to meet the tips. Each of the latter must also be reinforced by additional strip in the positions shown. Note also the extra pieces inserted at the centre of the leading edge to act as a reinforcement when the tail-plane is held in position with rubber bands.

The $\frac{1}{16}$ in. sheet fin ribs are of the symmetrical type. The largest and smallest ribs are shown, and after these have been cut it is a simple matter to place four blank pieces of balsa between them and cut the remainder.

Slide all the ribs on the $\frac{1}{8}$ in. sq. mainspar, and then add the $\frac{1}{8}$ in. sq. leading edge, for which slots are provided at the front of the ribs, and also the $\frac{1}{4}$ in. wide trailing edge. When the framework has been thus completed, the tip piece of $\frac{1}{16}$ in. sheet can be placed in position.

A short peg of $\frac{1}{16}$ in. diameter bamboo about $\frac{1}{2}$ in. long must be cemented to the bottom of the trailing edge of the fin, so that it fits fairly tightly into a hole made in the top of the fuselage at the extreme tail.

The fin fitting, the shape of which is shown, must be cut from ·8 mm. plywood, and cemented to the bottom of the fin at the front, the bottom rib occupying the position shown dotted.

Noseblock.—This consists of three laminations of $\frac{1}{4}$ in. sheet balsa, and is made in the usual manner. The propeller shaft is of 18 s. gauge wire, and incorporates a propeller free-wheel and rubber tensioner. Any of the generally used types will be found suitable, and it is not necessary to detail them here.

A 14 in. diameter propeller, which may be purchased ready made, and should be of the wide blade variety, is used. Preferably it should be of hardwood.

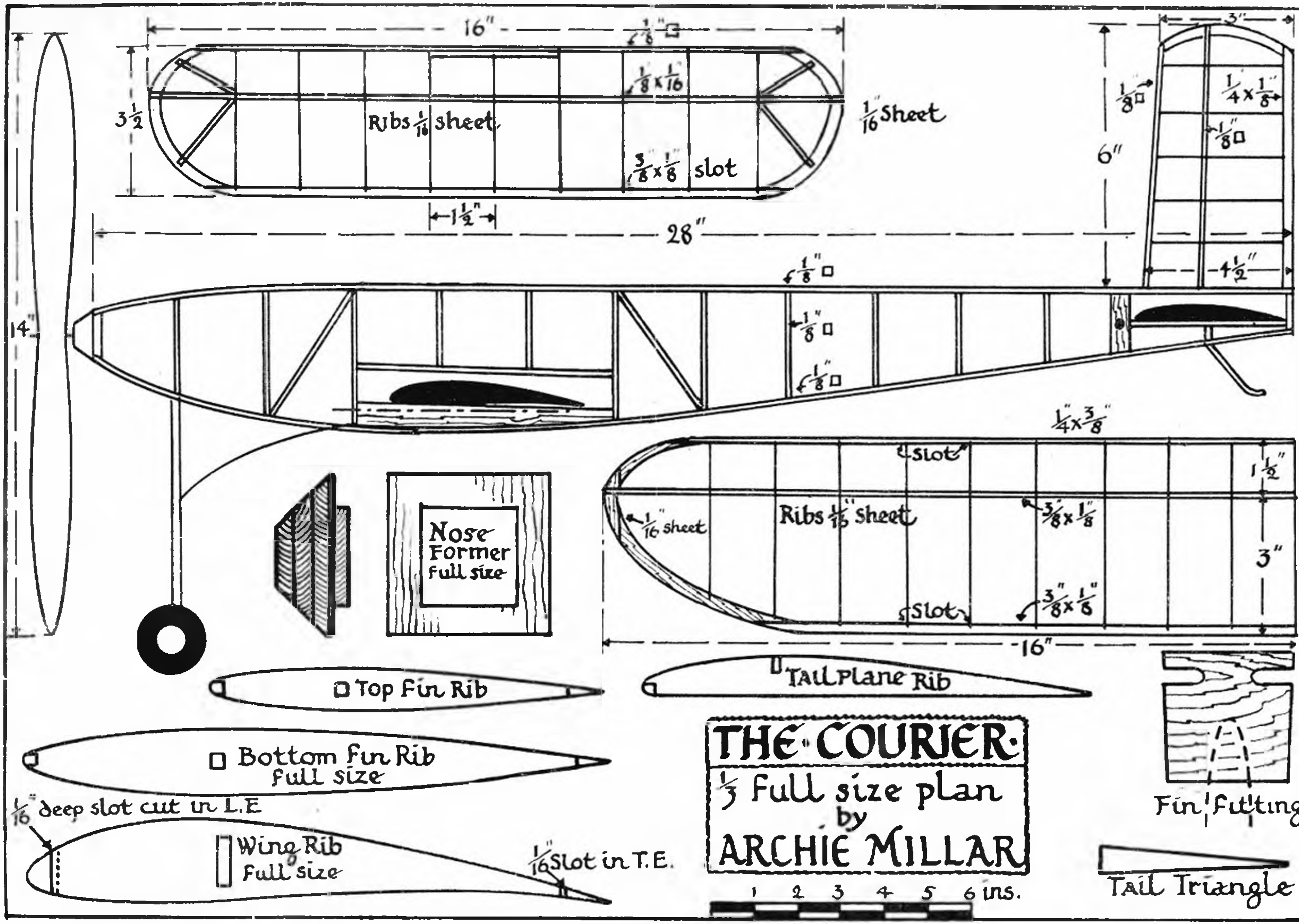
Covering.—Superfine Japanese tissue is used for the wing and tail surfaces, and medium grade for the fuselage. After being sprayed with water and allowed to dry, two coats of full strength dope may be applied to the wing and fuselage, but only one coat to the tail-plane and fin.

Assembly and Flying.—The wing slides through the slot in the bottom of the fuselage, and is held down by means of one or two large rubber bands, which may be conveniently made from discarded unlubricated $\frac{1}{8}$ in. flat strip.

Slide the tail-plane through the fuselage in the same manner and hold down with rubber bands. A rubber band placed round the fuselage prior to the tail-plane being fitted into place serves to hold the fitting at the front of the fin pressed firmly against the top of the fuselage. The slots at each side permit it to be moved for adjusting purposes. The rear of the fin is, of course, kept in position by the peg detailed previously.

Twelve or 14 strands of $\frac{1}{16}$ in. flat strip rubber made up into a skein 30 in. long comprise the motive power, and the rubber should be well lubricated before use.

It will be found that, due to the low centre of pressure, little or no downthrust is required for normal flying. One advantage of this type of low-wing fitting is that it allows a certain amount of incidence adjustment, which may be made by sliding pieces of balsa under the leading edge. Time spent in experimenting with varying incidences will certainly be conducive to the better results.



THE COURIER

1/3 Full size plan
by
ARCHIE MILLAR

MR. G. W. JONES WRITES A LETTER TO THE EDITOR—

DEAR SIR,

I was much gratified to read Mr. P. H. Warren's article in a recent issue of THE AERO-MODELLER.

Curiously enough I completed the first of a few articles several days ago, and I enclose it herewith. It is upon the same new " lines " which I hope I have laid; I have gone into the matter more fully, reinforcing the old foundations—which were a little weak—and present my findings in the article referred to.

It is very pleasing to see that upon the small arguments presented, that many—for very few readers take such pains as Mr. Warren—have investigated what was *behind* them. It proves that we are still virile, although I was beginning to doubt it!

Mr. Warren, however, although substantiating my plea to abandon L/D max. for duration models, is not quite plain enough.

What *he* is really doing is finding a *medium* between the streamlined and the unstreamlined models, and comes to the conclusion that a streamlined model is flown—for minimum rate of descent—at a lower angle than the unstreamlined one. This fact does not help us, however, to decide the angle of the wing of any streamlined model. A highly-streamlined model is *not* flown at a lower angle of incidence than a medium-streamlined model, as Mr. Warren's thesis would appear to suggest. Probably the *opposite* would be the case. The velocity may be growing considerably, and the DV factor may increase, if guided by Mr. Warren. It is quite a complex business; DV must be as small as possible, but, by decreasing D, V *increases* considerably (D varies as V^2), and *may* outweigh the new and supposedly-beneficial drag force.

In my article I present formulæ to find this optimum angle. (Advertisement!)

Another point is that in my article, " Streamlining and Its Bearing on Duration Models," *I did not mention any specific aerofoil*. The Glasgow chappie immediately assumed that I meant R.A.F.32. What I was really saying, in effect, was that most models it seems would have a superior performance if they were flown at 6 deg.; I merely quoted this as a guide—a pointer—for some sections it will be less, for some, more.

Yours faithfully,
G. W. JONES.

DESIGNING FOR DURATION—— By G. W. JONES

THIS duration-seeking business is one of great intricacy, or of great simplicity, according to the point from which one views it; there are, apparently, two lines of thought: one, that duration depends almost entirely upon the good fortune of " catching " a thermal; and two, that no matter by what method duration is obtained, that the maximum of designing ability of the person should be brought to bear on the problem. It is obvious, by my description of the two, which I myself prefer; perhaps one of thermalites would present the two cases in quite a different manner!

Most contests have some sort of limits imposed. Study these, and, if no definite things such as weight, etc., are mentioned, then decide upon some. In other words, make out a necessarily-sketchy specification of the 'plane you wish to design.

For instance, *if* no definite restrictions are imposed, then determine, say, the span of the model—perhaps you have a carrying-box of certain dimensions, and you also want to build a wing without a break in it, then here is a restriction that you should take into consideration. This is not so silly as, perhaps, it sounds—" Designing your model to fit the box! "—for there is nothing foolish in a full-size aircraft designer having to design a 'plane to certain " space-restrictions "—hanger-space, perhaps, or possibly storage-space below decks in an aircraft carrier. The reader will no doubt have his own ideas upon the subject of aspect ratio, and hence he may construct his wing's plan form. It is advisable, I think, owing to our climatic conditions of general windiness, not to use a wing-loading of less than about four ounces per square foot.

From this point one can progress until the complete model is no longer embryonic, at least as far as design goes.

However, in the type of contest with which I shall mainly deal, there are some quite definite rules to obey; I am referring, of course, to the Wakefield. The rules before the war were: A wing of 200 sq. in. with a plus or minus tolerance of ten sq. in., fuselage(s) conforming to the formula $L^2/100$, with a stabiliser area of 33 per cent of main wing area. The weight was not to be less than eight ounces.

Every modeller, I should think, has an idea, a picture in his mind, of what his craft will look like; he modifies this to suit his design. Proceeding as outlined above, he will determine all the areas and factors concerned. Now take aspect-ratio, for instance. Opinions differ, but I think that theory, and wind-tunnel practice, support the view that a high A.R. is advantageous, and this is strongly advised to be incorporated, the ratio not being less than, I suggest, twelve, although you should go as high as possible without getting too small a chord (3½ in.), and without getting too cumbersome a span—structurally, that is. Let us here construct general details of a model in order to give us some idea, as well as for clarity, as to procedure, and to cause and effect.

Suppose that we take a mean chord of 4 in., and a span of 54 in., which, minus tip losses, etc., will give something approaching 200 sq. in.; suppose that the tips are so made that the area *is* 200 sq. in. The A.R. will then be just over thirteen—a fairly good figure.

It is not my purpose here to describe why-and-what affects such-and-such an area—I am merely concerned with performance—so I shall take as my overall length 37 in. This will give us a cross-section area of 14 sq. in. Again, I shall take my fuselage shape as a circle; you may prefer another. This is approximately 2·20 in. radius—actually it is slightly less.

A fin area of 25 sq. in. will be assumed, together with a tail area of 66 sq. in. For the present we shall take M-6 as the stabiliser section. (M-6 was actually chosen because we have figures of low-speeds from Powdrill and MacBean at our disposal). I shall, however, have some more observations to make about the use of the tail, its section, and how

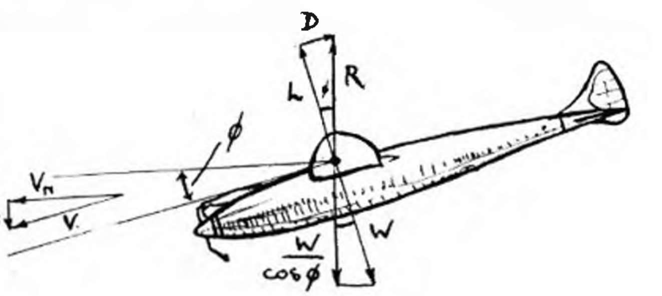
—— AND AN ARTICLE "DESIGNING FOR DURATION"

it may considerably aid the 'plane's efficiency. The under-carriage will be retracted, and a single-bladed folded propeller fitted.

So much for general details. Individual points should be given attention, with the object of eliminating all superfluous drag. The fuselage should be as close to the minimum area as allowed (but don't go *too* close or you may find that you have disqualified yourself, although, of course, this should not happen !) A high polish should be given to the whole 'plane. The fuselage shape should be such that the nose is not *too* pointed and thin, and the tail as smoothly-drawn to a point as you can get it, giving as little turbulence at the rejoining of the airflows at the rear of the fuselage. *Remember that the entries and exits are the most important points in streamline.*

Fig. 1. Sinking speed diagram.

V velocity.	*Lift varies as Cl.*
Vn velocity in horizontal plane.	*Drag varies as Cd.*
Vs velocity in vertical plane.	*Resultant varies as Cr.*



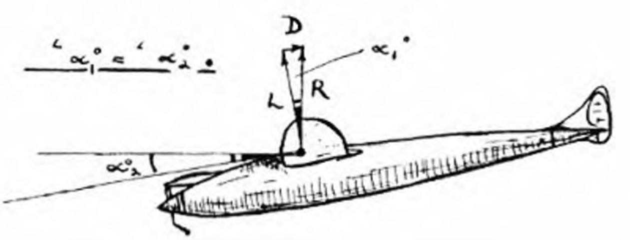


Fig. 2. The resultant is always vertical. So L/D max. will produce minimum $\angle \alpha_1°$***, and therefore minimum*** $\angle \alpha_2°$***. That is the angle OL L/D max. gives the angle of flattest glide.***

The drag forces on the proposed model may be found by the following formulæ. *The fuselage.* D equals KAV^2, where K is a coefficient depending on the "amount of streamlining" incorporated. For the average streamlined model it is ·0005. *The tailplane.* The usual formula for the drag of an aerofoil, $D = Cdp/2.S.V^2$, since I do not advise the use of streamlined tail-sections. If, however, you wish to use a streamline section then it should be treated as a fin. *The fin.* $D = KAV^2$, where K is a coefficient having a value of ·00006, and A is the stabiliser's area in square feet. *The airscrew.* The drag of the propeller in its folded position can be found approximately by $D = \cdot 58 (A) \sin. \alpha \sin. \beta$, where α is the angle of the blade at ·7 of radius from the root, and β is the angle of *backward* slope of the propeller when it is folded, the angle being taken from the centre-line of the fuselage. *Interference.* Now, as far as interference is concerned, nothing but "guesstimation" can be brought to bear ; it is usual to bring the total figures being dealt with to round figures, the increase being generally slight, but at least acknowledged.

Now, the whole point of duration-designing is the obtaining of the minimum sinking-speed. *What factors determine the sinking speed of a model?* Most modellers are, apparently, not aware of these. The L/D ratio is a very simple thing to grasp, and was naturally seized upon as being of some consequence ; it *is*—but *not* in relation to the sinking speed, as will, I hope, be shown.

The reader's attention is drawn to Fig. 1. V is the actual translational velocity, and V_n, V_s the speeds in the horizontal and vertical planes. It is obvious from a knowledge of geometry and trigonometry that :

$$V^2 = V_s^2/\sin^2\phi,$$
$$= V_s^2 (C_r/C_d)^2, \text{ and that :}$$
$$V_s^2 = \frac{V^2}{(C_r/C_d)^2} \text{ .... (1)}$$

For a model in the glide, the lift equals the weight. Our old friend, the formula giving the lift of a wing, gives us :

$$V^2 = 2L/C_l.p.S. \text{ and } L = W,$$
$$= 2W/C_l.p.S.$$

Inserting this value in (1), we obtain :

$$V_s^2 = \frac{2W}{C_r.p.S.} \cdot \frac{(C_d)^2}{(C_r)^2}$$

And so,

$$V_s = \sqrt{\frac{2W}{p.S.} \cdot \left(\frac{C_d}{C_r^{1.5}}\right)^2}$$
$$= \sqrt{\frac{2W}{p.S.}} \cdot \frac{C_d}{(C_r^{1.5})} \text{ .... (2).}$$

The sinking speed is determined by the factors as set out above ; we see that the rate of descent varies inversely as the wing loading—as, of course, we know—and as the ratio $C_d/C_r^{1.5}$. But W, p, and S are all fixed quantities, and so it appears that final success is to depend upon the selection of aerofoil-section. The study of the use of aerofoils is one that, in view of the above, needs renewed attention. Convention has taken too firm a grip upon this part of the hobby of hobbies ; in my opinion—I say this to soften the blow—if greater success is to be obtained, this grip must be loosened, and I hope, after the reader has digested this (and got over the ensuing stomach trouble) that he will abandon his old ideas, and begin thinking anew. So much for speeches. . . .

To resume. Our wing section must have as low a value of $C_d/C_r^{1.5}$ as possible, for this is the main factor we should consider. If we can reduce V, then our rate of descent will decrease (see (1)) ; as shown before the velocity of a 'plane varies inversely as the square root of the lift-coefficient, and the higher is the C_l, the lower is the speed. One must always bear in mind that a model should not fly too slowly, however, or it may not survive any windy weather.

Just previously I made a sudden outburst (?) against the *status quo* having regard to aerofoils. I feel, however, that some explanation is called for, not only to explain the same, but to point out the wrongs so prevalent in this part of duration flying. My argument is as follows :—It appears that modellers have been taught—and it is hard, therefore, for them to discard their ideas easily—that the best sinking speed occurs at the angle of maximum lift/drag ratio. *This is untrue.* The above statement should read, " does *not necessarily* occur at the angle of L/D max." Very rarely is L/D max. at the same angle as $D/L^{1.5}$. And yet, when I say this in any aero-modellers' community, I am shouted down, or at the best, heard without heed. I find it inexplicable. Look up any good work on full size sailplanes, or, for that matter, any technical book that bears on the subject, and you will find that the above is established beyond scientific doubt—and still the fallacy remains.

Notice this. The angle of incidence of a wing at its angle of maximum L/D provides the 'plane with which it is equipped, model or otherwise, with the *flattest* possible glide for that specific aircraft. Perhaps *this* accounts for the fallacy; and yet we at the moment are supposed to be approaching the subject from a scientific point—this should not be allowed to fool us; it *does* a lot of us, however.

In explanation let us look at Fig. 2. We can see that angle α_1 = angle α^2. The determinant angle is α. The smaller is this angle, then the smaller is the angle of glide, or, in other words, the higher the angle of L/D ratio, the smaller the angle of glide, and the greater the *horizontal distance* it will fly for any *given drop in vertical plane.*

The angle of incidence corresponding to the best rate of descent will occur, you will find, at a somewhat higher angle.

Fortunately, we have been provided with a means to find this angle of shortest rate of descent by our full size counterparts (!), as was shown earlier; such knowledge, apparently, we have refused to recognise, although placed at our very convenient disposal.

A further example to shake faith in the L/D fallacy is this: If L/D max. is the prime consideration, as undoubtedly many make it, why on earth not use sections that have very little camber, such as R.A.F.28, which is almost stream lined, and where very high L/D ratios exist? The answer is that the speed factor is entirely neglected.

To finish this part of this series, I should like to quote a few words from an article written by an acknowledged expert in model aeronautics. He says: " We must, therefore, fly at the angle corresponding to the smallest rate of descent; and this angle is *greater* than the angle corresponding to the flattest glide; that is, the angle of best L/D ratio. Now the latter (that is, the angle of L/D max.) may be between 0 degree and 3 degrees, while the former lies higher, that is, nearer 6 degrees to 8 degrees.

Who was this written by?—Mr. J. Van Hattum, A.F.R.Ae.S.

AERODYNAMIC FORMULÆ —— 3

By A. H. SMITH

Parasite Drag.

MY last article described various formulæ which could be applied to the forces acting on the wings or aerofoil of an aircraft, and it will be realised that the wings are the only part which generate the lift necessary to maintain flight, the thrust of the motor having to overcome the drag created in attaining the lift.

Now drag consists of two parts, wing drag and parasite drag. The latter is caused by skin friction and form drag, that is, fuselage shape, landing gear and control surfaces, and is the component of total resistance due to parts which do not contribute lift. This can be calculated from the formula

$$D \text{ in lb.} = KAV^2 \qquad (8)$$

where K is the drag coefficient for a particular shape.

A is the projected cross-sectional area in square feet, and V the speed in miles per hour.

Values of K for various fuselage forms are given by D. A. Russell in his " Design and Construction of Flying Model Aircraft," and an average value for a rectangular section is given as K = ·0009, a square-sided form with semicircular top and bottom is given a value of K = ·00045, while a good elliptical cross-section has a K value of only ·00025.

A parasite drag coefficient K can also be applied to obtain drag values for struts, wheels and other projections, the actual values of K depending on the degree of streamlining or fairing applied to them.

Wing Drag.

The drag of an aerofoil as obtained from the formula $D = C_D\frac{1}{2}\rho SV^2$ may be separated into two parts, " Profile " drag, consisting of skin friction, and form drag depending only on the shape of the aerofoil and its attitude to the air-flow; and " induced " drag, which varies with the lift and the " aspect ratio " of the plan form of the aerofoil.

Aspect Ratio.

This is the ratio of the dimension perpendicular to the direction of motion to the dimension parallel to the latter, and can also be expressed as the ratio of the square of the span to the wing area. If, for instance, a wing is 30 inches span by 6 inches wide, the aspect ratio is $\frac{30}{6}$ or 5 to 1, or we may determine it from

$$\frac{\text{Span}^2}{\text{area}} \text{ or } \frac{30 \times 30}{30 \times 6} = \frac{900}{180} = 5 \text{ to } 1$$

The following equation shows the relationship between any three of the four units which apply to the plan form of a wing:

$$W = LA \text{ or } \frac{S}{L} \text{ or } \sqrt{SA} \qquad (9)$$

$$S = WL \text{ or } \frac{W^2}{A} \text{ or } L^2A \qquad (10)$$

$$A = \frac{W}{L} \text{ or } \frac{W^2}{S} \text{ or } \frac{S}{L^2} \qquad (11)$$

$$L = \frac{S}{W} \text{ or } \frac{W}{A} \text{ or } \sqrt{\frac{S}{A}} \qquad (12)$$

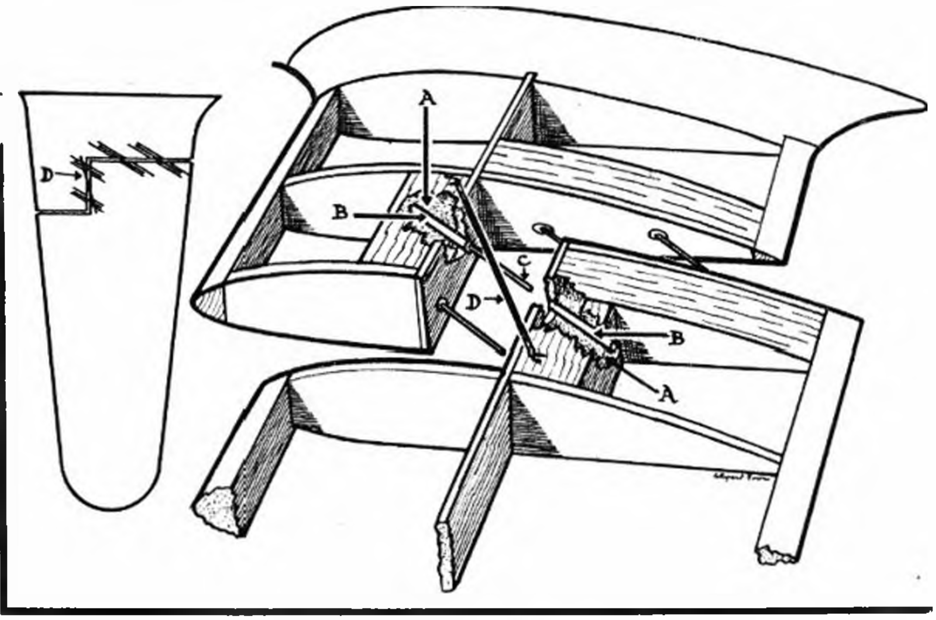
Where W = the wing span, S = the wing area, A = the aspect ratio, and L = the chord, W and L being, of course, in the same units.

It has been shown in previous articles in THE AERO-MODELLER how corrections to lift and drag incidence values can be applied for variations of aspect ratio, and readers can refer to the capable article, " Wing Efficiency," by T. A. Brown, in the September issue, or the graphical form given by the writer in the October issue.

From these it will be appreciated that, provided the structural arrangements do not add excessively to the drag or the overall weight, a high aspect ratio will be beneficial, and for most models can be 8 to 1 or 9 to 1.

A CRASH-PROOF WING FIXING — By T. W. EVANS

a—balsa blocks.
b—brass tube.
c—steel wire which slides in tubes.
d—rubber band to hold the units together.



Tails and Fins.

Various formulæ have been given for approximating the area of tail and fin surfaces, but as they are empirical or based on experience or observation, no attempt will be made here to justify them.

Performance—Velocity.

Let us now revert to our formulæ (4) and (5) for lift and drag, and see how changes in the arrangements of units or factors will affect our results. We know that, to a certain extent, the lift and drag of an aerofoil depend on—

(1) The shape of the aerofoil.
(2) The area in plan form.
(3) The square of the speed.
(4) The density of the air.

As the majority of my readers will be concerned with model design the last factor, density, will be considered constant, that is, at the standard value at sea level (·002378 slug per cubic feet). After all, if our models did reach a height of 1,000 feet the small difference in density would not upset our calculations.

Rewriting our lift formula (4) in terms of the square of the velocity, we have

$$V^2 = \frac{L}{C_L \tfrac{1}{2}\rho S} \qquad (13)$$

and it will be seen that, for a given lift which will be equal to the weight of the aircraft, a constant density factor, and a fixed plan form area, the velocity value will decrease at increasing values of the lift coefficient C_L until the critical or "stalling" angle of the aerofoil is reached.

This then will be the minimum speed at which the aerofoil will support the aircraft, and is also the speed at which the lift/drag ratio is at its lowest value, then

$$V \text{ minimum} = \sqrt{\frac{W/S}{C_L \text{ max.} \tfrac{1}{2}\rho}} \qquad (14)$$

Where W/S represents the wing loading or the weight in pounds divided by the area in square feet, and is expressed in lb. per square foot. V min. may also be written—

$$V = \sqrt{\frac{1}{\tfrac{1}{2}\rho}} \times \sqrt{\frac{W/S}{C_L \text{ max.}}} \text{ or } \sqrt{\frac{1}{\cdot 001189}} \times \sqrt{\frac{W/S}{C_L \text{ max}}}$$

$$= 29 \sqrt{\frac{W/S}{C_L \text{ max.}}} \qquad (15)$$

In the above the value of V is given in feet per second. Now 1 mile per minute is equal to 60 miles per hour, or 60 × 5,280 feet per 3,600 seconds.

$$\text{Then 60 miles per hour} = \frac{60 \times 5{,}280}{3600} \text{ or 88 ft./sec.}$$

Again, 1 mile per hour $= \frac{88}{60}$ ft./sec. = 1·4667 ft./sec., so that formula (15) can be expressed—

$$V \text{ in miles per hour} = \frac{29}{1 \cdot 4677} \sqrt{\frac{W/S}{C_L \text{ max.}}}$$

$$\text{or } 19 \cdot 77 \sqrt{\frac{W/S}{C_L \text{ max.}}} \qquad (16)$$

If, for simplicity in working, it is desired to express the wing loading in terms of ounces per square foot, as there are 16 ounces in one pound, wing loading will be $\frac{W(lb)/S}{16}$

then

$$V \text{ in ft./sec.} = \sqrt{\frac{1}{\cdot 001189}} \times \sqrt{\frac{1}{C_L \text{ max.}}} \times \sqrt{\frac{W/S}{1}} \times \sqrt{\frac{1}{16}}$$

$$\text{or } V = \tfrac{1}{4} \times 29 \sqrt{\frac{W/S}{C_L \text{ max.}}} = 7 \cdot 25 \sqrt{\frac{W/S}{C_L \text{ max.}}}$$

If our model comes out heavier than its designed weight, the plan form being constant, it will be seen that, if the aerofoil is set at the same incidence as originally designed, and consequently is using the same C_L value, the wing loading has increased and the velocity will be greater.

Again, if we wish our model, of a given weight, to fly at a definite velocity, our formula must be rewritten to express the area required, to create the necessary lift at a fixed incidence, then

$$S = \frac{L}{C_L \tfrac{1}{2}\rho V^2} \qquad (17)$$

For the benefit of my microfilm fans whose calculations will be in smaller units, the lift and drag formulæ (4) and (5) can be written—

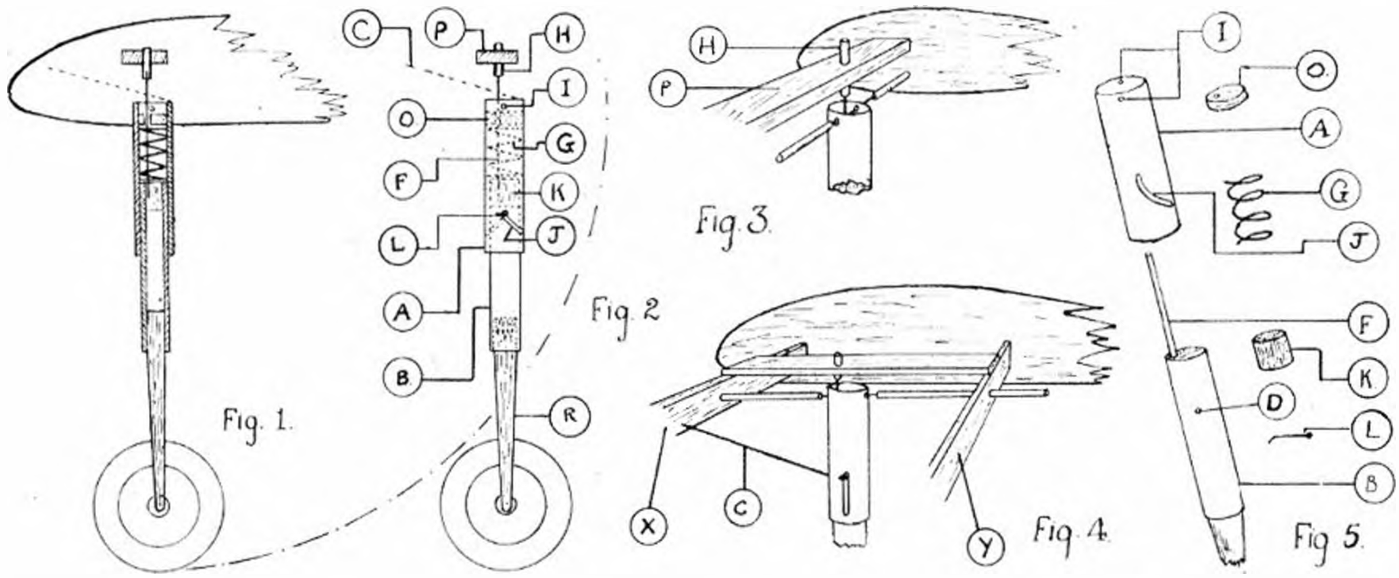
$$\frac{L\ (lb.)}{16} = C_L \tfrac{1}{2} \rho \frac{S}{144} V^2 \text{ or } L = C_L \frac{16}{288} (\cdot 002378)\ SV^2$$

$$\text{Then L in ounces} = \cdot 000132\ C_L\ S\ V^2 \qquad (18)$$

$$\text{and D in ounces} = \cdot 000132\ C_D\ S\ V^2 \qquad (19)$$

where S is the area in square inches and V the velocity in feet per second.

AUTOMATIC RETRACTABLE UNDERCARRIAGES By R. BOOTH



THE type of undercarriage, illustrated in Figs. 1 and 2, is designed to follow the practice of full sized aircraft of types like the Miles "Master," Curtis X.P. 40, X.P.37, and X.P. 42, etc., where, as the "undercart legs" move backwards, the wheels turn through 45 deg., and enter the underside of the wings flat (Fig. 6).

The method of operation is based on the fact that the "light" spring G is compressed by the weight of the 'plane until the machine is "air-borne."

In the particular undercart shown here, the aluminium tube A is 1 inch long, with an outside diameter of ¼ inch, into which slides another tube, B, 1⅜ inches long, 3/16 inches diameter. As the "walls" of aluminium tube are generally 1/32 inch thick, a perfectly telescoping leg can be obtained if necessary by light "sanding" of the tube B.

Tube A has two slots, J, cut at an angle of about 45 deg., one on each side of the tube. Care must be taken to cut the slots ***opposite***, and not both sloping to the back. As seen in the accompanying drawing, the ***outside*** slot starts below the pivoting holes I, and slopes downwards and round to the ***back*** of the upper tube; while the ***inside*** slot starts below the holes I, and slopes downwards and round to the ***front*** of the upper tube. (This is, of course, considering the ***port*** side undercart—the starboard one must be made opposite).

For cutting the slots, the point of a single edged razor blade will do the job quite easily.

Immediately the 'plane rises from the ground, the spring G (wound from 26 s.w.g. steel wire), expands, pushing the lower tube B downwards. As the pin L goes right through both tubes, D and J, it is forced to follow the course of the slot, cause the parts B and R and the wheel to turn through 45 deg.

It will be noted that the undercarriage, prior to the 'plane leaving the ground, is held in position by the needle F (fixed in the balsa block K). The needle passes through the tube A, through the "guide disc" O, and into the aluminium tube H. As the tube B moves down the needle F slides out of the "retaining tube" H, and the undercart is free to be pulled back by the 1-64 inch rubber C.

The circular "guide disc" can be cut from 1/32 inch sheet balsa, with a hole in it just large enough to take the needle freely.

A "stop" block can be fitted in the wing so that when the "leg" swings back, it will not travel too far, and smash into the upper surface of the mainplane.

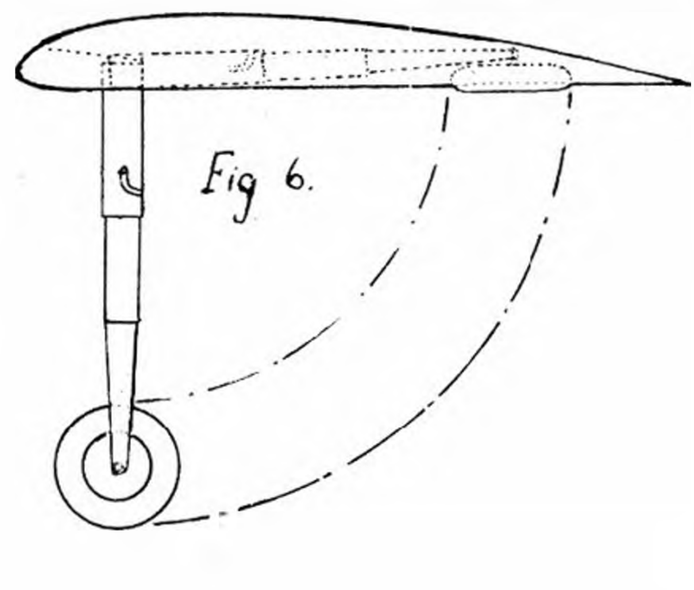
Fig. 5 shows the various pieces, comprising the undercart—***not*** to scale!

Fig. 3 is the method of attachment in the wings.

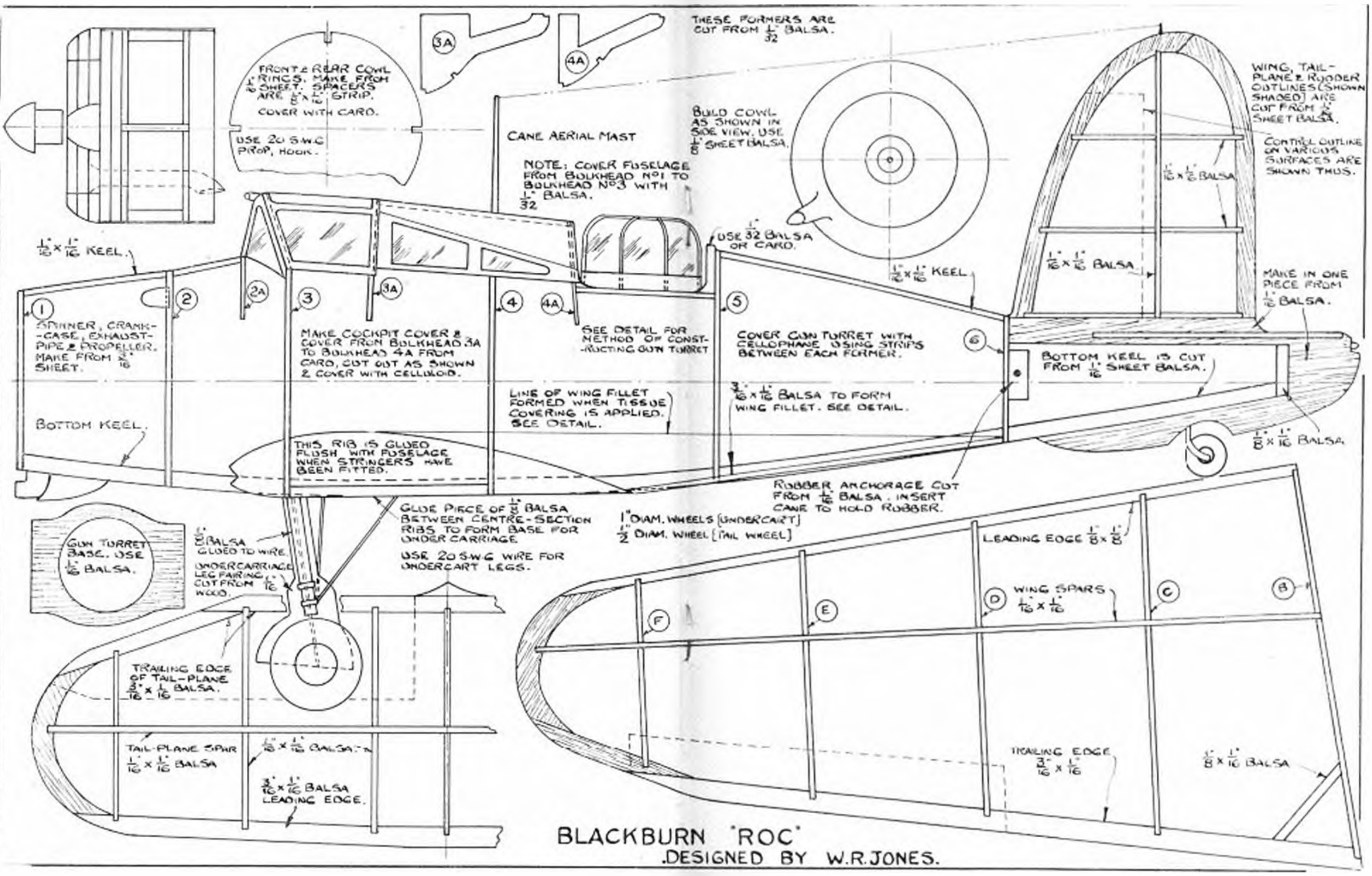
Fig. 4 explains how this undercart, with slight modifications (namely, ***vertical slots*** in tube A, and the pivoting holes I, fore and aft, instead of each side) can be made to swing inwards or outwards.

Actually, the two "carrier" spars X and Y need only be about 1 inch apart, but have been shown farther apart in the drawing, in order to make the method of installation clear.

By placing the 1-64 sq. inch rubber C, Fig. 4, either between the undercart and the fuselage, or the undercart and the wing tip, it can be made to swing inwards or outwards. Thus a duplication of the "Spitfire" or "Hurricane" type landing gear can be reproduced.




L6127
TRADE MARK
REGD.
FROG
READY TO FLY MODELS
FLYING KITS
NON FLYING KITS
SCALE MODEL AEROPLANES
OBTAINABLE AT ALL GOOD TOY SHOPS AND STORES
MADE IN ENGLAND BY INTERNATIONAL MODEL AIRCRAFT LTD
For the Sole Concessionaires: LINES BROTHERS LTD., TRI-ANG WORKS, MORDEN ROAD, MERTON, S.W. 19



FRONT & REAR COWL RINGS. MAKE FROM 1/16" SHEET. SPACERS ARE 1/8" x 1/16" STRIP. COVER WITH CARD.
USE 20 S.W.G PROP. HOOK.
3A
4A
THESE FORMERS ARE CUT FROM 1/32" BALSA.
CANE AERIAL MAST
NOTE: COVER FUSELAGE FROM BULKHEAD No1 TO BULKHEAD No3 WITH 1/32" BALSA.
BUILD COWL AS SHOWN IN SIDE VIEW. USE 1/8" SHEET BALSA.
WING, TAIL-PLANE & RUDDER OUTLINES (SHOWN SHADED) ARE CUT FROM 1/8" SHEET BALSA.
CONTROL OUTLINE ON VARIOUS SURFACES ARE SHOWN THUS.
1/16" x 1/8" BALSA
1/16" x 1/16" KEEL.
USE 1/32" BALSA OR CARD.
1/16" x 1/16" KEEL
1/16" x 1/16" BALSA
MAKE IN ONE PIECE FROM 1/8" BALSA.
1
2
2A
3
3A
4
4A
5
6
SPINNER, CRANK-CASE, EXHAUST-PIPE & PROPELLER. MAKE FROM 1/8" SHEET.
MAKE COCKPIT COVER & COVER FROM BULKHEAD 3A TO BULKHEAD 4A FROM CARD, CUT OUT AS SHOWN & COVER WITH CELLULOID.
SEE DETAIL FOR METHOD OF CONSTRUCTING GUN TURRET
COVER GUN TURRET WITH CELLOPHANE USING STRIPS BETWEEN EACH FORMER.
BOTTOM KEEL IS CUT FROM 1/16" SHEET BALSA.
BOTTOM KEEL.
LINE OF WING FILLET FORMED WHEN TISSUE COVERING IS APPLIED. SEE DETAIL.
3/16" x 1/16" BALSA TO FORM WING FILLET. SEE DETAIL.
1/8" x 1/16" BALSA
THIS RIB IS GLUED FLUSH WITH FUSELAGE WHEN STRINGERS HAVE BEEN FITTED.
ROBBER ANCHORAGE CUT FROM 1/16" BALSA. INSERT CANE TO HOLD RUBBER.
GUN TURRET BASE. USE 1/16" BALSA.
1/8" BALSA GLUED TO WIRE.
UNDERCARRIAGE LEG FAIRING CUT FROM 1/16" WOOD.
GLUE PIECE OF 1/8" BALSA BETWEEN CENTRE-SECTION RIBS TO FORM BASE FOR UNDERCARRIAGE
USE 20 S.W.G WIRE FOR UNDERCART LEGS.
1" DIAM. WHEELS (UNDERCART)
1/2" DIAM. WHEEL (TAIL WHEEL)
LEADING EDGE 1/8" x 1/8"
WING SPARS 1/16" x 1/16"
B
C
D
E
F
TRAILING EDGE OF TAIL-PLANE 3/16" x 1/16" BALSA.
TAIL-PLANE SPAR 1/16" x 1/16" BALSA
1/16" x 1/16" BALSA
3/16" x 1/16" BALSA LEADING EDGE.
TRAILING EDGE 3/16" x 1/16"
1/8" x 1/16" BALSA
BLACKBURN "ROC"
DESIGNED BY W.R.JONES.

DESIGNS FOR THE SCALE MODEL BUILDER—XII

By PETER GARROD CHINN

WITH this article, "Designs for the Scale Model Builder" comes to a temporary close, so to bring the series as up-to-date as possible I am including the latest military aircraft, with which we have not so far dealt—at least, the latest types of which it is permitted to give a description. There are several new types of British aircraft now being built for the R.A.F., but which, unfortunately, I shall not be able to describe owing to the fact that (at the time of writing) the Air Ministry have not permitted details of these aircraft to be released for publication.

However, the German Luftwaffe have recently acquired a new type, of which some details are available. This is the Focke-Wulf Fw. 187 "Zerstorer" ("destroyer") twin-engine two-seat fighter.

The Focke-Wulf 187 is a cantilever monoplane in the same class as the Messerschmitt Me.110. The inner sections of the wing appear to be swept downward in a slight anhedral which, with the underslung motors, should give a good view for the pilot. The motors, which are stated to be Daimler-Benz DB.601 of 1,150 h.p., project a considerable distance from the leading-edge, the front of the spinners, in fact, appear to be on a level with the nose of the fuselage. The usual ejector-type exhaust manifolds, as fitted to the Me.109 and He.112 and 113 are used, as opposed to the stub-pipes employed on the Me.110.

The undercarriage retracts backward into the engine nacelles, hydraulically, and is covered by hinged doors in two sections. A transparent panel appears to be fitted under the nose, probably for the purpose of bomb-aiming should the machine be employed as a light bomber.

The Fw. 187 is built entirely of metal, and is reasonably "clean," except for the engine-nacelles, which, like so many other German types, have a number of excrescences and are somewhat bulky. Details of weights, dimensions and loadings are not available, but in view of its high maximum speed (approximately 360 m.p.h.), it would appear that the German practice of high wing-loadings for fighters has been adhered to. Manœuvrability must therefore suffer. A low power-loading would seem to be indicated by the very fast rate of climb and high ceiling, and this might possibly be helped by the use of two-stage superchargers.

The ceiling is quoted as being 39,000 feet which, taking into consideration the fact that German aircraft are known to have been operating at altitudes above 37,000 feet recently, seems to be quite creditable.

The Focke-Wulf "Zerstorer" attains its maximum speed at 19,685 feet, an altitude which, it is claimed, can be reached in less than seven minutes. No indication as to range is given. Armament is uncertain, but is said to be either six rifle-calibre machine-guns, four large-bore machine-guns, or two shell-guns fixed to fire forward, with a rifle-bore machine gun swivel-mounted in the rear cockpit.

Up to the time of writing, the Fw. 187 has not been reported in action. In consideration of its high maximum speed and fast rate of climb, the new Focke-Wulf should be useful for bomber interception duties, but in combat with our own fighters it is unlikely to prove any more successful than previous German aircraft.

Another recent twin-engined fighter, but this time a single-seater, is the American Grumman "Skyrocket." This machine was designed and built for, and in conjunction with, the United States Navy, by the Grumman Aircraft Engineering Corporation, the firm who are supplying G.36 fleet-fighters to our Fleet Air Arm.

Few details have been released, but the "Skyrocket" is described as being a heavily-armed fighter capable of an extremely quick climb and high maximum speed (hence its name!). The machine is somewhat unorthodox in appearance, duly mainly to the shape of the fuselage, which is cut short before reaching the leading-edge of the wing. This arrangement, which must also result in an appreciable saving in weight, allows the motors to be placed closer together, thus assisting manœuvrability, although in the case of the Grumman, the engines do not seem to be placed as closely together as would be possible.

The power units are Wright "Cyclones" (probably of the G.200 type, since they are quoted as having an output of 1,200 h.p. each) and, from photographs, appear to drive Curtiss electric controllable-pitch airscrews.

The "Skyrocket" is said to be faster than the U.S. Army's Lockheed P.38 twin-engine fighter (which has an official top speed of 404 m.p.h.), and considering that the Grumman is smaller, yet slightly more powerful than the P.38, this is quite likely, although reports that it reaches 450 m.p.h. are probably rather exaggerated. The take-off time is said to be only seven seconds, and the rate of climb is undoubtedly very high. It is further stated that fuel capacity may be increased to permit the machine to operate as a "convoy" fighter to long range bombers.

No official details of armament have been revealed at the time of writing, although many quarters quote shell guns as being included, and one report states that eight shell-guns are installed. All the armament is believed to be centred in the nose-section between the two motors.

The new Grumman has a span of 42 feet, as compared with the 52 feet of the Lockheed P.38, and is 28·5 feet in length. It is therefore about the same size as the larger types of single-engine fighter.

Another new American Navy fighter is the Vought-Sikorsky XF4U-1. This is a very powerful single-motor single-seat low-wing monoplane, designed for operation from aircraft-carriers. It is of metal monocoque construction, in which an exceptionally fine finish has been obtained by spot-welding the covering plates, instead of the usual rivet construction.

The fuselage is of nicely balanced lines without unnecessary excrescences, and mounts a twin-row Pratt and Whitney R.2800 eighteen-cylinder radial in the nose. This motor drives a three-bladed constant-speed Hamilton airscrew, apparently of the hydromatic type. The tail-unit is of cantilever construction, and utilises trim-tab equipped elevators and a balanced rudder.

The cantilever wing structure is of single-spar design and is of an "inverted gull" shape. This "inverted gull" arrangement should decrease drag due to interference between the wing-root and fuselage, but has probably been adopted to provide low points of attachment for the undercart, which must raise the nose to a considerable height in order to give the necessary clearance for the large diameter propeller.

Deck-landings should be facilitated by the efficient design of the undercarriage. This is of the individual leg type.

mounted well forward and with a wide track. Each unit retracts backward into the wing, where the wells are completely closed by the leg-fairing and by flush-fitting hinged panels after retraction. The struts apparently swivel to permit the wheels to lie flush in the wing-panels.

The Vought-Sikorsky XF4U-1 is about the size of the "Hurricane," having a span of about 40 feet, and a length of approximately 30 feet. Wing-area may be larger, however, since the machine is said to have a gross weight of nearly 9,000 lb. No performance figures have been released, but it is undoubtedly very fast, and probably does well above the 400 m.p.h. mark. The maximum speed is probably attained at a high altitude, since the R.2800 motor develops 1,600 h.p. at above 20,000 feet. Take-off rating is 1,850 h.p., so it may be assumed that the XF4U-1 has a rapid climb and a short take-off.

It has not been stated whether orders for either of these two aircraft the Grumman "Skyrocket," or the Vought-Sikorsky XF4U-1 have been placed, but both are obviously first class fighters, and would be useful in this country.

Latest American Navy aircraft is the Curtiss XSB2C-1 dive-bomber. Very little information is available about the machine at the moment, but it is powered with a Wright double-row "Cyclone" 14-cylinder radial developing a maximum output of 1,700 h.p., and thus should be much faster than any other dive-bomber.

In general, the aircraft is a cantilever low-wing monoplane (apparently a two-seater), and of all-metal construction. The "Cyclone" is neatly cowled, and the propeller hub is enclosed in a large spinner, which enhances the appearance of the machine. The wide-track undercart retracts inward, and trailing-edge flaps, which can apparently be used as dive-brakes, are fitted.

Developed by the Curtiss Aeroplane Division, Curtiss-Wright Corporation, in co-operation with the U.S. Navy, the manufacturers state that the XSB2C-1 offers performance and versatility never before achieved in aircraft of its type. It is further stated to have a heavy armament, and to be capable of carrying a large bomb-load at a high speed over a long distance.

For this month's model drawing, the Henschel Hs.126 Observation Monoplane has been chosen. This machine is in the same class as our Westland "Lysander," and was described in the June, 1940, article. The full-size aircraft has a span of 47 ft. 7 in., so a ½ in. to the foot scale will give us a conveniently sized model of roughly 2 ft. span.

Since fixed strut-braced parasol-wings are never very durable, a suggested method of making a flexible mounting is shown in the sketch. The cabane struts are rigidly fixed to the fuselage, and a balsa platform mounted on top. The wing is then attached with rubber to this platform.

Wing struts and bracing wires always cause a lot of trouble, so these are also made to snap off in emergency. Simple plug fastenings are used to attach the spars to the undersurface of the wing. A rubber-band passing through the fuselage connects hooks on the bottom ends of the strut.

The usual "extras" for ultra-detailed models are noted with an asterisk in the drawing key.

COMMENCING NEXT MONTH :

A new series of articles, by H. J. Cooper, entitled :—

"FIGHTING AIRCRAFT OF THE PRESENT WAR"

BUILD A ½" Scale FLYING MODEL OF THE BLACKBURN 'ROC'

from the full size plans printed on pages 806, 807, 816, 817 ***Designed by W. R. Jones***

THIS model is true to scale, except for a slight increase of the tail and rudder area. It was designed over twelve months ago and can be relied upon to turn in very good flights around the 35 sec. mark.

Fuselage Construction.

The bottom keel member is pinned down on to the plan and the bulkheads (that is, one half of each) are glued on to this and the $\frac{1}{16}$ in. by $\frac{1}{16}$ in. top keels. When dry, remove from plan and glue the remaining half of each bulkhead on to keels. Add the stringers, keeping an equal number on either side. The $\frac{1}{16}$ in. sheet tail and rudder support is fitted when keel members are being pinned down. The rubber anchorage pieces are glued inside stringers when fuselage is completed. Refer to detail drawings for assembly of centre section and wing fillets.

Wing Construction.

These are built on the plan, using the wood stated. Note: Top and bottom spars. Leading edge may be covered with $\frac{1}{32}$ in. wood if desired.

Rudder and Tail-plane Construction.

These are built on plan when outlines, etc., have been cut out.

Undercarriage.

Build up as shown on the drawings and plug into ⅛ in. sheet inserts in the centre section.

Engine Cowl.

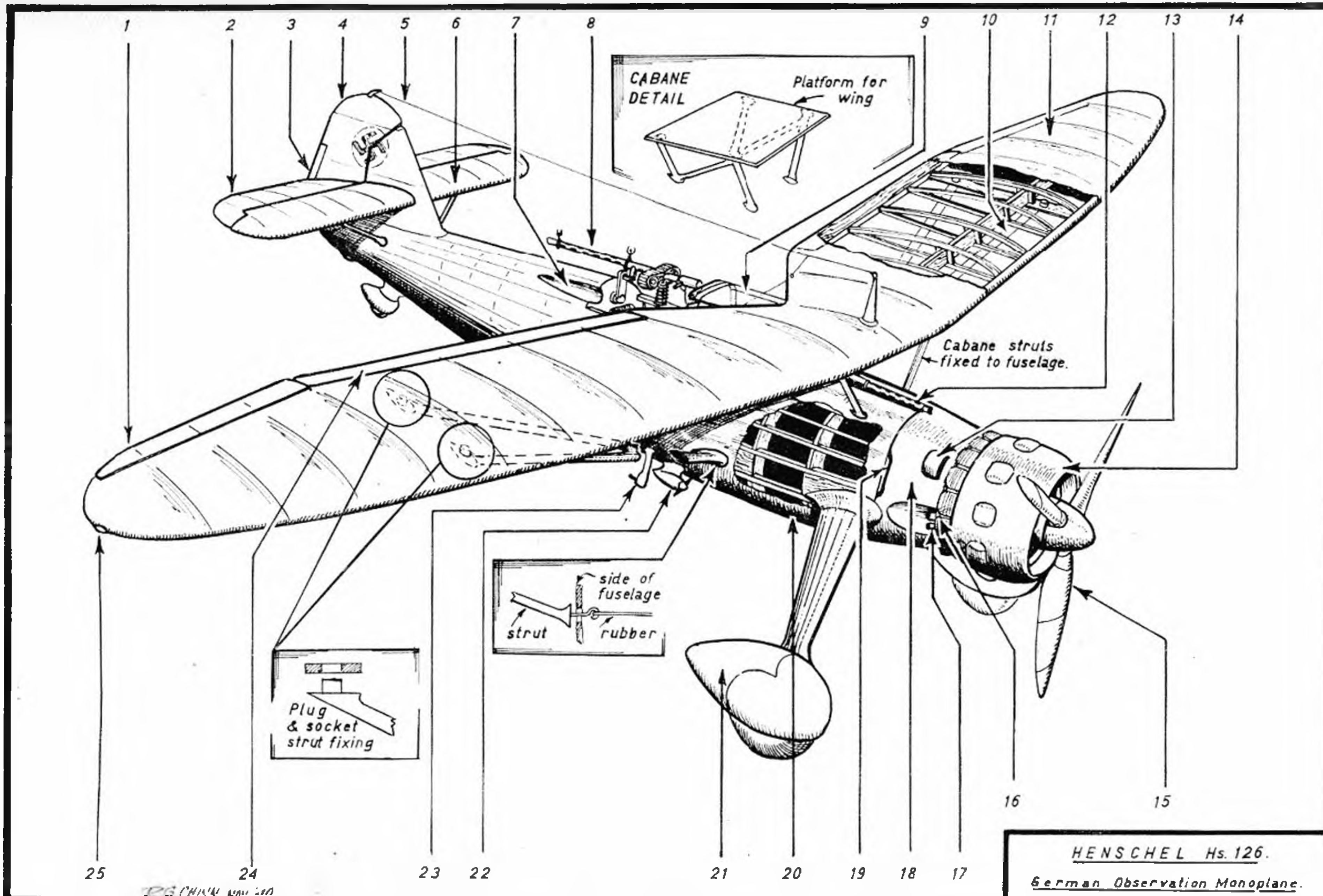
Build this as shown and cover with card or $\frac{1}{16}$ in. balsa. Card is preferable owing to the fact that it adds weight to the nose.

Assembly and Covering.

When each component has been completed, assemble as shown on the drawings, taking care to get everything true. Cover with tissue, and after shrinking with water add one coat of dope and one of banana oil. It is not advisable to use coloured dope if good flying is required.

Flying.

Use three-blade Paulowina 7 in. dia. propeller and three loops of $\frac{3}{16}$ in. rubber, well lubricated. Put on 500 turns for maximum flight after the usual test glides, etc., have been made. Note: If obtainable, use $\frac{1}{16}$ in. plywood for front and rear cowling rings and the model will balance perfectly. *Go to it!*



HENSCHEL Hs. 126.

German Observation Monoplane.

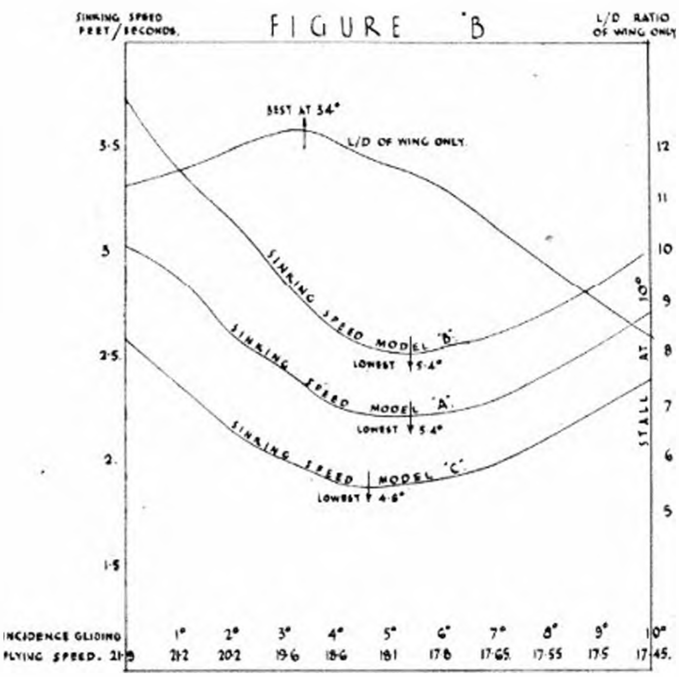
1. Movable aileron.*
2. Movable elevator.*
3. Rudder trim-tab.*
4. Movable rudder.*
5 Radio aerial.
6. Strut-braced tailplane.
7. Recess for machine-gun barrel.
8. Dummy machine-gun in "action" position.*
9. Transparent cockpit cover.
10. Wing strut
11. Wing construction: monospar with light ribs and tissue covering.
12. Dummy machine-gun.*
13. Dummy carburetter air-intake.
14. Balsa cowl.
15. Scale propeller.
16. Dummy cooling-gills
17. Dummy exhausts.
18. Balsa covered nose section.
19. Dummy air-outlet from oil-cooler.
20. Fuselage construction: backbone strips, formers and stringers. Tissue covering.
21. Hollow balsa spat.
22. Dummy radio generator.*
23. Dummy trailing-aerial post.*
24. Movable flap.*
25. Dummy navigation light.*

MORE "LETTERS TO THE EDITOR" ON

Dear Sir,

If I might be permitted to intrude in the Jones Maxwell controversy, I have a quarrel with Mr. Jones's article in the August issue. He states that the more you streamline a model the faster it flies. This is wrong, as so long as the wings and incidence, and the weight, remain unchanged the speed of flying in the glide is unaltered, since the lift is given by $L = G\frac{PAV^2}{2}$ and this is true for all models. What actually happens is that the better model will have a better L/D ratio, and so a better gliding ratio and a slower sinking speed.

Another of Mr. Jones's fallacies is the curious statement that we should add the saving in drag due to streamlining to the wing drag, and so by flying slower get a slower sinking speed. If we investigate closely we will find that the nearer we come to the "flying wing" condition the nearer the ideal wing incidence comes to the best L/D condition for the wing only, whereas we have to fly a box-like model at a higher incidence, with the wing at a less efficient angle, because the reduced drag of the box will make up for the increased wing drag. So that to take advantage of streamlining we should slightly *reduce* the wing incidence.



I don't expect Mr. Jones will believe me without figures, so I have prepared a table showing the wing incidence by one degree steps from 0° to 9° for R.A.F. 32 (from Messrs. Powdrill and MacBean's figures, which are about the most useful contribution to the amateur designer you have ever printed). I also show the flying speed and drag of wing for each setting, and, finally, for each of three models, a whole series of calculations leading to the sinking speeds at each setting. Model A is Mr. Maxwell's example, Model B a "box" having 50 per cent more drag, and Model C a "super" job with 50 per cent less. Finally, a graph of sinking speeds. You will see the best setting for *both* A and B is 5·4°, which knocks Mr. Jones's "add-the-drag-to-the-wing" theory on the head. Finally, the best setting for C is 4½°, and its sinking speed is 1·875 ft. per second with a forward speed of 18·4 ft./sec., which is very slightly faster than the 18·1 ft./sec. at which the box-bodied machine glides best.

What does all this mean in practice? Surely that the more we streamline our machines the *less* incidence they need, although the decrease will be small, since a "flying wing" would need about 4°. Actually, since we can't be expected to notice a machine having its tail up or down 1°, we would probably not find the rigging angle any different. I know many people will stick to 3½° rigging angle, with the thrust line a bit below the drag centre, and the upsetting force of the thrust will mean that the machine climbs at 5° incidence and glides at 3½°, the small difference in sinking speed at the 3½° setting being more than compensated by the extra margin between that figure and the stall, in particular in bad weather. That has been my own practice, and I will certainly need a lot of convincing before I change it, since it has proved itself in actual flying, which is a lot more to the point than Mr. Jones's theory.

I wouldn't be surprised if Mr. Jones's 6° machine (I presume he practises what he preaches) is really gliding with its nose down 1° or so! And mine 1° up!

Yours faithfully,

Robert Burns.

Angle of incidence in °	0°	+1°	2°	3°	4°	5°	6°	7°	8°	9°
Flying speed, ft. per sec.	21·9	21·2	20·2	19·6	18·6	18·1	17·8	17·65	17·55	17·5
Drag of wing, in ounces	·715	·69	·665	·65	·665	·683	·72	·76	·825	·89
Model A.										
Drag of fuselage	·425	·395	·36	·34	·305	·29	·28	·275	·272	·27
Fuselage + wing drag	1·14	1·085	1·025	0·99	0·97	0·973	1·0	1·035	1·097	1·16
L/D of model	7	7·36	7·8	8·03	8·25	8·22	8	7·72	7·3	6·9
Sinking speed	3·025	2·875	2·59	2·42	2·25	2·20	2·22	2·28	2·40	2·54
Model B.										
Fuselage drag	·637	·587	·54	·51	·457	·435	·42	·412	·410	·405
Fuselage + wing drag	1·35	1·277	1·205	1·16	1·122	1·118	1·14	1·172	1·23	1·294
L/D of model	5·9	6·25	6·65	6·9	7·12	7·2	7·02	6·84	6·5	6·17
Sinking speed	3·72	3·385	3·15	2·835	2·61	2·51	2·537	2·575	2·7	2·835
Model C.										
Fuselage drag	·21	·20	·18	·17	·15	·145	·14	·137	·136	·135
Fuselage + wing drag	·92	·89	·85	·82	·815	·828	·86	·897	·96	1·02
L/D of model	8·7	9	9·4	9·75	9·82	9·65	9·3	8·92	8·33	7·85
Sinking speed	2·58	2·355	2·135	2·01	1·89	1·875	1·915	1·975	2·105	2·23

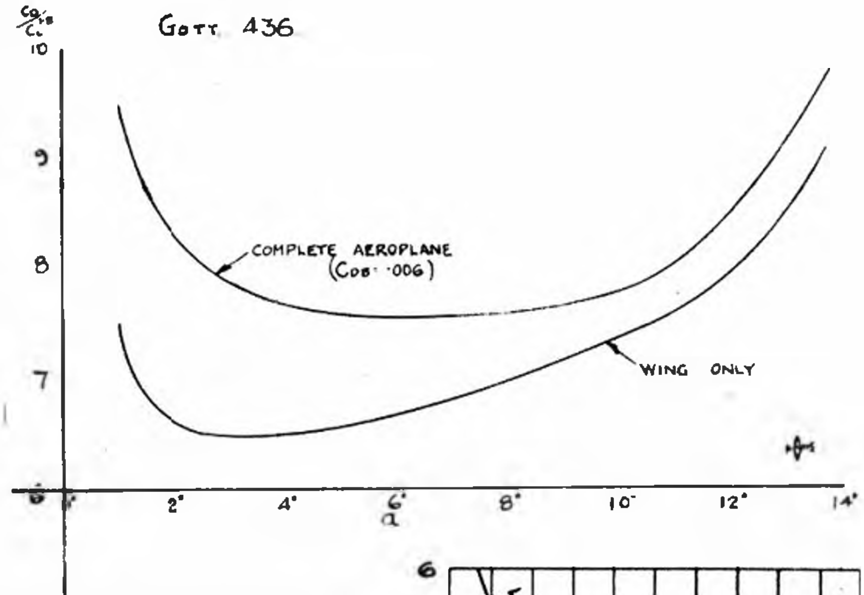
THE "JONES-MAXWELL" CONTROVERSY

Dear Sir,

A discussion such as that now going on over the least sinking speed of a model always interests me, and I felt I would like to add something to it.

The best angle of incidence depends on the drag of the whole model, and will therefore differ from one model to another. I have drawn a graph to help illustrate what happens.

The least sinking speed for a given machine occurs when $\frac{C_D}{C_L^{1.5}}$ is a minimum. This expression must include the drag of the body, tail, etc.; in fact, it is for the machine as a whole, and not just the wing. For all the drag of the machine extra to the wing, I have taken a coefficient of ·006. This is about 1/10 of the wing drag, and is about the same in proportion to a modern full-size machine. With a really well streamlined model this coefficient would be smaller, and therefore the incidence of least sinking speed would be nearer that of the wing only. Unfortunately, I have no performance figures to hand for R.A.F.32 section, so have used my old favourite Gott.436, which I am certain is not very different. In any case we cannot plot the correct curves without the true value for the drag coefficient, which can only be found by measurement of the model concerned. The main point is that the curve illustrates how the sinking speed is increased with extra drag from the body, etc., and with this extra drag a greater angle of incidence is required.



There is one more point I might mention, and that is an increase in aspect ratio would make the curve for the whole machine a little nearer that for the wing only.

Yours faithfully,
Howard Boys.

Dear Sir,

We must apologise to Mr. G. W. Jones. It was very careless of us to overlook the fact that the drag varies as velocity².

After correcting our calculations we find that actually the model in our example would have its lowest sinking speed if the wing were at 5 deg.

Round one to Mr. Jones.

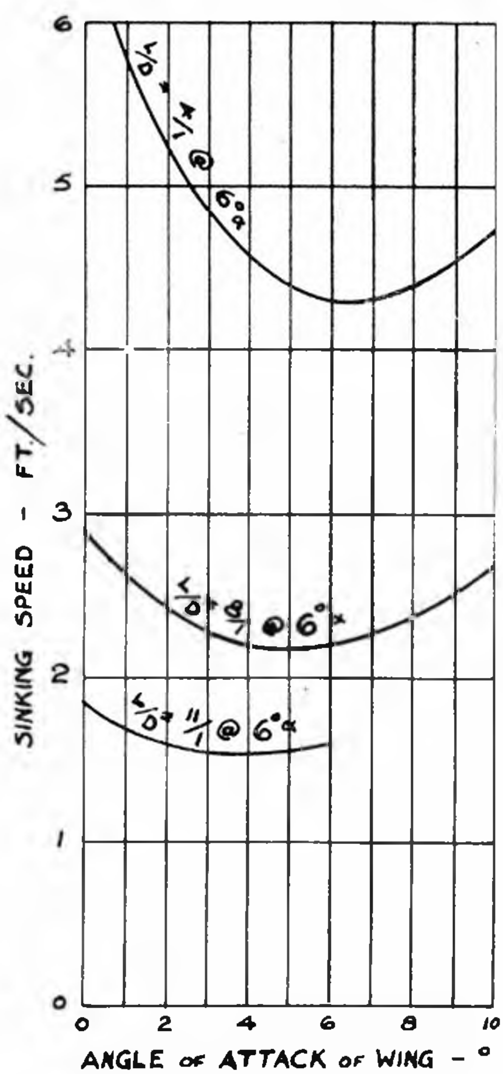
However, in his original article, Mr. Jones stated that streamlined models ought to have their drag increased to that of "unstreamlined" models by increasing the angle of the wing. By this means various advantages, which need not be repeated, would accrue.

Suppose, therefore, we have a model which is even more streamlined than our first example, in fact its L/D ratio when its wing is at 6 deg. is 11/1. Now we found that for our first model the best angle was 5 deg., so that, according to Mr. Jones, the angle for this new one ought to be greater than 5 deg. But our calculations show us that the lowest sinking speed for this super-streamliner occurs at 3⅞ deg. Similarly a model less streamlined than our first (L/D = 4/1 at 6 deg.) would have its lowest sinking speed at 6½ deg.

The conclusion is that while, as Mr. Jones says, it would be advantageous to fly the average streamlined model with its wing at a higher angle than is generally used, we contend that (contrary to Mr. Jones's statement) the more streamlined a model is the smaller need be the angle of attack to produce the lowest sinking speed.

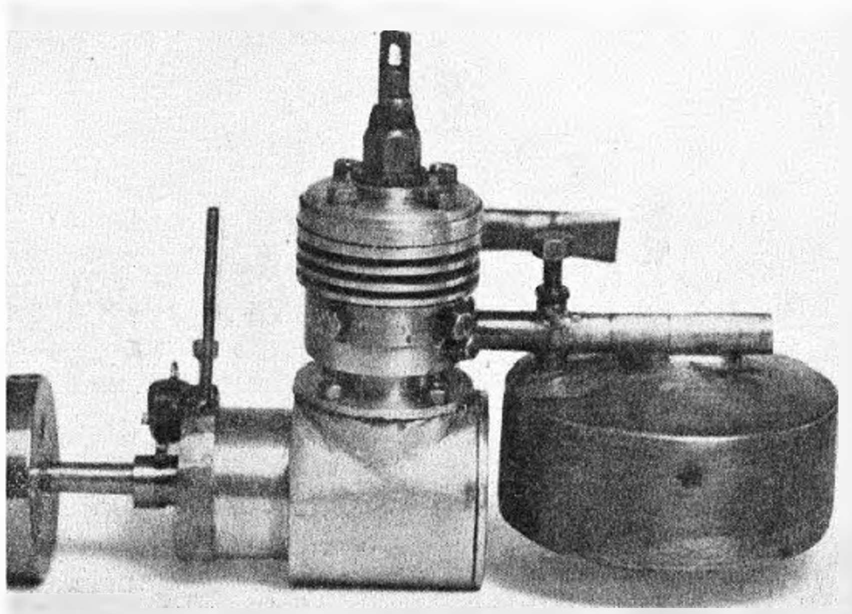
The accompanying graph and figures on the next page show our working.
Are we wrong again, Mr. Jones?

We are,
Yours faithfully,
G.M.A.C. Research Section.
J. H. Maxwell.



A 3 cc. PETROL ENGINE —— DESIGNED AND BUILT

This engine was entirely designed and constructed by a boy of 15 years of age. We print his description of how he went about this job exactly as sent in to us.



I HAVE heard so many people say that they would like a petrol engine, but have not got one because they are too expensive, that I thought I would make one myself. I have not bought any blue prints or castings, however. I happen to live in a large garage which belongs to my father, so I have a few more advantages than an ordinary aero-modeller, especially as the garage is exceedingly well equipped.

After collecting all my aero-modeller papers together, I found that nearly every one advertised had "spats," or flanges on the base, presumably to strengthen it. But I saw no need for it. To make the base I got a piece of piping the size of the base. Then I found another piece the size of the cylinder. Next I welded the cylinder on the base. I hack sawed the base pipe right down the centre so that I could take the mould out easily. I cast the first base of aluminium and she came out perfect, with no air bubbles or flaws. By the way, I got the aluminium from old gearboxes and crank-cases of cars. I faced the back practically to the cylinder base and turned a spigot on the other side of the cylinder on the end of the base for lightness. By chance that day a friend came along and gave me some self-aligning ball races about ½ of an inch in diameter, so, of course, I shrunk two of these in the base with a distance piece to hold the crankshaft.

Next job was the crankshaft. For this I got a bolt about 4 inches long and ⅝ of an inch across the flats. I turned it to fit the races, faced back the screw side of the head, and then faced up the top side until it was a plate about a sixteenth thick. Next I turned away the flats until I had a face diameter of ¾ in.

On making the connecting rod I had three shots: the first I tried carving from steel by hand, but this did not look very good, so I turned one from a bolt and filed two flats on it.

I cast an aluminium cylinder in another piece of pipe, drilled out the centre, and put in a mild steel sleeve. Then I made a mandrel, put the cylinder on it, and did the necessary turning of fins; the thick piece just under the fins is for bolting the different parts into, otherwise if one just bolts them on without it there is not much for the bolts to screw into. For the transfer port I drilled *up* the side of the cylinder, then *straight into* the cylinder, and bolted a plate on the outside. I cut a slot in the base so that the vapour could go up the side, leaving it absolutely airtight. I drilled the ports, screwed in the exhaust pipe, and made screw holes for the inlet.

Next I reamered out the cylinder, but this was not a

THE "JONES-MAXWELL" CONTROVERSY. *Continued.*

SYMBOLS.

α = Angle of attack of wing   Dw = Drag of wing in oz.   Dt = Total drag in oz.
V = Flying speed in ft./sec.   Dr = Drag of remainder of model in oz.   Vs = Sinking speed in ft. sec.

WING. (These values apply to all three models).

α	2	4	6	8
CL	·78	·89	·96	·99
CD	·062	·073	·086	·102
V	19·7	18·44	17·75	17·49
Dw	·635	·655	·715	·824

MODEL WITH L/D=8/1 at 6 deg. α
(As in previous letter).

DR	·351	·308	·285	·277
DT	·986	·963	1·	1·101
L/D	8·12	8·31	8·	7·27
Vs	2·43	2·22	2·22	2·4

MODEL WITH L/D=11/1 at 6 deg. α

DR	·0161	·0141	·013
DT	·6511	·6691	·728
L/D	12·29	11·95	11·
Vs	1·6	1·54	1·61

MODEL WITH L/D=4/1 at 6 deg. α

DR	1·58	1·387	1·285	1·25
DT	2·215	2·042	2·	2·074
L/D	3·61	3·91	4·	3·86
Vs	5¼46	4·72	4·44	4·53

AT THE AGE OF FIFTEEN YEARS — By H. E. GRIFFIN

good bore, so I kept on lapping the cylinder with a piece of turned wood and fine carborundum grind on a high speed drill. After a lot of work this eventually gave a very good bore.

Then I ground a piston of mild steel to fit the bore and put a mild steel ring on it, which gives excellent compression. The cylinder head is bolted down separately. I put four studs in the base to bolt the cylinder on to. I made the sleeve about $\frac{3}{8}$ of an inch longer at the bottom, so as to guide the cylinder into the base.

The gudgeon pin was made of mild steel.

The exhaust pipe is just annealed copper tubing.

The big end was turned from mild steel in the shape of a screw, and screwed into the crankshaft plate. To fill up the base and make it as small as possible I made an aluminium plate which goes right up to the big-end, leaving a gap of about $\frac{1}{4}$ of an inch. I bored out the centre on the outside for lightness, and tapered it to the edge.

The carburetter was quite easy. I bored a piece of steel for the inlet pipe, and brazed a smaller tube into it about three-quarters of the way along. I then brazed a plate on the same end, which is bolted into the cylinder. After putting the smaller tube in I redrilled the large one to clear it. Now I was left with about an eighth on top and a longer piece on the bottom of the small tube. This was then tapped. Next I got a bolt and put a gramophone needle in the thread end, so that when it was screwed in it regulated the flow of petrol accurately.

The tank is an old car carburetter floor, into which two pipes were soldered. The flywheel is a turned piece of steel with a grub screw through it to hold it. The contact-breaker was not so easy. First of all I turned a piece of steel, with a hole in the middle, for the crankshaft, to fit on the spigot of the base, and be held in position by a bolt. Then I brazed a handle on it. On the face of it there is a piece of steel holding a threaded fibre bush at one end into which a sixteenth bolt goes, which has a brazed platinum point as a head. In the middle, another piece of steel is pivoted, which has the other point at one end and a bump at the other, which is hit by a cam on the crankshaft.

I have also made a plug which happens to work, after having made 12 electrodes, because I kept on breaking them! The outer casing was made from hexagon brass and tapered inside; the electron was also tapered and covered by mica so that when a nut is tightened outside it pulls up the electron and so fixes it. In between the nut and the brass are two fibre washers. When it was finished I turned the nut and washers so as to make it look better. The weight of the complete engine is 8 oz.

THE USES OF CHEWING GUM IN SOLID MODELLING

By N. H. FENTON

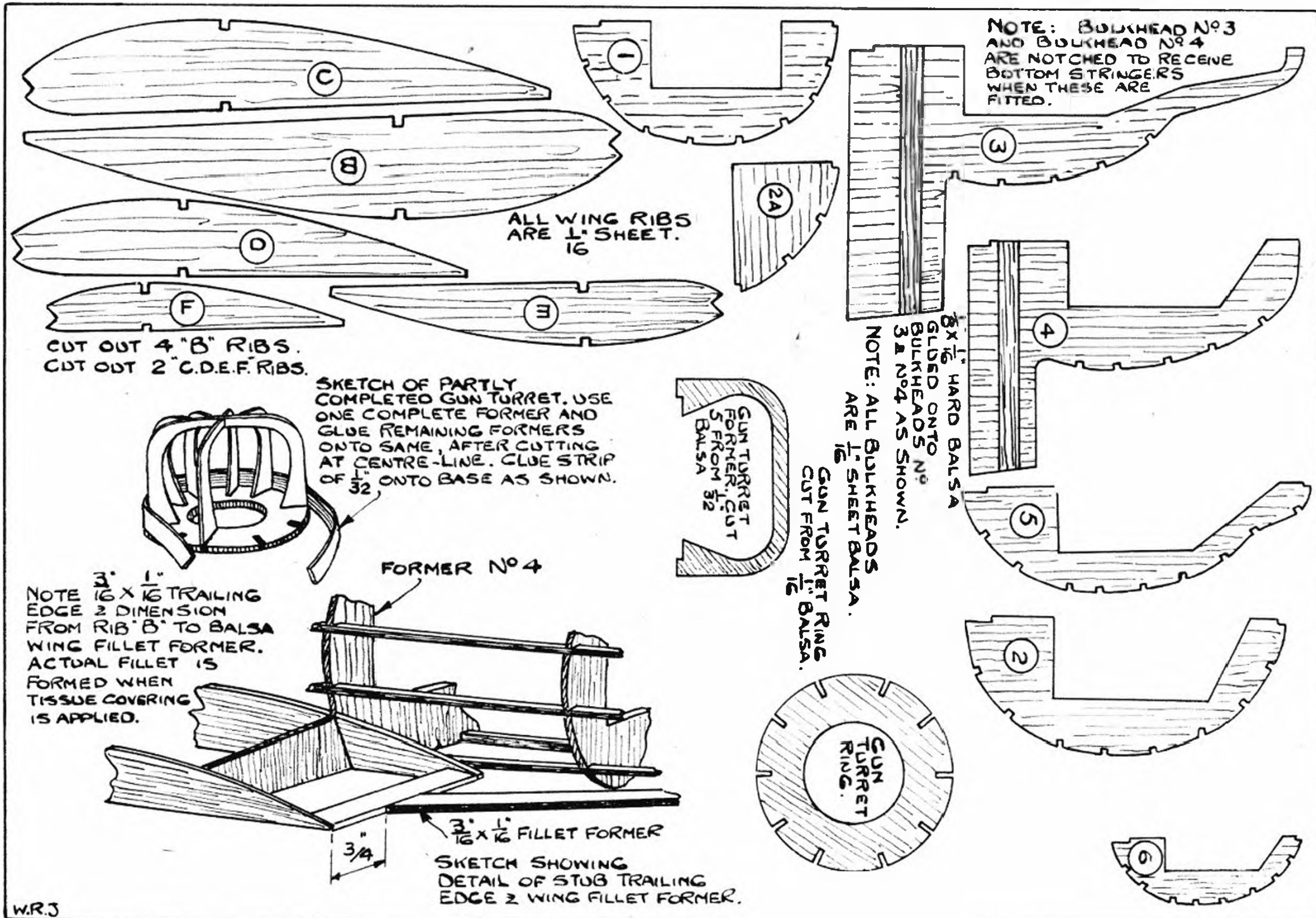
It is probably widely known that satisfactory fillets can be made from chewing-gum, though personally I prefer plastic wood; but realistic wheels for small models may also be made from it. The resulting wheel has a "rubber" finish.

Some practice will be needed to determine what quantity to use, but always begin by making *two* small balls of gum the same size. This is to ensure that one wheel won't be larger than the other, a truly horrible sight! Cut two discs for each wheel, and after carefully flattening the balls of gum, cement them on. Slight pressure will give the hubs that recessed effect, and a correct tyre shape will be formed. The whole should be coated several times to preserve the shape; clear dope or thin cement will do, and if you like you can flatten the portion which rests on the ground to imitate low pressure tyres.

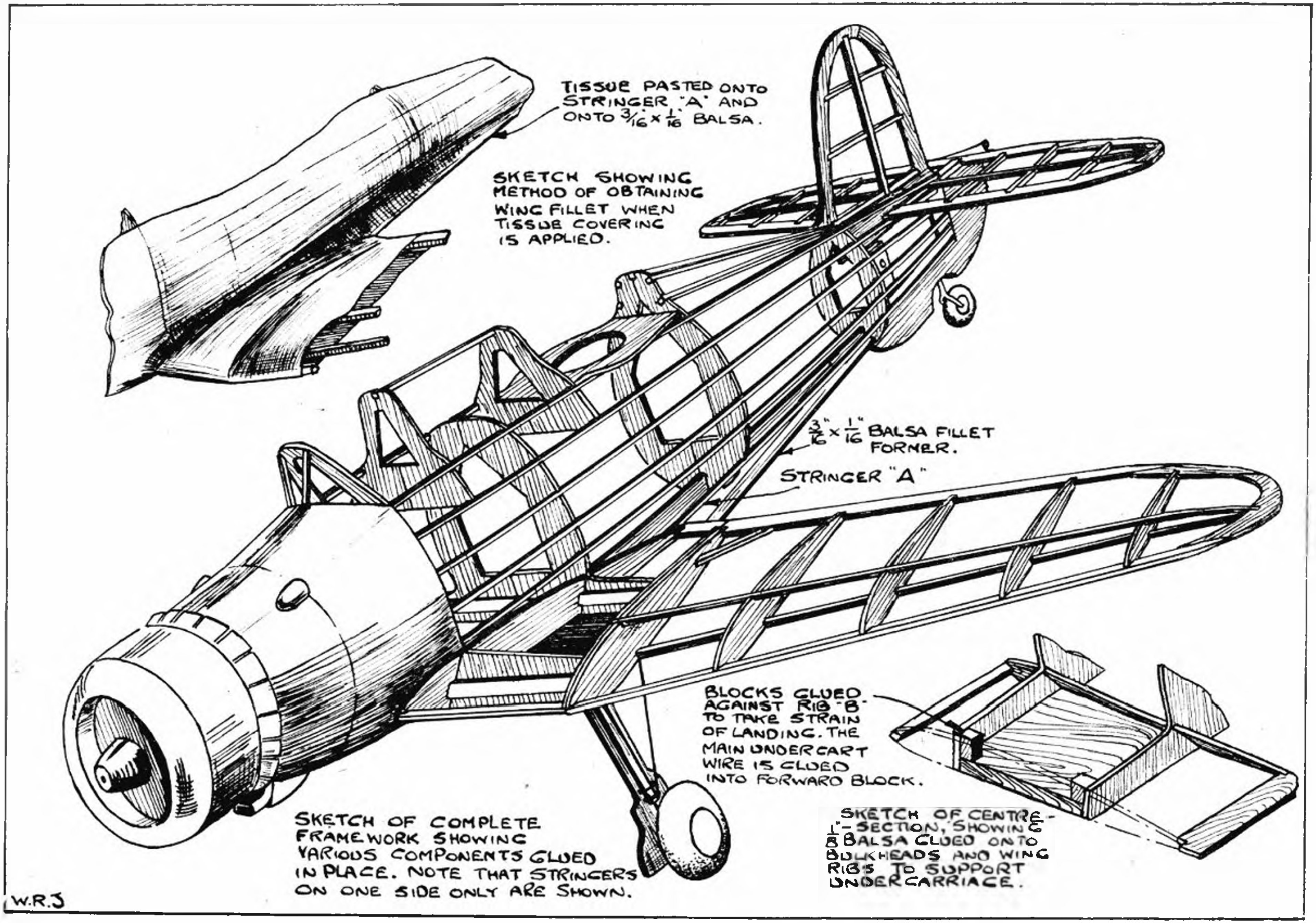
For old-type wheels, such as were used on the Fairey "Fox," Hawker biplanes, and almost all Great War machines, there is a method of slitting a linen button and filling with plastic wood, but a far simpler method is to press a ball of gum into the cavity, and cover the two holes on the other side with a smaller piece of gum. Mark the hub and valve-hole while still soft, and coat several times with clear liquid before giving the final coat of matt black.

Now, many builders of Avro "Ansons" will probably have been disheartened by unsuccessful attempts to reproduce the valve-cover bumps on the cowlings, but these can also be made from chewing-gum. A long thin length should be rolled, about the thickness of the "bumps," and small pieces cut off with a razor blade. With a little practice, correctly streamlined "bumps" can be pressed on to the cowlings, a slight drop of cement being needed for each one. Be sure that the cowling is well sandpapered before any bumps are put on, as this cannot be done afterwards.

It is quite possible that modellers may find other parts to make from chewing-gum, but the chief points to remember are: (1) Always keep fingers wet while handling gum. (2) Coat all parts with clear liquid, so that this will harden and prevent the gum from sticking to any surface on which the model is placed, as well as preserve the shape. And never, never be tempted to use wax or modelling-clay for fillets, as wax will not take paint, and both are affected by heat. A friend of mine once made two engine-cowlings from wax, and left his model near a window on a sunny day. You can imagine his surprise when he returned and surveyed two shapeless globules of wax on the bench beneath the engine nacelles!



NOTE: BULKHEAD Nº 3 AND BULKHEAD Nº 4 ARE NOTCHED TO RECEIVE BOTTOM STRINGERS WHEN THESE ARE FITTED.
C
B
D
F
E
1
2A
3
4
5
2
6
ALL WING RIBS ARE 1/16" SHEET.
CUT OUT 4 "B" RIBS.
CUT OUT 2 "C.D.E.F." RIBS.
1/8 x 1/16" HARD BALSA GLUED ONTO BULKHEADS Nº 3 & Nº 4 AS SHOWN.
NOTE: ALL BULKHEADS ARE 1/16" SHEET BALSA.
GUN TURRET RING CUT FROM 1/16" BALSA.
GUN TURRET RING.
GUN TURRET FORMER. CUT 5 FROM 1/32 BALSA
SKETCH OF PARTLY COMPLETED GUN TURRET. USE ONE COMPLETE FORMER AND GLUE REMAINING FORMERS ONTO SAME, AFTER CUTTING AT CENTRE-LINE. GLUE STRIP OF 1/32" ONTO BASE AS SHOWN.
FORMER Nº 4
NOTE 3/16" x 1/16" TRAILING EDGE & DIMENSION FROM RIB "B" TO BALSA WING FILLET FORMER. ACTUAL FILLET IS FORMED WHEN TISSUE COVERING IS APPLIED.
3/16" x 1/16" FILLET FORMER
3/4"
SKETCH SHOWING DETAIL OF STUB TRAILING EDGE & WING FILLET FORMER.
W.R.J



TISSUE PASTED ONTO STRINGER "A" AND ONTO 3/16" x 1/16" BALSA.
SKETCH SHOWING METHOD OF OBTAINING WING FILLET WHEN TISSUE COVERING IS APPLIED.
3/16" x 1/16" BALSA FILLET FORMER.
STRINGER "A"
BLOCKS GLUED AGAINST RIB "B" TO TAKE STRAIN OF LANDING. THE MAIN UNDERCART WIRE IS GLUED INTO FORWARD BLOCK.
SKETCH OF COMPLETE FRAMEWORK SHOWING VARIOUS COMPONENTS GLUED IN PLACE. NOTE THAT STRINGERS ON ONE SIDE ONLY ARE SHOWN.
SKETCH OF CENTRE-SECTION, SHOWING 1/8" BALSA GLUED ONTO BULKHEADS AND WING RIBS TO SUPPORT UNDERCARRIAGE.
W.R.J

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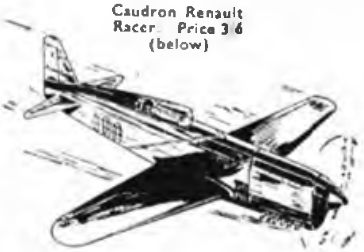

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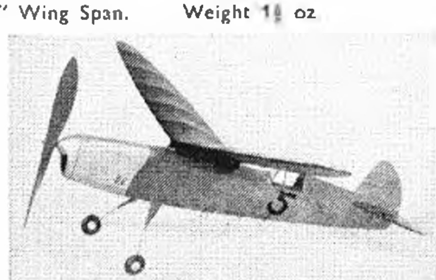

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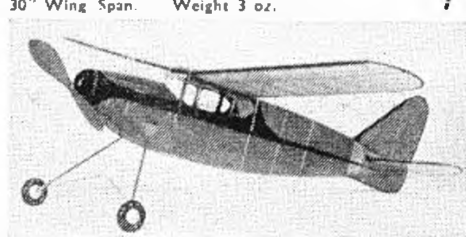

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Hon. Inst., No 85 (Southgate) Squadron

DOUBTLESS since last month many of you have been thinking over my appeal to you, and are considering organising or reorganising your aero-modelling section. I shall be glad to hear from squadrons who have already an organised section, and also from those who have a number of aero-modellers whom they would like to organise. Remember, these are your own special pages, and I am to hand to help you along. Send along chatty news of your activities, or details of any interesting model, gadget, sketches and snaps, too, will all help you to get together and learn what each squadron is doing. Amongst you there must inevitably be some lone hands, perhaps only one or two in a squadron; don't be dismayed on that account. We want your news, and I am sure that as soon as your officers see you and your models mentioned their interest will be aroused, and that is the first step towards forming a live aero-modelling section. Don't trouble to write your reports or descriptions into an article. Send along concise notes. I'll knock them into presentable shape. I want your news, and I don't want you to delay sending in because you cannot find time to "write it up." Even a postcard will do—if one turns up with something like this: "No. 000 squadron of so and so held an exhibition of solid models. The Mayor was impressed by the work displayed, and which was much admired by visitors, who helped swell the 'Spitfire' fund. We gained two new members." That's news, and shows that No. 000 squadron is active in the aero-modelling field, and that's what we want to see. Let's have your news, *brief but complete.* No. 85 (Southgate) Squadron, which is sponsoring the borough Spitfire Fund, has had a Messerschmitt 109 on show; the cadets in attendance have spent a busy time explaining the machine to visitors, and it has been noted that many local aero-modellers who specialise in scale models have been along to study the machine at first hand; doubtless their models will be extra detailed on this account!

With the New Year upon us, we ought to consider what models we should build for the spring. Flying in the spring calls for a fairly robust job, and the super-duration type of model doesn't really come into its own until May and onwards. It is wise to get in some practice with a hack or general purpose model before risking the newest "creation," with which you hope to win squadron honours. Doubtless in the pages of THE AERO-MODELLER you will find that tough, sturdy job, suitable for breezy weather. Talking of the spring, this is the finest and most convenient time to hold an exhibition of models. Throughout the winter you have all been as busy as bees, building intriguing little solid models, and they are all aglow with freshness; or scale flying models, or duration models, so what better time to whip up a really representative collection of 'planes to draw attention to your squadron's activities, and perhaps pull in the shekels to augment the funds? Your local model supply stores, or a local shop of some standing, will doubtless co-operate, by lending you window space, to your mutual advantage. Dealers! here's a chance to link up with your local Air Cadet squadron. And I say, clubs, "What about it?" Have you made contact with your local squadron yet? At the risk of

A 7 ft. 4 in. span double-size "cruiser" built by Mr. A. Adkins. Weight of 'plane is 4½ lb.

being hackneyed I must urge you to " go to it." If you are holding a local exhibition, invite the Air Cadets to show their models, and some of the very excellent pictures and other gear they have by them. Remember this is the air age, and anything and everything to do with air matters is studied with great interest. I know myself that more people have been attracted to aero-modelling during the first year of war than in any year before. So your co-operation means new members for both organisations, and new strength, too.

I wonder if the cadet squadron local to Mr. Peekes (who won the first prize for the best G.W.7 Wakefield model) will be enterprising enough to contact him and make him a member. Congratulations, Mr. Peekes. You are an inspiration to those in their teens: you did it, so others can do it. By the way, I am going to tell you of " Good Air Cadets," so with your pictures, if they feature personalities, will you include some interesting facts to enable me to " write them up."

This good-looking 'plane was designed and built by Cadet Boulesteix, of the King's Lynn Squadron of the A.D.C.C. Best time is 19 min. O.O.S. Age of builder, 15 years.

"SPILLING THE BEANS"

HERE'S a " stunt " we work on an occasion when we are stumped for a lecturer, or we have time on our hands at a meeting. The secretary has ready to hand a number of slips of paper, on which are written a number of subjects. Wings, undercarriages, line up, covering, doping, etc., etc. The slips are scrambled in a hat (or beret), and each member present draws one. After two or three minutes to consider their subjects, they each talk on their selected subject for a maximum of two minutes. If, as often happens, one doesn't know enough about the subject, you are allowed to question any person present who you consider knows the subject sufficiently well. This scheme is very informative and pools knowledge, and it has been noticed that on occasions, when the interest is keen and the speaker good, the chairman forgets to clock off at two minutes. We have found that quite a number of our members do know their subject, and can speak once you can get them started, and this is one very good way of doing it.

"A POEM LOVELY AS A TREE"

ONE of my many correspondents, Mr. D. Martia, of Singapore, points out to me that even in Singapore aeromodellers have tree troubles. He writes: " Palm trees are much harder to climb than any other trees with branches lower down. Quite recently I had occasion to have a machine retrieved from one of the coconut palm trees which fringe one side of my flying ground. I usually have to enlist the aid of a Tamil coolie who can climb a coconut tree, for it is not every Tamil who can climb. On this particular occasion it was my Sparrowhawk which had to be fetched, and as it was rapidly becoming dark, I was naturally very anxious about it. I eventually got a tree-climber and brought him to the scene. He got to the top very quickly, but as it happened the machine elected to fasten itself to the outer end of one of the spreading branches. The poor climber necessarily had to get into and among the branches to get at the one on which the machine was, and in doing so he climbed into a nest of large ants and bats which happened to be hanging in the branches. To my consternation I heard a yell, and saw the branches shake violently. The machine eventually dropped from its perch, however, none the worse for its shaking. The Tamil also arrived on terra firma in due course, looking very miserable after his encounter with the ants in the tree top, but he was rewarded handsomely for his trouble."

I have long made up my mind to write of " Adventures with Trees," but I'm quite sure that none of my adventures could equal ants and bats in the same tree. We've a lot to be thankful for.

Just a Few Simple Rules for My Correspondents

1. Don't delay, write to-day.
2. Always enclose an addressed envelope, together with a 2½d. stamp for a reply.
3. Keep your letters and enquiries concise and to the point.
4. Limit your questions to *three*.
5. Whenever possible, write on one side of the paper only.
6. Good clear amateur snaps are welcomed, but professional pictures only accepted by arrangement. The return of photos cannot be guaranteed, unless accompanied by stamped and addressed cover.

RIP.

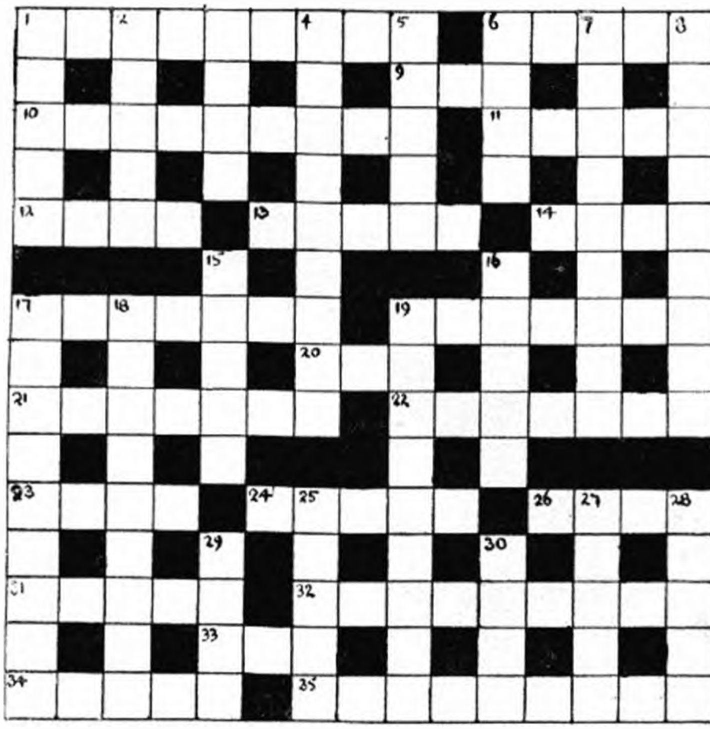
IMPORTANT NOTICE TO ALL CADETS—

NEXT MONTH'S "AERO-MODELLER" WILL CONTAIN FULL PARTICULARS OF ANOTHER COMPETITION—FOR A SOLID SILVER TROPHY—OPEN TO ALL CADETS . . . *SO ORDER YOUR COPY NOW*

THE AERO-MODELLERS' X-WORD —— No. 3

ACROSS.

1. Power converter (9).
6. Thus the cap is not empty (5).
9. Very much self (3).
10. Dick is one of these who seem to finish up successfully in tins (9).
11. Part of rudder is the beginning of the end (5).
12. Upset their teas (4).
13. Get together lads (6).
14. A deer at one time (4).
17. Enforced correctly? (7).
19. It's lovely for favourite grass (7).
20. Linden —— (3).
21. Treachery it is (7).
22. Mischievous fool starts deadlock (7).
23. It is ill at the end of a spike (4).
24. The old god seated further up? (5).
26. Is being a deity (4).
31. It is a muddle when a clergyman is in drink (5).
32. Wine o' Pair (Anag.) (9).
34. Not a cricketer's duck (5).
35. Holding type of model.



DOWN.

1. Projects arrangements of model (5).
2. Work or ape (5).
3. Time march out (4).
4. Technical staff of THE AERO-MODELLER discourse thus (9).
5. Do it with rubber bands after trial flight (5).
6. Ideal landing (4).
7. Main frames sound larger than they are (9).
8. Quality of man required when perusing 1 down (9).
15. Definitely a spot (5).
16. Hang on (5).
17. Rear end containing writer (9).
18. Everybody is these days (3 hyphen 6).
19. Delightful spot when a "Battle" comes down (9).
25. Always this balsa in a kit (5).
27. A noble son (5).
28. Sounds seen in a play (5).
29. Repeat for approval (4).
30. It's grand when a glider does well (4).

10s. 6d. will be paid to the sender of the first correct solution to this crossword puzzle received at our Leicester offices. Entries should be marked "Crossword" on the top left-hand corner of the envelope. —— *Closing date, January 4th, 1941.*

? ? ? ASKED AND ANSWERED ? ? ?

***Conducted by* —— "RUSHY"**

Q. *Can you tell me the correct colourings for the Dewoitine D.520 and the Heinkel He.112?*—(G. W. O., York).

A. Dewoitine D.520: Upper surfaces were painted with large irregular patches of light green and buff, similar to our own "shadow-shading" system. Underneath light grey. Cockades should be painted on both upper and lower surfaces of wings, and on fuselage sides, this being the first French machine to bear cockades on the fuselage. Rudder painted with vertical red, white and blue stripes, the red being at the trailing edge. Heinkel He.112: Little has been heard of the production model of this aeroplane, but presumably the colour scheme follows the usual German practice of black or bluish-grey upper surfaces, and light blue-grey underneath. Black crosses outlined in white are carried on upper and lower wing surfaces, and on fuselage sides. Black swastika, also outlined in white, is carried on the tail across the fin and rudder. (This aeroplane has since been superseded by the He.113 fighter, which first saw service in Norway.

Q. *We are about to start indoor flying in my club, and I should be obliged of your guidance as to the best type of model to build. What does R.T.P. mean, and what is O.O.S.?*—(F. G., Cambridge).

A. Type of model depends largely on the facilities available, and the types of event to be staged by your club. Many clubs have to utilise quite small halls, the usual height of pole being 3-4 ft. and length of line about 5-6 ft. For these conditions a smallish model about 20 in. span seems to meet the conditions, but as to what shape this model should take is largely a matter of individual design and tastes. Simplicity coupled with lightness is what to aim for, the main attribute of a "pole" model being long propeller run. I have yet to see the pole-flying model that does not land without a fair number of turns still on the motor. "R.T.P." is an abbreviation of round the pole, the name generally used to denote this type of flying. "O.O.S." is used to denote where a model has flown "out of sight" to the timekeepers.

Q. *Re the Westland Lysander. Where is the pitot tube situated? Are the under surfaces of wings, fuselage, etc., entirely silver? What is the wheel track? And finally, what is "Bristol Board"?*—(F. W., Berkhamstead).

A. All photographs of the Lysander we have seen appear to indicate that no orthodox pitot tube is carried. Presumably a venturi tube is used. The under surfaces of the wings and tail are silver doped, but the fuselage is camouflaged all over, as are the top surfaces of the wings, tail-plane, rudder and fin. Wheel track (measured from the centre of each wheel) is 9 ft. 9 in. Bristol Board is a special medium for pen drawing, and can be obtained through any stationer.

IF YOU INTEND MAKING SOLID MODELS OF 'PLANES DESCRIBED IN

"Aircraft of the Fighting Powers"

THEN YOU SHOULD GET A COPY OF ELWELL'S BOOK —WRITTEN ESPECIALLY FOR "SOLID" MODELLERS

By **J. H. ELWELL**
(Aero-Modeller Staff)

CONTENTS

Written by a member of the "Aero-Modeller" staff, this book will be of great assistance to those thousands of aero-modellers who this winter will be constructing solid scale models of military aircraft now in use in the second great war of the twentieth century.

There are close on 100 pages in this book, which is illustrated by a considerable number of photographs and over 50 sketches specially drawn by another well-known aero-modeller, C. Rupert Moore, A.R.C.A. In addition there are 1/72 scale plans, together with full building instructions, for the Supermarine " Spitfire," the Hawker " Hurricane," and the Boulton-Paul " Defiant."

The book is printed on art paper, and is bound in a stiff card cover, size 11" x 8½" printed in full colours, of which a small reproduction is shown above.

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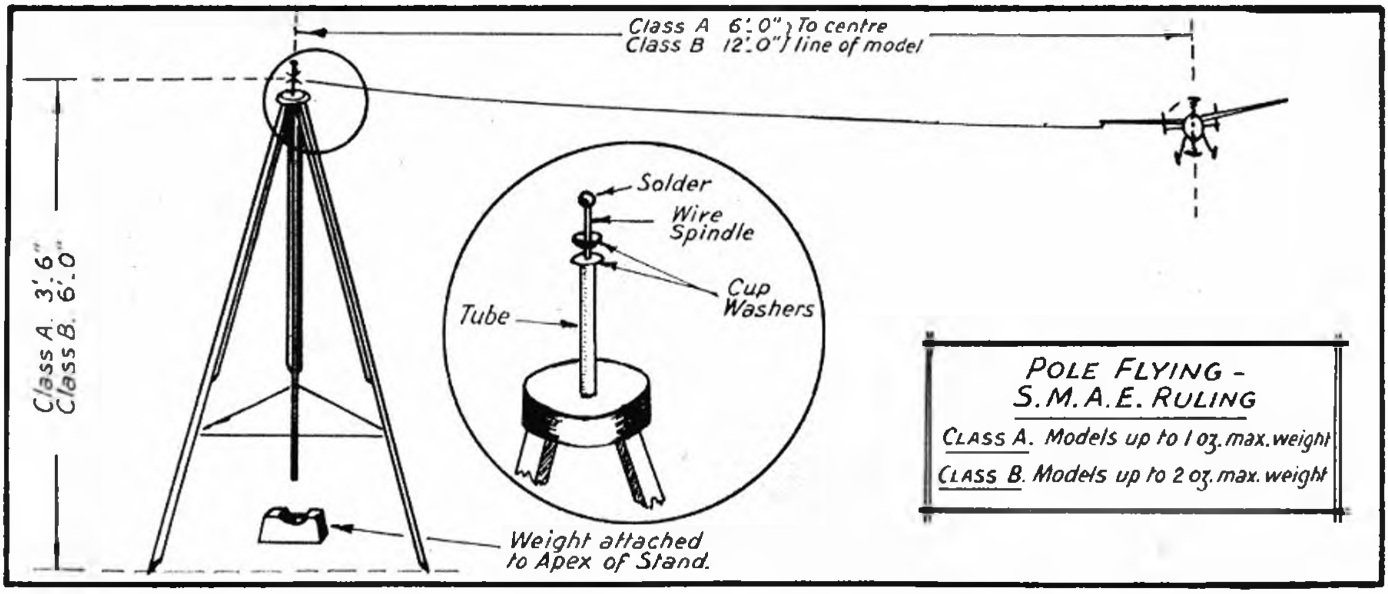


WHY NOT A SPOT OF POLE FLYING?

By C. A. RIPPON

DURING the winter months much fun and instruction can be obtained from pole flying, and interesting duration, speed, and distance competitions can be run.

The obvious advantages of this class of model flying are:

A: It can be done in any reasonably large room or small hall.

B: It is inexpensive, and the models are of an easy type to construct.

C: It has definite entertainment value, which you can turn to good account to augment your own or the local "Spitfire" fund.

D: Useful experiments with airscrews can be carried out, and positive results obtained which will prove valuable in designing your outdoor models. Some aero-modellers have obtained most promising results with Wakefield type models. The apparatus required for pole flying is simple, but there are certain factors which need careful attention if flying is to be carried out without a hitch. There is nothing more irritating than to have the fundamental apparatus failing you at a critical moment, say, when someone is in the exciting process of putting up a new duration record! So it will be wise to see that the "pole" is of sound and sturdy construction, and not liable to be pulled over by the centrifugal force developed by a model flying around it.

Most models used for pole flying weigh between ½ oz. and 1½ oz., and the loading per sq. ft. is fairly low, so that these models will only tend to pull the "pole" over at the commencement of each flight, but if speed models are used the centrifugal force is pretty high, and I've seen some weird results occasioned by models sort of "flying off the handle," and have on occasion narrowly missed a crack on the head. The safest form of "pole" for all-round work should be built as a collapsible tripod, on the principle of the camera stand, with provision not only for lengthening or shortening the legs, but also for anchoring them down so that the affair can not be pulled over. If you can arrange some permanent fixture points in the floor, all well and good, but a heavy weight directly under the apex of the tripod, to which a strong cord is attached, and which at the other end is fastened to the weight, will serve the purpose very well, providing cords are also run from leg to leg to prevent the tripod from collapsing. The above apparatus is very easy to fix up, and you should have no excuse at all in making an early start. Now, in order to get some comparative results it is essential that the models shall conform to a standard which, whilst compelling you to build to this standard, gives you plenty of scope for your ingenuity and enterprise, so I will suggest you build your models to the following simple formula in the absence of anything better.

Total weight of model, between ½ oz. and 1 oz. Maximum area of main 'plane, 72 sq. in. Maximum area of tail 33 per cent of main wing area. No restrictions on size of airscrew or amount of rubber, or area of vertical fin.

All models to be fitted with an undercarriage, and rise from the ground without a push. Length of line (which can be ordinary sewing thread) from swivel point on "pole" to centre line of fuselage, 6 ft., and the height of the swivel 3 ft. 6 in. from floor level, but the longer the length of line the higher the tripod may be set up. These figures are suggested because I know they work well, and will allow cadets to get busy. Most of you can fix matters so that you can have a 12 ft. diameter flight path. The swivel at the top of the pole is of simple construction, and can be seen indicated in the sketch.

The other end of the line can be attached by means of a thin wire hook to either of one of two points in the port or left hand wing (1) At the extreme wing tip; or (2) at about 1 in. or more along the leading edge. When you have found the correct place, it is a good idea to fasten a loop of thread at that spot to hook the line into. It saves fiddling about or tearing the tissue covering. The model should preferably be trimmed to fly outwards, so that tension is kept upon the line, and it is not necessary to use excessive dihedral on the wings, but what *is* very important, the wings must be of reasonably sturdy construction, and fixed firmly in position; there must be no possibility of centrifugal force upsetting the trim at all.

Now a word or two about the types of models that lend themselves to pole flying. There are certain specialised duration designs on the market, with which you can make a start, but an interesting field for experiment also is with the popular priced flying scale kits, of which there are plenty of varieties. When you have found out the correct airscrew for one of them (which will need to be well over size for best results), you will find they are a fascinating spectacle, and certainly allow you to keep the model under observation, and the crash element is very low if the model is flown with reasonable care.

Speed models are more of a specialist's job, and special times should be arranged for speed flying, otherwise some damage may be done to more delicate models which may be present, and which may get in the way if the line breaks and the speed model goes "haywire"—which brings me to an important feature about pole flying.

This pastime demands that those participating shall develop unselfishness, for as there is usually only one pole it is not good sportsmanship to monopolise it to the exclusion of a fellow flyer, who is of a possibly retiring nature, so he who is responsible for the organisation of the session should keep his eyes open and see that all and everyone get their fair share of flights. When superintending a pole flying competition, I usually arrange for all intending competitors to have a limited number of test flights, which the timekeepers check as a guide for the flyers, and then all test flights cease and the competition proper commences, flyers making their attempts when called upon. As one man launches his model, the next man is already winding up. A word here for those who will be trying their hand at timing for the first time. It is essential that a "stop-watch" (or more correctly termed, a "time recorder"), be used, and a flight commences from the moment the competition *releases the model*, and ceases the very first time the model touches down. It is possible that a model may be slow taking off, the general rule is that if the model makes more than one circle before becoming unstuck, that flight is forfeit, but there is no official ruling on this point yet, but the above is obviously fair. In speed contests the timekeepers have to be pretty slick on the button, because one-fifth second error makes a big difference, and it is possible for a competitor to win by the unwitting grace of the timekeeper, so some practice is called for.

Speed contests may be run over a number of laps giving the model a "flying start" of one or two laps, or from take off to landing, or for fastest lap. I shall be pleased to hear from you about your pole flying, and when enough squadrons are getting down to it, we can then see about a pole-flying contest. In the meantime I wonder which squadron can send in the best timed duration?

Since writing these notes I have learned the rules which will givern pole flying during the winter season, and they are explained on the enclosed sketch showing you the main details of the pole, and in the Christmas number my friend Warring described his "crack" pole flyer, so you are all set for a successful start.

LETTER TO THE EDITOR

DEAR SIR,

Referring to Clubman's notes in the October AERO MODELLER anent flying on Epsom Downs during air-raids, may we, through the courtesy of your columns, draw attention to the following points?

The Downs are held under a form of tenure known as "Manorial Rights," and only a sub-tenancy such as that granted to Stanley Wootton, Esq., president of the Cheam M.A.C., is competent to delegate permission to fly on this land.

To our certain knowledge no other club has Mr. Wootton's permission to use his ground for this purpose, and while we are ever ready to extend a welcome to clubs whose own grounds are no longer available, we feel the abuse to which this privilege has been subjected recently calls for strong protest.

The parking of cars on grass land is prohibited, but we had considerable difficulty in enforcing the order when a well-known annual meeting was held on the Downs this summer. A large amount of avoidable litter served to mark the event.

Finally, the incident referred to by "Clubman," perpetrated by people whom one would expect to have the well-being of the sport at heart, can only be classified as exhibitionist hooliganism designed to sabotage the effort so carefully fostered since the last war.

We regard these offenders as a danger to aero-modelling, and demand a full investigation by the S.M.A.E. and publication of their findings, in order to rid the sport of a pestilential menace.

H. P. COSTENBARDER, *Competition Secretary*.
S. KELSEY, *Hon. Secretary*.

AMOS BREAKS A RECORD.—*Continued from opposite page.*

The last event, Job's rocket-launched glider, was about to take place, and it was here that things began to happen. The glider had been rigged up on beer bottles. The crowd were expectant, especially the kids. The rocket looked a good 'un. At Job's request I was standing behind Amos, just to keep an eye on him. Amos was explaining to the kids that that was his dad's glider, and his dad lighting the rocket, which Amos himself had fetched only that morning all the way from Birmingham.

Job was about to apply the match, when suddenly Amos jumped up, and with a stampede he and his mates rushed towards the scene of operations.

"Job!" I yelled.

My warning was in time. Job blew out the match and led his offspring firmly by the scruff of the neck and planted him in his place of safety.

"Just see as he don't move," said Job to me, a bit cross-looking.

I fancy I heard Amos saying something, but it was lost in the general hubbub. The whole club was tense with excitement just after, as Job applied the match to the rocket. There was some blue smoke. Then, zip! The rocket soared up into the blue—with Job's glider.

Amos's feet were beating a frantic tattoo on the boards about the table. The rocket *was* a good 'un. Up! Up it went! We weren't half in for a glide.

Then, with a suddenness that shocked us, there was a terrific bang! Bits of Job's glider spread across the sky and began to descend about us.

A few of the ignorant laughed, but Job didn't. Neither did his son for quite a time afterwards.

Poor old Amos had done it again. He'd bought his father a maroon!

AMOS BREAKS A RECORD

By

ARTHUR MOUNTSTEPHENS

"Zip! The rocket soared up into the blue—with Job's glider."

JOB WOOD is the only exciting thing in our club, almost. The other is Job's son, Amos. Amos ought to be kept on a chain. Job has been trying to get a club record for years, and he hasn't got one. But Amos has. It's the club record for bust models.

Amos is a dreamy-eyed youth of fourteen with long legs and big feet, and he never looks where he's going. If a model makes a three-point landing anywhere near Amos's feet, Amos loses his head, his feet lose theirs, the model loses a wing, or maybe a tail, and the owner his temper. Amos makes a good job of it too. You'll see him do a kind of sailor's hornpipe, and it's a bink in the wing or a bonk in the fuselage for the unlucky model. Of course, it's good for Job in a way because he's the local balsa supplier.

But when it happened a fourth time we had to do something about it. On this occasion it was the President's latest model. Somebody noticed that Amos was streaking towards the model's intended landing place. We shouted. As usual, Amos was looking skywards, and he was completely oblivious of the model coming towards him. Just as he was about to connect, Amos turned, stopped, turned again and tried to run backwards, all in one movement. He gave that model a beautiful backheeler that would have shamed an international rugby hooker.

It was our gala day on the following Saturday, and we appointed a sub-committee to deal with Amos. There were going to be some expensive models about, and we felt that something would have to be done. You'd be surprised at the variety of suggestions we had, from giving him a free ticket for the pictures to allowing him to come with his feet tied together. Then we hit on a brilliant idea. You see, we couldn't expel him from the club, being Job's son.

So we made Amos into an official. He was to attend the meetings as the clerical department: sit at a table and make records dictated to him by the timekeepers. As an additional precaution we decided to have boards round the table legs. This would render any descending model safe from his feet.

Job agreed that it was a good scheme, especially as he had designs of his own that day. Job was going to make sure of a record at last. He was going to give us the first demonstration of a rocket-launched glider, and by the look of things he meant to create a record that would stand for all time.

On gala day I called for Job. His glider was the biggest I had seen, and the rocket was a useful looking affair.

"Half-a-crown, cost price," Job confided to me as I watched Amos fixing it. We were in for a show.

"But why all the trouble?" I asked. Why all this expense to get a record there's no competition for yet?"

Job winked solemnly. "I'm going to make a record that won't be beaten in a hurry, just to show 'em."

And, as I discovered later, he certainly was.

We went off to the field then, which wasn't far. Job carried his glider and Amos and I hugged the table between us. It was heavy, but I felt that it was worth it. My kid was bringing along a useful model of mine, and I had no desire to introduce it to Amos's hornpipe. Job was still a bit tender about some of the things that had been said regarding his son at the meeting.

"He's a good kid really," he confided. "He cycled all the way to Birmingham this morning to get that rocket."

"Yes, he's a good kid," I agreed. I felt that I could afford to be generous. The problem of Amos had been solved.

"It's a funny thing," ruminated Job, "but he's never bust one of my models. It's just hard luck that he can't seem to help walking into other people's 'planes."

"Something had to be done," I said, thinking of the table I was carrying. After taking this trouble, I meant to see that Amos was kept in a safe place this afternoon.

But neither of us knew what was in store for us.

As a matter of fact, things went well right up to the moment of the last event. Amos had kept to his post, with his feet tucked safely beneath the table. So impressed was he with his own importance, sitting behind the table and the papers, and half the juvenile population gaping at him, that there was never the slightest chance of his running berserk, however close a model came to him.

(Continued on opposite page.)

THE BLACKBURN "ROC" (British).

Manufacturers: Boulton Paul Aircraft Ltd., Wolverhampton.

Purpose: Two seater Fleet fighter. A replacement type for the Hawker "Osprey."

Origin and Development: First appeared in 1939 as a development of the Skua for fighter duties only. Most important modification was the power-driven turret for the rear gunner in place of manually operated installation.

Power Plant: One Bristol Perseus XII motor. Maximum power, 905 h.p. at 2,750 r.p.m. at 6,500 ft. Cruising, 715 745 h.p. at 2,400 r.p.m. at 6,500 ft. Take-off, 815 h.p.

Construction: Wings—Two Alclad box-spars with Z section stringers and stressed-skin covering. Water-tight compartments and Zapp flaps. Folding type. Fuselage—Metal monocoque structure in two sections, joined just forward of fin. Alclad frames and stringers carrying flush-riveted plating. Two water-tight compartments. Tail unit—Metal framework, metal covering but fabric-covered control surfaces.

Dimensions: Span, 46 ft. Length, 35 ft. 7 in. Height, 12 ft. 1 in.

Weights and performance: Not released.

Armament: Four machine-guns concentrated in rear turret.

Equipment: Deck landing arrester hook. Catapult launching gear attachment points.

Remarks: May also be used as a floatplane for use with cruisers, etc. It will be noticed that the wing-tips of the Roc are not swept upwards like those of the Skua.

Photo by courtesy of "Flight."

First production Rocs were left the silver finish of the Alclad covering, and red, white and blue cockades were painted on fuselage sides and above and below wings. Recently, however, these machines have been shadow-shaded on the upper surfaces and painted "duck-egg" blue on the undersides. On the fuselage the camouflage extends nearly to the wing fillet, the rest being pale blue finish. Some machines have all the fuselage camouflaged. The red and blue cockades are carried above the wings, some distance from the tips, while red, white and blue rings are painted beneath each tip. As is the case with the Skua, the system of cockades on the fuselage varied considerably on the early machines. Sometimes red and blue cockades were outlined with a wide yellow ring, or red, white and blue rings were surrounded with a yellow ring. The latter system is now standard.

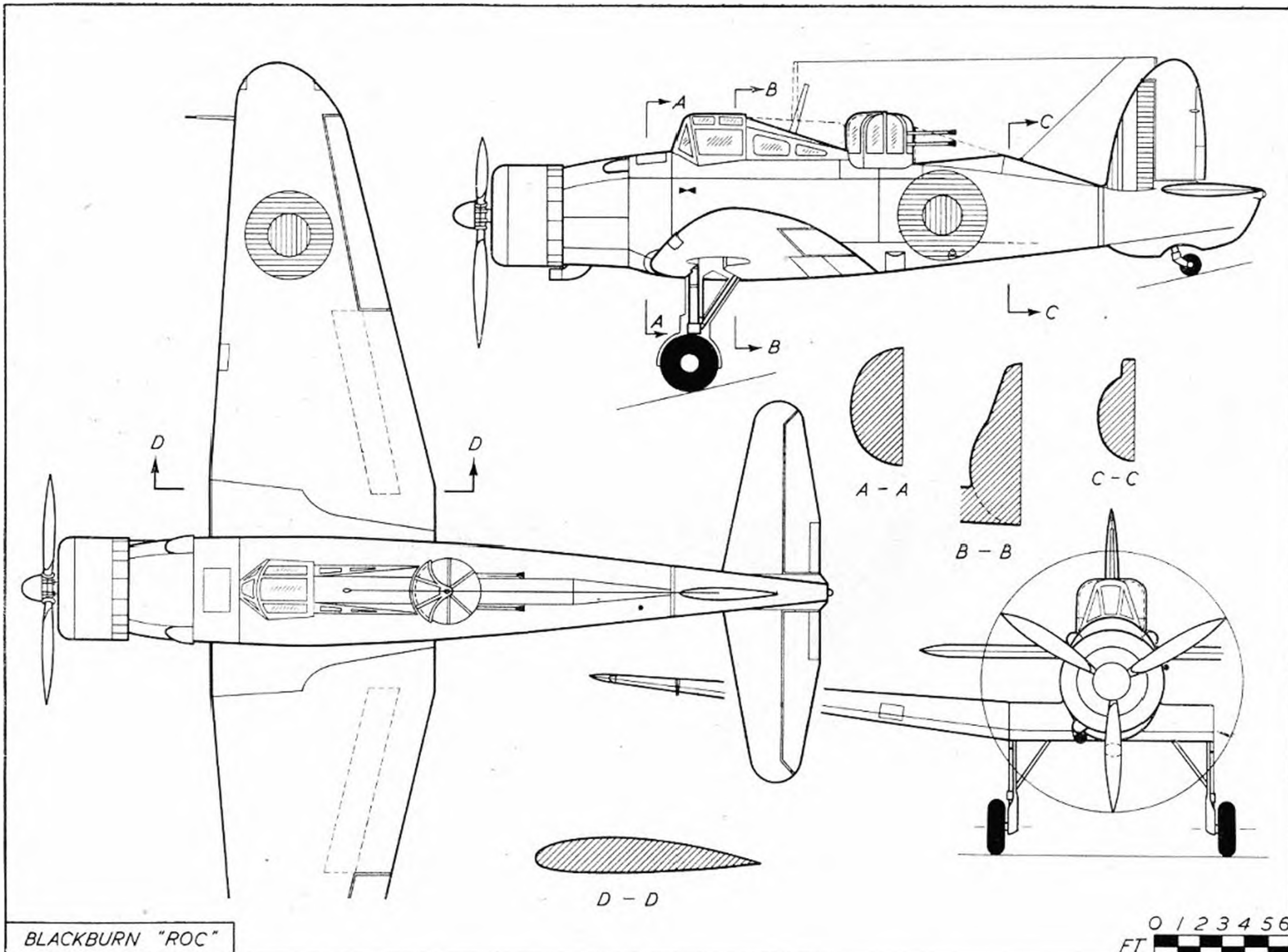
Before the light blue undersides became standard for Fleet fighters, certain Rocs were painted light grey under the starboard wing and black under the port. No cockades appeared beneath the wings. This system has now been abandoned completely.

Recent production Rocs have only the decking of the fuselage shadow shaded, the rest being "duck-egg" blue. The light section meets the camouflage section near the top of the cockade on the side of the fuselage. The yellow ring is carried right round the cockade, even on the light section.

The vertical red, white and blue stripes are painted on the fin of all machines. The rudder is sometimes camouflaged, but on most recent machines it is light blue like the undersides.

Certain unit markings were often painted on the fin before the stripes became standard. One machine had the markings "L6R" in black on the fin, with the "L" above the number and the "R" at the bottom.

The serial number, in black, is painted on the sides of the fuselage only. It is generally very small. The spinner and airscrew are all-silver finish. When floats are fitted they are painted the same shade as the undersides of the machine.



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BLACKBURN "ROC"
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S.M.A.E. REPORT

Notes on a meeting of the Emergency Committee, held on Saturday and Sunday, November 9th and 10th, at "Crossways," Staunton Road, Oxford.

There were present: Mr. A. F. Houlberg, F./O. P. R. S. Gutteridge, Messrs. C. S. Rushbrooke, C. A. Rippon, A. G. Bell, M. R. Knight, L. J. Hawkins.

The hon. secretary, Mr. E. F. H. Cosh, had been called up for duties in the Air Force before he had prepared the Minutes of the last meeting. Mr. Cosh's rough notes were amplified by the press secretary's report.

It was decided that the complete Minutes should be prepared by the chairman from these notes, and duly signed as a true report of the business conducted at the Royal Aero Club on September 1st.

Arising from the Minutes, Mr. C. S. Rushbrooke reported that the S.M.A.E. Fighter Fund on November 9th stood at £122 17s. 10d. A hearty vote of thanks was accorded to the Woking Club for their sporting action in combining their Fighter Fund with that of the S.M.A.E.

Mr. Rippon explained the difficulty of raising money for the fund in the London district during the winter months owing to the restricted activities imposed by air raids.

It was proposed by Mr. Rippon and seconded by Mr. Knight that the Committee record their very keen appreciation of the services rendered to the Society in the past by Mr. Cosh. They wished him every success in his Service career, coupled with a safe and speedy return to the model movement, for which he has done so much. This proposal was carried unanimously.

A discussion on the important question of the venue of future meetings, and the advantages of meetings in London or the provinces were reviewed in detail. It was decided that future meetings should be held in London on Sundays, at 10 a.m., so long as circumstances permit and when the business of the Society demands. It was also agreed that an alternative meeting place should be arranged, to guard against failure of contact between members of the Emergency Committee as the result of the inability to approach the meeting place due to enemy action.

Mr. D. A. Russell has since offered his house at Highgate for the use of the Emergency Committee. His offer was warmly appreciated and he was accorded a vote of thanks.

Mr. Rippon raised a number of points concerning the editorial and distribution of the *S.M.A.E. Journal*. After some discussion, it was proposed by Mr. Knight and seconded by F./O. Gutteridge that Mr. Rippon be appointed Editor of the *Journal*, with direct access to all sources of information concerning the Society's business. The Editorial Committee, now being redundant, was dissolved.

Mr. L. J. Hawkins, the Treasurer, announced that he had transferred the Society's account from Tottenham Court Road branch to the Torquay branch. The Treasurer's action in this matter was endorsed by the Committee. Mr. Hawkins pointed out that this would save him considerable amount of work in correspondence, etc.

The Kendal Model Aero Club, with seventeen members, was affiliated.

The following clubs were reaffiliated:

Torquay Model Aeroplane Club.
Batley and District Model Aeroplane Club.
Fairey Aviation Co. (Heaton Chapel) Sports Club.
Hayes and District Model Aeroplane Club.
Fife Model Aero Club.
Salisbury and District Model Engineering Society.
Northern Heights Model Flying Club.

The Committee then discussed the 1941 competition programme, and it was finally decided that the 1940 competition programme should be retained for next year, with the exceptional of the National Cup, which should be decentralised and held under the old rules, namely, four to a team, etc.

The advisability of standardising the pole heights and line lengths used for round-the-pole indoor flying was discussed at length. In conclusion it was suggested that two classes should be instituted.

Class "A."—Pole height, 6 ft. Maximum line length, 12 ft. Maximum model weight, 2 oz.
Class "B."—Pole height, 3 ft. 6 in. Maximum line length, 6 ft. Maximum model weight, 1 oz.

Suggested rules for a contest were also discussed.

The meeting then adjourned at 10.30 p.m. until Sunday, November 10th, 1940.

At the resumed meeting, on the morning of November 10th, the important question of the appointment of a secretary to replace Mr. Cosh was discussed in great detail. Willingness to accept the office of acting secretary had been received from Mr. H. York, Mr. A. Bell and F./O. Gutteridge.

After a careful consideration of the points involved, the following resolution was put forward: That Mr. York be appointed as acting hon. secretary. This was carried unanimously.

As a result of a discussion on the overlapping of certain official duties in the past, it was proposed by Mr. Knight and seconded by Mr. Bell that the question of the duties of the various officials of the Society be clearly defined at the annual general meeting.

The meeting then closed at twelve noon with expressions of thanks to the chairman and Mrs. Houlberg for their hospitality during the Committee's visit to Oxford.

H. York,
Hon. Press Secretary.

Notes on a meeting of the Emergency Committee, held at the Royal Aero Club on December 8th, 1940, at 10 a.m.

There were present: Messrs. A. F. Houlberg, A. G. Bell, D. A. Gordon, M. R. Knight, C. A. Rippon, C. S. Rushbrooke, J. C. Smith, T. Wickens, H. York.

As Mr. Houlberg was delayed on his journey from Oxford, the hon. vice-chairman, Mr. A. G. Bell, occupied the chair until Mr. Houlberg's arrival.

The Minutes of the previous meeting were read and confirmed.

Arising from the Minutes, it was decided to leave the preparation and distribution of the *Journal* in the hands of the Editor, Mr. Rippon.

At this juncture, Mr. Bell vacated the chair in favour of Mr. Houlberg.

Alterations and additions, bringing the number to twelve, was made in the timekeepers of the Northern Heights M.F.C.

The Mersey Model Flying Club, with ten members, and the Aldenham School Model Aircraft Club, with eleven members, was affiliated.

Mr. York stated that he had received one or two letters asking for S.M.A.E. transfers. These enquiries contained no information that they came from members of affiliated clubs. The Committee did not feel that it was advisable to distribute these transfers to anyone who liked to write in for them. It was therefore decided that in future these transfers should only be obtainable through affiliated club secretaries.

Mr. Rushbrooke announced that the S.M.A.E. Fighter Fund on December 6th had reached a total of £174 17s. 4d. The Committee suggested that a Christmas reminder should be sent round to all clubs.

It was decided to retain Mr. Cosh's telephone up to the end of the March quarter, as the Society sometimes had reason to get in touch with Mrs. Cosh quickly.

Mr. J. C. Smith, the competition secretary, explained that the Biplane and Plugge Cup results had been inadvertently held up, as his house had been bombed. His new address is 9 Westwood Gardens, S.W.13. He hoped to find the papers concerned in his damaged house, when he would pass them on to the press secretary as usual.

The Committee then discussed the decentralised indoor round-the-pole contests. It was finally decided to hold competitions in February, March and April, 1941. The maximum height of pole and length of line to be as laid down at the previous Committee meeting. All models must be R.O.G. Where a model makes one circuit of the pole without leaving the ground, this to be considered as one flight. There will be two flights per competitor. Clubs can organise these competitions any time during the month, and as many times as they wish, the three best flights of the month counting as the club's score. The entrance fee per club per month will be 2s. 6d.

The results must be sent in to Mr. J. C. Smith by the 14th of the month following the competition. A stamped addressed envelope must be sent to Mr. Smith for acknowledgment of receipt. Prizes will be awarded.

The Committee then decided to draw up constitutional rules of the S.M.A.E. Mr. Bell kindly undertook to go into details of these. They will then be considered at the next meeting of the Emergency Committee, which will be held on January 12th, 1941.

The Committee decided to hold the annual general meeting of the Society on February 9th, 1941.

The meeting then discussed the agenda for the A.G.M., and it was decided that as the Society, at the moment, is lacking of a President, Mr. Houlberg should be asked to take the chair at this meeting. The Committee considered one or two gentlemen who should be asked to become President. Mr. Rippon and Mr. York promised to go into this matter before the A.G.M.

The meeting closed at 1.30 p.m. with a vote of thanks to the chair, coupled with the thanks of the Committee to Commander Perrin and the Royal Aero Club for granting the S.M.A.E. facilities to hold the meeting.

H. York, *Hon. Press Secretary.*

THE S.M.A.E. FIGHTER FUND

SINCE the appearance of the last list of contributions to the fund a number of clubs have forwarded what I hope are the first of many donations, and we see a nice increase of £74 10s. above the previous figure.

This is very gratifying, but still far short of the sum we all looked forward to, and I trust that all clubs and individuals are putting their best foot forward and rattling the collecting box to good purpose. Remember, this is not an affair that is on to-day and finished to-morrow—I feel we can go on collecting for as long as the necessity lasts. As long as fighter aircraft are needed to put the wind up the Messerschmitts and Heinkels, so shall we need to provide the R.A.F. with more and better types of machines, and we, as enthusiasts with " air " in our blood, should be the most diligent of collectors in the good cause.

Don't forget the first-class model to be purchased, as mentioned last time. I have had a number of offers, but I look forward to even higher bids. (No—I'm not telling you what has been bid so far ; I'm too good a " bookie " for that !). So let's see if we can get a bumper offer over the Christmas holidays and swell the fund by a suitable amount.

Clubs will have received a special envelope for Christmas collections, and should any individuals care to have one of them they can do so with the greatest of pleasure on forwarding me a stamped addressed envelope to The Aero-Modeller offices.

Don't forget to forward any bright ideas for distribution to the other clubs, and in the meantime " Keep At It."

C. S. Rushbrooke,
" Fighter Fund " Secretary.

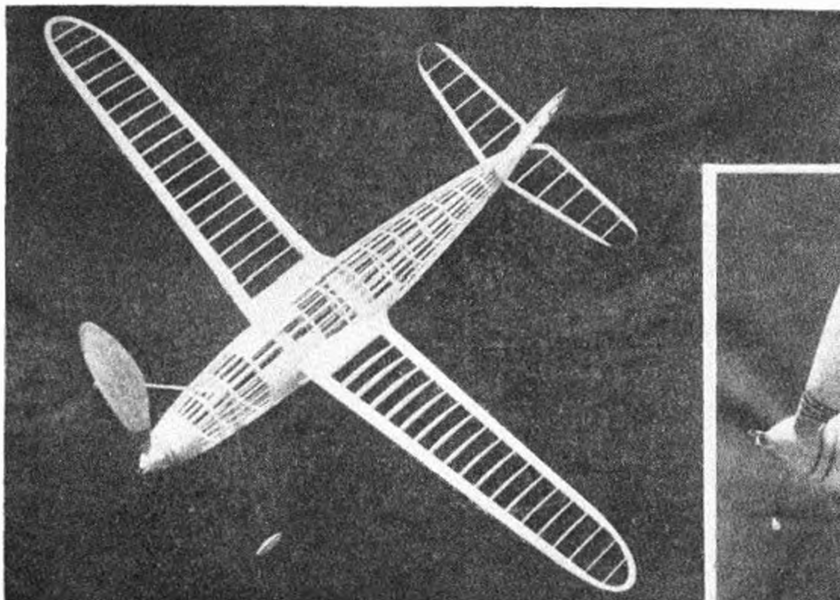
List of contributions up to December 6th, 1940 :

	£	s.	d.
Acknowledged	110	14	1
Batley and D.M.A.C.	15	0	0
E. Keil and Co.	10	10	0
*Norwich M.A.C.	11	5	0
Beverley and D.M.A.C.	8	0	0
Halifax M.A.C.	5	0	0
*Woking and D.M.A.C. (second contribution) ...	4	14	6
Stockton-on-Tees M.A.C.	4	7	3
Stockton-on-Tees M.A.C. (second contribution) ...		9	0
E. E. Fraser	3	0	0
Westland (Essex) M.A.C.	1	17	3
*Leamington and Warwick M.A.C.	1	5	0
Lewis's (Manchester)	1	1	0
Reading and D.M.A.C.	1	1	0
Southwick M.A.C.	1	0	6
V. Wright	1	0	0
Salisbury and D.M.E.S.		17	0
J. M. Milner		15	0
Whitstable, Tankerton and D.M.A.C.		10	6
*F/O Allis		10	0
Brighton D.M.A.C.		10	0
Skybirds (374) M.A.C.		10	0
Egham and D.M.A.C.		5	0
A. Palfrey		5	0
*W. Titcombe		5	0
B. D. Stead		3	6
H. Gresley-Hinton		2	6
M. W. Harber		2	6
J. Peate		2	6
T. E. Taylor		1	6
J. R. Evans (California)		1	3
J. Babbs		1	0
A. Lewis			6
	£185	7	4

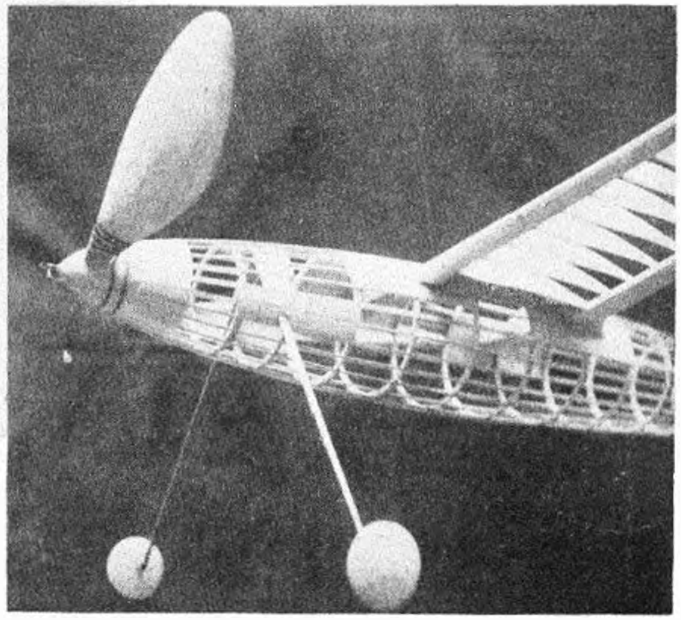
* Via Woking and D.M.A.C.

CLUB NEWS

By "CLUBMAN"



A fine effort by Jose Da Silva, a Portuguese reader of THE AERO-MODELLER. *The model is, of course, the "Copland's Wakefield," and unfortunately the photos arrived just too late for entry into the special competition. The photos show exceptional workmanship, and our foreign friend is to be congratulated on a fine model well built.*



BRRRR—gets parky, doesn't it! We seem to be getting it with a vengeance where I hang out, and that curse of all flyers—*fog*—is making its murky appearance. Still, I suppose we shall just have to grin and bear it, and get down to a spot of building again.

Do you know, I have done less building this year than ever before, and it's not because I haven't wanted to. I seem to have been pushed about from pillar to post, and haven't had time to breathe. (Who said, "Good"?) However, with the advent of winter, and the cutting down of duties in the Home Guard, I feel I shall have a bit more time to myself, and I am now planning many new and radical designs that will put the wind up all my aero-modelling pals! Trouble is, they never seem to perform as they should, and by the time I've finished hacking bits off here, and sticking bits on there, they never seem to bear any resemblance to the beautiful design that appeared on the drawing board. Ah me, what it is to be born handsome instead of lucky!

A point raised by an American contemporary the other day interested me—and I thought it worth while enlarging on it for you wallahs. In a nutshell, he asks for more originality in model design, and says: "Too many folk are thinking alike and acting alike in building and flying their model aircraft. Why, its getting so, original design craft are almost as scarce as hen's teeth—and we haven't seen hen's teeth in a dog's age."

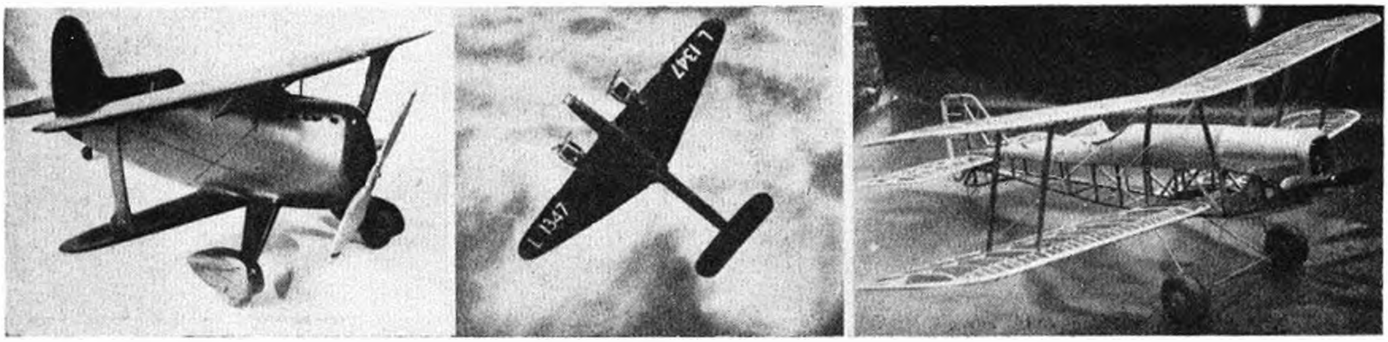
Well, you know, there's a lot in what he says, and while I think we can claim to have more chaps producing original designs here than in the States, there is still a large tendency to follow my leader, and if John Willie Winterbottom builds a successful model all his little pals go and do likewise.

These remarks, of course, do not apply to the newcomer to the game. We realise that the beginner has to follow the expert for a start; but I do think the more advanced fellows could show a bit more initiative, and bring out a design that is not a combination of two or three well known designs, masquerading under a high-falutin name. Yes, I know I shall get the answer, "Well, what are *you* doing about it?" But there, how can I bring out a super-super streamliner, and give myself away by putting my name on it? Be fair, thou good flyer, and let him hibernate who would!

I don't suppose many of you get the chance to study conditions and happenings overseas these days, but I can tell you there is a very strong movement going on in the States to bring the control of aero-modelling much into line with our own activities. The A.M.A. (Academy of Model Aeronautics) is promoting the policy of "Fly-your-model safely," and has for its motto, "By the modellers, for the modellers."

This you will note ties in very much with our own system, whereby the control of the hobby is given over to a body of aero-modellers, as distinct from a Government department, usually managed by someone who doesn't know a thing about the hobby. (Bet I cop out for that!) Obviously, though, it is naturally far better for control to be handled by those to whom the game is their hobby rather than their livelihood, and it is a fillip to us over here to note the way our American friends have adopted very largely our own way of running things. Obviously, in many details, there is a fairly big difference between us, as the commercial tie-ups over the Herring Pond are much stronger than here, but it is good to see such determined efforts to keep the control of the sport in the hands of those who understand the modellers' requirements, and can act accordingly.

I am not claiming any kudos for our own S.M.A.E., but I think it worth noting that their policy, formed some time ago, has been followed so closely by our friends. The request to follow a few simple rules when flying petrol-driven models to ensure the safety of the general public—and ourselves—has proved reasonable, and the main thing is it was adopted by a very large majority of the aero-modellers over here, even though the committee had no



(Left to right) A tip-top piece of " solid " work by A. Wigdahl, of Garston, the model being a 15 in. replica of the " Payne Knight Twister." The " Hampden," built from THE AERO-MODELLER *plans by R. Briault, of Brighton. A beautifully constructed petrol-powered S.E.5, built by H. E. Vaucells, of the Leeds M.F.C.*

method of enforcing any rules they might adopt. Naturally, as in everything else, we found the irresponsible few who saw no reason why they should not chuck their models about with no consideration to others, but I feel that the chaps with the hobby really at heart found no objection to the reasonable request to be circumspect. After all, isn't it far better to be careful than sorry, and no one wants to see the hobby brought under official supervision.

Whilst on this subject, I think it is about time that certain persons were answered on a very pertinent question. I have had it said to me on a number of occasions, " Why don't the S.M.A.E. do this?" " Why don't they do that?" " When are they going to fix this up for us," etc., etc., etc. My main reply to these criticisms is that all the work carried out by the S.M.A.E. officials is in a purely honorary capacity, and after all (especially in these times) one has to look after one's business affairs first, and I don't think any of us have the right to complain if this is done.

Many of the committee are engaged on work of very distinct national importance, and it is no easy matter to arrange a meeting that is convenient to all the members. This fact, coupled with the obvious difficulty of meeting in London under current conditions, has not made for the usual efficient meeting of the committee, but I am given to understand that many of the difficulties have been overcome now, and we can look forward to a better working in future.

Don't think I am firing bullets provided by someone else—these are purely my own personal observations. My biggest grouse is against that cocky few who are always full of criticism of what others are doing, but do nothing themselves! Unfortunately, there are too many of these blighters, and they sit up on their hind legs and bleat for this and that, and run like rabbits when they are offered an official position. However, I hope that the annual general meeting will see less talk and more action from some of these grousers.

By the way, didst hear tell of the aero-modeller who offered to give a lecture on models to the Home Guard in his area? And now he is so full of " dates " he can't find time to build a blinking model! And the chappie who studiously locks his balsa stock in the safe every night? (And that's not so daft as you might think! Methinks we shall soon be back to the old days of Silkanspruce—if we can get any silk, and if we had any spruce. Woe is me).

What do you think of our " heading " piece this month? I think most of us forget there are such places as Portugal, etc., when we think of aero-modelling, but the photos shown are a good indication of the ability of some of these chaps. Also, it is good to see intelligent photography combined with a good model. How often is a tip-top model denied its rightful representation in these columns owing to photography that can only be classed as lousy. Hang it all, how long does it take to hang a sheet or similar article as a background to the model—and how often do we see a collection of tin cans, or the rockery-cum-garage door. Makes yer fair weep it do!

Incidentally, if it takes an ounce of strip balsa to make a good duration model, how many light weights can you get out of a pre-war " gas job " ? Again, how many hairs are there in a dope brush? What are the propeller sellers

The Northern Heights M.F.C. all ready for a good day's flying.

saying now the chaps make two from one? Has the originator of "R.T.P." flying got a cure for swivel neck? If a club can appoint its own timekeepers, who tests their eyesight? If a sheet and a half of tissue covers a model and a half, how many wrinkle erasers are there in a pint of water? With the average "club membership-duration" sticking around the minute mark, how much better were the old-stagers, who did that and more without balsa and tissue? With razor blades being the best tool for cutting balsa, how many nicks does papa's face collect to one model?

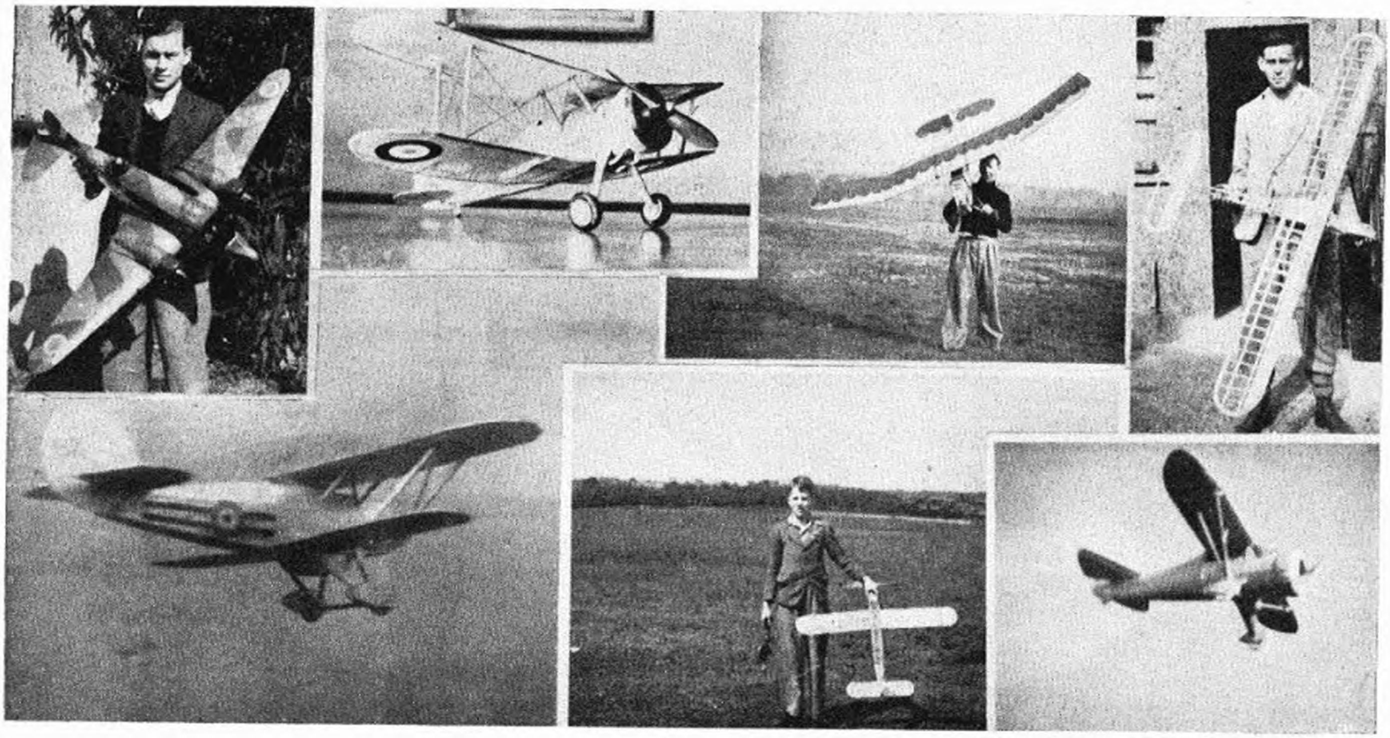
Daft ain't it—but it makes yer fink!

And so, down to brass tacks once again, and let's see what you have all been up to this past month.

First report is from the BATLEY AND D.M.A.C., who report that they have had to cancel indoor flying owing to lack of a suitable hall, but have substituted a series of lectures. These chaps staged an exhibition and a dance in aid of the "Fighter Fund," and have collected the sum of £15—which I reckon is jolly good going. (I note that more clubs are showing a spot of activity in this direction this month, and look forward to even greater efforts in the future. I should like to see the fund growing faster, but suppose we shall see a boost once the better weather comes along).

The Batley fellows ask if the authorities have been approached regarding the "pole flying" of petrol models. I do not have any definite information, but don't hold out much hope. After all, the Air Ministry was definite enough about the total ban of petrol flying—and I can't see any way round it. So just be good, and let things be, otherwise, as the Americans say—*or else!*

It is good to hear of a new club, and counteracts the one or two instances of suspension of activities. A band of chaps have formed the ST. HELEN'S M.A.C., and interested parties are asked to contact the secretary, Mr. E. Ball, of 2 City Gardens, St. Helens, Lancs. Fortunately, a good flying field has been secured—(struth, how did you wangle it?)—and it is suggested that the neighbouring Southport and Liverpool get in touch with a view to fixing up inter-club meetings.



Top (left to right) V. E. Brooke, of the Witney and D.M.A.C., with his "Airspeed Oxford," developed from the plans of the "Envoy" he obtained from The Aero-Modeller Plans Service. How's this for a second effort? A fine "Gloster Gladiator," constructed by R. G. Davies, of Barbourne. J. Williams, of the Offerton M.A.C., with his "Miss Philadelphia." A member of the Woking and D.M.A.C. with a 6 ft. glider under construction.

Bottom (left to right) The "Hawker Fury," built by L. A. Swindale, of Hanwell. 13-year-old G. Pike with his duration model, best time to date 119 sec. Action shot of the "Mr. Mulligan," built by Mr. Wilson, secretary of the Mersey M.F.C.

Another newly-formed club, the WITNEY AND D.M.A.C., report steady progress, and thank the members of the Oxford club who visited them, and provided some good competition. The club record is held by F. Humphries with a time of 90 seconds.

The WIRRAL M.A.S. has had its field effectively "wired up," but they still hope to continue flying. It is hoped to fix up meetings at the local Y.M.C.A., though current "excitement" does not contribute to attendances!

Seventy models were on show at the exhibition staged by the ST. IVES M.A.C. in aid of the local "Spitfire Fund," and the sum of over £8 was collected.

These chaps ask for particulars of affiliation to the S.M.A.E., and I would refer them to the Secretary, Mr. H. York, 23 Tyson Road, Forest Hill, London.

Will those interested in the Loughborough district please get in touch with the secretary of the newly formed club there, Mr. F. Brown, 38a Sparrow Hill, Loughborough.

I have a plea this month from D. P. Robinson, formerly of Crewe, and now stationed at "Blenneville," Little Waltham, nr. Chelmsford. He asks that someone in his new location will get in touch with him, as he misses his model-

ling like h——. So what about it you Chelmsford fellows?

The members of WOKING AND D.M.A.C. are nothing if not versatile. In addition to busily running around getting subs. for the Fighter Fund (see special list), they have been running a scale model competition for juniors, which has stimulated great local interest in a certain shop window, where the public are wont to gather to gain free information on the recognition of aircraft. Some of the better exhibits were sold to swell the fund. (In this connection it is hoped to hold a flying scale competition after Christmas). In Class 1 a really fine job, complete with split flaps and a fully-feathering airscrew, of a Hurricane carried first award, while in Class 2 for rough kit models a Do.215 and a Hampden could not be split by the judges, who incidentally were members of the R.A.F. Observer Corps.

In far from ideal weather, the competition for the MERSEY M.F.C. "Pilot Cup" was won by Len May, flying an "Ajax," for a total time for three flights of 238·8 seconds. J. Wilson, the runner-up, totalled 207·2 seconds. Mr. Elwell, of THE AERO-MODELLER, was an interested witness, and helped with the timing of flights. These chaps have been entertaining a number of R.A.F. fellows lately—a suggestion I pass on to other clubs.

At the annual general meeting of ULSTER M.A.C. there was a poor turnout of members, 32 being present out of a total of 76. Members please note!

The secretary and treasurer's report was loudly applauded when he stated the club had a balance of £10. This is very encouraging for the start of a new season.

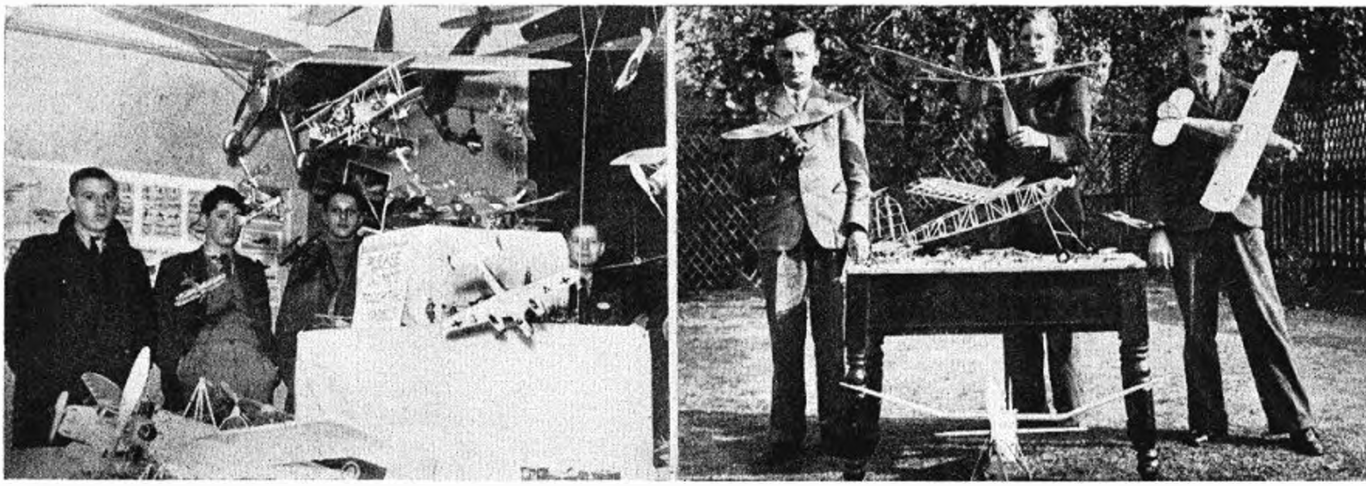
Two flying grounds have now been obtained at Mallusk and Malone. All competitions, of which there are many, are to be decentralised. The first meeting is to take place at the end of March. New programmes it is hoped will be ready in time for the presentation of cups and trophies, which takes place at the end of this month.

W. A. Martin outlined the activities for the coming season very fully. Much discussion took place over the awarding of points for the Efficiency Trophy. E. Bingham gave the details of a new method of awarding points, which was adopted. Dividing the club into flights was proposed by E. Little. Flight leaders are to be appointed, and to have four members whom they will instruct and help in their model building. Further particulars of this will be known next month.

A club-room is being prepared in the centre of the city where members can meet and build to their heart's content. It is regretted by all Ulster aero-modellers that their brother builders across the pond are not as fortunate as they, as the "Nawzeys" had fortunately not caused any interruption in their activities.

The WOLVERHAMPTON GRAMMAR SCHOOL M.A.C. is run by a committee of six boys, with two masters in charge. A very successful exhibition was staged in the school workshop. This show was seen by the manager of a

"ONLY TWO MORE DAYS TO THE COMP."



(Left) An exhibition of models staged by the Batley and D.M.A.C. in aid of the "Fighter Fund." (Right) Members of the St. Ives M.A.C. with a few of their models.

large local store, the result being that the show was transferred to the store for two weeks, and over £22 collected for the Red Cross in consequence. Good work! The club duration record is held by E. S. P. Evans with a time of 147 seconds, while D. G. Parkes holds the R.T.P. record. (This chap has had excellent success with "Disruptors" on his Round-the-Poler).

Indoor flying is going ahead with the LEICESTER M.A.C., and a number of successful meetings have been staged recently. E. Powdrill won the first competition with a time of 46 seconds, but durations are expected to rise when more experience has been gained with this type of flying. John Klee won the following meeting. "Rushy" gave a demonstration of microfilm flying, but the small hall and low ceiling did not allow of a proper flight, and one of many obstructions put paid to the exhibition by puncturing the covering of one wing.

At an exhibition staged at a local store, some 86 models were on show, the winners of various classes being:

Solid Scale: K. Plowman.
Flying Scale: E. Powdrill.
Duration: D. J. Dawson.

A committee meeting was brought to an abrupt close by a shower of incendiaries on and near the premises, and the "chin waggers" turned firemen for a hectic five minutes! There are rumours that "Rushy" is to build a rocket 'plane with the fins he collected from various bombs.

The last outdoor competitions of the season staged by the HUDDERSFIELD M.A.S. resulted in wins for R. Calvert (Duration) with a total time of 323 seconds, and E. Bateman (Gliders) total time of 188·4 seconds. Bateman was runner-up in the duration event with 306·5 seconds, while D. Bower was placed second in the gliding with 150 seconds. Negotiations are going ahead for indoor flying, and it is hoped to keep the members interested for the winter months.

The LIVERPOOL M.A.C. wish to draw attention to their new club-room, in a fine basement, where they carry on in spite of raids, etc., and cry "Phooey" to Hitler and Co. The address is 31 St. Domingo Grove, Liverpool 5, and all interested are asked to pay a call.

The 7th annual general meeting of the NORTHERN HEIGHTS M.F.C. was held and, for the first meeting of its kind held "out of town," was very well attended. The secretary's report showed them to be in a stronger position than ever, in spite of the war, 95 new members having been enrolled in the past year—a record. Many members have, of course, had to resign for many and varied reasons, but the membership now stands at 178, an extraordinary total compared to some clubs.

For services rendered, Mr. C. A. Rippon was unanimously elected a vice-president, and Mrs. "Rip" awarded an honorarium. Very few changes were made in officers for the coming year, and the new committee held its first meeting the following week, when it was decided to form a section of the N.H. club at Welwyn Garden City, under the able guidance of Mr. C. R. Clarke, the originator of the idea.

Yet another new club has been formed in Loughborough, under the title of the LOUGHBOROUGH COLLEGE SCHOOL M.A.C., the secretary being G. T. Mayer, of 98 Beacon Road, Loughborough. (May I suggest that it would be a good idea for these two new clubs to meet and co-operate and possibly amalgamate. I think it tends to strengthen both clubs in such circumstances).

The first annual general meeting of the HULL AND D.M.A.C. was held with about forty members in attendance. The club-house, which I am told is a super affair, is open three nights a week and throughout the week-end, and beginners' classes are being held in an effort to start the newcomers on the right track.

Most of the WHITSTABLE, TANKERTON AND D.M.A.C. are busily engaged on turning out models for the club "mass production for the Fighter Fund" scheme. A big exhibition is being held in a large showroom, and the attendance has run into the hundreds. The first of what is promised to be a long line of contributions to the fund has been forwarded to the secretary. In spite of all this "scale" activity, flying is still going on outdoors when conditions permit.

News from the LEEDS M.F.C. this month tells the results of the final competitions of the season, the lucky winners being:

Anderton Cup: H. E. Vauville.
Senior Cup: H. E. Vauville.
Junior Cup: Tie between P. Albericci and J. Miller.
Cup for the best Timed Flight: R. Heppenstall, 233 sec.

The club held its first exhibition in aid of the Fighter Fund, and hopes to stage another soon. Many models were on view, one of the most interesting being the "petrol" S.E.5, built by Mr. Vauville, a photo of which is reproduced in this month's columns. A press cutting referring to the show unfortunately gives the impression that *all* model aircraft are now banned from flying. Hope you can do something to rectify that misstatement, Leeds!

The KINGSTON-UPON-HULL M.A.C. send in their first report this month, and report steady growth. The club record is held by P. Fordham with the time of 125 seconds, and a busy winter programme is planned. The secretary, Mr. R. Barnes, would be pleased for interested parties to get in touch with him at 40 Hayburn Avenue, National Avenue, Hull.

Well, that's all the reports this month chaps, and it would seem that some Press secretaries' pens have run dry! Still, I can do with a rest now and then (Who said "always"!) so I'm not grousing. Quite a change from my usual struggle to cut down lengthy chatter without slaying the reports completely.

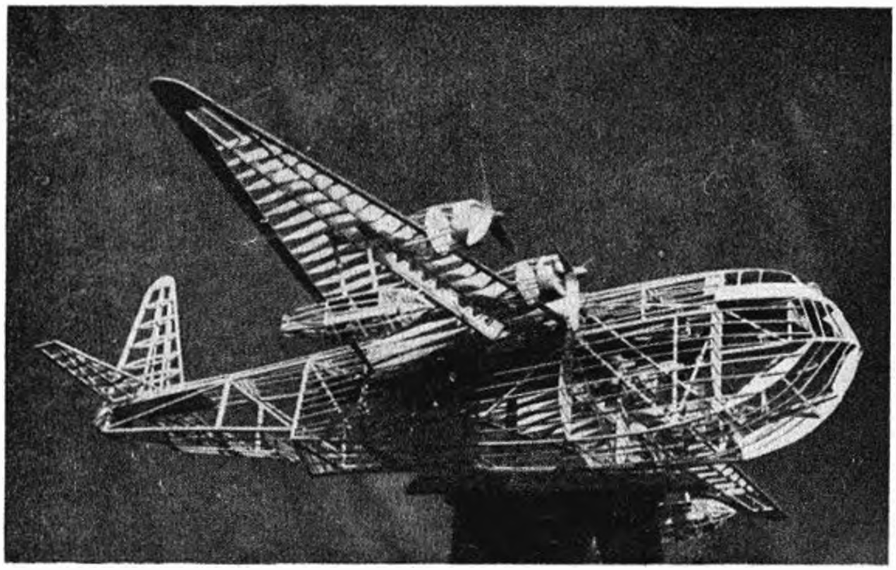
One last item before packing up, and that is the suggestion we have received for a revised list of clubs, names and addresses, etc., of secretaries. This will be most handy for members of the Forces who might like to contact fellow enthusiasts in their new locations, and I feel it high time we had a comprehensive list to refer to. So, will all clubs please forward *without fail, pronto*, and *sooner than that*, full particulars of their title, name and address of secretary or other person to whom correspondence should be addressed, etc., etc., etc.

Now, I'm not just making this request for fun—it's a serious request, and I hope it won't be treated in the manner some previous requests have been. (It is only a few weeks ago that the Editor wrote to some hundreds of addresses asking for confirmation of the continued existence of certain clubs, and—and this is no cod—he received replies from less than 10 per cent. Now, this is no way to conduct business, and I feel that some officials are not doing the job they should. Therefore, will all club members—whether of an affiliated club or not—please see to it that your club has been registered for inclusion on the new AERO-MODELLER roster to be published shortly. It's up to you—and don't start a moan when you find that you are a missing quantity. That is what happened last time the list was prepared—but hang it all, you can't blame the AERO-MODELLER staff for your own shortcomings.

So, will you please oblige me—and yourselves—by just sitting down for two minutes, using one postcard, a tiny drop of ink, and one 2d. stamp, and the great effort of dropping said epistle in the pillar-box. You don't maind—thanks!

Bungho, and more power to your elbows, whether it be inkslinging or mug-lifting.

THE CLUBMAN.



An ambitious effort by G. H. Bennett, of Coventry. Wing span is 56 in., and the four propellers are driven by pulleys from the central main motor. We are promised a photo of the finished article.

Small Traders' Announcements

The charge for these insertions is 5/- each prepaid for a minimun of 30 words, extra words charged at rate of 2d. per word.

ALDERSHOT. All Aeromodel supplies. Cloud. KeilKraft. Skyleada, Atlanta, etc. Post orders 6d. extra. Balsa, tissue, races, wire, bobbins, dopes, rubber, propellers and all accessories. E. Standing, 2 Short Street.

BERKHAMSTED. J. W. Wood & Son, 20 Lower King's Road. M.A.T.A. for Flying Scale. Duration and Solid kits by Cloud, Veron, Aeromodel, Keelbild, Penguin, Skybird, etc. Selected balsa and full range of accessories.

BIRMINGHAM Model Supplies, 96 Dale End and 61 High Street, King's Heath, have now stocks of all leading makes of flying, solid and duration aircraft. Also dope, cement, balsa, etc.

BLACKPOOL. The Sports Shop, Palladium Buildings, Waterloo Road. All model supplies. Joy, Studiette, Cloud, Drome, kits, balsa, cements, dopes; grand flying scale kits at 1s. 6d., including postage. Latest models, solids, duration. Remember "The Sports Shop."

BROMLEY. H. E. Hills & Son, 481 Bromley Road, Downham, 646 Downham Way, Bromley (Phone HIT 4197). Model aeroplane supplies. Dozens of kits, plenty of spares, miles of balsa.

CHISWICK, W.4. A. A. Baker, 526 High Road. Splendid selection of Atlanta, Aeromodels, Cloud, Club, Comet, Skyleada, Keelbild, Scalecraft, Truscale, Veron, Megow, Chingford, etc. Large stocks of balsa, blue prints, propellers and accessories. 'Phone Chiswick 3816.

CHISWICK, W.4. G. W. Jones Bros. & Co., 56 Turnham Green Terrace (Chiswick 0858). Stock balsa wood and cut special sizes as required. Agents for Club, Cloud, Aeromodels, Atlanta, Skyleada, etc. Large selection of solid scale kits and accessories. Penguin, Skybird, Scalecraft, etc. Caton's rubber, Joy-plane products.

DUMFRIES. Campbell's, 46 High Street. Penny stamp brings our price list. Balsa, stripwood, dopes, kits, all sundries. Skybirds, Skyryda, Aeromodels, Studiette, Tower, Comet; hand-painted tarmac paper, 9d. per sheet, post free.

EDINBURGH. Everything for the aero-modeller. All the leading models stocked. Joy-plane cements, dopes, Japanese tissue, ball races, etc. Wade & Co., 40 Chambers Street.

EDINBURGH. "Calling all aero-modellers." Whatever your requirements Frank Royle, 54 South Clerk Street, is at your service. Fullest range of kits, balsa wood, accessories.

EPPING. Chases of Epping for all flying and solid kits. Also strip and sheet balsa, dopes and all accessories. Remember! Let Chases of 190 High Street supply all your balsa requirements.

HARROW. A. H. Matthews, 15 Peterborough Road. For model aircraft supplies, balsa wood, cements, dopes, Japanese tissue, piano wire, celluloid wheels, plywoods and hardwoods of every description.

HERNE HILL, S.E.24. T. W. Standivan, 1 Milkwood Road. 'Phone BRI. 3741. For all model aeroplane supplies—Cloud, KeilKraft, Skyleada, Keelbild, Studiette, Veronite. All accessories. Postage 6d. extra. Open Sunday morning. Satisfaction guaranteed.

IPSWICH, Suffolk. A. J. Sneezum & Sons, 31-35 Norwich Road. 'Phone 2779. Model aircraft supplies, Aeromodel, Atlanta, Cloud, Elite, Frog, Skyleada, Studiette, Tower, Veronite, Penguin, Scalecraft, Skybird, Truscale kits. Caton's rubber. Joy-plane productions, etc.

LEICESTER. Aero-Modellers! C. Farmer can supply all your requirements. Kits, balsa, tissue, propellers, wheels, dope in bottle or sold loose, wire, cement. Caton's rubber, etc. Call and have a chat. The address is 183 Green Lane Road ('phone 2722). Also THE AERO-MODELLER in stock.

LEICESTER. Harper's, The Aero-Modellers' Stores. Over 1,000 kits to choose from. 34 Belgrave Gate and 67 Braunstone Gate.

LONDON, SYDENHAM. Toy and Model Shop, 15 Sydenham Road, S.E.26. Skyleada specialists. Other popular kits and all accessories, including plans, balsa wood, etc. Warship kits. Aircraft and warship lead models.

NOTTINGHAM'S Model Aero Shop. KeilKraft, Skyleada, Cloudcraft, Airyda, Frog, Atlanta kits. Joy-plane products, balsa and THE AERO-MODELLER in stock. Radet Electric, 21 Arkwright Street, near Midland Station, and 87 Wilford Road, near Imperial Cinema.

PRESTON, BLACKBURN AND DISTRICT AERO-MODELLERS. We have large stocks of balsa, sundries, first quality cement, solid, flying, scale, duration and galleon kits. Also THE AERO-MODELLER publications. George Eastham, 10 Stanley Street, Preston.

STAFFORD. Aircraft Models, South Walls, is just the place to call and see a good variety of models and obtain advice on the best way to buy from modellers like yourself.

STOCKPORT'S Aeromodel Shop. All materials and accessories in stock. Large range of kits Frog, Cloud, Studiette, KeilKraft, 'Drome, Tower, Chingford, etc. 54 Wellington Road South.

WILLESDEN'S leading aero-model suppliers. Woods Sports Ltd., 98 Chamberlayne Road, Kensal Rise, N.W.10. Comprehensive stocks of all kits, materials, prints, etc. Write for free catalogue. 'Phone LADbroke 1414. Buses Nos. 6, 46, 52, 70 stop at door.

WOLVERTON. A good range of scale and duration kits, Cloud, Studiette, Atlanta, Aeromodels, KeilKraft, Frog, Penguin, etc. Joy-plane cement and dopes, high-grade balsa and all accessories at Lake Bros., 28 Stratford Road.

WOLVERHAMPTON. Regent Cycle Stores for latest duration, flying scale and solids by leading makers. All Frog spares in stock. Balsa, cements, tissue, rubber. Expert advice given. Cleveland Street, Wolverhampton.

WOLVERHAMPTON.—The aero-modeller's rendezvous: Start & Sons, 61 Victoria Street. Kits by all popular makers. Selected balsa, spruce, cements, dopes, etc., and a complete range of materials and accessories.

WORCESTER. A. N. Cutler, Bridge Street. For balsa, dopes, tissues, elastic, propellers, cements, etc. In fact, all accessories for the aero-modeller. Stockist of 'Drome, Studiette, Skyleada, Scalecraft, etc. 'Phone Worcester 4137.