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O.S. Max II 29 5 c.c. glow	65/-
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Merco 35 6 c.c. glow ...	119/6
Merco 35 multi	152/-
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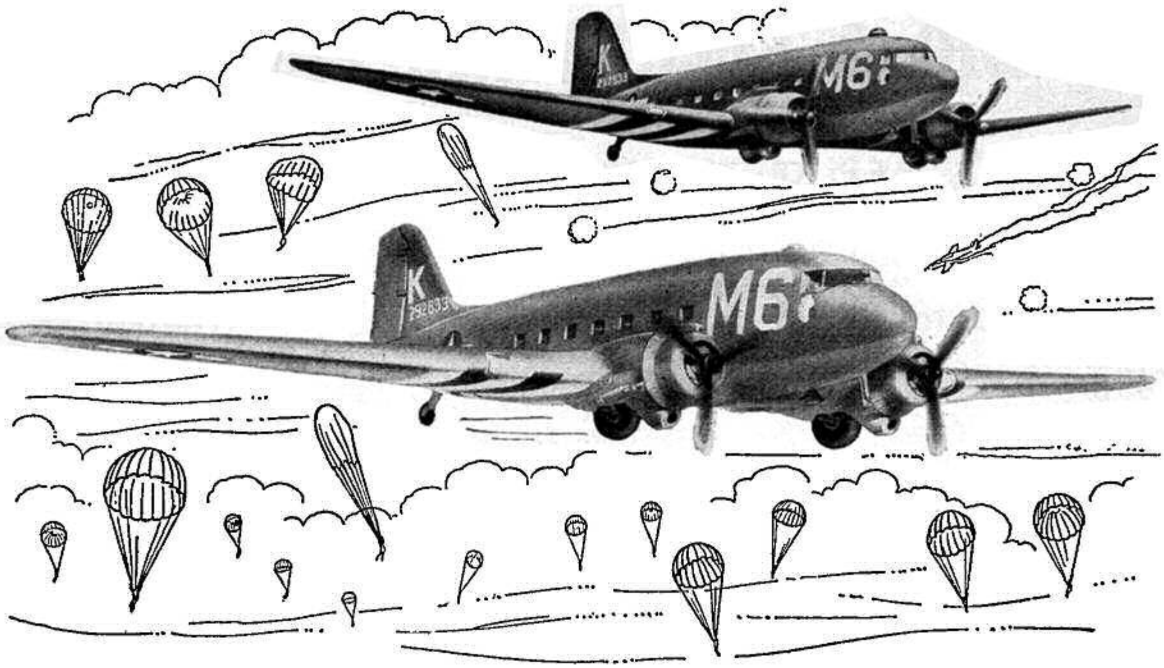

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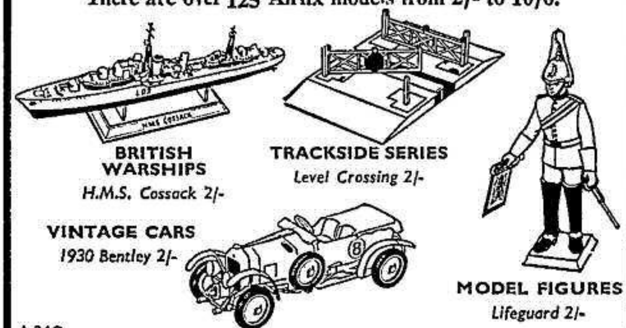

A.360

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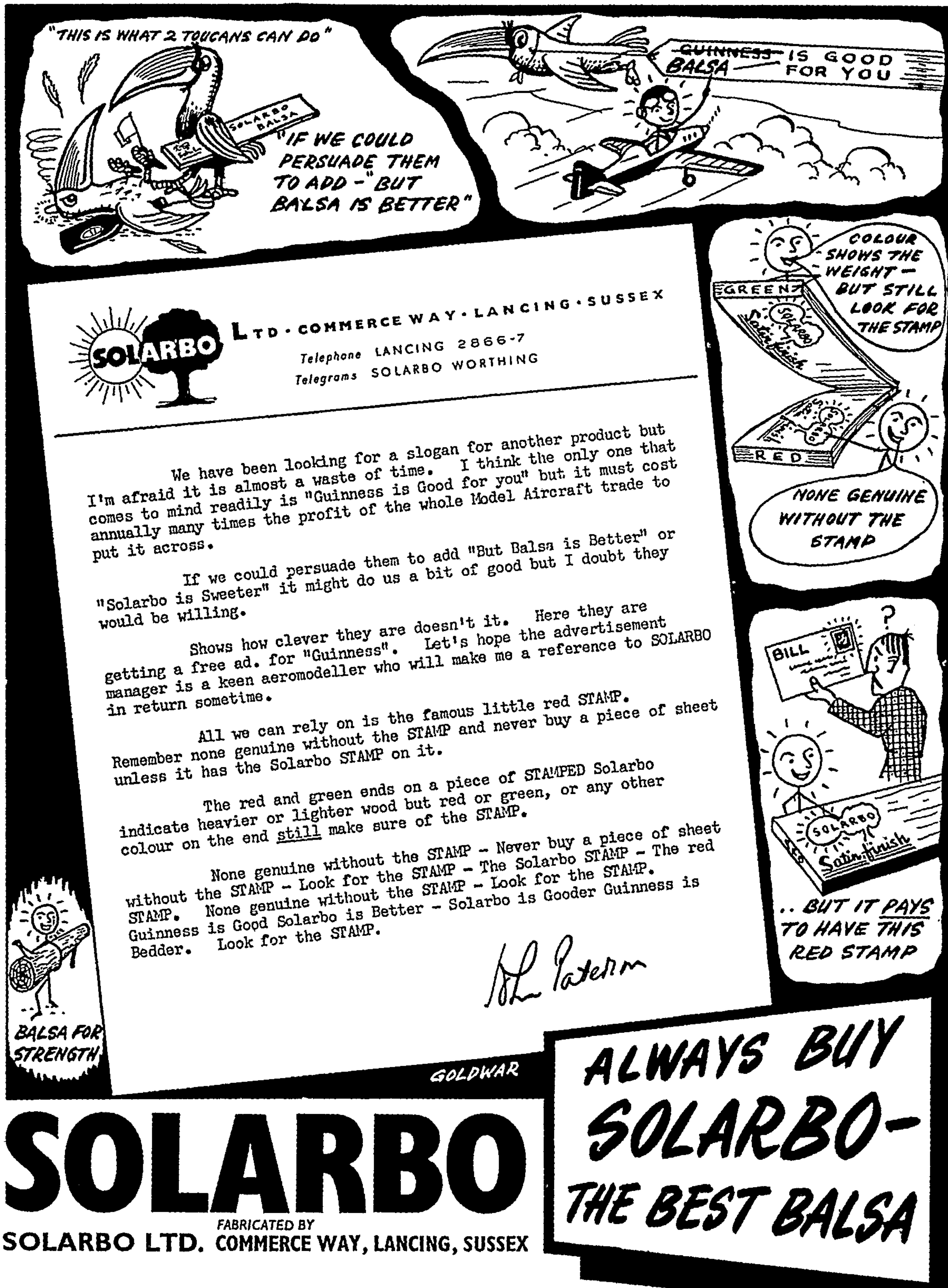
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NEW ISSUE

THE SCORCHER. Ken Willard's latest pylon racing R/C model. 32 in. span for the Holland Hornet

VOUGHT F4U CORSAIR. A simple-to-build 18 in. span profile scale control-liner for the Cox Pee Wee

M.A.N. 80 FIVE GIANT STEPS. A complete building course by Peter Chinn, with plans and text of *five* models. These comprise: chuck glider; R.O.G. ruber; profile rubber; built-up rubber; Pee Wee powered F/F.

M.A.N. 81 JAY DEE FALCON. Trophy-winning stunter of advanced design for .35 engines. By John D'Ottavio.

MAX MAKER. George Reich's U.S. Nats. record-holding Wakefield. An outstanding contest-winning rubber model.

M.A.N. 82 HI-THRUST VIKING. Carl Goldberg's latest—a high thrustline power model for .049's.

PATRIOT. A-2 glider.

M.A.N. 83 WIRELESS WIDGEON. Scale model of Westland Widgeon for single or multi R/C. For .29 engines.

TEE DEE BIRD. Free-flight power model for Cox .010.

M.A.N. 84 LIGHTNING BUG. Bill Winter's 27 in. span R/C model for the Cox .010.

ARROWHEAD 3. Three simple control-line variants of a basic design for the Cox .010.

VOODOO. A "35" Combat model.

PIPER TRI-PACER. Profile free-flight semi-scale model for .3-.5 c.c. motors.

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MODEL aircraft

OCTOBER 1961

No. 244 VOLUME 20

The official Journal of the SOCIETY OF MODEL AERONAUTICAL ENGINEERS

IN THIS ISSUE

Published on the 20th of each month prior to date of issue by

PERCIVAL MARSHALL & CO. LTD.
19-20 NOEL STREET, LONDON, W.1.

Telephone: GERrard 8811

Annual subscription 22s. post paid. (U.S.A. and Canada $3.)

Here and There

Major S. D. Taylor

IT is with great regret that we have to report the death of Major S. D. Taylor, General Secretary of the S.M.A.E. His interest in aeromodelling dated from the early 1930's, when he was what today would be called a "sport flier." During the war years, in spite of having no really free time, he took an interest in the local club near where he was stationed at Preston, Lancs. At the end of the war Sidney, as he was known to all his friends, found himself back in London and in 1946 he founded the present Brixton M.F.C.

His interest soon took him on to the S.M.A.E. London Area Committee, as club delegate. In 1948 he held office in the movement for the first time, as Area Competition Secretary and his success at this post led to his election as S.M.A.E. Competition Secretary in 1951.

In 1956, after a period of five years as Competition Secretary, he gave up the post to take over the General Secretaryship of the Society, a position which he held until his death from cancer. Just over a year ago he became the Society's first full time paid Secretary, when the Council decided that the work involved was beyond the scope of an honorary official.

His biggest regret was that he would not be able to complete the work he had undertaken in this new capacity, the Society's affairs being in his mind right up to the last minute. For the last ten years the progress of aeromodelling and the Society were his greatest concern and interest—in fact his "life's work."

We know that Major Taylor's friends from the entire world of aeromodelling will join us in extending sympathy to his wife and son.

Overpowered

IT is not surprising, in these technical times, that free flight power has developed to the point where mechanical precision has become one of the chief arbiters of contest success. This does not mean that other skills, including the fundamental one of good model building, are not equally involved, but, as engine units increase in power, with a consequent reduction in engine run, so more attention is focused on the quality

and precision of timer mechanisms. Some models even incorporate a second timer for glide trim.

Such devices are not in themselves bad, but if the finesse of contest flying is to depend ultimately upon the quality of the manufactured components—given that all other things are equal—then it closes the field, as it were, to all but the favoured few who can afford, or wish to afford, such expensive trappings on a model which can be so readily lost.

The use of specialised engines and precision equipment undoubtedly has its place in certain outer reaches of the hobby such as Speed and Multi Radio, but can have a limiting effect upon the open field events, where the average competitor likes to think he has a winning chance. A measure of this anxiety was expressed in the introduction of the ½A Power event, which is now an accepted feature of most popular rallies. Even so, the challenge of rocketing a model to several hundred feet, in the space of a few seconds, is a provoking and exciting one and is too often taken up by modellers whose lack of competence presents a serious hazard to other airfield users.

Perhaps our rally organisers should seek to keep the popular events popular by agreeing to some power formula, which would at once cut down the ballistic climb and open out the motor run, to a point where the odd second or two would not be so decisive. This would make for safer flying and wider participation.

Where's the Twist

WHEN testing a rubber powered model recently, we were disappointed at the seemingly flat performance. The model appeared to be in good trim, with the motor run of a duration consistent with the propeller size and motor arrangement, yet the rate of climb was non-existent.

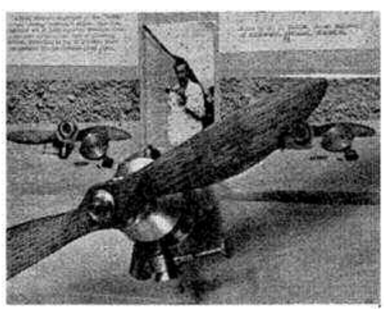
We then decided to use a motor from a different stock of rubber. The improvement was astonishing; the model climbing almost vertically. Curiously enough, though, the motor run variation between the duff motor and the good one was only a matter of a few seconds. This suggests that the average revs per minute of the propeller was almost identical in each case, yet the thrust output was demonstrably of a totally different order.

This reminds me of a teasing controversy, some years ago, about the fitting of a governor to the prop shaft, in order to dampen out the violent initial burst and conserve this energy for a more even thrust output. The theory was that you can only discharge the energy stored in a rubber motor through the turning of the propeller. If a motor is given a thousand turns then it will rotate the propeller a thousand times. And if you arrange it so that the first two hundred turns will take 20 seconds to expire instead of an unrestricted 10, then you would be utilising that energy, which would have been wasted in useless prop slip, to an extension of the motor run.

We think there was a catch somewhere and, no doubt, our torque experts will be quick to point it out.

First of many?

A PARTICULARLY facinating exhibit at this year's Model Engineer Exhibition, which is reported elsewhere in this issue, was this Wankel type aircraft engine, built by J. Taylor, a motor engineer



from Yorkshire. This is the first miniature engine of this type we have seen and is, as far as we know, the only one yet built in Gt. Britain. We hope to be able to present further details in a future issue.

On the Cover

MAX HACKLINGER of Essen, W. Germany, carefully examines his propeller bearing, before setting up the highest indoor time ever officially recorded of 44 min. 20 sec.

This momentous flight was made following the first World Indoor Championships in the airship shed at R.A.F. station, Cardington, on August 8th, 1961. The record flight and the meeting itself are fully reported elsewhere in this issue.

Model Engineer Exhibition Results

CLASS AB

Free Flight Power Driven Aircraft

VHC—R. M. Dudley (Weston-super-Mare), *Jumpin' Bean.*

HC—J. M. Devenish (Chichester), precision power aircraft; C. E. Read (Newport Pagnell), experimental twin gyro plane.

CLASS AC

Control Line Models

Model Aircraft Prize—W. Jeffery (Bexleyheath), *Coy Cat.*

VHC—K. G. Russell (London, N.15), *Minx*, class "B" team racer.

C—J. Wylie (London, S.E.17), *Kittyhawk*, stunt model.

CLASS AD

Sailplanes

VHC—A. D. Pollard (Thames Ditton), O/D sailplane, 18 ft. wingspan.

HC—B. Edwards (Newport), O/D glider, 70 in. wingspan.

C—C. J. Pollington (Sholing), A/2 class glider, 66 in. wingspan.

CLASS AE

Non-Flying Aircraft

Bronze medal—H. J. Randall (Brighton), 1917 BE 2E, No. 2, Squadron R.F.C.

VHC—H. J. Randall (Brighton), 1915 Vickers FB5 *Gunbus*; B. Gronroos (Finland), model *Caravelle.*

HC—P. G. Cooksley (Coulsdon), Sopwith 7F1 *Snipe*; H. J. Randall (Brighton), 1917 DH5; M. A. Shepherd (Sandown), "City of London" Vickers *Vimy.*

C—H. J. Randall (Brighton), 1917 *Albatros* DIII.

CLASS AF

Scale Free Flight or Control Line Models

Championship Cup—C. Milani (London, S. W.7), Caproni 34 bomber.

Silver medal—C. Milani (London, S.W.7), S.V.A. 4, 1917.

Bronze medal—A. C. Day (Birmingham), Fokker D. VII biplane.

VHC—B. F. Brown (Sutton Coldfield), *Spitfire* Mk. XII.

C—A. F. Clements (Maidenhead), Ansaldo S.V.A.5.

CLASS AH

Junior Section

VHC—G. Woodward (Harrow Weald), *Falcon* stunt model and *Vuntu*, high aspect ratio glider, both own design.

HC—V. Aldrich (Goffs Oak), freelance control line model.

Indoor World Championships Results

Team Placings

(Total of the team members' best flights.)

1.	U.S.A.	103 min. 41 sec.
2.	Finland	94 min. 10 sec.
3.	Germany	89 min. 32 sec.
4.	G.B.	76 min. 08 sec.
5.	Hungary	57 min. 56 sec.

Individual Placings

(The best recorded time of three official flights made by each competitor.).

1.	Bilgri	U.S.A.	37 min. 49 sec.
2.	Reike	Germany	34 min. 11 sec.
3.	Bigge	U.S.A.	34 min. 56 sec.
4.	Hamalainen	Finland	33 min. 03 sec.
5.	Read	G.B.	32 min. 48 sec.
6.	Hewell	Germany	32 min. 00 sec.
7.	Hyvarinen	Finland	31 min. 03 sec.
8.	Redlin	U.S.A.	30 min. 56 sec.
9.	Ocsody	Hungary	30 min. 41 sec.
10.	Englund	Finland	30 min. 04 sec.
11.	Egri	Hungary	27 min. 15 sec.
12.	Parham	G.B.	22 min. 35 sec.
13.	Hacklinger	Germany	22 min. 21 sec.
14.	Draper	G.B.	20 min. 45 sec.

The first

INDOOR WORLD CHAMPS

THE first World Championships for indoor models was held at Cardington in the enormous airship shed, itself charged with such nostalgic memories of the pioneering days of British lighter-than-air craft. So stately, graceful and reluctant to descend, were the microfilm models flown there, that at times it almost seemed that they too, like their gigantic ancestors, were lighter than air.

For the unhappy British team, we feel that a little hydrogen in the right place might have helped, but there is no doubt that the victorious American team were deserving winners. Experience and reliability, plus a proportion of good fortune, paid off, for not only did they carry off the team prize, but their veteran indoor man, Joe Bilgri, romped away with the individual honours as well!

The meeting was spread over three days, the first day (devoted to test flying) was spoiled by treacherous and erratic drift, the direction of which was quite unpredictable.

Britain's Phil Read extensively damaged his best model in the girders whilst flying quite low, and Ron Draper's wings folded after striking an unseen hanging rope which was later hoisted up. Meanwhile, Germany's Max Hacklinger wrote off his No. 1 model before he had even flown it, by accidentally fouling one of his rigging wires and destroying its delicately constructed elliptical wing, during pre-flight preparations.

But the really thrilling team was undoubtedly the Finnish group. Having started F.A.I. indoor modelling only this year and achieving 17 min. in their 43 ft. hall, they made use of every valuable practice minute, and by the end of the day had upped their times by over 6 min.

Joe Bilgri, after nursing his precious model box thousands of miles from the U.S.A., assembled his best model, wound 'er up and just let 'er go—once! This check flight pleased him, so he put the model back in the box. Such enviable confidence is the mark of the expert.

The two Hungarians earned everyone's admiration. Arriving in this country with seriously damaged models, following rough handling in transit, they sat up half the night re-building. The sight of their "telescoped" reed fuselages and damaged covering would have daunted many less determined souls.

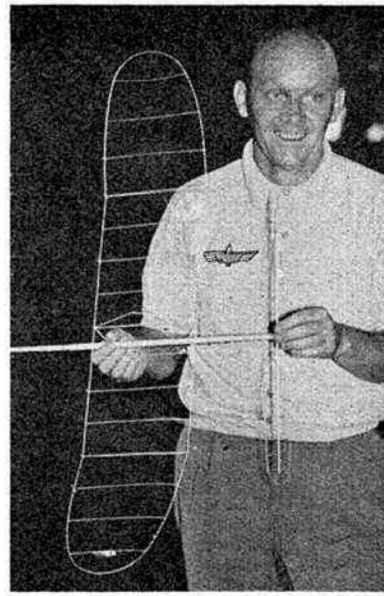
Only one of the three rounds was flown on the first contest day and again considerable drift was present. The reluctance to kick off at the starting bell was understandable, in view of the fact that four hours were available in which to fly and conditions were expected to improve later on.

Phil Read, on full turns, stalled in and his second attempt seemed to be a repeat performance. After staggering around, hanging on the prop, neither gaining nor losing height for a breath-taking half minute, the model sorted itself out and began to climb. Unfortunately, the poor start lost Phil valuable height, and what would have been a "cert" half hour plus, amounted to only 27.09. Team mate Reg Parham got away well, but went into the girders after 16 min.

At four o'clock Joe Bilgri took the floor and, after replacing a broken motor, got away smoothly into a fast climb, but at about 100 ft. began, like previous models, to drift towards the side of the shed. Miraculously, the sideways drift diminished and, still dangerously near the girders, the drift changed towards the south end of the shed! After travelling to within 30 ft. of the end doors, the incredible flight ended after the model had begun to return to the centre of the shed! The prop was barely turning at the touch-down, after the day's longest trip, up to that time, of 32.24.

An indication of the confusing conditions was clearly given when Englund of Finland and Reike of Germany launched almost simultaneously, Englund drifting left, and Reike drifting right! Both did well, however, and exceeded the half hour.

The Germans' fortunes were not to remain good and Hacklinger was forced to bring down his model with the captive hydrogen balloon after a faulty launch, with the prop shaft out of its rear bearing. His second launch, hastily positioned, took the model quickly towards the side girders and again the



Happy winner's smile from Joe Bilgri after his thrilling flight of 37 min. 40 sec.

balloon was needed to keep the model out of danger. The "interception" was made at about 100 ft. and the flight timing was terminated when the model touched the balloon cable, after 4.27. At this point it began to rain heavily, and Max was unfortunate enough to collect two holes from stray raindrops, before he was able to retrieve his model.

We have already mentioned the previous day's performances of the remarkable Finnish team, and their contest times continued the upward trend. Reino Hyvarinen returned 31.03 after a dead stick approach, and it would have been longer had his propeller not stopped at an awkward angle, considerably steepening the descent.

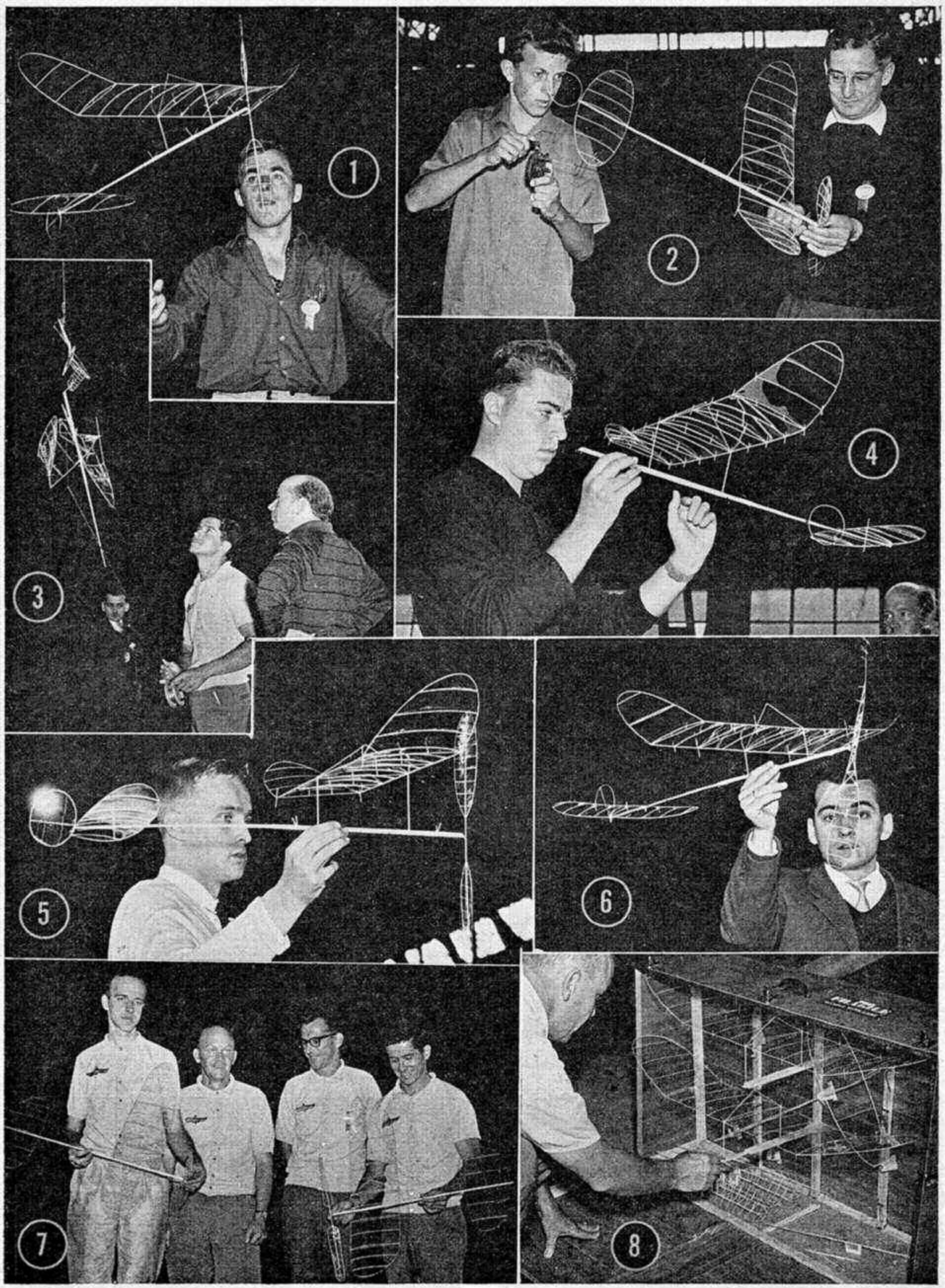
The last contest flight of the day by American Bill Bigge was, appropriately, the real climax. Drift had considerably lessened, and Bill's model touched down following an almost straight up-and-down flight at 33.07 with the prop windmilling gracefully.

This made six over 30 min. flights. Two to Finland, one to Germany, and two to the U.S.A.

The two remaining rounds were flown on the Monday, and drift conditions were happily very much improved. Before contest flying began, some exciting test

Below—the victorious U.S. team share a joke with S.M.A.E. Chairman A. F. Houlberg at the prizegiving dinner.

Below—Joe Bilgri carefully dissembles his model ("built tough for shipping!") See also photo 8, overleaf.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flights were made, Max Hacklinger, using a more powerful motor, almost finished up in the roof and we joined Max on one of the catwalks, 140 ft. up as he anxiously "willed" his model to stop climbing! It is an exhilarating and slightly eerie experience, to stand perched up on the roof, looking down on a model slowly circling only a couple of feet away!

Another notable test flight was that of Reg Parham whose fortunes, we hoped, had changed for the better as we watched him clock 35 min. Unfortunately, Reg subsequently broke his motor and the replacement—considerably inferior—only produced 22 min. during the second round.

Bill Bigge completely rigged another wing for the second round, this one being lighter than the first. It paid off and Bill looked well in the running for the individual prize following a magnificent flight of 34.56.

All eyes were now on Joe Bilgri, but unfortunately he climbed too fast and high, hitting the roof after only 6½ min.

The only mid-air collision during the contest came when Reike tangled with Hyvarinen. Reike's model struck after being airborne for only 9 min. and flying well. It was badly damaged and he was unable to repair before the end of the round. Hyvarinen flew again, scoring 28.19.

Before the third round Hacklinger made a further test flight to try to cut down the excessive climb. This was an indication of things to come, clocking 39 min.

However, during the 3rd round, Max had an underwound motor and returned less than 20 min.—almost exactly half his test time to the second.

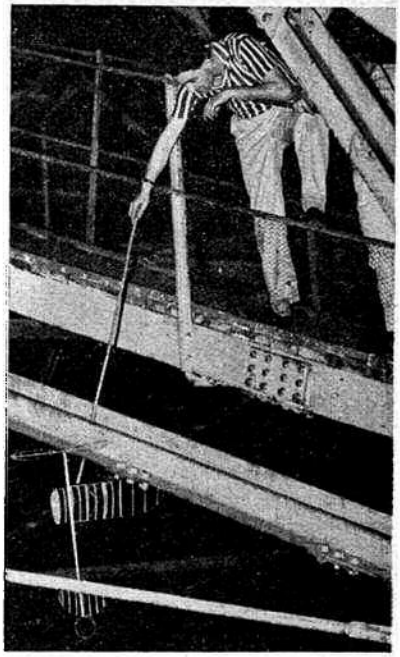
Phil Read scored 32.48 in the second round, our only contest flight over the half hour; but his third round flight was again plagued by stalling troubles shortly after launching, despite allowing a number of turns to unwind before release. The models having proportionately larger elevators, particularly the Americans, seem much better able to handle this initial "burst" of power (if such it can be called when the prop turns at about 65 r.p.m.!).

1. Esko Hamalainen of Finland launches. Note the marked helical pitch on the propeller. 2. A. J. Barr of Coventry holds Ron Draper's model while I. R. Hydon winds. 3. Unlucky Carl Redlin (U.S.A.) reels in the remains of his model, watched by Karl-Heinz Reike of Germany. 4. Klaus Hewell (Germany) adjusts his rigging. Note the fin position, later moved behind the elevator. 5. Reino Hyvarinen (Finland). Equally at home indoors or out. 6. Antal Egri (Hungary) allows a few turns to unwind before releasing. 7. The U.S. Team, from left to right—William Bigge, Joe Bilgri, Dick Kowalski (Manager) and Carl Redlin. 8. Bilgri's magnificent model box—just look at all those props!

The lack of drift enabled the models to be carefully "placed" so that they could make use of the extra height available down the centre ridge of the roof. One who took full advantage of this happy state was Hungarian, Zoltan Öcsödy (pronounced Ercherdy). After climbing steadily, the model circled for several min. exactly beneath the highest centre catwalk, the tips of the propeller repeatedly just touching the steelwork! Once again we happened to be up there with Zoltan watching, fascinated, as the model gently nudged the catwalk below us. Another 6 in. or so and the model would have been hooked up. We don't know whether it was this, or the unaccustomed altitude, but we were just in time to prevent Zoltan lighting a nerve-soothing Hungarian cigarette—Hydrogen is still stored in the shed! The flight was the longest by the Hungarian team, 30.41, and their only one of half-hour plus.

Joe Bilgri didn't repeat his unhappy second round performance, and with fellow team man Bigge's 34.56 as a bait, went all out to better it which he did, to put up the time that won him individual honours—37.49.

The third U.S. member, Carl Redlin, from Detroit, with such inspiration from the rest of the team, seemed to be well on the way to bettering even Bilgri's performance and after climbing well, and remaining at maximum height for over 20 min., it seemed certain to be a 40 min. trip. Soon after commencing the descent, however, he ran into what must have been the only draught in the shed and drifted into the girders about 130 ft. up. The model was well and truly lodged, and completely inaccessible from the catwalks. Recovery by captive balloon wrecked the model as you can see in our heartbreaking picture. The estimate of a probable 40 min. was confirmed when Carl checked the remaining turns upon recovery.



Ron Draper, 150 ft. up in the shed roof, gently eases his model off one of the girders.

After the contest, as described on page 321 Max, Hacklinger set up his new record time.

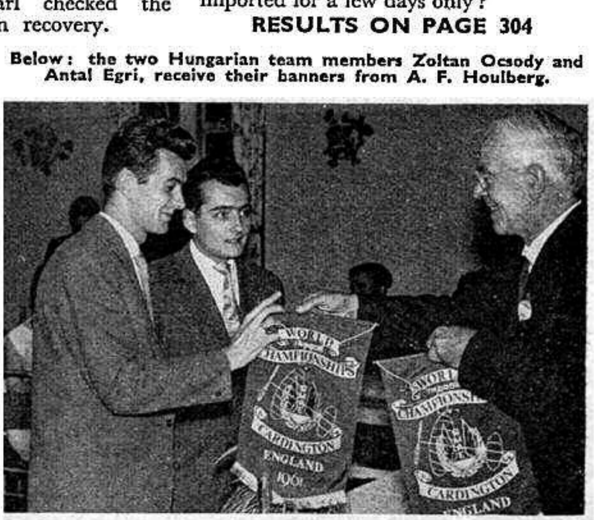
Altogether this was a memorable contest and one of the very few where no moans were heard about the organisation, for which congratulations are due to all concerned. The S.M.A.E. recognised the value of the services rendered by timekeepers and others, by presenting each one of them with a small replica of the beautiful banners which were specially produced for the contestants.

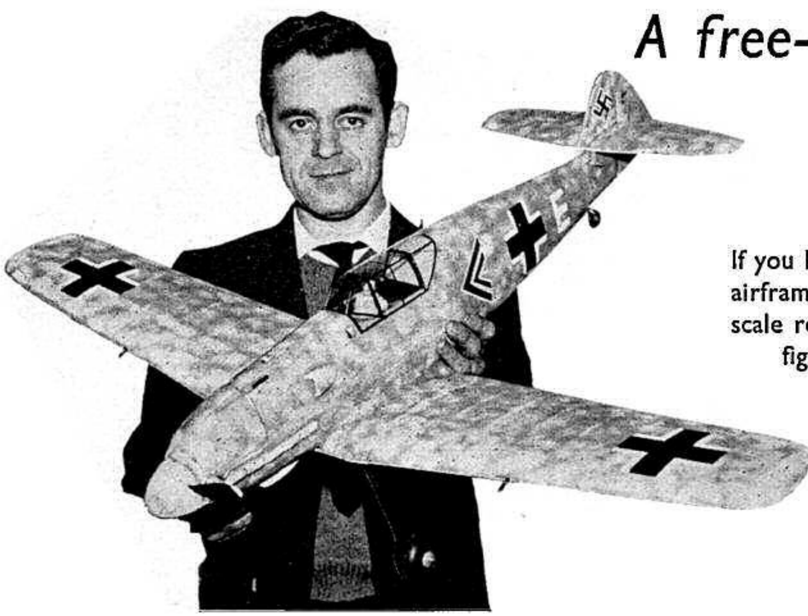
Footnote: The magnificent team trophy was donated by the A.M.A. and brought over by the U.S. team. They had considerable difficulty in getting the valuable cup past H.M. Customs! Having won the team trophy themselves we wonder whether they had equal difficulty in getting it *out* of the country—or did they promise the Customs people upon entry that the trophy was being imported for a few days only?

RESULTS ON PAGE 304

Below: Reg Parham holds his model as Ron Dukes of Birmingham piles on the turns.

Below: the two Hungarian team members Zoltan Ocsody and Antal Egri, receive their banners from A. F. Houlberg.





A free-flight

Me. 109E

If you have a 1.5 c.c. engine waiting for an airframe, Stan Cole's very practical F/F scale replica of this infrequently modelled fighter, will fill the bill perfectly.

WE first saw this model at the Richmond Club's exhibition and we were immediately struck by its obvious practicability. It was tough, of straightforward construction, and obviously built to *fly*. As a F/F subject the Me.109 is not often considered, but Stan Cole's very attractive design should soon alter that situation. It is a fine testimony to the design, that a replica has been built from the original drawings by someone who has never previously attempted F/F scale and it flies as well as the original model—need we say more?

Fuselage and Wings

Start by building the 1/8 in. × 1/2 in. crutch from hard balsa, flat on the plan. Next cut formers (1) to (9) paying particular attention to accuracy in formers (4) and (5) as these will later determine the wing incidence. Former (4) is pre-drilled to take the u/c binding. The formers are now cemented into the crutch, checking for squareness from both side and top. Next add the 1/8 in. sq. spines to top and bottom of the formers and block balsa to the front and rear of fuselage, together with tail wheel assembly, prior to adding the sheeting.

This is best done in two separate pieces, cemented along the *top* line of the crutch. The sheet should be pre-shaped by damping, to curve it over the top half of the fuselage along the entire length between formers (3) and (9). The rear lower half of fuselage is best "planked" with 1/4 in. × 1/16 in. balsa strip, starting from the bottom line of the crutch. At this stage it is *essential* to assemble ribs A and B—together with wing tongues—"dry" (uncemented) to formers (4) and (5).

The fuselage assembly can now be placed on a flat surface and the completed wing halves (which are of conventional construction) are pushed onto the wing tongues and the wing tips are packed up to give 3 1/8 in. dihedral under each tip. Holding everything in place with suitable weights, the wing tongues are now finally cemented to ribs A and B *in situ*, this method ensuring accuracy, and equality of dihedral angles.

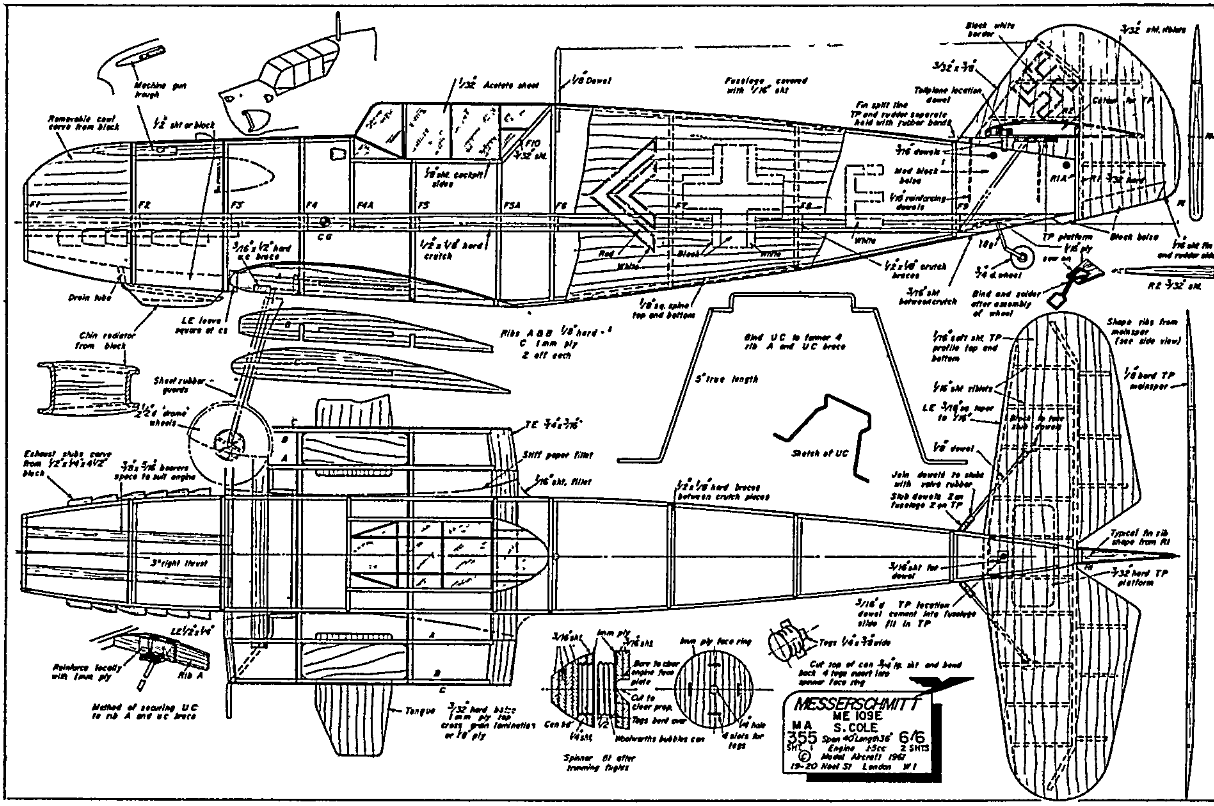
Little instruction is needed on tail and wing construction, as these will be found quite simple to build from the plan. For final "embellishment" add pilot, wing radiators, oil cooler, etc. Colour trim should be light and dark grey mottle on top with very light blue undersides; the spinner is yellow. Standard Luftwaffe markings are shown on the plan, alternatively the entire top sides of the model may be painted olive green with very light blue undersides.

Built as per plan, the model is sufficiently robust to withstand any initial trimming "prangs" without damage. "Durofix" was used for all hardwood components, and a strong carpet thread is a must for the u/c binding; 2 1/2 in. balloon type "Drome" wheels also assist greatly in absorbing landing shocks and protecting the u/cart—"solid" type wheels being quite unsuitable, event apart from their un-scalish appearance. A departure from true scale has been purposely made in retaining the tail unit with outside rubber bands, since this vulnerable component is now both practical and really crashproof! If desired, the prop (a 9 in. × 5 in. on a 1.5 c.c. engine) may be reversed and the spinner omitted, until characteristics of the model are learned.

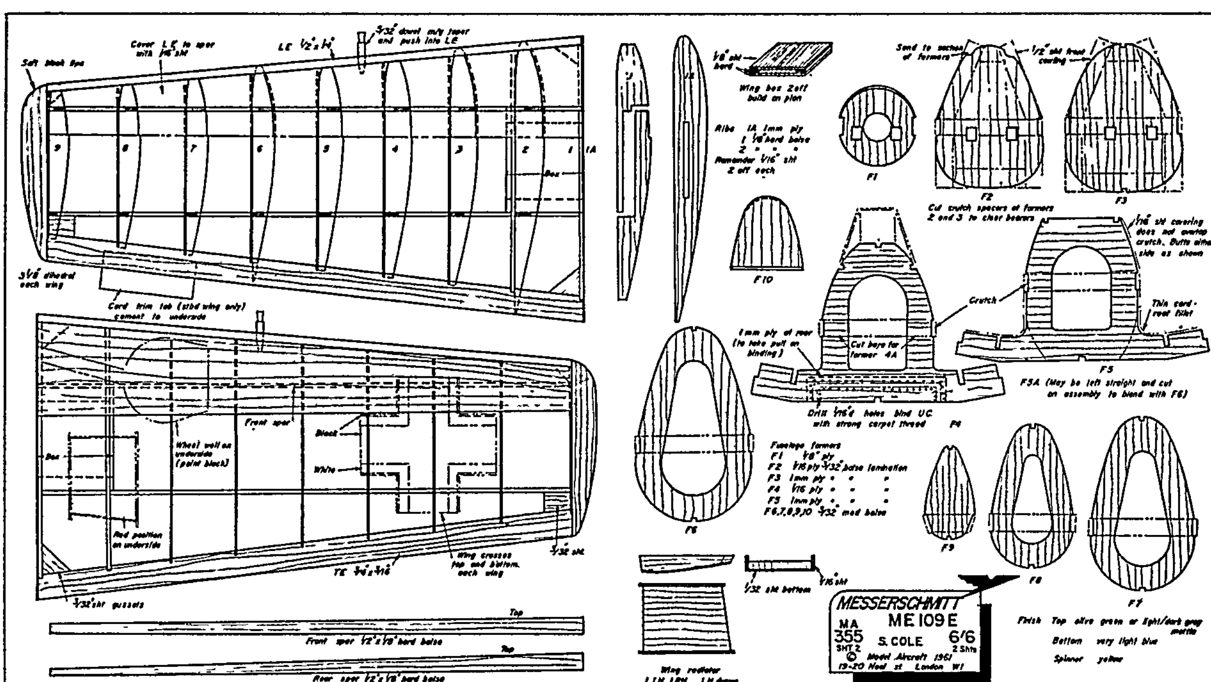
Flying

The initial trimming of the model proved that fairly high revs are needed from the start, with about 3 deg. right side-thrust to counteract torque. The rudder is best left in neutral position with a 10 deg. to 15 deg. "down" trimtab to keep the left wing up on the model's left-hand flight path. With the c.g. as per plan, the prototype needed no down-thrust.

Never trim for right-hand circles, but adjust engine *right* thrust, to obtain wide safe left-hand circles. For its size, the model is by no means heavy (all-up flying weight is about 25 oz.), but a smooth "follow-through" launch with power on will give best results. No adjustment was necessary to obtain a flat hand launch glide, which, of course, is best done over long grass in fairly calm weather; however the tailplane is easily adjustable, should this be necessary. Pack up T.E. if nose dips and L.E. if the model stalls.

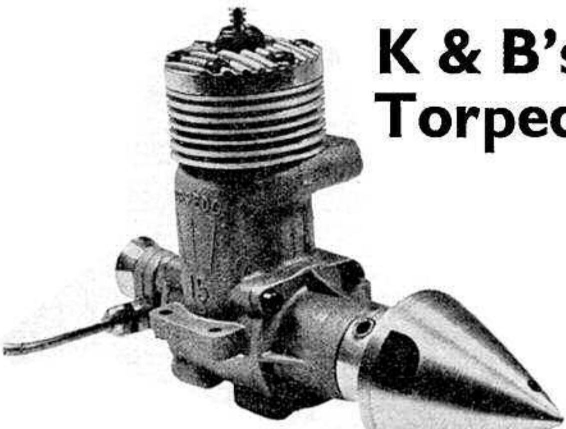


FULL SIZE WORKING DRAWINGS ARE OBTAINABLE FROM YOUR LOCAL DEALER, OR BY POST FROM THE "MODEL AIRCRAFT" PLANS DEPARTMENT, 19-20, NOEL STREET, LONDON, W.1, PRICE 6s. 6d., (TWO SHEETS) POST FREE



Two more International class racing motors

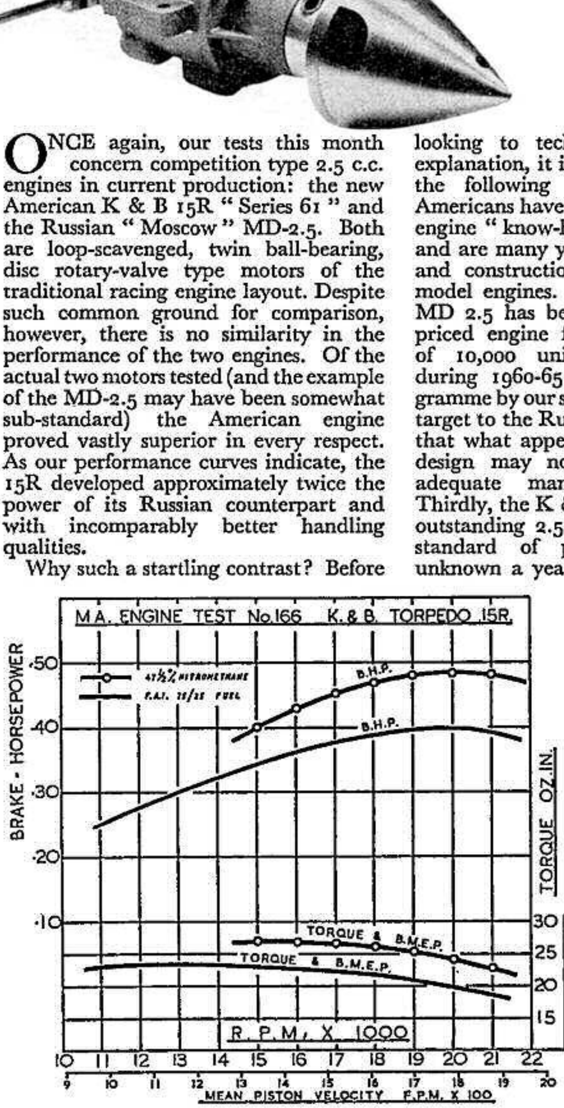
K & B's Torpedo 15R



Moscow MD-2.5

ONCE again, our tests this month concern competition type 2.5 c.c. engines in current production: the new American K & B 15R "Series 61" and the Russian "Moscow" MD-2.5. Both are loop-scavenged, twin ball-bearing, disc rotary-valve type motors of the traditional racing engine layout. Despite such common ground for comparison, however, there is no similarity in the performance of the two engines. Of the actual two motors tested (and the example of the MD-2.5 may have been somewhat sub-standard) the American engine proved vastly superior in every respect. As our performance curves indicate, the 15R developed approximately twice the power of its Russian counterpart and with incomparably better handling qualities.

Why such a startling contrast? Before looking to technical analyses for an explanation, it is worth bearing in mind the following factors. Firstly, the Americans have a great deal more model engine "know-how" than the Russians and are many years ahead in the design and construction of quantity-produced model engines. Secondly, the Moscow MD 2.5 has been publicised as a low-priced engine for which a production of 10,000 units has been planned during 1960-65. This, a modest programme by our standards, is an ambitious target to the Russians and it would seem that what appears to be a sound basic design may not yet be matched by adequate manufacturing techniques. Thirdly, the K & B 15R is a particularly outstanding 2.5 c.c. engine, reaching a standard of performance that was unknown a year ago and many motors better than the Moscow will pale by comparison when put beside it.



K & B Torpedo 15R "Series 61"

The Torpedo 15R represents a new depature in model engine production for the well-known K & B firm of Los Angeles. Hitherto, all Torpedo engines, even dating right back to the late pre-war era and the original Atwood designed Torpedo from which the early post-war K & B products were developed, have been plain-bearing, shaft-valve engines

Last year, following the absorption a few months previously of the K & B company into the Aurora Plastics Corporation, plans were laid to introduce a new line of very high performance model engines for production in the K & B Manufacturing Corporation's new plant. First on the list was a production version of Bill Wisniewski's record-breaking 0.15 cu. in. engine, the motor that was subsequently to appear, in April this year, as the Torpedo 15R "Series 61."

The 15R has appeared at a time when three other very high performance 2.5 c.c. glowplug engines,* all quite different and originating from three different countries, the U.S., Italy and Japan, are also beginning to make an impact on the modelling world. Coincidentally, these four engines are all capable of outputs up to 50 per cent. better than previously accepted levels in the 2.5 c.c. class and despite their dissimilarity of design, all have one thing in common—an unrestricted intake system.

On the 15R, induction takes place through a large bore horizontal carburettor and disc type rotary valve. Air is drawn through a nicely contoured venturi with ¼ in. dia. throat. From here, the entry changes smoothly into a 90 deg. segment aperture in the face of the backplate. No spraybar or needle-valve obstructs the air flow through the intake. The needle-valve is contained in a separate diecast collar which fits tightly around the outside of the carburettor venturi and meters fuel to a 360-deg. channel in the latter. This channel, in turn, feeds six very small

* Cox Tee-Dee 15, 1961 Super-Tigre G.20 Jubilee and O.S. Max 15 Racing Glow. See M.A. Engine Tests, August and September issues.

jets spaced equidistantly around the venturi throat. The multiple jet system should, of course, offer better fuel atomisation than the usual single large jet but a little more attention to fuel cleanliness would seem to be indicated to eliminate any possibility of these small jets becoming blocked.

Typical of the traditional racing engine layout, the 15R uses a unit crankcase/cylinder block casting with separate front and backplate components. All castings are very cleanly produced, and finely machined metal-to-metal joints are used throughout.

One of the more original features of the design is the crankshaft. The crank disc has deep slots milled in its periphery each side of the hard-plated crankpin which is produced separately and then pressed in. The complete periphery of the crank disc is then encased in an alloy rim. In this way, crankcase volume is reduced to a minimum while retaining the requisite degree of counterbalancing.

The shaft is carried in two very free-running $\frac{1}{4}$ in. i.d. ball bearings. The front end of the shaft is not threaded in any way for prop attachment, instead a small flat is milled on the shaft, and the prop drive hub, which slides over the shaft end, is locked in position by means of an Allen grub screw engaging this flat. The drive hub is a substantial machined alloy die-casting and also forms an integral spinner backplate. It has a $\frac{5}{16}$ in dia. boss for centring the prop and this boss is internally threaded for a $\frac{3}{16}$ in. dia. stud. The prop is retained by a washer and nut on the stud and the diecast and machined spinner shell is then secured by a conical nut screwed over the stud end to make a very solid and accurately aligned assembly.

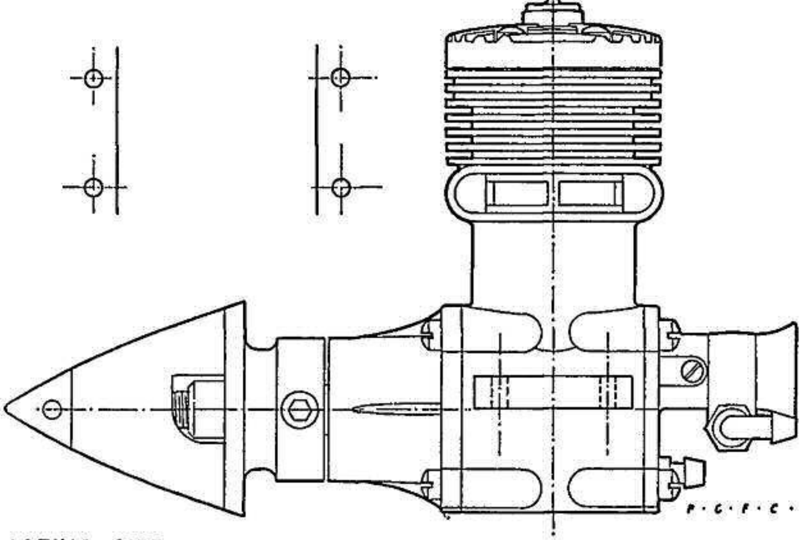
The piston, like the crankpin, has a special "Electrolized" hard-chromed surface and runs in a meehanite cylinder liner. The piston has a straight filleted baffle and a pair of 7/32 in. dia. skirt transfer ports which coincide with similar ports in the cylinder liner at bottom-dead-centre. The finned cylinder head is of hemispherical pattern with centrally located plug.

The 15R is intended to run on a pressurised fuel system only. The user may employ the well-known pen-bladder system, but the engine is supplied with a screw-in crankcase pressure nipple for coupling to a sealed rigid tank. The nipple is fitted in a convenient position at the bottom of the backplate, facing rearward for easy connection to the fuel tank, and is, of course, of the high pressure type, timed by the rotary valve.

The valve rotor itself is a non-metallic moulding of an undisclosed special material. It is light, very rigid and is cleverly moulded to offer a minimum of unbalance. The valve is timed to open at 35 deg. ABDC and close at 45 deg. ATDC. The exhaust and transfer ports are timed to open and close at 70 deg. (exhaust) and 62 deg. (transfer) each side of BDC.

The whole design—understandably since Bill Wisniewski was responsible for it—is clearly a speed man's motor and is admirably tailored to speed model installation. Evidence of this is to be found in its compact dimensions, substantial but narrow mounting lugs, the excellent integral spinner, shaped just right to follow the natural fuselage outline and the fully adjustable needle-valve assembly with its neat rearwards facing fuel line connection.

K & B TORPEDO 15R



ACTUAL SIZE

Parts of the K & B 15, the relatively complicated design is clearly shown.

Specification

Type: Single-cylinder, air-cooled, loop-scavenged, two-stroke cycle, glow-plug ignition. Rear rotary disc type induction. Baffle piston and central ignition plug. Pressurised fuel system.

Bore: 0.600 in. Stroke: 0.537 in.

Swept Volume: 0.1518 cu. in. = 2.488 c.c.

Stroke/Bore Ratio: 0.895 : 1.

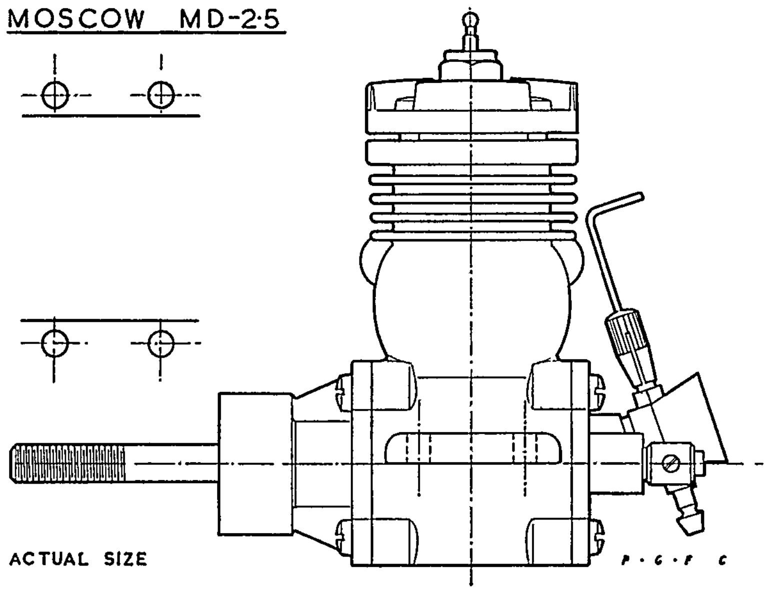
Weight: 5 oz.

General Structure Data

Pressure diecast aluminium alloy crankcase/cylinder block unit with pressed-in Meehanite cylinder liner. Pressure diecast aluminium alloy main bearing housing, secured to crankcase with four screws and containing two $\frac{1}{4} \times \frac{5}{8}$ in. Barden 8-ball precision bearings supporting crankshaft. Counter-balanced crankshaft of "Stressproof" high-tensile steel with pressed-in "electrolized" plated crankpin. Light-weight steel piston with "electrolized" surface, relieved below gudgeon-pin centres. Hot-forged Alcoa 2014 aluminium alloy connecting-rod and 5/32 in. dia. tubular fully-floating gudgeon-pin with aluminium end pads. Pressure diecast aluminium alloy cylinder head secured with six screws. Valve rotor of special moulded material, bronze bushed and rotating on steel pin pressed into pressure diecast aluminium alloy back-plate. Machined aluminium alloy carburettor venturi with separate diecast needle-valve body, stainless steel needle and brass gland nut and fittings. Carburettor adjustable for needle-control location and locked by grub-screws. Beam mounting lugs. Special integral diecast and machined spinner assembly. Special crankshaft bearings available at extra cost.

Test Conditions

Running time prior to test: $2\frac{1}{2}$ hours.



Our G.A. drawing shows the Moscow without prop-drive assembly. A spinner type assembly is normally supplied with the Moscow but our test sample was received without this.

Fuels used: (i) 75 per cent. methanol and 25 per cent. Duckhams Racing Castor Oil (running-in and first dynamometer test). (ii) 47½ per cent. nitromethane, 10 per cent. polyoxide synthetic lubricant, 10 per cent. castor-oil, 10 per cent nitrobenzene, 22½ per cent. methanol.

Ignition plug used: K & B KB-1S glowplug, short reach, platinum filament, 1.5 volt, as supplied.

Fuel system used: Veco pressure tank from standard crankcase high pressure tapping.

Air temperature: 54-62 deg. F.

Barometer: 29.6-29.8 in. Hg.

Performance

From the first moment of starting up, the Torpedo 15R was very impressive. Starting we found remarkably easy. Hot restarts, provided the fuel line to the tank was full, required, literally, just one flick of the prop—no prime. When starting up from cold, we found it best to have the needle-valve closed about one turn down from the running setting to prevent any risk of too much fuel being pumped from the tank initially. The engine was then primed and started, after which, the needle could be gradually opened up again.

Running qualities were, perhaps, the best we have yet encountered in a contest 2.5. The very low level of vibration was especially noteworthy and the 15R was also exceptionally steady, holding an indicated r.p.m. with negligible variation.

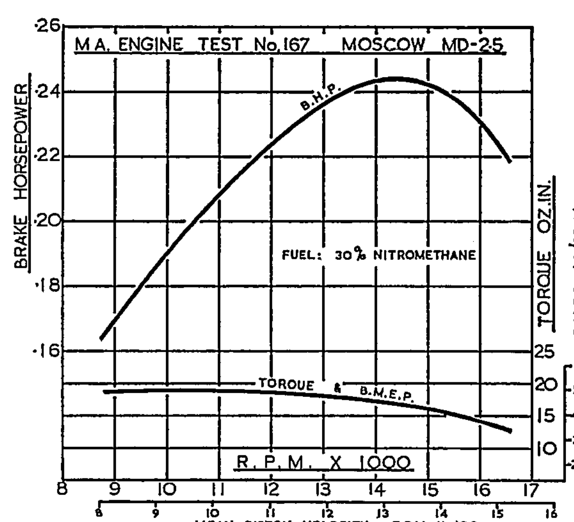
As one might expect, this is an engine which revels in really high speeds. Under any load limiting revolutions below 15-16,000 r.p.m., there was a tendency to lose power on warming up, even after a careful and protracted running-in period, but at around the 18,000 r.p.m. mark and upwards, this tendency was eliminated.

Tested on straight methanol and castor oil fuel, our 15R recorded 0.40 b.h.p. at a little over 19,500 r.p.m., while on 47½ per cent. nitromethane nearly 0.49 b.h.p. was reached at between 20,000 and 21,000 r.p.m. Wonderful as this is, we have a report from another source that credits the 15R with no less than 0.54 b.h.p. on only 30 per cent. nitromethane, which suggests that our 15R is no isolated example

We have one complaint concerning the Torpedo 15R and that is its voracious appetite for glowplug filaments, even on straight methanol/castor fuel. Actually the 15R is not the only offender, in this respect, among the current crop of ultra high performance glow engines and we can only hope that glowplug manufacturers are soon able to offer a plug that will stand up to these new high levels of performance.

Power/Weight Ratio (as tested on straight fuel): 1.28 b.h.p./lb. (as tested on 47½ per cent. nitromethane): 1.55 b.h.p./lb.

Specific Output (as tested on straight fuel): 160 b.h.p./litre (as tested on on 47½ per cent. nitromethane): 196 b.h.p./litre.



Moscow M.D—2.5

If the Moscow MD-2.5 owes anything to any previous design, it is most obviously to the Czech MVVS 2.5/1959 racing glow motor. As already mentioned, it also resembles in general layout, the Torpedo 15R just dealt with.

The crankcase, like the 15R, is in unit with the cylinder block but features a "Dooling" type transfer passage—i.e. the entire charge movement, from crankcase to transfer passage, takes place through skirt ports in the piston and cylinder liner. These ports are rectangular in shape and extremely large. The cast aluminium piston has a contoured baffle, two compression rings and, perhaps not the best arrangement with a piston of this type, a gudgeon-pin pressed into the piston bosses.

The crankshaft has a disc web with machined-in crescent counterbalance. It is supported in two 6-ball bearings which, on our test sample were a rather poor fit in the diecast front housing.

The valve rotor is of aluminium, fixed to a pin rotating in a bronze bushing in the backplate and retained by a collar and grub screw. It gives a conventional 180 deg. timing period of 45 deg. ABDC to 45 deg. ATDC. The carburettor venturi is inclined upwards and is simply pushed into a boss formed in the backplate. Minimum throat dia. is 6.5 mm. but is restricted by a 3 mm. dia. spraybar. Due to the angle of the carburettor, it would be necessary, when installing the engine in a model, to cut away the bearers behind the motor to obtain clearance for the fuel inlet nipple. If this is not done, and the fuel inlet is taken between the bearers, the needle control fouls the cylinder or exhaust duct. For our tests, the complete assembly was inverted to bring the needle control below the crankcase.

The quality of construction, in general, is not high by British standards.

Specification

Type: Single-cylinder, air-cooled,

loop-scavenged, two-stroke cycle, glow-plug ignition. Rear rotary disc type induction. Baffle piston and offset ignition plug. Suction feed.

Bore: 15 mm. (0.5905 in.) Stroke: 14 mm. (0.5512 in.)

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

Stroke/Bore Ratio: 0.933 : 1.

Weight: 4.8 oz.

General Structural Data

Pressure diecast aluminium alloy crankcase/cylinder block unit with drop-in hardened cylinder liner. Pressure diecast aluminium alloy main bearing housing secured to crankcase with four screws and containing one 5 × 16 mm. and one 7 × 19 mm. ball journal bearings. Counterbalanced crankshaft with 5 mm. dia. tubular crankpin. Cast aluminium alloy piston with two cast-iron compression rings and pressed-in tubular gudgeon pin. Forged aluminium alloy unbushed connecting-rod. Pressure diecast aluminium alloy cylinder head with soft aluminium gasket and secured with four screws. Aluminium alloy valve rotor fixed to 3.5 mm. dia. steel pin running in bronze bushing. Aluminium alloy carburettor venturi with brass spraybar. Beam mounting lugs.

Test Conditions

Running time prior to test: 1 hour plus.

Fuel used: Record Super Nitrex (30 per cent. nitromethane).

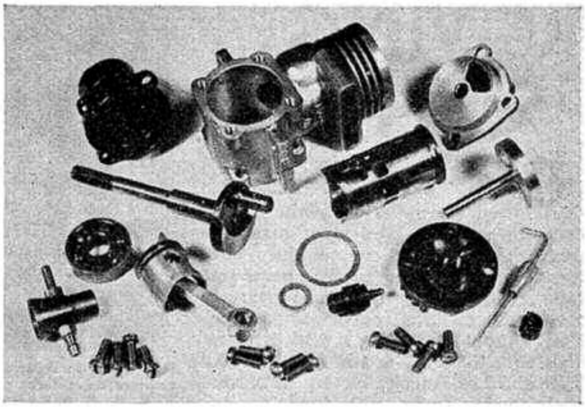
Ignition plug used: KLG EG.150 glowplug, short reach, platinum filament 1.5 volt.

Fuel system used: standard suction feed.

Air temperature: 67 deg. F.

Barometer: 29.6 in. Hg.

Parts for the Moscow MD-2.5. It is interesting to compare with the photo of the K & B parts on page 311.



Performance

Starting qualities of the Moscow were disappointing due, primarily, to poor compression. Initially, the only way to be sure of obtaining a start was to inject castor oil into the cylinder which, picked up by the rings, would give the required piston seal. It was noticed that starting was especially difficult on straight methanol/castor fuel but improved slightly with the 30 per cent. nitromethane mixture used for our tests.

On test, the Moscow delivered a maximum torque of 19 oz. in. at around 10-11,000 r.p.m. and the best output that could be extracted from the engine was 0.244 b.h.p. at 14,5000 r.p.m. In terms of prop r.p.m., the MD-2.5 turned various 8 × 4's at speeds ranging from 12,600 to 14,200 r.p.m.

Our test sample may, as we have said, be a poor specimen. The basic design is interesting but is poorly executed with somewhat sloppy fits and a lack of precision in certain details. Performance, of course, falls well below acceptable contest levels. It is quite possible, however, that attention to these defects in other examples of the MD-2.5 would result in an engine more closely comparable with established international standards.

Power/Weight Ratio (as tested on 30 per cent. nitromethane fuel): 0.81 b.h.p./lb.

Specific Output (as tested on 30 per cent. nitromethane fuel): 98.6 b.h.p./litre.

STOP PRESS World Free Flight Championships

THE World F/F Championships, run jointly by the A.M.A. and the Deutscher Aero Club, took place on the 1st to 3rd September at Leutkirch in Southern Germany. The meeting, which was attended by teams from 29 countries, was flown in almost windless conditions, with the sun beating down from a clear blue sky.

One contest was flown on each of the three days—A-2, Power and Wakefield in that order. In Wakefield, there was a three-man fly-off and in glider, four finalists fought for the honours.

Unhappily, British competitors do not appear in any of the top positions, our highest placing going to George French, who tied for 9th place in power with Karl-Heinz Rieke of Germany, each scoring three out of five max's, for a total flight time of 803 secs. Ray Monks came 12th and Tony Young 20th, out of 66 entrants. Our team placed 5th out of 20.

Ironically, Pete Buskell, who was proxy flying John Sheppard's N.Z. model, finished the power comp in 4th position, a magnificent performance. The two other British modellers who proxy-flew N.Z. models—Pete Muller for Ian Henry and Vic Jays for John Winn—ended in 45th and 50th positions respectively, with only four of their five flights being valid.

In A-2, Dallimer and Freeston tied for 12th place, Bruce Halford finishing 47th out of 69 flyers. Teams from 22 countries were entered, the British Team finishing 8th.

Lou Roberts was our top Wakefield man in 19th spot, followed by Norman Elliot in 32nd and John O'Donnell in 41st. There were 65 entrants from 21 countries, the British team position being an unlucky 13th. The Wakefield Cup, won by George Reich of U.S.A., goes back to the family as it were, George being Dick Korda's brother-in-law. It was a very popular victory, George missed the Wakefield fly-off in 1953 by only one second and he was also in the U.S. 1958 team, so it was a real case of 3rd time lucky!

British Team Manager Sid Smeed, shepherded his flock very efficiently during the trip via Boeing 707, train and *Viscount*. Despite one or two little "incidents," the whole meeting was most enjoyable and well worth while, the hospitality offered by our German hosts being quite magnificent.

Full report in next month's issue

RESULTS

A-2 GLIDER

1. Averijanov	Russia	180	180	180	180	180	900+171
2. Soave	Italy	180	180	180	180	180	900+159
3. Kalen	Sweden	180	180	180	180	180	900+147
4. Van't Rood	Holland	180	180	180	180	180	900+131
5. Rodrigues	Portugal	180	180	180	162	180	882
6. Michalek	Czechoslovakia	180	180	147	180	180	867

Team: 1. Holland 2,498. 2. Czechoslovakia 2,459. 3. Italy 2,420.

POWER

1. Schneeberger	Switzerland	180	180	180	180	180	900
2. Frigyes	Hungary	180	162	180	157	180	859
3. Cerny	Czechoslovakia	180	180	161	180	153	854
4. Sheppard (P) Buskell	New Zealand	132	179	180	180	180	851
5. Meczner	Hungary	158	180	137	180	180	835
6. Verbitz	Russia	160	176	149	175	171	831

Team: 1. Hungary 2,442. 2. Czechoslovakia 2,408. 3. Switzerland 2,354.

WAKEFIELD

1. Reich	U.S.A.	180	180	180	180	180	900+210
2. Kosinski	Poland	180	180	180	180	180	900+207
3. Alinari	Italy	180	180	180	180	180	900+169
4. Azor	Hungary	180	180	167	180	180	887
5. Niestoj	Poland	180	180	162	180	180	882
6. Riffaud	France	180	160	180	180	180	880

Team: 1. Poland 2,600. 2. Russia 2,553. 3. U.S.A. 2,529.

ROVING REPORT

SURPRISE news from the U.S. model industry is that the Wen-Mac Corporation is going into the radio-control market. Wen-Mac, manufacturers of Half-A class engines and ready-to-run powered model aircraft, boats and cars, claim to be the world's largest producers in this particular sphere. Daily output of engines is said to be as high as 3,500 . . . nearly all of which leave the Los Angeles factory in ready-made models to be distributed, not by model shops, but by major department stores throughout the length and breadth of the U.S.

Wen-Mac's new equipment is a single-channel "packaged" outfit, selling for \$70 (£25). The receiver is a transistor, superhet, relayless type complete with battery case. It weighs 4 oz. and has overall dimensions of $3\frac{1}{2} \times 2 \times 1\frac{1}{4}$ in. The transistor transmitter is a miniature "one-hand" type in a case only $6\frac{1}{2} \times 3\frac{1}{4} \times 1\frac{1}{2}$ in. It has a telescopic aerial and built in meter which gives a continual indication of battery condition.

We wait to see whether this new Wen-Mac move is to be accompanied by ready-to-operate radio-controlled models.

* * *

Another piece of news concerning ready-mades is that the A. C. Gilbert Company will be entering the ready-to-fly C/L model market very shortly. This is interesting on two counts, firstly it adds a large and long-established model company to the industry—the A. C. Gilbert Company make electric trains and "Erector," the U.S. equivalent of "Meccano." Secondly, the firm's move presumably has some connection with Bill (Berkeley Models) Effinger's joining A. C. Gilbert some months ago.

* * *

It seems that the phenomenal power of the new glow 2.5's (K & B, O.S., Cox, Super-Tigre) has caused both elation and frustration. In the U.S. even some of the experts were caught out when using the new Cox and K & B for the first time in FAI F/F. Late delivery of these motors had given many contestants insufficient time to build new models and old ones, in many cases, were unable to handle the extra power without extensive re-trimming.

R/C flying in Australia. Jack Bone (holding transmitter, left) prepares to take off his K & B 45 powered "Smog-Hog." Model has O.S. 10-channel receiver and Bonner servos. (Photo: Norman Bell.)

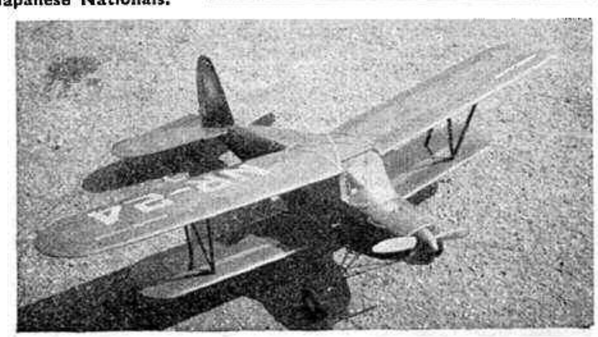
In the U.K., George French who, using one of the new ball-bearing O.S. racing glows, topped the British team trials, comments that he gets maxes more easily on this engine with 10 sec. motor run than he did on 15 sec. with the best diesel 2.5. George got his O.S. only about a month before the first trials but had taken the precaution of getting well ahead with a new (and obviously very good) model for it. For his reserve, he is using a Cox Tee-Dee 15 powered model.

Dave Posner who flew the only other O.S. Racing 15 at the trials was less fortunate. Flying first a diesel job he was right out of luck and was over 3 min. down after the first two flights. Use of his O.S. model gave him two successive maxes, then his wing broke on D/T but he got a final max with his Eta 15 model to finish 14th. On the second leg of the trials three weeks later, Dave had the O.S. in his *Eta* model, quickly climbed to 3rd and looked like being in the team. Then, after climbing high enough to do 5 min., the model hit an immense downdraught and Posner dropped six places.

* * *

From far-off Vietnam, we have received an autographed copy of the first ever book on model building published there. Written by Nguyen-Quang-Ru, a leading figure in the model movement in Saigon, the book deals with C/L models and contains chapters on stunt, speed and team-racing, with construction methods, stunt technique and hints on engine operation.

Right: this new C/L manual by Nguyen-Quang-Ru is the first book on model flying to be published in Vietnam. Bottom left: spectators at the Japanese Nationals watch a contestant in the Wakefield class event using a "stooge" to assist winding. Below: neat O.S. equipped multi-channel R/C biplane seen at Japanese Nationals.

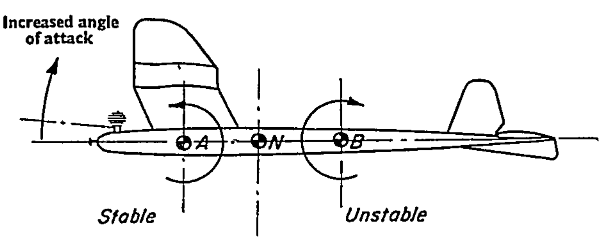


STABILITY OF MODEL AIRCRAFT

In this easy to understand article MARTIN PRESSNELL clarifies some of the mystery surrounding basic theory

PROBABLY the aspect of model aeroplane design least understood is that of stability, surely the most important quality of all. Our understanding is not helped by a number of fallacious ideas which are widely held in modelling circles. Let me say at the outset that the purpose of this article is not to tell you how to ensure stability at the building stage. I cannot answer this problem apart from offering the old advice—rely on your own experience gained from previous models, or base your designs on proven machines, keeping approximately the same layout. The purpose of this article is to review the known facts about stability and describe how the various parts of our planes affect stability.

Firstly let us define stability. Suppose we have a model trimmed for steady level flight, then stability is that capability of the model to return to its trimmed condition when disturbed. The degree of stability is measured by the time taken to recover from the disturbance. For example, a power model which makes a long dive before gliding when the engine cuts has poor stability, since it does not recover quickly.



The effect of the c.g. on longitudinal stability, when a model encounters an upgust tending to increase the angle of attack.

In analysing stability it helps to divide the motion of the model into two departments, longitudinal and lateral. Longitudinal motion occurs in the plane of symmetry and involves flying speed, heaving and pitching. Lateral motion involves sideslipping, yawing and rolling. In this way we have accounted for the three linear velocities, flight speed, heave and sideslip and the three rotational velocities, pitch, yaw and roll. A further division can also be made. Imagine a model has just been disturbed. Consideration of the restoring moments and forces only is termed statical, whereas if the subsequent response to the disturbance is considered, involving inertia and time, then the problem is termed dynamical.

So much for the definitions, now let us turn to stability proper.

Longitudinal Static Stability

Longitudinal stability depends largely on the location of the centre of gravity. Referring to Fig. 1, suppose a model is in trimmed flight with its c.g. at point B, if disturbed the model will pitch about its c.g. Now suppose the model encounters an upgust, the wing and tail angles of attack will be increased and their lifts likewise increased. Since the c.g. is well aft, the tendency will be for the model to pitch nose up, so tending to further increase the angles of attack. This is an unstable set-up, since the model diverges from its trimmed position.

Now let us suppose the c.g. to be at point A. In a similar disturbance, the model will tend to pitch nose down and so regain its trimmed attitude. The machine is then stable. There is, however, a position of the c.g. at say N, such that on meeting the gust the model does not tend to pitch at all. Here the machine is said to be neutrally stable and point N is called the neutral point. It is essential then that the c.g. should be ahead of N. The distance A-N is a measure of the stability and is called the static margin. This in turn is proportional to the tail volume, V, where

$$V = \frac{St \, . \, lt}{Sw \, . \, c}$$

St = tail area
Sw = wing area
lt = tail arm (between wing and tail quarter chord points)
c = wing mean chord.

For adequate stability V should range from about 0.80 for gliders to about 1.20 for power models.

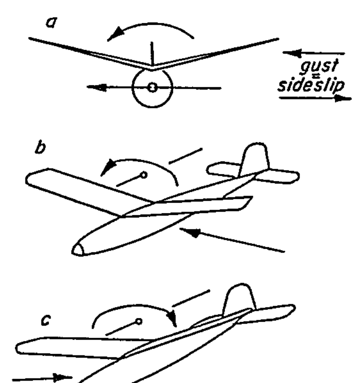
There is another important factor, however, connected with the downwash from the wing passing over the tail. If wing incidence is increased as in the case considered above, then the tail incidence does not increase by the same amount. It does not increase as much, due to a change in the downwash. The rate of change of downwash at the tail with change of wing incidence must be kept small. This can be achieved by a long moment arm, although this may be undesirable for other reasons. An alternative improvement is to use high aspect ratio wings, which keeps the tip vortices away from the tailplane.

Longitudinal Dihedral

We have seen that longitudinal stability depends on c.g. position, tail volume and downwash. The tailplane incidence required to trim a model also depends on these three factors, so it is not surprising that there is a tie-up between stability and tailplane incidence. Let us measure this angle as that between wing and tail chord lines, in other words the longitudinal dihedral.

For stability, the longitudinal dihedral (l.d.) must be greater than that required to trim the model, when the c.g. is at the neutral point. The limiting l.d. is commonly held to be zero deg. However, its value is a little more involved than that. (See Fig. 7.)

(a) If the wing, tail and fuselage are completely symmetrical, as could be the case for a control line model, then the limiting l.d. is zero deg.



Above: the development of the Dutch roll. The model has excess dihedral and a rather small fin. The principal forces acting are the ones shown. (a) A model meets a side gust, and this applies a large rolling moment side force. (b) The model swings away from the gust and begins to roll. (c) The model sideslips and this reverses the rolling moment and side load. As a result, the manoeuvre is repeated in the other direction.

(b) If the wing and tail sections are the same, then the limiting l.d. is the angle required at the tail to equilibriate the pitching moment of the aircraft at zero lift. This angle is not likely to exceed 0.5 deg.

(c) If the wing and tail sections are different then, in addition to the above angle, we must take the difference of wing and tail " no lift " angles. The no lift angle is that between the chord line and the incidence for zero lift. Then the limiting l.d. could be as much as −4 deg., depending on undercamber.

Lateral Stability

There are two extremes of lateral instability, the spiral dive and the Dutch

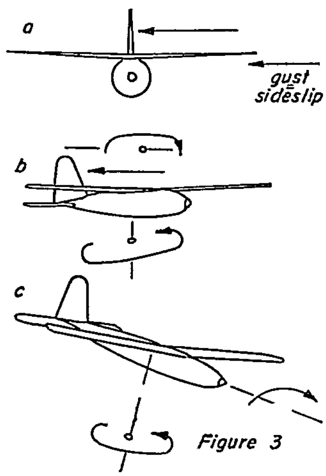


Figure 3

Above : the development of a spiral dive. The model has little dihedral and a large fin. The principal forces acting are the ones shown. (a) A model meets a side gust and this applies a yawing moment and side force. (b) As a result of the resulting yaw a rolling moment. (c) The model rolls and continues to yaw, steepening into a spiral dive.

roll. The spiral dive needs no description to the average aeromodeller—its catastrophic climax is well known. The Dutch roll on the other hand is quite rare. In this the model proceeds to sideslip, roll and yaw, first to one side then the other. The manoeuvre may become more

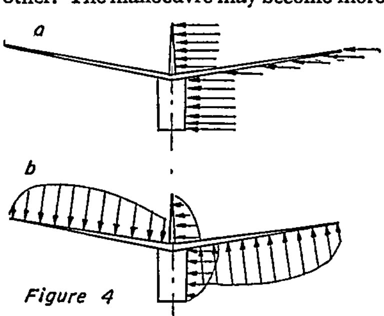


Figure 4

Above : the loads on a model due to a gust or sideslip. (a) Side load distribution based on the assumptions of C.L.A. theory. Note uniformity of loading. (b) A more realistic distribution of load. Note non-uniform distribution.

and more violent until the model dives to the ground, or it may be quite a gentle snaking motion.

Consider what happens when a model sideslips. Due to the dihedral of the wing the incidence of the leading wing is increased, while the incidence of the other is reduced. This creates an asymmetric wing loading, which in turn tends to roll the model away from the sideslip.

Also due to the sideslip the incidence of the fin is increased, which tends to turn (yaw) the model into the sideslip. The effect of the fuselage in this connection, will more than likely be to yaw the model to a greater sideslip. This is

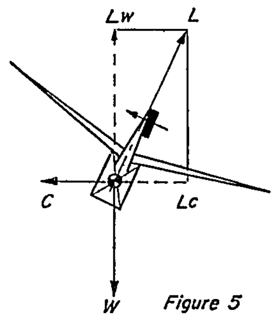


Figure 5

Above : rear view of a model turning to the right. Centrifugal force is balanced by bank. Balancing components of lift are shown dotted.

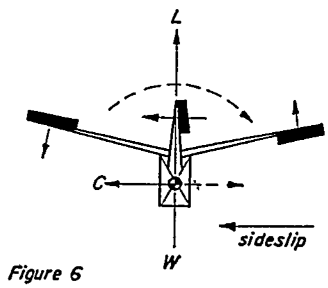


Figure 6

Above : rear view of a model turning to the right. Centrifugal force is balanced by sideslip. Bank is prevented by ailerons or wing twist. The balancing moment and side force, due to sideslip, are shown dotted.

an aerodynamic property of slender cylindrical shapes as opposed to wings. Fuselages tend to be unstable, therefore, especially those of rubber models. The flatter fuselages of gliders, if fairly deep, may exert some significant yawing moment, but generally the fin must be relied on to perform this function. The ability of a model to yaw into a sideslip or lateral gust, is called weathercock stability.

Consider now a model which is yawing, as in a steady turn. The outside wing in a turn flies faster and hence creates more lift. This tends to roll the model over into the turn. It is seen that the three lateral motions are connected and if one is initiated, the others will follow.

In order to understand lateral instability, let us consider two different models. The first has a good deal of dihedral and a rather small fin. It will therefore have a large sideload and rolling moment on the wing in a side gust, but only a small yawing moment—see Fig. 2 (a). In (b) the model has rolled away from the gust and the resulting sideslip reverses the rolling moment in (c). The manoeuvre is then repeated in the other direction. This is the Dutch roll.

Now consider a model with a large fin and little dihedral. This machine will have a small sideload and rolling moment on the wing due to sideslip, but will have a large yawing moment. It will also have a rolling moment due to yaw. Such a model encounters a side gust as shown in Fig. 3 (a). It yaws into the gust (b), which in turn induces a rolling moment (c). The model enters a spiral turn, which more often than not tightens into a dive.

Many writers advocate a large sub-fin as an aid to spiral stability, on the grounds that it will roll the model out of a spiral turn. The pitfall here I think, is to suppose that the fin, either above or below the fuselage, can provide a significant rolling moment. The function of the fin is to provide yawing moments and the dihedralled wing must be relied on to provide rolling moments. It is only by having these latter two moments present to a sufficient degree and in the right ratio, that lateral stability can be ensured.

Dynamic Stability

Under the action of a given force, the mass of a model determines its acceleration in the direction of that force. Likewise, the inertia determines the rate of yaw, pitch or roll, under the action of a moment. Inertia depends on the distribution of mass relative to the

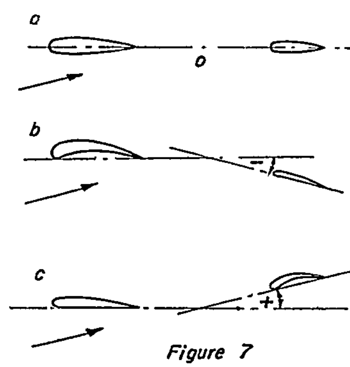


Figure 7

Above : the effect of undercamber on limiting longitudinal dihedral, for stability. (a) Symmetrical tail and fuselage. Limiting l.d.=0°. (b) Undercambered wing and flat tail. Limiting l.d.=−ve. (c) Flat wing and undercambered tail. Limiting l.d.=+ve.

c.g. By minimising inertia, that is lightening the tail and wing tips, the rate of recovery from a disturbance may be improved. On the other hand, by reducing the total mass (all up weight) or inertia, stability might be impaired, since the same disturbance will be more severe. In many disturbances, the response of the model is an oscillation.

In some cases, where a fluctuation of flight speed is concerned, the main factor damping the motion is the drag of the

Continued on page 339.

John W. R. Taylor's Planes of the month

U.S. HOMEBUILTS

NEWS that a branch of the Experimental Aircraft Association may be formed in the U.K. offers a good excuse to take a look at some of the latest creations of U.S. amateur constructors, most of whom get their inspiration and expert guidance from the EAA.

Current projects range from tiny up-to-the-minute all-metal deltas to a full-scale replica of the Wright *EX* biplane *Vin Fiz* in which Calbraith Rodgers made the first U.S. trans-continental flight, September 11 to November 5, 1911: The replica is being built by vintage aircraft experts Pete Bowers, who hopes to use it to duplicate Rodgers' flight on the 50th anniversary this Autumn.

Another recently-completed replica is the ¾-scale Nieuport 17*C* of Hobart Sorrell, whose ¾-scale Fokker *Triplane* has been flying since 1957. Powered by a 40 h.p. nine-cylinder Salmson radial, it looks remarkably like the real thing, as the illustration shows. This is quite an achievement, as scaling down introduces many problems, unless the pilot is also ¾-scale. As he usually sits well behind the c.g., the engine has to go forward to maintain stability and the tail surfaces tend to get proportionaly larger than they should be.

Pete Bowers, who sent the Nieuport picture, comments that it is never easy to photograph Sorrell's aircraft, as his airstrip is just a slot in the forest, with no clear backgrounds. There could hardly be a better compliment to the take-off performance of the replicas.

Arlo Schroeder's *Hawk-Pshaw* is not a replica, but carries a paint-scheme made famous by the U.S. Army Air Corps' Curtiss Hawk *P-6E* fighters of 1932. It was built from plans of the Meyer *Little Toot* and spans only 19 ft. Powered by an 85 h.p. Continental, it is capable of a level 135 m.p.h. and has been dived to 180 m.p.h. with subsequent 5¾G pull-out, which emphasises the skilled engineering and structural strength that go into the home-builts.

Hawk-Pshaw's fuselage and wing struts are dark green, with royal blue engine cowling and landing gear, and white trim. The wings and tail surfaces are bright yellow, except for the red and white striped rudder. Old-style red-white-and-blue star roundels appear above and below the wings, and there is a white eagle on a royal blue band around the fuselage. The final effect is every bit as striking as it sounds.

Another link with the past is provided by the *Special* built by 66-year-old Ernie Fillinger, who works on the supersonic rocket track at Edwards AFB. With a 90 h.p. Franklin engine, his special is far from supersonic, but cruises at a pleasant 100 m.p.h. Its diamond-shape fuselage is based on that of the pre-war Prest *Pursuit*, one of which Fillinger built before getting down to his own design. The wings are modified Luscombe panels, with a span of 21 ft.

Far less orthdox is the *Chinook*, with mid-wing, T-tail and tricycle undercarriage, using Cessna 140 main legs. Its builder, Bill Meadowcroft, admits that the workmanship is not as good as on some home-builts, but it gets a cruising speed of 125 m.p.h. from a 95 h.p. Continental and is designed as a roomy side-by-side two-seater. What is more, it operates happily from 1,300 ft. hayfield, although it appears that the birds which formerly nested in trees at the end have moved to the relative safety of the local city park since the first take-off.

A design which calls for no complaints on the score of workmanship is the Warwick *Tiny Champ*, which carried off first prize for outstanding design at the 1960 EAA Fly-in. A single-seater with a 65 h.p. Continental, it cruises at 100-105 m.p.h. and has a rate-of-climb of 800 ft/min. Span is 20 ft. and empty weight a mere 571 lb. Fresh-air fiends can convert it into an open-cockpit parasol monoplane by simply removing the doors and cabin fairing.

Finally to something that promises to be a very hot ship—the *Stinger* by Larry Heuberger, whose *Doodle-Bug* and *Sizzler* are already well-known. Of all-metal construction, it has folding delta wings, a pusher prop, tricycle undercarriage, and a "wait and see" performance.

It may be a long time before anyone in Britain gets as ambitious as this, but the formation of an EAA branch here would be a step in the right direction. Anyone interested in joining and helping to put British private flying back on the map should contact The Popular Flying Association, Londonderry House, Park Lane, London, W.1.

Heading photo shows the Warwick "Tiny Champ." Left: the "Hawk Pshaw." Bottom left: ¾ scale Nieuport 17c. Below: the Heuberger "Stinger."

MODEL ENGINEER EXHIBITION

THE 1961 Model Engineer Exhibition was the first to be held in the Central Hall, Westminster. Since 1907, when the Exhibition was first held, it has been associated with the Royal Horticultural Hall, but the new venue has done nothing to discourage entries or visitors, both of which are, of course, vital to the success of any exhibition.

In the aircraft section it was pleasant to see evidence to soundly reject the oft-repeated slogans "craftsmanship is dead" and "plastics are killing creative modelling." To prove this statement take a look at our photographs on these two pages.

The heading photo shows Sir Miles Thomas pointing out some interesting item to an attentive group of young visitors. Sir Miles opened the exhibition and a more appropriate personage it would be difficult to find. His close association with aviation and his active interest in the creative arts is well known. Just in front of Sir Miles can be seen C. E. Read's very novel "convertiplane" with two rotors, one on each stub-wing tip and each driven by two Jetex motors. Forward thrust is provided by a diesel engine in the nose.

Right, Capt. Cesare Milani examines his C/L twin Merco 29 powered Caproni 34, which won the Championship Cup. This well-known model is no stranger to our pages, but it now sports authentic camouflage on the upper flying surfaces (compare it with last month's picture).

On the opposite page **Photos 1 and 2** show another of C. E. Read's models, a really eye-catching F/F low winger, beautifully finished in orange, with black and white trim and complete with fully equipped cockpit. He calls it *Pinky*!

Photo 3 shows the nose section of Noel Barker's 1/9 scale F/F Vickers F.B.9 *Gunbus*. Powered with a Mills 1.3 diesel it won the Club Team Cup.

Photo 4 supports what we said earlier about plastics. It shows H. J. Randall's beautiful little 1/48 scale B.E.2E., finished in No. 2 Squadron colours. It won a bronze medal.

Mr. Randall entered three other solids, all to the same high standard, each one being displayed in a neat little Perspex case. The ubiquitous S.E.5A crops up again in **Photo 5**! This one was built by A. A. Crick of Bexley and is 1/12 scale, free-flighter.

J. M. Devenish of Chichester entered the superbly finished little F/F sportster shown in **Photo 6.** The all-white paint job with simple blue trim really sets off this very smart design which was Highly Commended.

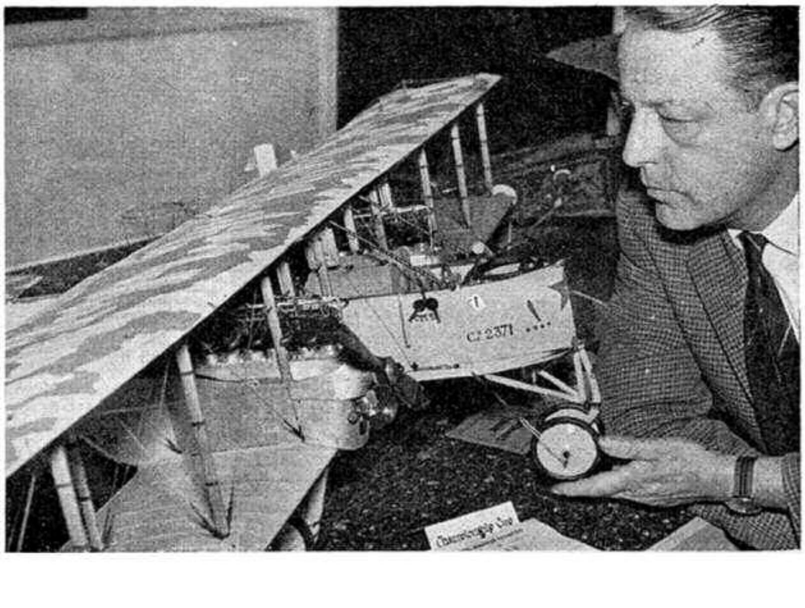
Originality plus—that's the little fibreglass helicopter seen in **Photo 7.** It was exhibited by Roger Dudley of Weston-super-Mare and the Merlin power unit is fully enclosed in the fuselage shell.

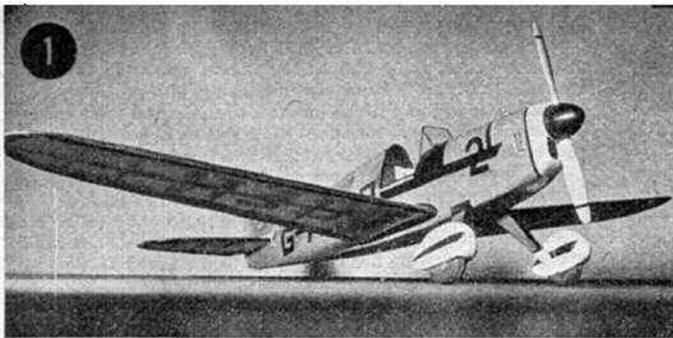
Photo 8 shows an almost complete pair of ambitious scale control-liners. The subject chosen is just about as novel as one could wish—the unique German wartime "Mistel" composite aircraft, which consisted of a Messerschmitt Me.109 on top of a Junkers Ju 88H which was modified as a flying bomb. When in sight of the target the Messerschmitt pilot released the Junkers, which glided earthwards; the Me.109 then returned to base at high speed!

C. G. Crawley built this model, which requires two pilots, one for the Me.109 and one for the "bomb" which, like its full size counterpart, can be released in flight. We'd love to see the first flight—hope it isn't *too* realistic!

Performance Kits were there with all their latest lines, Reading Model Supplies gave a practical display of R.E.P. Radio Equipment and demonstrations of constructional techniques were continuously given by members of the Springpark M.A.C.

RESULTS ON PAGE 304

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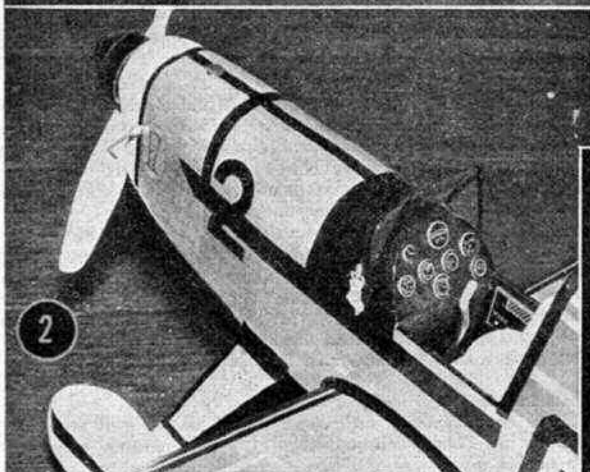
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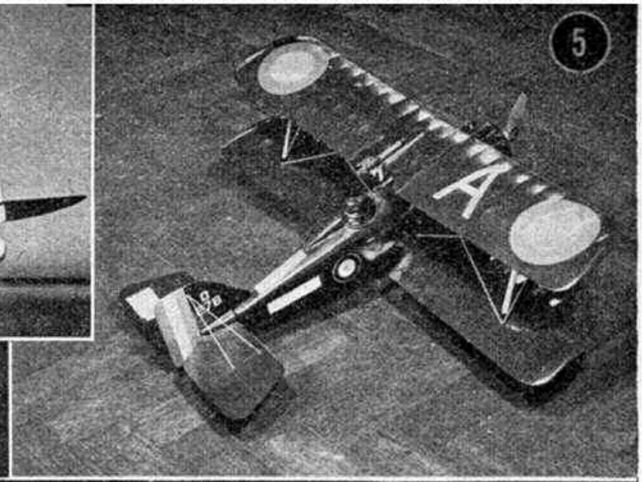
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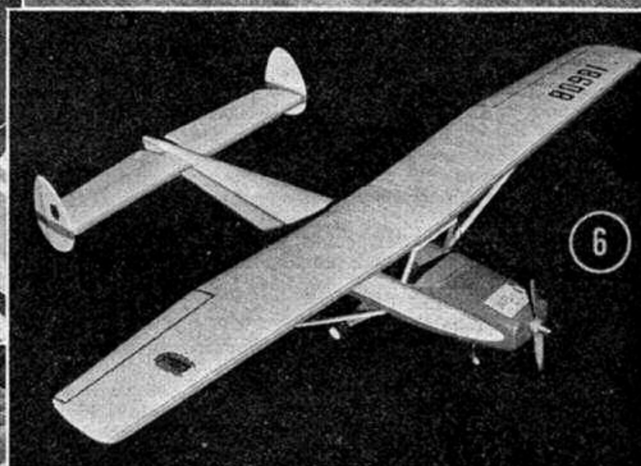
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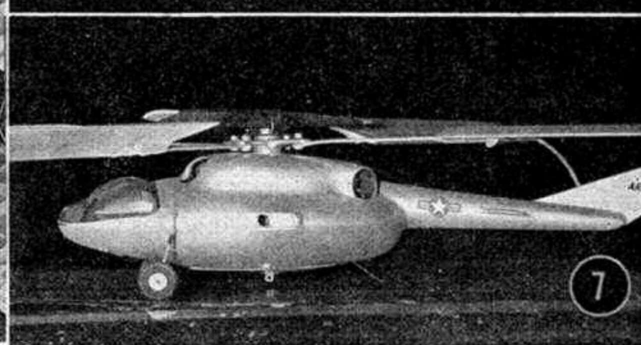
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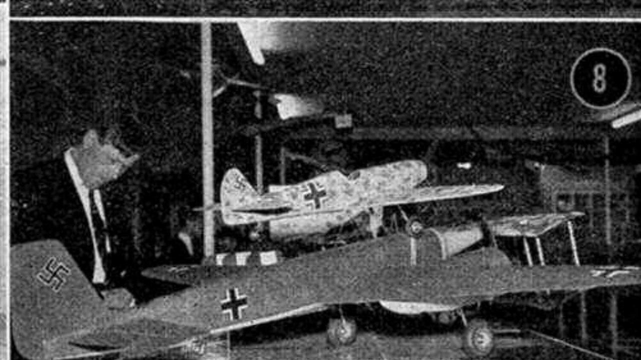
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TOPICAL TWISTS

by pylonius

Hard Case

The latest speech from the Prosecution seems to indicate that the trial of the S.M.A.E. v. the People has moved into a phase of legal complexity quite beyond the comprehension of the mere layman. When the trial opened the issue appeared to be quite clear cut. Were the defendants legally entitled to withdraw their cheap insurance concession to the masses as threatened and limit their services to the contest field, or should they continue to preside as the non-governing, governing body?

But now things are getting involved. We are asked to consider who said what, when they said it, and why they shouldn't have said it. Also we are asked to ponder such bizarre ingredients as displaced persons, modellers' denominations (R.C. etc.?) and length of service. Then the mystery: if the defendants' P.R.O., likes to keep everything under his hat, why then does he wear such a meagre, pork-pie effort. Surely a ten gallon Stetson would be more appropriate. He could then safely store both his secrets and enough fuel to keep all the contest flyers happy.

Now, at the risk of earning myself a further 10 years in the doghouse for contempt, here is a short extract from the court proceedings:

Counsel: Is your name Pylonius?

Yours Truly: Guilty, your honour.

Counsel: The same Pylonius accused of muttering in print?

Y. T.: So it is alleged.

Counsel: Then it could be said that you can't tell talk from mutter. But let that pass... (exit the T.V. delegation in high dudgeon). Now, to continue. Is it true you are prepared to speak on behalf of the defendants?

Y. T.: No, your honour.

Counsel: Not even if they gave you the badge you won in 1959.

Y. T.: No. I believe in giving them time.

Counsel: Ah. So you admit their guilt? And speaking of time. You state you have been flying models for 20 years.

Y. T.: Yes, sir. Man and Toy.

Counsel: And, in that time, have you ever had a claim for insurance made against you?

Y. T.: No, your honour. I never put my name and address on my models.

Counsel: But you will admit that this model, marked Exhibit Z, is one of yours, and also that it bears the initials S.M.A.E. Can you tell me what those initials stand for?

Y. T.: Not unless you dig my teeth out of that glass of water.

Counsel: But, will you not agree that, when looking at the state of that er model and the august initials displayed upon it, do you not consider the defendents lenient in not taking libel proceeding against you?

Y. T.: No, your honour.

Counsel: And why not, may I ask?

Y. T.: Because they are the initials of the new national movement: The Scribes and Mutterers Airborne Enterprises. (Collapse of Perry Mason.)

Small Talk

Generaly the trend in R/C is one of diminution. As the electronic and I/C gadgetry becomes transistored and tinkered down to the point of near invisibility, so do the models shrink like a sports flyer at an area meeting. Ultimately, it is hoped, the miniaturisation will reach the desired point where the transmitter can be coupled to the remote telly control, so that flying and viewing can be carried out as a simultaneous operation. No more tiresome searching for flying space or suffering that empty feeling of missing your favourite T.V. show.

With all this eye straining midgetry going on it is refreshing to see someone going the whole hog in the other direction. Instead of tweezer picking the engine out of its plastic bubble, our big time friend got cracking on the powered lawn mower, and with 14 ft. across the span, the resulting monster should be clearly visible to the most myopic spectator.

And speaking of spectators, all that model could be used to frighten away the too inquisitive onlooker. Attempts to do this with explodable models and ground to ground missiles have been without avail. The new resistant strain of spectator operates on a viewing basis of two yards distance per ft. of wing span. With models now being measured in inches rather than footage it is sometimes difficult to decide whether the rudder escapement is working, or if it is just someone wiggling an ear. But, at least, 14 ft. of wing scything its way through the gaga masses should enable all of us to spot the spot landing spot if nothing else.

* * *

Perhaps it is a comment on the whittling down of the radio model to insect size that they seem to flit rather than fly. Even one of the expert bleepers is a bit perturbed by the way the modern mutli thrashes about the sky like a demented wasp, and would like to see its special brand of lightning scareobatics slowed down to an observable motion.

So, too, would the radio judges. Already one of their august breed has been known to give maximum points to a low flying bumblebee, while another has abandoned any attempt to follow the flight schedule visually, preferring to close his eyes and award points on the volume of applause. Indeed, it has now been suggested that all flights be recorded on film, then judged on a slow motion run in the projection room.

Kids' Stuff

The worst of being an expert is that all the guff you read in the Tiny Tots' Technical Monthly, more sedately known as the model periodical, is all so dreadfully elementary. As one would-be Wakefield winner claims, you are not likely to find the latest comp beating gimmick knocking around in the Wings Club section. When you reach the advanced grade, where warps become variated angles of incidence, you can safely ignore anything but the most learned treatise.

Back in the early days of the model journal the expert could look confidently forward to his monthly feast of maths and physics. Of course, in those days, all the modellers were experts, and, if they weren't, they could jolly well suffer for their ignorance. Since then the cult of the beginner has blossomed into full flower. The expert to expert exchange has given way to the novices' forum, and the pages of maths to the painting of plastics.

Even so, the expert doesn't take his calling quite so seriously as he used to do. The scholarly approach is out. Hardly anyone gives a hoot for maths any more; it is now a question of how much high explosive can be stacked into a bottle of fuel, and which country is currently producing the snortiest engine. Now and again the experts might wrangle among themselves on the amount of wash-in to use, but the modern treatise, as per Frank Zaic's Year Book, is usually on these highly scientific lines:

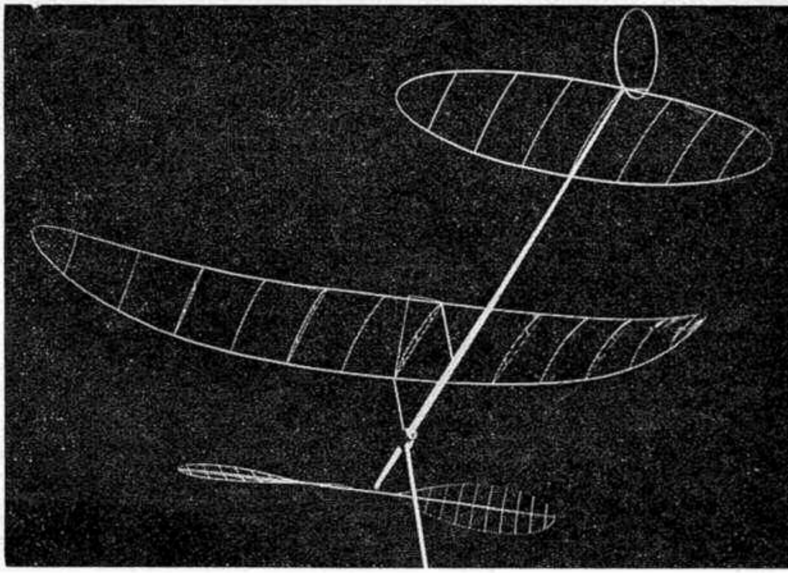
"We found the crate performed better with the tailplane reversed. We put this down to the fact that we had fixed it on wrong to start with. The next problem was to cure the nose in tendency, and so Jake thought of uncoupling the accumulator before launching. Next thing we knew the crate had developed a vicious spiral. We tried cranking in another 10 deg. wash-in on the starboard wing, but no good. Then I got the idea of lopping 6 in. off the port wing. This did the trick.

"Next time out we hope to try a power on flight . . ."

Coming back to maths. It was always the unknown factors that beat me, quite apart from my lack of schooling. Before you could work out the design of the model you had to build it first in order to find its airspeed and rate of sink. For this purpose you needed a rangefinder, altimeter and all sorts of precision instruments. As these were never obtainable, and you'd built the model anyway, you went thankfully back to the good old rule of thumb, which is about the only worthwile digit in any modelling calculations.

THE NEW INDOOR CHALLENGE—

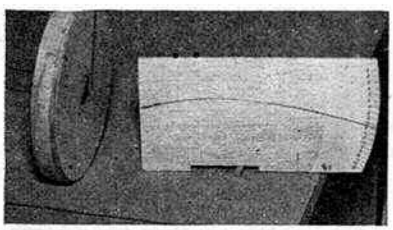
45 Minutes!



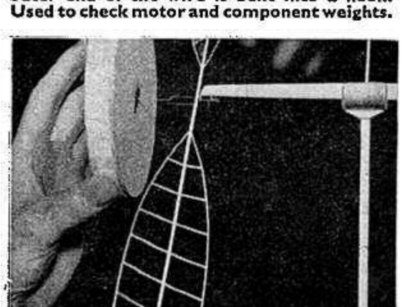
THIRTY minutes has long been the elusive goal aimed at by aspiring indoor flyers. Those who achieved it were considered to have "arrived," but from now on, there is a new measure of proficiency—*forty-five minutes*! The man who opened this new era was Germany's Max Hacklinger, whose model, after the World Championships at Cardington, wafted around the airship sheds for 44 min. 20 sec., to set up a very decisive new world record.

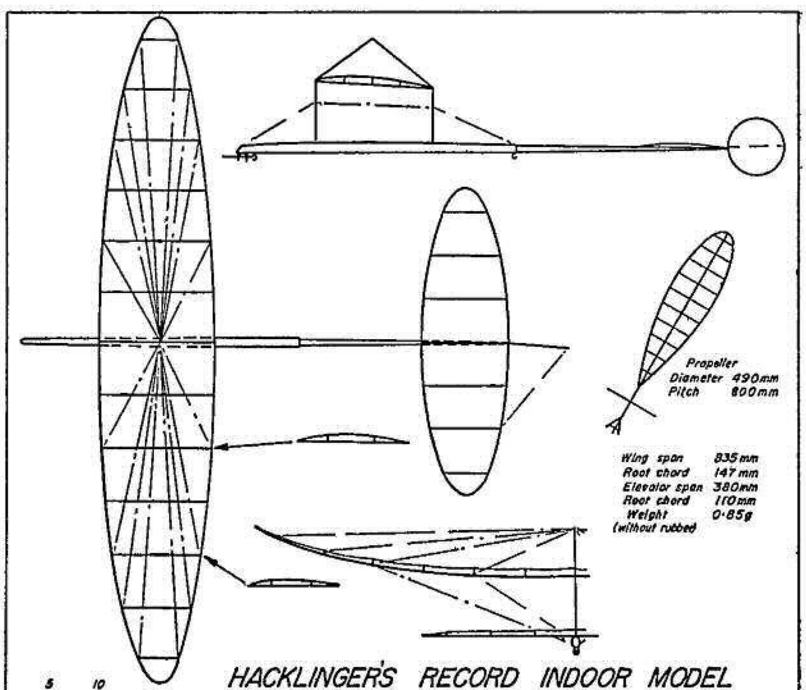
Max has long been known for his carefully calculated sailplane wing sections and he applies his theoretical approach just as much to Microfilmies as to their outdoor cousins. His indoor calculations have paid off, and it is interesting to note that long before his record attempt, Max declared that his beautiful elliptical wing model was *designed* for 45 min.! It also holds the present German record of 30.29 flown in a 75 ft. high hall.

For various reasons Max fared very poorly during the actual championships, in fact he finished in 13th place—second from the bottom! It was obviously not an unlucky 13th, for although his performance, judged against his own new standards, was below par, we feel that the 1961 Cardington championships will long be remembered as the occasion when the three-quarters of an hour indoor model became a practical possibility. We know that the contestants left the meeting in a *very* thoughtful frame of mind. Forty-five minutes needs a whole lot of revised thinking.



The heading photo shows Max's model on its stand. Above: two simple little gadgets that Max used to enable him to achieve his remarkable flight. Left, the disc shaped torque meter which consists chiefly of an old clock spring attached to a central shaft, one end of which is a fork (see photo below), and the other end bent into an indicating hand reads off against the calibrations on the face of the disc. Used to check and compare fully wound motors. The right hand device in the picture above is a simple weighing machine—$\frac{1}{16}$ in. balsa calibrated down one edge and a piece of 24g wire cemented to one side. The outer end of the wire is bent into a hook. Used to check motor and component weights.





RADIO TOPICS

MOTORISED actuators—or servos as they are generally termed to distinguish them from escapement-type actuators—are about the biggest single source of argument, misconception (and misapplication) and general misunderstanding of any radio control system component. They also offer an almost endless possibility of working electro-mechanical switchery, to make a simple electric motor become a more sophisticated device. The services an electric motor can be made to perform on a bench rig are quite fantastic, once you go into it and more readers take us to task for criticising motor-servos than write on any other subject.

We feel bound to make it clear that we

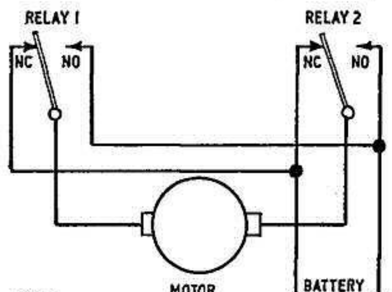


FIG. I

" Standard " circuit for single battery connection to motor-servo switched via two relays.

are not against motor-servos. Far from it—for multi-channel systems they are the only suitable type of actuator. What we are suspicious of, through experience, is the motorised servo which gives a whole variety of duties from a simple single-channel control. There are usually limitations in practical application, which can, quite often, be serious. Hence we stick with our recommendation that for *simple* single-channel *aircraft* control, the simple or compound escapement will usually give more reliable results for the average user.

Even this statement needs qualification. There are escapements and escapements—those which are really reliable and those which jam or skip. Of course, not everyone wants to stick to *simple* control systems with single-channel equipment, which is where the motorised servo does come into its own. On a rough count, many more commercial motorised servos are made for single-channel application than for multi—so there is variety enough to confuse anybody for a start.

We also know that the North Kent club have developed a motorised servo for rudder-only control, which gives very satisfactory results—selective switching with faster operation than a typical multi-servo, which disproves the old standing rule that for rudder-only single-channel, only an escapement gives a fast enough response. One of the biggest snags, we understand, has been in providing complete suppression for the motor. The final solution, which appears entirely adequate, is a 70 to 100 millihenry choke in each motor lead adjacent to the motor, with a 0.04 microfarad capacitor across the motor terminals and a 200 picofarad capacitor across the other side of the RF chokes.

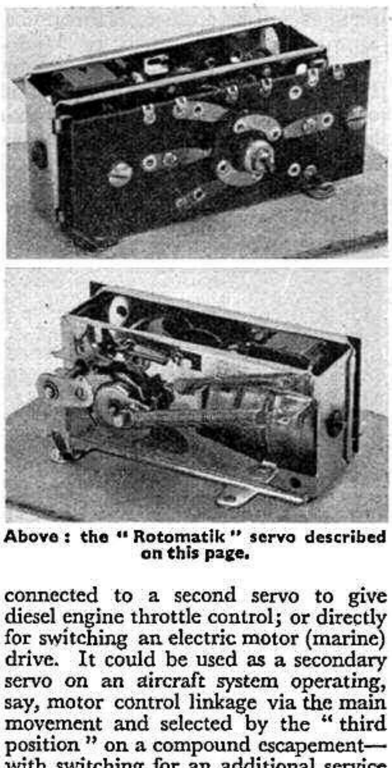
* * *

Having deliberately published a one-battery circuit for a motor-servo which would not work, we have had, as we anticipated, dozens of further circuits which *do* work (or at least, nearly all of them were practical). In case this is still puzzling further readers, Fig. 1 shows the correct circuit for reversing motor direction using a single battery and two relays (i.e. selective switching of the motor via two channels). This is suitable for most types of motor-servos, including those basically intended for " Galloping Ghost " but used on two channels as a selective servo.

* * *

Yet another German motor-servo reached us this month—the Engel " Rotomatik " which is to be distributed in this country by Mercury Models Ltd. This is a single-channel compound servo giving rudder operation in sequence—press and hold gives right rudder, release gives neutral, press and hold gives left rudder, and so on. In addition, four separate sequence switching positions are given by successive quick blips—e.g. for motor control.

The " Rotomatik " is a large and rather heavy unit and intended specifically for boats. The drive motor control consists of a double-pole double-throw switch, which entails the use of only one battery for the motor. The switch can be

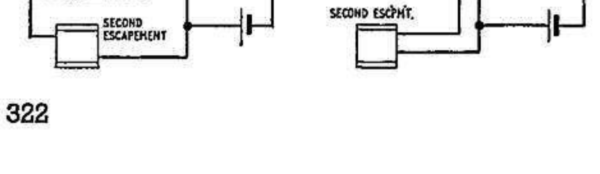


Above : the " Rotomatik " servo described on this page.

connected to a second servo to give diesel engine throttle control; or directly for switching an electric motor (marine) drive. It could be used as a secondary servo on an aircraft system operating, say, motor control linkage via the main movement and selected by the " third position " on a compound escapement—with switching for an additional service via " quick blip " contacts on the same escapement.

* * *

Reader D. Swan says that he finds it impossible to use a secondary escapement wired to the " third " position contacts on a compound escapement, without the escapement " tripping " every time the compound returns to neutral after a rudder control. He says, also, that he can trip the escapement when wanted by a " quick blip " signal, but has been told



Left: "Third" position switching connections on left: " quick blip " switching connections on right. Note how " quick blip " circuit is wired through back contact of receiver relay.

that this is impossible (even if it works!) because, for " quick blip " switching, the secondary escapement has to be wired to the back contact of the relay.

Let's sort this out from scratch. First—" third " position and " quick blip " switching are quite distinct and each involves a separate set of electrical contacts, although a compound actuator may incorporate *both* sets, but more usually one or the other The "third " position is a " held " position and the contacts are wired *in series with the receiver relay contacts*—see Fig. 2. Thus the " third " position *circuit* is complete *only* when this position is *held*. Although the " third " position contacts are momentarily made by the escapement wheel rotating to neutral position, the receiver relay contacts in this case are open and thus the circuit is " open."

With " quick blip " the " quick-blip " switching contacts are momentarily closed by passage of the escapement wheel, after being tripped by the signal. By this time the receiver relay has dropped out and, in this case, the switching circuit is wired through the back contact of the relay—see Fig. 2. Hence, the switching circuit is completed momentarily as these " quick blip " contacts close—for a period sufficient to trip an escapement.

The " quick blip " switching operation takes place *between* neutral and the first selective control position. Hence, when selecting the first (or second or third) control position, which calls for the signal to be *held*, the relay is pulled in and the " quick blip " circuit remains open, even though the actual " quick-blip " contacts momentarily close.

Note, also, that the " third " position control can be held and thus can be used to operate either a secondary escapement or servo motor. It may, however, only be used to momentarily hold, and then release, an escapement used as a motor-speed control, i.e. connected mechanically so that the two neutral positions correspond to " high " and " low " speed, respectively. The " third " position *held*, in such cases, gives an intermediate control position—hence a three-speed motor control. " Quick-blip," on the other hand, can only be used to trip an escapement, unless the complication of using a latching relay in the circuit is accepted.

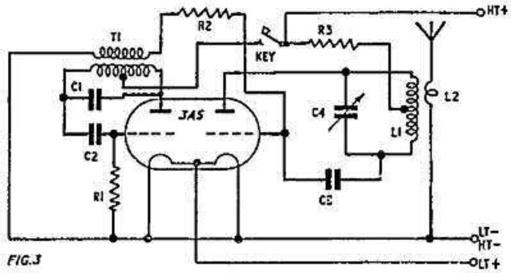
Reader Swan has obviously connected the " third " position contacts as a control switch in a *separate* circuit—hence its momentary operation every rotation of the escapement wheel. It is not " quick blip " operation, although with such a connection it will respond to every momentary closure of the " third " position contacts.

The (correct) " quick blip " control switching is usually preferable for sequence high-low motor-speed control, since the response is more rapid. "Third " position used for motor-speed control can give three motor-control positions, as noted. It is more useful, however, for operating a definite " hold " control, such as " kick " elevator.

* * *

Right: Windy Kreulen transmitter circuit.

Components:
R1—100 k ohms
R2—10 k ohms
R3—1 k ohms
C1—22 pF
C2—10 pF
C3—47 pF
C4—3-30 pF
T1—output transformer
L1, L2 } prefabricated coil



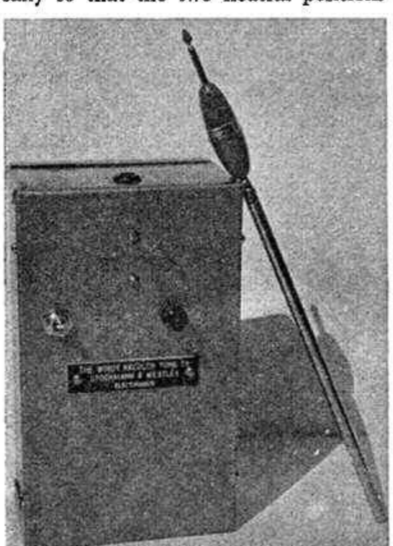
A simple, efficient, tone transmitter by Dutch enthusiast Windy Kreulen, is marketed in this country by Stockmann and Westley, in the form of a kit which is just about ideally suited to the beginner, or for many of the more experienced, whose practical work on electronic assemblies often leave a lot to be desired. Stockmann and Westley have adapted the design to printed circuit assembly, ensuring consistency of results, while leaving foil areas as large as possible, to provide adequate support for the components. Assembly time is about one hour, and is virtually foolproof.

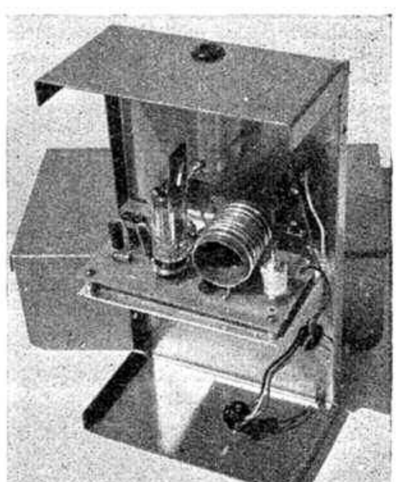
A special telescopic aerial, with centre loading coil, is provided in the kit. The loading coil is pre-tuned to the Windy Kreulen circuit, but with adequate band width to accept drives from other transmitters, the S & W aerial might be an answer to lack of range on other designs.

Ground range of the Windy Kreulen Tx with this aerial, is quoted as ¾ mile with a typical receiver.

A circuit diagram is given in Fig. 3. One half of the 3A5 valve is used to provide sufficient AF to modulate the RF produced by the other half, with a push-pull output transformer. A rather unusual feature is the use of a combined HT and LT battery (two B.114's), but the transmitter consumption gives a balanced load on each section and maximum battery economy.

The kit represents good value at 97s. 6d. and includes gold " hammer " finish case, ready-wound coils, glass fibre printed circuit, aerial and all components. A " conversion " kit for incorporating crystal control, will also be available shortly at 35s. (basically this envolves replacing the 47 pF capacitor with a crystal). Stockmann and Westley are also developing the circuit for three-channel control, ample space being available within the case for the additional components. If this works out successfully, this will also be available as a " conversion " kit.





These three photos show the Windy Kreulen transmitter kit parts, and complete Tx.

OVER the COUNTER

TWO super kits from **Frog** this month. The first is the long awaited, much heralded *Jackdaw* for R/C or F/F. This is just about the most complete and well produced kit we have ever examined. The quality of the wood and the die cutting is magnificent and three beautifully drawn plan sheets simplify the building, which in any case is perfectly straightforward.

Radio installation details cover both single and multi operation, ailerons being optional, but fully detailed on the plan. We know for a fact that this design has been a " no expense spared " project, and a tremendous amount of time has been spent on extensive development before going into production. Radio man Stewart Uwins has flown prototype *Jackdaws* to victory in several contests this year and these were perfectly standard models which you can easily duplicate thanks to I.M.A.'s fine kitting.

Veco semi-pneumatic wheels come with the kit, and there are large transfers, a " clunk tank," pre-formed alloy undercarriage and a host of other extras not often found in kits at *any* price. This one costs £5 17s. od. and is very good value. It will be popular for a long time to come.

* * *

Just to prove that the C/L boys have not been neglected, Frog have also come up with a big new stunt job—the *Attacker*. Our comments on the *Jackdaw* can be repeated in full for this one. Besides all the fine timber and even more extensive prefabrication, the builder will be pleased to see that the brass control horns are already *brazed* onto their respective wire parts which are, themselves preformed !

The boxes of both these kits are commendably stout and of very generous size —you can actually put the bits all back after taking them out to goggle at— not that you'll want to, of course, for we believe that once you have seen one of these beauties you will want to get building right away. The *Attacker* costs £5 12s. 6d.

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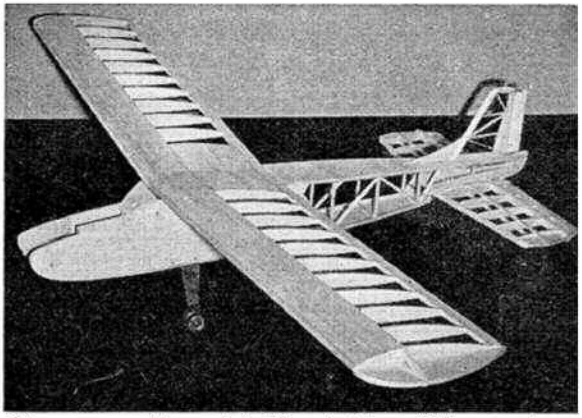


Above: our partly completed Frog Jackdaw which we are to use for R/C equipment testing.

A very useful gift for the young plastics enthusiast, or any modeller for that matter, is the new **Humbrol** painting kit, consisting of six tinlets of the most popular enamel colours in a presentation box, complete with brush and tube of polystyrene cement. These latter items are virtually free gifts, since the cost of the set is the same as that of six tins bought separately—4s. 6d.

The introduction of the Humbrol Fuel-proof Dopes has given rise to some confusion over the new product and the existing range of the well-known Britfix dopes by the same manufacturer. To clarify the situation a new leaflet has been prepared detailing the differences and uses of these two products. Supplies of these leaflets are available to retailers for passing on to their customers.

* * *

Although not marketed specifically for the model aircraft trade, the **B. J. Aerosols** of cellulose, samples of which we recently received, are quite suitable for model use.

Besides a range of bright, glossy colours in 6 oz. packs which retail at 7s. 11d. each, there is a clear non-shrinking finish at the same price. Black and Silver are also put out in 12 oz. aerosols at a more economical price of 11s. 6d. and since most models will require more than 6 oz. of dope (thinned for spraying, remember) this is the best way to buy it.

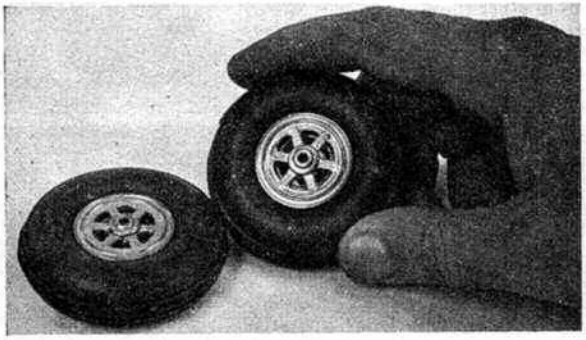
Aerosol doping at present day costs, is always much more expensive than other methods of application, but against this must be weighed the convenience and cleanliness of the system which many users consider justifies the extra cost.

The important thing to remember when spraying is to avoid over heavy application; use only a very *thin* coat at a time and allow it to dry completely (20 min.) before adding further coats. If this is not done, runs will develop which are very difficult to rectify.

* * *

We recently mentioned **H.M.G.** one-solution fuel proofer and commented upon its apparent effectivness. This sort of thing can only be really proved by time and use, and we are now able to confirm, that after taking a real hammering on the Editor's speed models (which on occcasion use very highly doped fuel), the proofer remains proof ! A 2 oz.

Left: the two new Frog kits, the Attacker (left) and the Jackdaw. Below left: Veco semi pneumatic wheels are imported by Bradshaw Model Products and cost 12s. 11d. (2 in.), 14s. 6d. (2½ in.) and 19s. (3 in.) per pair from your local shop. Below right : The new Humbrol paint kit.



jar costing 2s. will go a very long way since it need only be applied very thinly.

* * *

Due to town redevelopment the long association of **M.S.S.** (Model Supply Stores to you), with Brazennose Street in Manchester is ended, and the new address will be Model Supply Stores Ltd., c/o Godley's, 2-8, Shudehill, Manchester.

We have happy memories of this store going back to the days of 1d.-a-yard rubber, and we are sure that the reputation for attentive service built up over the years by M.S.S. will be carried over to their new premises.

* * *

Particularly welcome are the "radio control" sizes of nylon propellers just introduced by **E. Keil and Co.,** covering the 10, 11 and 12 in. dia. Of nice blade shape with good aerofoil sections, thin trailing edges and plenty of strength near the hubs, these will be a logical choice for the larger engine sizes. Sizes available and prices are: 10 × 4, 10 × 6—5s. 3d.; 11 × 4, 11 × 6—6s. 1d.; 12 × 4—7s. 6d.

* * *

Sole distribution of **DEAC** batteries to the model trade has been negotiated by Roland Scott—hence stabilised prices, at last (hitherto prices tended to vary with source). DEAC's, of course, have become just about the "standard" accumulator-type battery for model radio control work in this country and we personally have not yet found any point on which to fault them.

Right: B. J. Aerolacquer is quite suitable for model use.

Below left: one of the new, bigger, K.K. nylon propellers. Below right: the beautifully built Elmic Conquest, recommended for the Frog Jackdaw.

HARLEYFORD books continue to bring to light all manner of interesting and often obscure facts about many branches of aviation and the personalities connected with it. Their latest epic—**"Fokker, The Man and the Aircraft"**—takes its place alongside its popular predecessors this month, and a worthy place it is.

One of the reasons for the success of these books is the careful blending of two often incompatible approaches to the subject. On the one hand, the wealth of photos and drawings makes an immediate appeal to the modeller, and on the other, the very readable historical facts, figures and fascinating snippets of personal information are gold dust to the aerophile and, for that matter, a wide section of the general public.

Anthony Fokker is a wonderful subject for the Harleyford treatment and Author Henri Gegener has taken full advantage of its possibilities.

The part of the book which will particularly appeal to our readers is the section devoted to 49 tone drawings of Fokker aircraft, all to 1/72nd scale, by W. E. Hepworth, M.S.I.A. 17 of the aircraft ranging from the Fokker's first 1910 machine to the latest Friendship occupy double pages.

We must make a couple of comments on these drawings. From a modeller's point of view, although they are quite accurate they include no sections or underside detail. The tone type of drawing gives an attractive three-dimensional effect showing all colour divisions and individual markings, but in this case the reader is not told what the colours *are*, and a great opportunity has thus been lost to supply this, very valuable information, the acquisition of which can be so frustrating to the scale modeller.

There are 224 $8\frac{1}{2}$ in. × 11 in. pages in this weighty volume, and the hundreds of unique, well reproduced photographs alone justifies the cost of the book. Harleyford Publications 45s. 0d.

* * *

"Aircraft Camouflage and Markings" by the same publisher is now in its fourth reprint! This latest run, with much improved binding, incorporates some further changes, the most obvious being J. D. Carrick's cover painting of the famous, garish, Curtiss Warhawk bedecked with the National insignia of all the countries with which Curtiss fighters served—28 in all! The painting is also reproduced as a frontispiece.

The major internal difference between this and previous editions is the deletion of the 1/72nd scale drawings at the back of the book, and the substitution of a section illustrating every squadron badge of the R.A.F.—nearly 400 of them!

continued foot of next page

LETTERS to the Editor

Wot, a Giggle !

SIR,—My Dad and I have been readers of your magazine for a long time (well Dad has anyway), and for bedtime stories he reads me the serials; the Saga of the Twisted Rubber Model was very exciting (we think the Wire Fence was the villain, and not Mr. O'Donnell).

The latest one about the Ladies who never won the "Thurston" would be good if my Mum wasn't concerned, but I remember Dad telling me she did win it once, and I feel I ought to tell you about it, as Mum might think they were jealous; though who wants to polish a cup for a whole year just for the sake of it beats me!

My Mum's glider also does long flights, in fact I lost sight of it while chasing at the Team Trials, and it is still in a cornfield somewhere; she was ever so cross (seems she had got it trimmed after four years of trying, then I go and lose it!), and I thought if I got Dad to write to you about how good she was (at flying anyway) she might forgive me, and return my piggy-bank she took to buy wood for a new glider. I see Mum has also won the Woman's Cup again (that is the one that the ladies wanted more entries for). They tell me she won it twice before, but I can't remember back that far, and when I ask about it Mum and Dad go all soppy, saying that for a year or so she couldn't fly as she was building an own design scale model, which seems a long time to take as the new one only took a month, and they won't show me the plan, or explain about the birds and balsa bugs, so I'll have to wait till I am older and find out for myself!

I must say I like going flying (but not when Dad sends me that way for touching his gliders), as I have lots of friends who say hallo, and play with me while Mum and Dad are busy flying; it all seems too complicated to me with maximums and line checks (I'm the 11 lb. weight that they try to pull over) and I only watch, though I bet I'll have a go when I get a bit past the crawling stage, and can run backwards like Dad does.

In conclusion, I hope that the other ladies get their maximums in the right order one day, and win something at least, then they might be satisfied and settle down to just making the tea, and feeding us who have a lot more competition to contend with.

Yours truly,

Master COLIN GIGGLE, age 1 year 8 mths.
Stevenage, Herts.

Drag comments

SIR,—I was very interested to read "Drag Analysis of a Team Racer," by H. MacDonald in the August MODEL AIRCRAFT. The drag equation quoted can be used for most types of model and I have specifically used it to investigate the performance of A.2 gliders. A comparison of results is rather interesting.

For the team racer $C_L = 0.0762$ and the resulting induced drag is less than 1 per cent. of the model drag, while for an A.2 the coefficient of lift is about 1.0 and the induced drag about 50 per cent. of the total. Therefore, factors affecting induced drag, such as aspect ratio and loading distribution/planform washout, etc., are insignificant for C/L models, but are most important in F/F. Regrettably the emphasis must be on "more power" in C/L circles, but in F/F there is the element of design as well.

On one point I am in disagreement with Mr. MacDonald. In his article, the thrust of the model is equated to the drag of the model plus the drag of the lines, the reaction at the handle being overlooked. The drag of the lines effectively acts at three-quarters of the radius from the centre, and the correct solution of the problem is, therefore, obtained by equating the moment of the thrust to that of the drag about the centre of the circle.

For the typical team racer quoted, the reaction at the handle augments the thrust by about 11 per cent. and it is found that the line drag is 40 per cent. of the total, instead of 44.5 per cent. Equation (*a*) should be re-written:

$$V_{new} = V_{old} \sqrt[3]{\frac{(C_D + 0.75 \cdot C_{DL})\ old}{(C_D + 0.75 \cdot C_{DL})\ new}}$$

Using this expression it can be deduced that a monoline gives only an improvement of 3.4 per cent. in speed instead of 5 per cent.

Yours faithfully,

M. S. PRESSNELL.
London, N.W.2.

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Again, looking at it purely from the modeller's point of view, this change will be worth very little, and it will be considered by some to be a retrograde step. Whilst it is no doubt interesting to examine all these badges "under one roof" as it were, they have no *practical* value as no colour key is provided and no information is given as to the origin of the motif nor the nature of the squadron to whom the badge belongs.

To enable this *tour-de-force* to be included, the book has been extended by 24 pages. Harleyford Publications 50s. 0d

* * *

Putnam's range of aviation books is this month extended by Francis K. Mason's **"Hawker Aircraft Since 1920."**

The first 80 pages are devoted to a most fascinating account of the rise of the Hawker organisation, from modest beginnings to their present powerful position in the aircraft industry.

Following this section there are 280 pages devoted to three-views, photos specifications and development histories of every Hawker aeroplane. Interesting development prototypes are also drawn, and although, again there are no sections on the drawings, it must be emphasised that these drawings are not primarily intended for the modeller, although this in no way lessens their value which is very considerable.

The remainder of the 475 pages are devoted to extensive notes on individual aircraft and further three-views of some most interesting Hawker projects.

This book has obviously occupied Mr. Mason's time for many years and is clearly a labour of love, which the reader will find tremendously interesting and worthwhile. Putnams £3 3s. 0d.

* * *

"Books may come and books may go but **Zaic's Year Book** goes on for ever" or so it seems! This is not meant to be in any sense derogatory and as these publications seem to appear irregularly and at the most unexpected times the sight of a new issue on our desk is rather like an unexpected gift from a long lost friend.

The first Year Book was published back in 1933 and immediately filled a very real need as a clearing house for modelling "gen." Despite the fact that there are now many model magazines doing the job that the first Year Book set out to do, the value of it is still tremendous. Containing as it does vast quantities of most interesting information from experts all over the world and hundreds of small scale plans drawn in Frank Zaic's inimitable style, the new **"1959-1961 Model Aeronautic Year Book"** is as useful as ever.

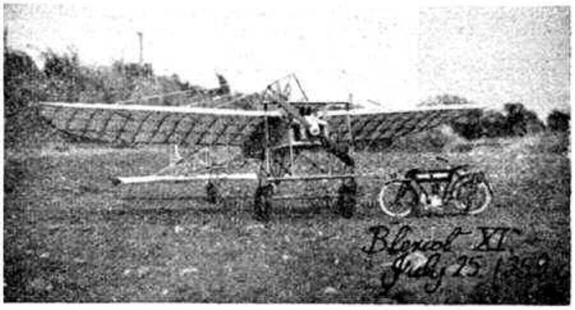
This is a real bumper edition, bigger than its predecessors and containing for the first time material on C/L flying. Even this last sanctuary of F/F has been compelled to yield to "progress" but the incursion is only very limited!

Those who know Frank will not be surprised to see a feature by Dr. Richard V. Gansen on Fatigue, not aircraft fatigue, but the ordinary physical type! Sub headings such as "Bored with work," "Repressed and Oppressed," "Tired of living?" give some idea of the content of this five page article which could *only* appear in a Zaic Year Book!

There are nearly 300 pages in this new edition and it's worth every penny of its comparatively modest cost—buy it!

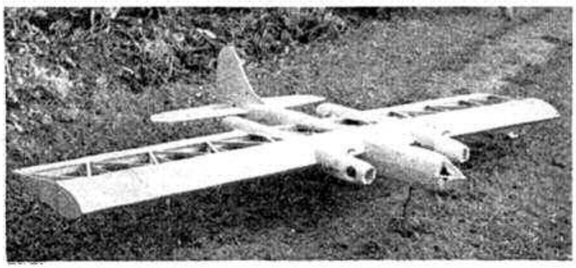
British agent is Urlan Wannop, 36, Park Way, Cumbernauld, Glasgow. 15s. 0d. post free.

PHOTONEWS— *brings you a selection of readers' photographs*



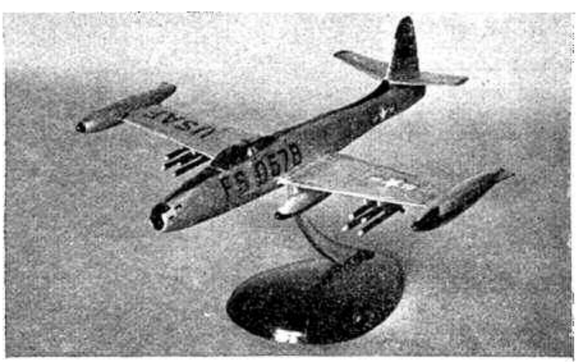
R. J. Halfpenny's photo of his 1/12 scale cross-channe Bleriot XI was taken on the fiftieth anniversary of the crossing. Powered by a K "Hawk" .2 c.c. diesel engine it took six months to build, and is detailed right down to the original suspension and dummy induction pipes.

Neat 60 *in. span scale Piper* Super Cruiser *designed and built by* 16*-year-old Colin Austen of Taupiri, N.Z. Power is a Frog* 2.49 *engine with Wright R/C equipment, working on* 27.12 *mcs., all-up weight is* 3½ *lb. It flew straight from the drawing board, and goes equally well in either calm or windy weather.*



This Zephyr Mk. 4, *being built by Stan Robinson, will be powered by two engines with individual tanks, and fitted with a tricycle undercarriage. Estimated weight will be* 4¾ *lb. and the elevator has* 90 *deg. full down to act as an airbrake when landing.*

P. E. Norman's R/C Comper Swift *photographed by M. M. Gates. The model is finished in blue and white, powered by an E.D.* 3.46. *The R/C is rudder only, the elevator being pendulum controlled.*



A 1/72 *scale model of the U.S.A.F. Republic F-84G* Thunderjet *built by* 15*-year-old R. Phillips of Leeds. Seventy hours of work have gone into this model, of which the detailed cockpit took nearly a week.*

This M.A. Nervensage *with modified aluminium cowling was built by John Webb of Warwick. It is powered by a Webra Mark I engine with a K.K.* 7 × 8 *Truflex prop and has reached approximately* 80 *m.p.h.*

MODEL AIRCRAFT WINGS CLUB

FLY SAFELY

At the Model Engineer Exhibition

HAVING staggered across to a typewriter, I may as well use it. If anyone asks, say that my condition is as well as can be expected. It always takes me some time to recover.

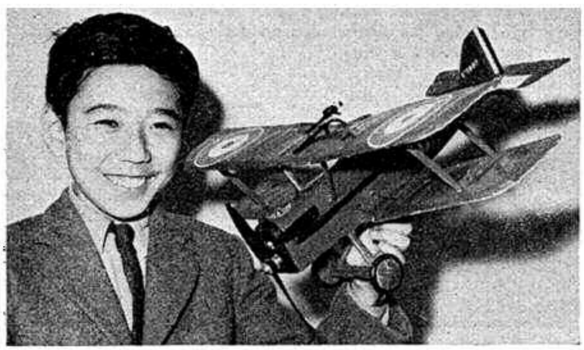
After all, the Model Engineer Exhibition lasted for 10 days. For you, if you had the luck to be there, it meant a morning, afternoon or evening of pleasure; for those of us at Noel Street it meant, in all, several weeks of rush.

I do not know how many Wingmen I met there—perhaps you were one of them? One of my most interesting conversations was with a boy, himself a keen aeromodeller, who spoke with sincere indignation of the unnecessary noise made by some model aircraft near his home. He lives near an aerodrome. "The models make such a din," he said, "that you can't hear the *Viscounts* coming in."

This seemed to me excellent propaganda for the Wings Club and the spirit which it seeks to foster. There are, I am afraid, some modellers whose disregard of other people—and of the Noise Abatement Act—is the greatest danger which ever confronted the flying of models in Britain. If it continues unchecked we shall all suffer.

Here, then, was a boy talking excellent sense. No sooner had he gone, than I found myself jammed into a group admiring a model which had been built by one of the youngest competitors—Naomi Ohno, the 12-year-old son of the Japanese Ambassador to the Court of St. James, and an avid reader of MODEL AIRCRAFT.

Naomi, who is shown in the photo below with his model, lives at the Japanese Embassy at 23 Kensington Palace Gardens. He didn't win a prize but this is hardly surprising since it is his first attempt to enter an exhibition which attracts the finest to be found in the modelling world.



Having regard to the circumstances, yong Naomi showed considerable enterprise in competing. He has modelled quite alone, and has very little free time to spare at the end of his long school days. He has been in England only three years, yet in his bedroom, on a piece of pegboard provided by his mother, hang over 100 aeroplane models which he has made.

The plane he showed at the Central Hall—an S.E.5a 1914-18 single-seat fighter—is his most ambitious attempt to date. It is powered by a Japanese engine, an Enya 09, and took him 50 hours to complete.—ALAN WINTERTON.

Dear Alan Winterton—I am between 10 and 16 years of age and would like to become a member of the Model Aircraft Wings Club. With this coupon I enclose a postal order (overseas readers should send an International Money Order as local postal orders cannot be cashed in England) for 1/- to help cover the cost of the badge, transfers and membership book. *All membership applications must be on this form.*

Name in full..

Address..

....

.... Year of birth..............................

School or College..

Name of other club or clubs to which I belong (if any)..............................

....

Send to—MODEL AIRCRAFT WINGS CLUB, 19-20 NOEL STREET, LONDON, W.1

Wingmen write . . . .

Regarding the *Tiny Tot* C/L Bipe plans (MODEL AIRCRAFT, July, 1961), I would like to point out that the model can be made almost crashproof if the wings are sheeted top and bottom with 1/32 in. sheet and tissue covered over the top. This does not impair the performance, for I found that loops and wingovers are still possible—even with a Mills .75 as the power unit!

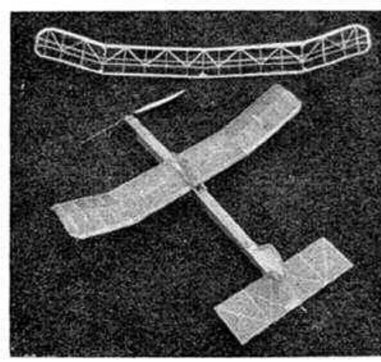
I would just like to mention that a better performance can be obtained if a high pitch prop (7 in. × 6 in.) is used—it's slower accelerating, but really pulls the model round after a couple of circuits.

Yours faithfully,
C. WESTERMAN.

Pudsey, Yorkshire.

* * *

I am sending you a photograph of my *Compact*, built from MODEL AIRCRAFT plans. It has on three occasions flown out of sight. The longest recorded flight lasted for 92 sec. The model is now seriously damaged after flying into a railway signal!



In the photograph is the *Compact* and the wing of my own design rubber model.

Yours faithfully,
PETER AUSTEN.

Felixstowe,
Suffolk.

We have received numerous requests for a "Workbench" article on the basic principles of flight and stability. This is too lengthy a subject for the Wings Club, but on page 315 of this issue, Martin Pressnell deals with the matter in a manner which any theory minded Wingman can understand.

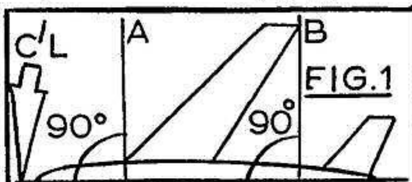
Ray Malmstrom's

MODEL'N TIP

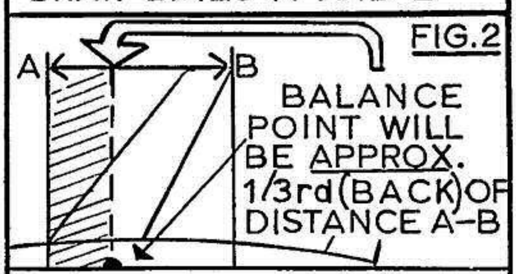
THE BALANCE POINT OF SWEPT-WING MODELS

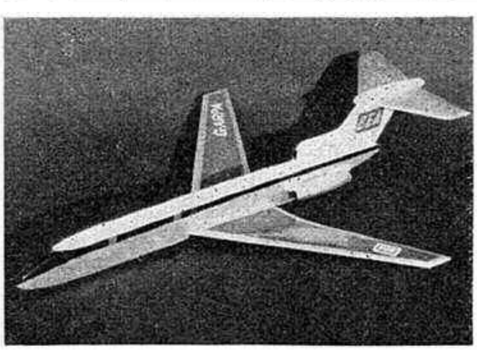
MANY modern aircraft have swept-back wings. When designing a model with wings of this type, it is essential to know at least the approximate position of the balance point of the model, before commencing gliding tests. Figs. 1 and 2 below show a simple method for finding the approximate balance point.

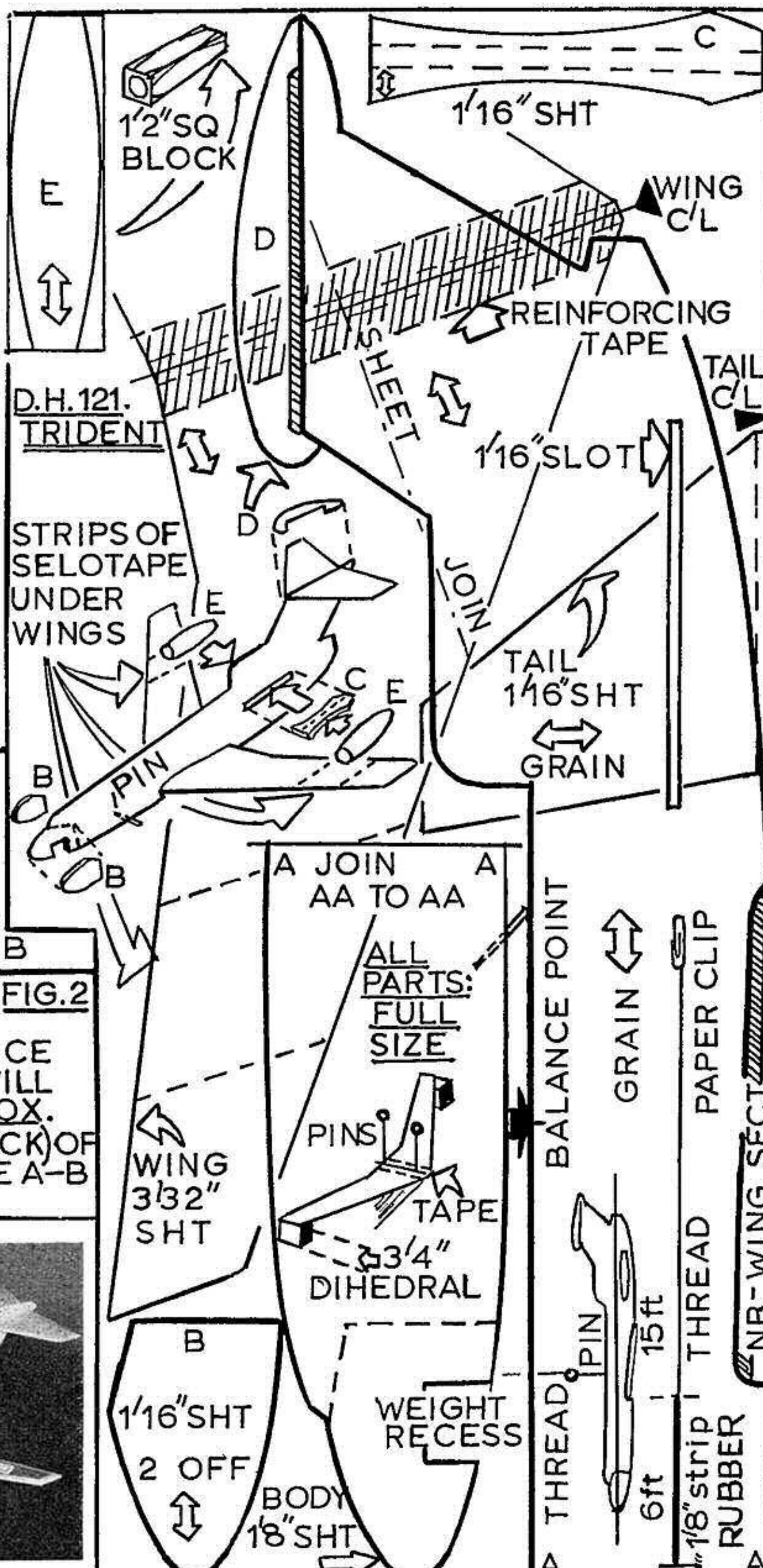
Now step into the future! From the full size parts alongside, build a catapult-towline model of the De Havilland *Trident*. This model flies very fast, so accurate building, and careful trimming are essential. Balance exactly as on the plan. Test over long grass on a calm day. Due to the high flying speed do not test glide by hand. Place the model on the catapult-towline, pull back a little way and release. Your *Trident* should take off in a straight line. Avoid steep turns. A left turn is cured by bending down the trailing edge of the left-hand wing near the tip *very slightly*, and vice versa. Increase the pull-back with each successful flight. For maximum performance the rear edges of the tailplane must be raised by $\frac{1}{16}$-$^{3}/_{32}$ in.

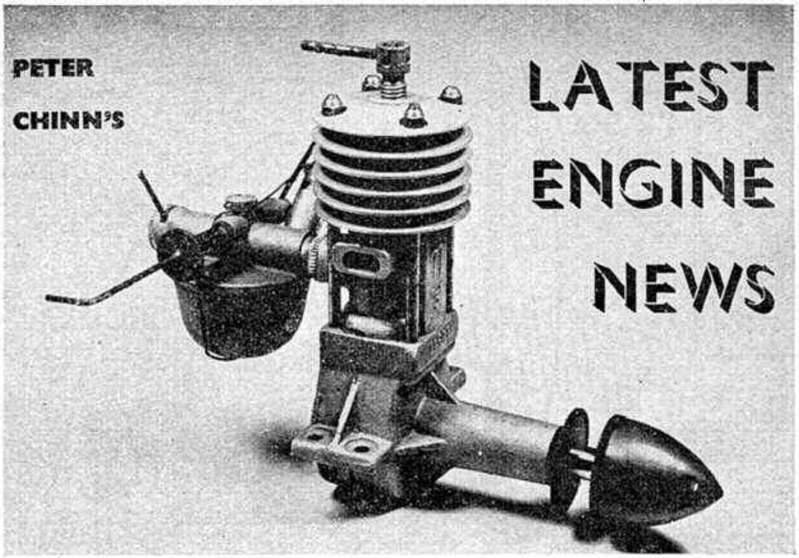


DRAW LINES A AND B









Great Britain

FOR the past several years, "Half-A" (0.049 cu. in. or 0.8 c.c.) free-flight has been one of the most popular contest classes in the United States. Since the appearance, early in 1960, of British Half-A class engines, an increasing number of competitions for engines of this size have been held in the U.K.

The original idea behind the British Half-A contest was to provide a free-flight class for beginners but, in the absence of rules limiting entry to the available low-priced British beginner type Half-A engine, it was, of course, inevitable that the much more powerful American motors (notably the Holland Hornet and Cox Hopper series) would soon steal the limelight. We therefore waited patiently for the day when one of our manufacturers would answer the challenge and produce a British high-performance 0.8 c.c. motor.

First to pick up the glove is Dydesyne Ltd. This is a new company, headed by Alan Dye who has had considerable experience in internal combustion engine design and development and related industrial applications, including sorties into the racing car world. Notwithstanding these latter connections, Dye is an uncompromising "dieselphile" and tells us that he had no doubt about choosing compresion ignition rather than glowplug ignition for his contest 0.8 c.c. project. We gathered from a recent long discussion with Alan Dye that, apart from this predilection, he approached the problem of producing a world-beating 0.8 c.c. diesel with a completely open mind. Despite no previous experience in model engine design or construction, Dye claims that he did not allow himself to be swayed by current model engine design trends and made no attempt to seek inspiration by examining existing leading designs. The fact that Dydesyne's products do, in fact, still look like model engines is presumably due to the influence of Gordon Cornell, who, until recently, was engaged on the Dydesyne model engine projects. Cornell, it will be recalled, was responsible for raising E.D.'s original pleasant-handling but average-performing Fury diesel to its current Super-Fury pleasant-but-potent status and for pepping up the output of the beginners' 1 c.c. Bee engine to a very non-beginner standard.

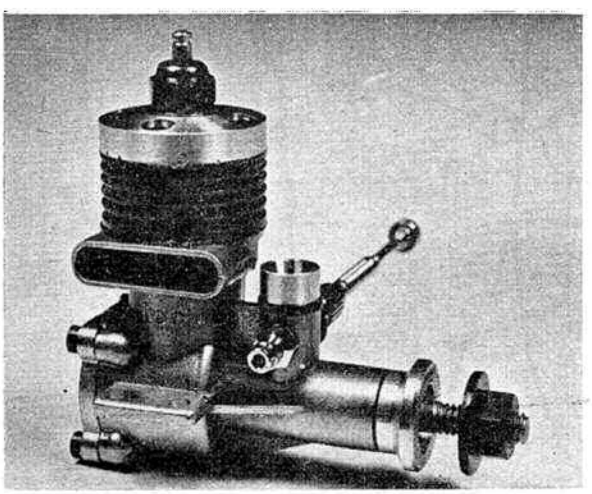
Dydesyne (pronounce it "Dye-Design"—not "Dide-Sine") have two engines on the stocks. One of these, the Dynamic 049 has already been seen on the contest field in prototype form and should be available in its regular production version by the time these words appear. The second engine is the Tutor 049, a simpler and cheaper motor aimed at the beginner and fly-for-fun market.

The Dynamic has a rotary drum type induction valve and a twin ball-bearing crankshaft. Neither of these features is original but it is uncommon to find them in an engine so small—in fact the only small motor we can call to mind having a similar specification is the 0.95 c.c. Super-Tigre G.32 of 1958 which had a drum valve and a single ball bearing.

An efficient intake system is, unquestionably, of major importance in the realisation of high power. This, of course, has been known for a very long time but only recently has it been demonstrated quite so forcibly—the best illustration being, perhaps, the very generously proportioned shaft valve of the new Cox Tee-Dee series of engines.

The design of the Dynamic's induction system we rate highly. It combines extremely large and unrestricted gas passages with a minimum crankcase volume and also readily lends itself to tuning modifications. It consists of a very large drum type rotor, $\frac{3}{8}$ in. o.d. by $\frac{5}{16}$ in. i.d. running in a diecast aluminium alloy housing which, with the carburettor intake, forms the crankcase cover. The valve is of the horizontal intake type, i.e. mixture enters direct through the open end of the valve rotor and discharges vertically upwards inside the crankcase.

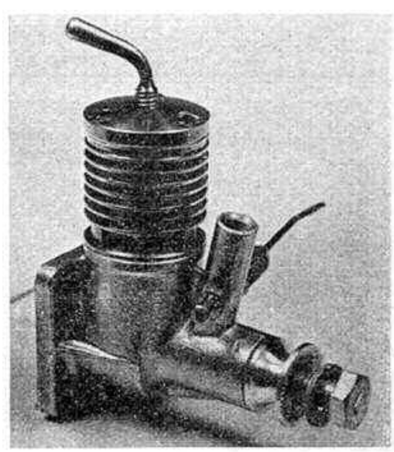
Gas flow through the carburettor and valve is very free since the inside diameter of the valve rotor follows smoothly from



Engine in the heading photo is not exactly the latest, but of interest to vintage engine fans and collectors is the news that Eta Instruments Ltd. have a few Eta "5" diesels for sale at bargain price. Engines date from 1947.

Left: smallest O.S. engine produced to date is this new 1 c.c. Max-6 glowplug model

Right: prototype of new low-priced Dydesyne Tutor 049. Production version will have beam instead of radial mounting.



the venturi sectioned carburettor. Transfer to the crankcase interior is then effected through a large rectangular valve aperture, ¼ in. long, and a 7/32 in. dia. inclined intake port through the alloy housing, giving an induction period of 180 deg., timed, by our measurement, from 50 deg. ABDC to 50 deg. ATDC. On one of the works engines submitted for examination, the intake port had been flared out and flats had been filed on the spraybar to increase choke area. This engine also had a counterbalanced pattern crankshaft and is shown in our photographs.

Externally, the Dynamic is of extremely rugged appearance, due, primarily, to the solid proportions of its main casting and very thick beam mounting lugs. The cylinder is of a convential screw-in pattern with integral cooling fins and radial porting. There are three exhaust ports giving an exhaust period of approximately 140 deg. and three internal transfer flutes spaced between them. Following a current trend, transfer timing is extremely close to that of the exhaust.

By present Half-A standards, the Dynamic is no lightweight and is over 2½ oz., or nearly twice as heavy as, for example, the Cox Space-Hopper. For most contest applications, however, this is no objection if the power is there and, according to the makers, the Dynamic has, in this respect, shown itself capable of exceeding the performance of the best American Half-A motors. This being so, the relatively high price of the Dynamic may also be justified.

For those who require a more economically priced motor, however, Dydesyne's Tutor is expected to retail at less than half the price of the Dynamic. This uses the same cylinder assembly as the Dynamic but has shaft induction and a plain bearing. The example shown in our photo is a prototype having a square flange for bulkhead mounting. Production engines will have beam mounting lugs.

"Engine Test" Reports on the Dynamic and Tutor will follow in M.A. after we have had word from the manufacturer that the production versions have been finalised. Meanwhile, we quote the following prop/r.p.m. figures as given to us by the manufacturer for the Dynamic.

Firstly, Dydesyne are prepared to guarantee a figure of 16,500 r.p.m. on a KK 6 × 3 or 18,000 on a KK 5 × 4. They also quote the following figures for, respectively, "average" and "good" examples of the Dynamic after running-in.

Thimbledrome	6 × 3—15,000-16,000
Frog Nylon	6 × 4—16,500-17,000
KK Nylon	6 × 3—17,000-17,500
KK Nylon	5½ × 4—16,800-17,400
KK Nylon	5 × 4—19,000-20,000
KK Nylon	5 × 3—20,000-22,000

U.S.A.

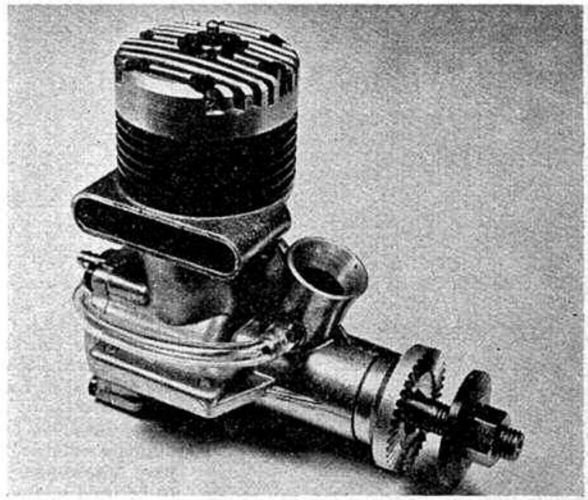
It so happens that we were testing a couple of the new Cox Tee-Dee 049's recently and therefore made a point of checking the r.p.m. on the five British props mentioned above, using Super-Nitrex fuel. We came up with the following: Frog 6 × 4—17,000; KK 6 × 3—16,500; KK 5½ × 4—17,300; KK 5 × 4—19,600; KK 5 × 3—21,900.

This new shaft-valve Cox 049 very definitely out-performs the previous reed-valve Cox models. Handling, we thought, was not quite so foolproof as with the "Hopper" series but still very good. The engine has loads of power over a wide range of speeds—over 13,000 r.p.m. on a 7 × 3 Top-Flight wood, for example, but really sounds happiest at the highest speeds—i.e. in the 18,000-22,000 r.p.m. bracket.

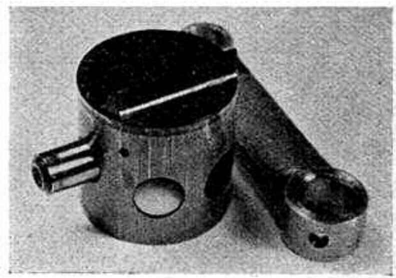
Japan

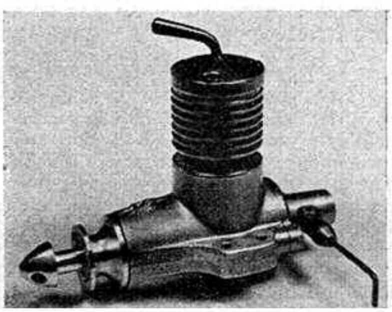
We have been fortunate enough to acquire one of the new "29X" versions of the O.S. Max-III engines. This is the

Continued on page 336

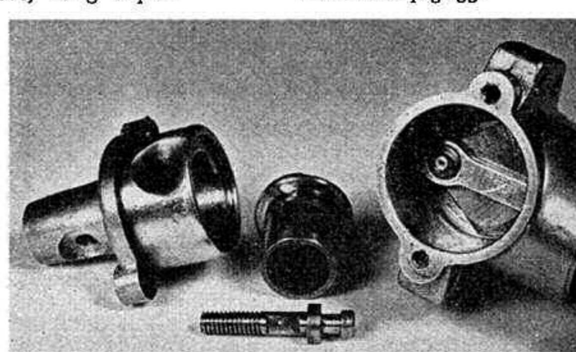


Right: first example to reach the U.K. of the new 29X racing version of the O.S. Max-III. Needle-valve is at rear. Special piston and conrod of Max 29X engine are shown in the small photo below. Note tiny lubrication hole in piston wall.





Left: two views of the Dydesyne Dynamic 049. Featuring twin ball-bearings and rotary drum valve, this engine is claimed to be the equal of top U.S.contest glow 049's.



Right: induction components of Dynamic 049 separated from crankcase. This non-standard example submitted by factory has flattened spraybar, re-worked inlet and counterbalanced shaft.

JOHN POOL

concludes his discussion of

PITCH and PROPELLERS

for rubber models

LAST month I dealt with the comparatively straightforward aspects of laying out and carving a propeller but, in the examples quoted, the pitch and diameter had already been chosen—choosing these is the problem that drives most people to Frank Zaic's Year Book, or the model magazines, to find out what the winners are doing. Having weakened thus far, the best thing to do is to copy one of the winners' propeller blocks. Another way out of the difficulty is to decide on a diameter and use a hub which will allow the pitch to be varied during flight testing. This is, no doubt, better than the first method, because it will, in the end, produce a propeller which suits both model and motor. Using someone else's propeller can be fatal, because it assumes that your rubber, model and trimming technique must be the same as that of the original propellers' designer. This can rarely be the case.

In selecting a propeller, two basic principles must be borne in mind, the first being the character of the power output of a rubber motor. Anyone who has ever wound a rubber motor will know that the power output is very high as the first few turns run out, but it then drops quite rapidly to a low level, which it holds for a while, before the power runs out altogether (Fig. 5a). No propeller can be designed to be efficient at all stages of this run. The pitch/diameter ratio (P/D) of the propeller is a simple comparison of the pitch and diameter, with the diameter reduced to one. Thus the 24 in. dia. × 30 in. pitch propeller has a P/D of 1.25/1. A propeller with a P/D ratio of 1 : 1 will probably be most efficient at the beginning of the power run, whereas one with a P/D ratio of over 1.5 : 1 will be more efficient during the later part.

To these two basic principles must be added a number of others which may, or may not, apply. The way the power is to be used in the model is vital and yet many modellers must wait for the first flights, before they can estimate the length of the power run. It is vital, because the P/D ratio should be chosen in connection with the extent of the power run.

The type of power output may be classified in three groups. First is that usually known as the "short burst," where the model almost "helicopters" up to a good height. Such models are usually termed thermal catchers, because making a model climb fast means rapid expenditure of power and thus a long glide is needed to score a max. The long glide is, of course, subject to down-draughts and a thermal is usually needed to make the grade. Because the power runs out quickly, there is no extended "cruise" period in the motor run and hence a propeller with a low P/D ratio, perhaps 1 : 1, may be used.

In an endeavour to shorten the required glide and produce a more consistent model, the longer run type is resorted to. In applying the power over a longer period, the output at any given moment must be lower and these models do climb more slowly than, and perhaps not as high as, the short burst type.

There are other disadvantages however; because the model does not get so high, it either misses the thermals, or flies into them lower down where they are weaker. "Stretching" the power run involves introducing a "cruise" period, during which a folder model usually gets its nose down. Therefore, this type of flying is reserved for free wheeler equipped models, or those with a spring tensioner which will stop the propeller just before the dive begins.

Because it is essential to have the propeller showing some efficiency throughout the run, it is usual to have a higher P/D ratio for this style of flying. In the case of the freewheeler, this is essential to secure a good glide. The feathering propeller is only a high pitch freewheeler (Fig. 5b).

The third type of power run is an attempt to combine the advantages of the first two and discard the disadvantages. It may be called the "short burst long run" and the Bilgri and Foster Wakefields of 1951-52-53 are good examples of this. When these models first appeared, their outstanding performance was attributed to the "Bilgri" propellers. These were big (up to 24 in. dia.) by the then current standards and with the typical short burst P/D ratio of 1 : 1. In actual fact, the real secret lay in the vast quantity of rubber used—up to 6 oz.—running off very quickly. They ran off 1,200 turns in 90 sec., giving an r.p.m. figure of 800, whereas typical British models had prop. speeds of around 600 r.p.m. Because of this rapid run-off, these models had no marked cruise, so there was no danger of their diving at the end of the run. With a 90 sec. motor run, the glide needed to be less than twice this to ensure a 5 min, maximum. A glide to power-run ratio of 2 : 1 was not difficult to obtain, especially as these models had a very rearward centre of gravity, so that the tail contributed lift.

However, even this type of model, using short-burst characteristics with a lot of rubber to ensure a respectable power run, has snags. The rubber must be bought, fitted in the fuselage and wound, not to mention the very light airframe needed. A fly-away can be a very disturbing event.

The type of power run cannot, however, be chosen without consideration of the power characteristics of the rubber to be used. Only two seem to be in the field, the much criticised Dunlop and the popular, but also criticised, Pirelli. The fact that both are criticised points the moral that perhaps, in designing, their peculiar qualities have not been allowed for.

My own experience of Dunlop began when Pirelli went off the market. Models which had performed well enough at the end of the previous season on Pirelli were check flown on half turns with Dunlop, showing no significant difference. When wound up to nearly full turns they all spiralled sharply in to the right. The models used lots of sidethrust but no down and the conclusion was that the Dunlop gave slightly more than Pirelli at the beginning of the run, the nose was pulled round more quickly and didn't manage to get up. A further characteristic showed. The models glided left and had previously shown no tendency to drop the nose at the end of the run, but with the Dunlop, the dive effect was most marked. Conclusion—more power at the beginning and less at

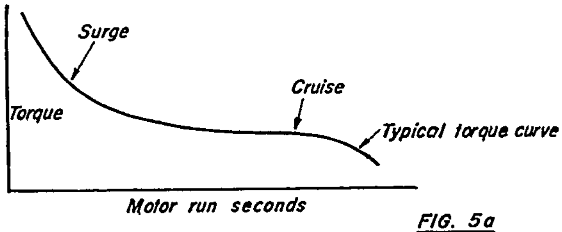


FIG. 5a

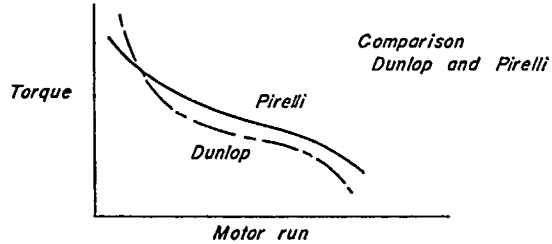


FIG. 5c

the end of the run. This same characteristic has been noted by many other observers (Fig. 5c).

How does it affect propeller design? Pirelli saves rather more energy for the end of the run than Dunlop; in other words, it has a more powerful cruise. Therefore, it is more suitable for the long run type of model than Dunlop. Because of this power in the cruise, propellers with a lower P/D ratio may be used without the same fear of diving on the last few turns. So people who have copied the Bilgri blocks, but not used the same quantity of rubber or the same high r.p.m., have adapted a short burst type propeller to a longer run type model with pleasing results. Should Dunlop be substituted in these models, the complaint would probably be that it loses all its power in the first burst. How often have we heard that?

Dunlop rubber used in a short burst model, with a short burst type propeller, is probably as good as Pirelli. Readers may remember *Mavis IIIb* which was drawn in my previous article ("Designing for Duration," MODEL AIRCRAFT, March, 1958). Its successor, *Mavis IIIc*, had a 22D × 24 P propeller (copied from Bilgri), which had done very well on the Pirelli powered previous models. Power was 14 strands of Dunlop, 54 in. long, giving a motor run of 80-90 sec.

All up weight of this Wakefield size model was $7\frac{1}{2}$ oz., and the flight characteristics were remarkable. On full turns the model went up in an O'Donnell type spiral for 15 sec. It then levelled out and cruised, neither losing nor gaining height for over a minute. Total flight time was in the region of 2 min. 15 sec.—this for a model that was supposed to do $4\frac{1}{2}$ min. At the time, I blamed the rubber and made the same motor up to 16 strands 45 in. long, in an attempt to make 3 min. for local competitions. The result was a vertical climb for about 40 sec., followed by another 20-25 sec. with the nose well up and a total flight time comfortably over 4 min. This model was lost on Gamage Cup day 1959, after duly turning in a max.

The short burst type model has never been as popular in England as in America; in fact for a long time it was termed American style. The longer run type model with a free wheel propeller was, at the same time, called the British type. For those interested in maximum performance from a given airframe and motor, the longer run type seems most likely to achieve it and will certainly be less critical for trim. When the short burst type of model was flying against the longer run type in the first few Wakefield competitions after the war, honours were about even. At that time typical English propellers were 18 D × 24-30 P. American propellers, folders of course, showed a lower pitch/dia. ratio, Joe Bilgri's original *Duster* propeller being 21D × 23P.

With the introduction of Pirelli rubber two significant changes crept in, although the connection went unnoticed at the time and has never, to my knowledge, been mentioned in print. First was a resurgence of interest in the folding propeller type model in England. These propellers had been largely abandoned after 1939, mainly because of the diving tendency at the end of the run. They were resorted to in an attempt to "stretch" the performance of models, which must already have been near their peak. No doubt because of the peculiar character of Pirelli rubber they worked. Even Ted Evans abandoned his featherer for a folder. The second change, which few will deny, was a mass swingover to lower pitch propellers, with greater diameters. Size in propeller was believed to be the mark of efficiency.

This second change had, to my mind, a braking effect on progress. While Pirelli rubber was available and good, no harm was done. When its quality fell and later it went off the market, people began to blame low scores on bad rubber. Bad rubber became, in fact, a better excuse than downdraughts!

With the Halifax lightweights, mentioned in "Designing for Duration," an attempt was made to combine the folding propeller with a long run. At that time we felt that the secret of preventing the nose dropping was to have a very slow glide, so that even the last few turns would have enough power to fly the model at, or faster than, its gliding speed. Also at that time two lines were followed that seemed to be equally successful, a low power motor, using lots of turns with a fairly fast revving propeller, or a higher power motor but driving a bigger propeller more slowly. Since then other features have emerged.

The low power motors seem to exhibit a vice at the beginning of the run, which might be called an over-emphasised surge. Its effect on a slow flying model is to produce an unpleasant power stall on full turns. It does seem that increasing the cross-section of the motor tends to flatten the torque curve. Which means, of course, using a bigger propeller. Dunlop rubber has a marked surge effect at any time and, seemingly, no power at the end of the run. Coupled to this are the usual vices of a long run type folder.

Here is one line which appears to get round most of the problems. It seems a backward step to go back to the old high pitches, but it has a number of advantages. The high pitch serves to slow down the run, just as well as a large dia. propeller would have done. The high pitch/dia. ratio makes the prop most efficient at the end of the run, squeezing the last few feet of altitude from the rubber on the one hand and delaying the onset of the nose down effect, caused by the model trying to reach its gliding speed but being held back by the drag created by a low pitch propeller on the other.

At the beginning of the run, the higher cross-section motor needed to drive a high pitch prop, plus the propeller's resistance to acceleration, help to master the surge. This might be called wasting

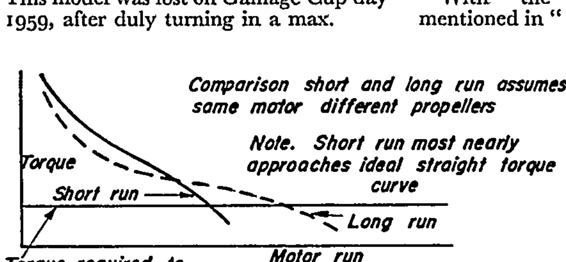


FIG. 5b

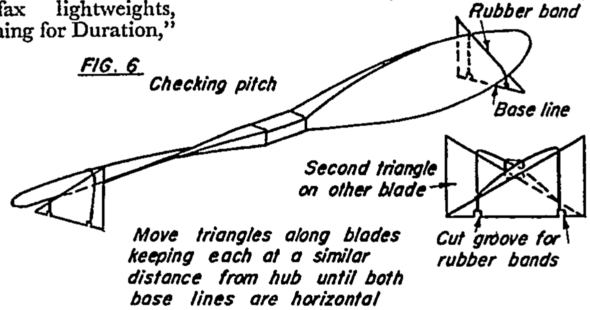


FIG. 6

power, but it does seem to be better to waste it when there is too much, rather than when there is very little. Another asset in controlling surge is to trim with the C.G. on the trailing edge, giving the tailplane a chance to increase its lift as the model accelerates. To this, of course, must be added the low wingloading as before, to give a slow glide.

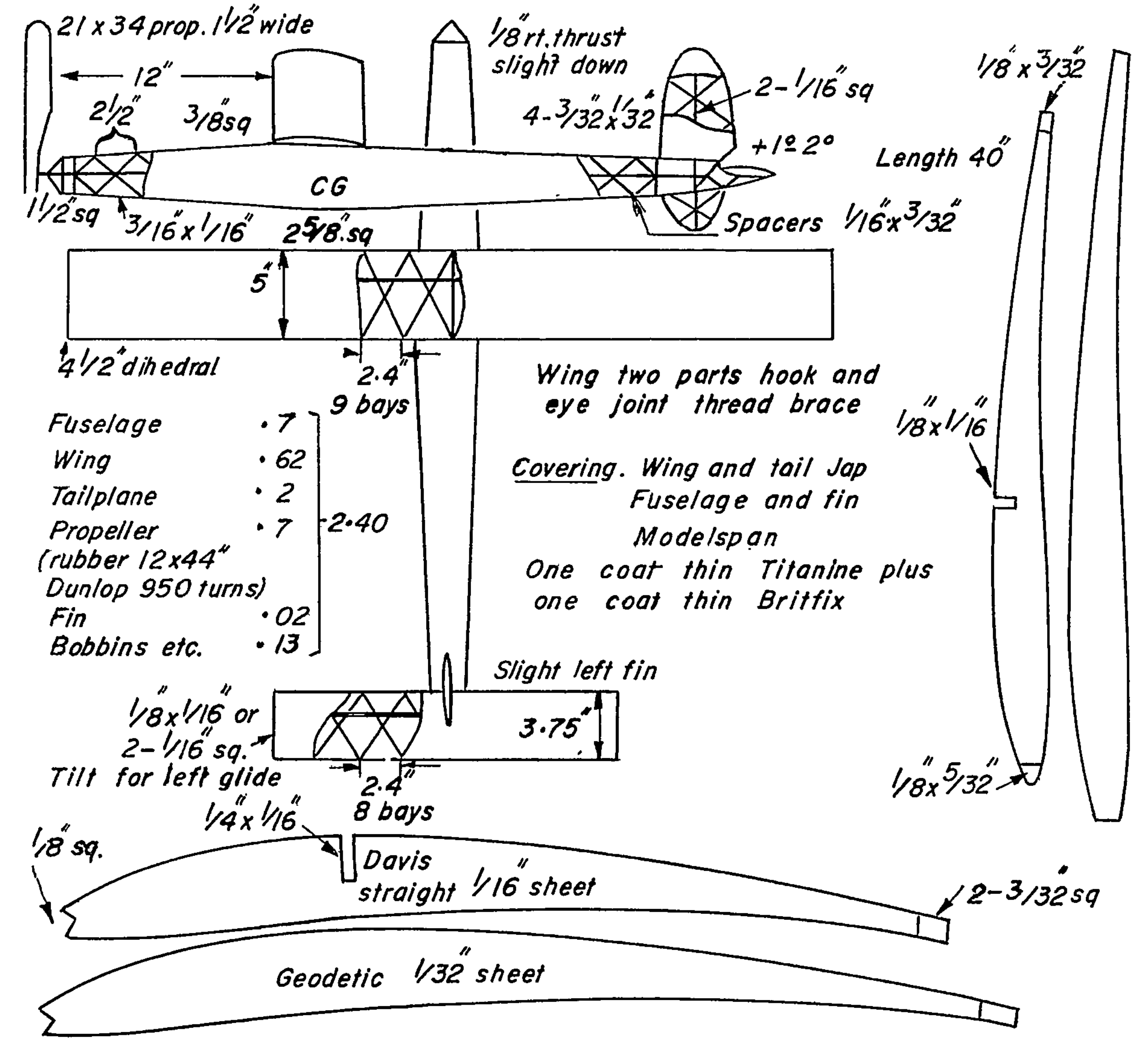
This was not worked out logically—an accident helped to point the moral! Ken Grant's *Lytewake* showed the way with 10 strands on a 20D × 30P propeller, 2.6 oz. airframe and 2.4 oz. rubber. Twelve strands seemed easier to handle than 10 so I increased the diameter to 22 in. to handle the extra power. This was quite satisfactory and another 22 × 30 in. prop was begun. Unfortunately, when the whole thing was assembled and pitch already set, I discovered the dia. was strangely 24 in. When the propeller was cut down to 22 in. and the pitch measured, it was found to be 34 in. This seemed a bit excessive, so to compensate, the dia. was reduced to 21 in. This "accident" was very successful, and another 22 × 30 in. was made and flown on a similar model at the same time. There is no doubt in my mind that the 21 × 34 in. propeller is the best.

Of course every "solution" has its snags and with this type of model there appear to be two main ones. First, and really critical, is below par rubber. One of my old 16 strand medium/fast climbing Wakefields (1955/56) used to perform equally well on almost any old rubber. In particular, with a 4 oz. motor giving a pull test at six times extension of a mere 2 lb. 4 oz., it had a long, slow plod and, on many occasions, approached or exceeded the 4 min. With rubber giving a 3 lb. 8 oz. pull and taking less turns, it didn't do much better, although the initial climb was faster. However, a slightly below par motor in one of the new style models can cut the performance to very little longer than the power run. This has also been observed by my friend Urlan Wannop, who flies a model having similar characteristics, albeit with rather more rubber than I do.

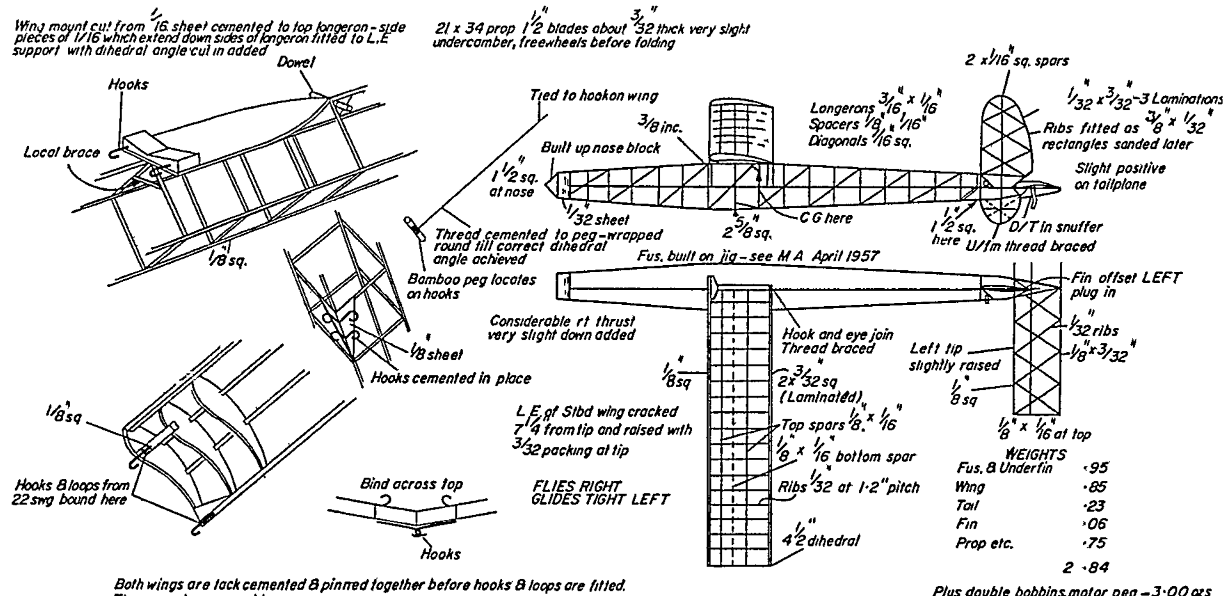
At this stage I had better define rather

Motor No.	Extension of 1 in. length after breaking in			
	x3	x4	x5	x6
1	1-7	1-14 lb.	2-10	3-10
2	1-5	1-14	2-11	3-14
3	1-7	2-00	2-14	4-00
4	1-5	1-11	2-7	3-5
5	1-6	1-13	2-8	3-3
6	1-6	1-14	2-10	3-13

more clearly what I mean by good and bad rubber. I do not mean a rubber is bad because it has a lot of surge and no end power. This is, however, what most people mean when they talk about bad rubber. During 1959 while talking to others about rubber—Dunlop in particular—I came to the conclusion that I had had a very fortunate couple of pounds. The second of these two pounds was made into six 2.8 oz. motors. These were carefully checked by the pull test described by Ron Warring in MODEL



MARY III 1961 SERIES J.B.POOL



MARY IIIa 2.

Aircraft in June 1954, the results being shown in the table on the previous page.

The model was trimmed on motors Nos. 1 and 2 and proved very satisfactory. With motor No. 3—which only took 800 as opposed to 830 turns—it climbed much faster and although never failing, there were always cuts to repair after use. This motor was later sent to C.P. Miller of the Baildon Club, who has made a torque tester and he found it pretty good, although not as good as his usual Pirelli.

In search of some of this good Dunlop, about which I probably talked too much, he bought, almost at the same time as I did, from the Halifax model shop, another pound. This he tested, and found it as he usually finds Dunlop—poor.

In 1959 my own pound again gave one motor like No. 3 and the rest about the standard of Nos. 1 and 6. These I call good—I've now come to the conclusion that when I talk about good Dunlop and others talk about bad we are really talking about the same thing!

Motors Nos. 4 and 5 are what I call bad, as with these my models stop climbing long before the propeller folds. This effect does not, of course, show in lift and it was actually these two motors that I used at the Northern Gala, 1959, when the cushion of warm air above the ground kept the model up three times for a max., and in the somewhat cooler air at the fly off, it was all out to do 3.15.

I now feel confident enough to throw away the odd poor motor in my Dunlop on the result of this rapid check, using a Little Samson fish weigher, graduated from 4 lb. down, in ounces. At 14s. 6d. a pound this is not a very great loss.

The second snag is the old one—downdraught. Any model climbing in downdraught will have its rate of climb reduced. A slow climbing model, especially one flying on very low power for a fairly long cruise period, will not climb at all. However, downdraught is not very selective about whose model it catches—be it a model loaded with 6 oz. or one with 2 oz. of rubber. We have not yet reached the stage where we can foresee a thermal long enough ahead to be able to wind up ready for it and most folk dare not wait for one with the motor fully wound, although I have seen Tom Chambers of the Tees Group do just that, with disastrous effects on the onlookers' morale. So really this second snag is not really a snag at all!

There is a third anticipated failing with these models, a tendency to stall on take-off. This was, of course, one reason why many people liked the Bilgri propellers and why some others subscribe to the very fast climb school, using a high power/weight ratio in a very light airframe. My own anticipation led me to fit a thread turbulator on the blades, about $\frac{1}{16}$ in. from the leading edge. Andy Anderton uses slots very successfully for a similar reason and Tom Chambers is sporting blades with stranded C/L wire leading edges, partly for carving reasons and partly to get a turbulating leading edge. John O'Donnell has, I believe, tried pinholes and turbulating strips.

Here are results so far, which at least show that these ideas work.

Mary xIII (x for experimental)
1958 *Farrow Shield* 4.00 3.37 4.00 Perfect weather, these were trimming flights
1959 *Northern Area Winter Rally*—Foggy 2nd (about 5.00 min.)
Gamage Cup 1.31 going up still under power in fog—Lost

Mary IIIa. (A production version of xIII)
1959 *Area Champs*—Wigsley N.F. 0.05 Max. and 1.31 (Damaged)
Scottish Gala 5th 2.35 3.01 (both had short d/ts) 4.00
Northern Gala 4.00 4.00 4.00 (3.15 Fly-off) 5th
Farrow 4.00 2.31 4.00 (about 4th in Area)
1960 *Northern Area Winter Rally* 4.00 4.00 (Model hung up and burnt in tree)

Mary IIIa2
Northern Area Open Rubber 3.54 3.20 2.56 Equal 2nd. Trimming flights
Nationals 4.00 4.00 4.00 Model returned finless. Reserve—a rough weather fast climber—didn't!

The models have all had 40 in. diamond fuselages with 2⅝ in. max. cross-section. Motor hook distance 35 in. but 33 in. on IIIa2. Wings 44 × 5 in. Davis section. Tailplanes 20 × 3.7 in. Go602 type section, xIII had a nominal 22 × 30 in. prop with wire hub. It was probably more than 30 in. pitch because it revved at 400 r.p.m. Motor 12 × 40 in. Dunlop, turns 800. IIIa had a 21 × 34 in. prop again 12 × 40 in. motor, turns 830 (600 have 80 sec. run). IIIa2 had a 21 × 34 in. prop with a 12 × 44 in. motor and 900 turns used. Weights xIII and IIIa—2.8 airframe, 2.8 rubber. IIIa2 3.00 airframe, 3.00 rubber.

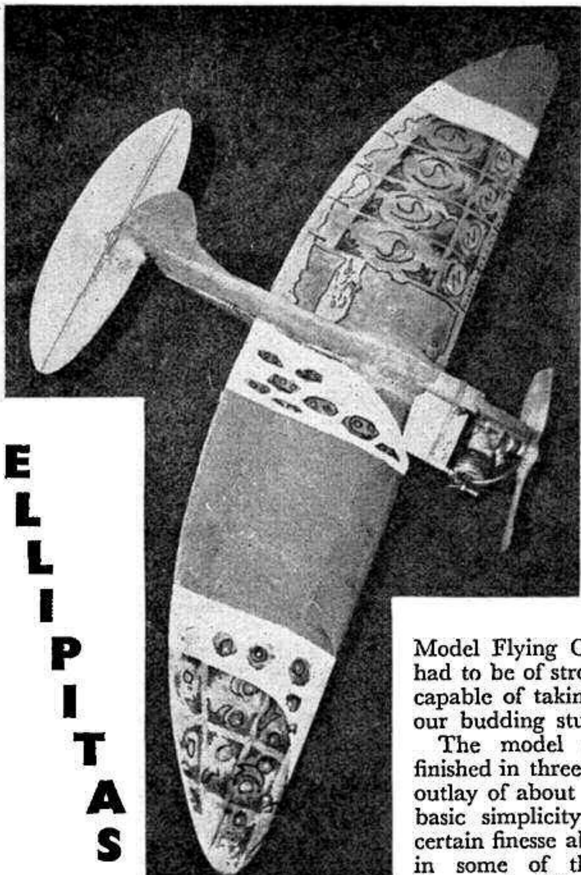
There is a handy gadget which can be used to check the pitch of an already assembled propeller. This you may apply to the prop on the model you have just found, it leaves no trace. The principle is to apply two similar triangles at the same place on each blade (Fig. 6). These are then moved in or out until the bases of the triangles are in line. By then applying one of these to a pitch diagram at the appropriate place (3 1/7 × 2 × distance from centre, triangle was along blade) a hypotenuse may be drawn, which will intersect the upright at the appropriate pitch. It is easier, of course, to make two 30 deg. and two 45 deg. triangles and then use the table below.

Of course, by using a pitch diagram and some triangles of different angles, you can quite quickly draw up your own tables.

30 deg. right angled triangle							
Radius at which triangles line up	4½	5	6	7	8	9	10
Pitch approx.	16	18	22	26	29	33	38

45 deg.				
Radius	3	4	5	6
Pitch	19	25	31	27

ELLIPITAS



designed by M. TURNER

Something quite different in control-line trainers that is shapely, yet easy to build and will take a lot of punishment in the hands of a novice.

IN designing *Ellipitas* I wanted a reasonably good looking model which was inexpensive to construct and could be produced quickly, as like most modellers, both my pocket and building time are limited! The design was primarily intended as a Club stunt trainer for the Medway Model Flying Club, and as such it had to be of strong construction and capable of taking hard knocks from our budding stunt pilots!

The model can be completely finished in three evenings, for a cash outlay of about 14s., yet despite this basic simplicity, the design has a certain finesse about it, often lacking in some of the quick to build "squared off" stunt/combat designs usually seen.

Begin construction by cutting the fuselage outline to shape and then round off all the corners. Cut the slots for the engine bearers after trimming the bearers to length, and then cement them to the fuselage, facing forward part with $\frac{1}{16}$ in. ply. Now cut the slots to take the tailplane and fin, both of which should be a tight fit. Finally, cut out the middle of the fuselage to take the wing.

Construction of the wing is quite straightforward provided the following sequence is observed. The three trailing edge pieces are cut out slotted to take the ribs and cemented together; the shaped leading edge is then trimmed to length and slotted for the ribs; the leading and trailing edges are then cemented together at the tips and the ribs cemented in the leading and trailing edge slots. If the slots have been cut accurately the ribs will automatically line up. The full depth mainspar is cut from $\frac{1}{8}$ in. sheet, slotted to take the ribs and cemented in position. The capping strips and centre section sheeting are then added.

When the wing assembly is complete, it is pushed through the fuselage, carefully centralised and securely cemented. The wing/fuselage joint is afterwards reinforced with gauze bandage to form a good fillet. The plywood bell-crank supports are now cemented on to the wing centre section, and the bellcrank bolt is screwed right through the wing.

The wing is covered with heavyweight Modelspan and the remainder of the model with lightweight Modelspan. When covering the wing it is best to use cement to attach the covering to the rear (concave) portion of each rib, otherwise the tissue will not adhere to the rib contour.

By the way, I have found that a very lightweight multicoloured finish can be applied to the wing by using ordinary water colour paints before doping. Although the finish is not so brilliant as a colour doped surface, the water paint shows up quite brightly when clear doped and fuel proofed.

LATEST ENGINE NEWS

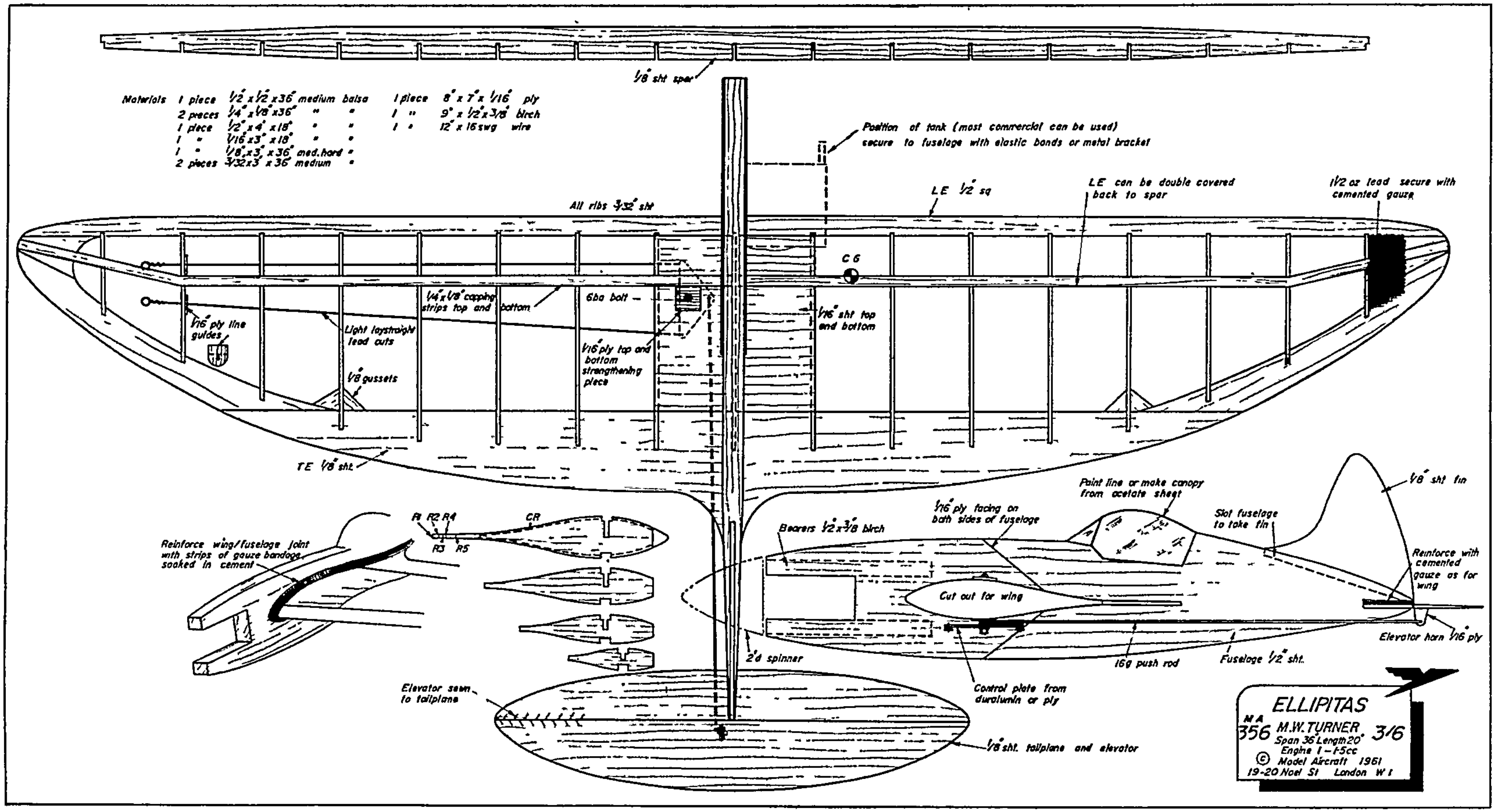
continued from page 331

engine first mentioned in our August column. It is intended for applications where maximum b.h.p. is the primary consideration, such as "rat-racing," combat and larger F/F contest models and may also have possibilities as a team-racing and speed engine in some areas.

Our sample, just received, has not yet been run but looks as though it may offer quite an increase in performance over the standard Max-III 0.29 engine. The motor is intended for operation on pressure feed only and has the needle-valve mounted at the rear, as on the O.S. Racing 15 and metering fuel to a fixed jet in the intake. The massive intake has a throat dia. of no less than $\frac{7}{16}$ in.

Internal modifications include a larger gas passage through the crankshaft, a special machined connecting-rod and a revised cylinder head and piston. The latter has two small holes through its wall on the transfer side below the crown and located roughly in line with the ends of the baffle—presumably to aid lubrication.

Submitted with the 29X for assessment was a pre-production sample of the new O.S. Max-6. This 1 c.c. motor is the smallest O.S. engine to date. Design closely follows established O.S. Max practice and construction and finish throughout is to a very high standard. The crankshaft, counterbalanced and hardened, has a 7 mm. journal and runs in a bronze main bearing. The loop-scavenged cylinder is of the usual Max pattern with integral fins topped by a machined alloy head. The piston has a filleted baffle and a fully-floating gudgeon pin. The conrod is of machined dural. A detachable venturi choke is fitted, retained by the needle-valve assembly which, like the bigger Max engine, has a flexible control extension. The complete engine weighs a little under 2 oz.



FULL SIZE WORKING DRAWINGS ARE OBTAINABLE FROM YOUR LOCAL DEALER, OR BY POST FROM THE "MODEL AIRCRAFT" PLANS DEPARTMENT, 19-20, NOEL STREET, LONDON, W.1, PRICE 3s. 6d., POST FREE

CLUB NEWS

U.S.A.C.

We would like to welcome to the ranks of U.S.A.C., the Croydon M.A.C. We hope we shall be seeing more of them at our flying meetings very soon.

Another barbecue-cum-flying meeting was held recently at Goodwood, this time with a difference. Balloon-busting (C/L) and a scramble, which included all classes of models, were organised, and proved to be by far the most popular events so far. Although there were fewer clubs attending, the entry list was the largest yet. Worthing Bald Eagles M.A.C. triumphed in both events, B. Bumstead winning the scramble with an M.A.N. *Voodoo* and Ed Hodge taking the first place in balloon popping, a very creditable effort considering the strong wind prevailing over the otherwise fine weekend.

Numerous ingenious devices were employed by the controliners to limit their engines to the 45 sec. flight time required by the scramble, but all their efforts were brought to nought when the organisers altered the flight time for the F/F boys (due to the wind) to 30 sec.!

Camping at the meeting was enlivened by some very curious cows who partially consumed one gentleman's motorcycle pannier bag. Fish, chips, sausages and beer in large quantities disappeared down the throats of hungry modellers and a midnight card game gave the more freely spending a chance to improve their finances! Verdict seemed to be a jolly good time had by all, and thanks go in no small measure to those organising dynamos, the Chichester and Horsham Clubs, who always work so hard and provide such excellent facilities at our meetings.

Any club in the South-Eastern Area who would like four more flying meetings to visit each year is invited to write to G. J. Haigh, 8 Gainsborough Avenue, Worthing, Sussex, for details of our organisation. We are NOT attempting to compete with the S.M.A.E., with whom we are on the best of terms, but are merely one large association of aeromodelling clubs to promote interest in the hobby in this part of England.

BRIGHTON D.M.A.C.

The second Team Trial at Barkston Heath did not bring any joy to club members, although at one time Dennis Latter was lying second in A.2. At the end of the final round Fred Boxall was 7th and Dennis Latter 9th heading the club contingent and Ian Lucas topped the club's Power entry.

At St. Albans Gala, Fred Boxall won the fly-off of the rubber event with a time of 7:1 and John West came 5th out of the Open Power fly-off of 13.

OUTLAWS M.A.C.

We are now firmly established in our new clubroom, which is conveniently located at the back of a pub! To mark the occasion we recently held a grand "house-warming" party with buffet and bar. The mention of free food brought 60 bods from seven neighbouring clubs rolling in; highlight of the evening was a paper aeroplane contest, won by our own Treasurer (fiddle) with the staggering time of 4 sec.

We are shortly to hold what we believe will be the first open Rat Race Rally in this country.

Two classes will be run. 1. Up to 3.5 c.c., 50' lines. 2. Up to 0.40 cu. in. 60' lines. No model specs other than fixed u/c. No minimum line diameter but 10G pull test. No tank limit. 1st heat over 35 laps. 2nd heat over 70 laps—must include one pit stop. Finals over 140 laps—must include two pit stops.

Date October 29th, venue to be announced next month. A stunt event will also be held.

We have played around with the smaller class and recommend something about 80 sq. in., upright motor, interchangeable tank, medium moment arm, and generous size wheel(s). These jobs take about three hours to build from scrap and are great fun to fly. For the larger class, of course, an abundance of American designs have been published.

CROYDON & D.M.A.C.

The St. Albans gala provided a win in glider for yet another of Al Wisher's ten-footers with 3 : 19 in the dead air fly-off; the presence of a bacon slicing machine in his car boot is purely coincidental, as he sells them and apparently they're no good for wing ribs, only bacon!

Martin Dilly's 250 sq. in. modified Holland Hornet model came second in the ½A fly-off with 4 : 20, while team racer Gordon Cornell broke into F/F with a 280 sq. in. *Dynamic* .049 model, which, on its first outing, did two max's and 2 min. something.

Wakefield team man Norm. Elliot had an off day in open rubber; he missed out on his third max, broke one model and lost another—even got chased by a snake while looking for it, incidentally. After the glut of vipers at Chobham, the boys now have a communal ampoule of the appropriate snake serum, just in case!

CHEADLE & D.M.A.C.

After four months of legal wrangling we have secured a new flying field in Cheadle. Due to the proximity of houses this field is restricted to rubber, glider, limited motor run power and R/C gliders only, the R/C power model being considered far too noisy and lethal. Meetings for the "pre 1950" types are held Wednesday nights.

R/C and C/L meetings are held on Friday evenings and Sundays at a field about two miles out of Cheadle.

The club has been reorganised to cater for the expansion of the club into three groups and three competition secretaries were elected at the EAGM as follows: R/C, D. Brunt, C/L, T. Watson and F/F, L. Whalley. This new system will give better "news spread" and faster competition entries.

An excellent film show was given at the EAGM by Alan Whittaker showing all aspects of R/C.

The Colne rally drew a small band of glider enthusiasts and although total rally entries were about the level of a club comp, the Cheadle lads enjoyed a good meeting. Brian Faulkner flew the 1955 vintage *Mousetrap* complete with ex W.D. 3s. bomb timer into second place. Strength of wind was high enough to bring out the 60 lb. nylon line.

New members will be welcome and should write to the Hon. Sec., S. Faulkner, 3, Burns Avenue, Cheadle or call at the model shop, Cheadle Green, for details.

MARKET HARBOROUGH M.A.C.

As we now have a membership of over 50, it was decided to hold a sports competition. On the Sunday of the competition the weather was fine and calm, and many modellers were out early trimming new and old models. After a hard fight in the afternoon Peter Driver won the junior prize and E. Vye won the senior prize.

We now have nine R/C enthusiasts in the club led by the club expert, R. Michael, with his multi-channel McCoy 60 powered model. A R/C spot-landing competition and a chuck glider competition have been arranged.

HAYES D.M.A.C.

We had no luck in FAI team racing at the Ashford C/L Rally, but Dave (Hercules) Balch was the combat victor. Open Rubber and Combat, have been the most successful of our contest activities so far this season.

Two Cox TD .010 stunters with wingspans around the 18 in. mark have caused a stir at our Cranford Park flying ground. One will do everything in the book with its motor turning near the 30,000 r.p.m. mark! Before long we shall have a speed job flying behind the 0.010 Cox with a target of 80 m.p.h. to aim at.

NORTH KENT NOMADS

So far this season, the weather has been very kind to us on our competition days.

Our cup for the four Bank Holiday scrambles has been won by junior, David Crow, who entered only three of the competitions. The Rotarian Glider Cup was won by Geoff Chapman, and the Ball Tail-less Trophy won by Ivor Bittle.

For the Roberts Cup this year we are experimenting on Dartford Heath with a water tank constructed of Polythene sheet, and from the trials, the possibilities appear very good. Bill Hubbard has already exceeded the British record with his new flying boat.

R/C continues as popular as ever. George Hattemore does not consider he has had a good weekend's flying until he has put a pint and a half of fuel through his 1.49, and all this on a soft valve Rx!

Lost models are finding their way back to their owners much quicker since the local police have taken an interest, due to the influence by their representative in our club—John Giffin.

MACCLESFIELD M.A.S.

During the early months of the year the aeromodelling activity was curtailed by exams, etc.; but now it has been restarted with renewed enthusiasm.

The most recent club Combat Comp. provided a most amusing morning. Not one of the four entries escaped unscathed. No. 1 had his tailplane eaten and retired; No. 2 was written-off and the owner dashed off home to screw his P.A.W. 2.46 into an 18 in. E.D. Bee trainer, to qualify for the second round; No. 3 started to fall to pieces in the air and No. 4, after rather a lot of agriculture, flew in the last round with one piece of ply doubler (1/32 in. × ¼ in.), holding down his P.A.W. 19-D which almost wore away the leading edge with its vibration. Eventual winner was J. M. Snape with an O.D. P.A.W. 19-D *Bomarc*.

The next comp. is to be single-channel R/C, for which several radio models are being built, including a semi-scale, power-assisted *Foka* sailplane.

We seem to be rather short of younger members, and we are hoping to increase our membership soon. Anyone wishing to join should contact Chas. Eifflaender (Secretary), Fieldbank, Chester Road, Macclesfield, and will be welcome any day that the noise of diesels can be heard on the flying field at Congleton Road.

ABINGDON D.M.F.C.

We recently had a good day's flying on Port Meadow, the weather being excellent. Andy Crisp's new short moment A.2 made a nice max.

CONTEST CALENDAR

Sept. 24th	*KEIL TROPHY U/R Team Power. Area.
,, ,,	FROG JUNIOR TROPHY. U/R Rubber/Glider. Area.
,, ,,	SPEED. Centralised.
,, ,,	South West R/C M.F.S. Rally, Dunkeswell, near Honiton, Devon. Single and Multi, 5s. entry fee pooled for prizes.
Oct. 1st	†South Coast Gala, R.A.F. West Malling, Kent. R/G/P/½A. P., F.A.I., T/R, R/C Tailless, Combat.
,, ,,	Northern Area all F.A.I. C/L Meeting (Speed, Stunt. T/R), Rufforth.
,, 8th	"½-A" Power.
,, ,,	*FARROW SHIELD. U/R Team Rubber. Area.
,, ,,	TEAM RACING. Class "½-A" "A" and "B."
,, ,,	Hayes Gala. Chobham. Glider Rubber, Power, "½-A."
,, 15th	AREA CHAMPIONSHIPS.
,, 22nd	FROG SENIOR CUP. U/R Power. Decentralised.
,, ,,	CMA CUP. U/R Glider. Decentralised.
,, 29th	Blackheath Gala. Chobham Common. U/R, Rubber, Glider, Power.
Nov. 5th	Wharfedale, 1,000 lap class "B" T/R, R.A.F. Rufforth.

†SMAE sanctioned contests.
SMAE events in capitals.
*Plugge Cup events.

off 60 ft. of line on its first flight, it landed a few yards from the banks of Mother Thames !

Lift was evident, for Neil Webb's *Thing* kept up after the engine had cut. Albert Fathers provided much awe among the spectators, for his 1.5 model (originally *Lucky Lindy* with modified fus.) had a new power unit giving a fabulous climb, what one would expect from an O.S. Max 15 pressurised. We estimated about 700 ft. on a 10 sec. run. Trimming it was hair-raising for all on the Meadow.

Pete Pemberton's 650 *Starduster* went O.K. with E.T.A. 29, it flew the same pattern as original ½A, the engine has since been pressurised.

WINCHESTER M.A.S.

We recently held another club Combat Contest, the results were as follows: ½A—1. T. Airey; 2. F. Skipwith; 3. A. Wright. A—1. D. Price; 2. T. Airey; 3. D. Simmonds.

We have also held our first Rat Race, which, much to the surprise of some of the members, was a great success, the results were: 1. D. Price; 2. F. Skipwith; 3. B. Dracup.

HIGH WYCOMBE M.A.C.

C/L has gained so much popularity lately that T/R and Combat contests are being organised.

The first was a Combat comp., which was well attended and it ended with a fine victory for J. Bell over D. Hubble.

The following Sunday we ran a handicap F.A.I. T/R comp. where everybody stands an equal chance of winning. All we did was time the models for their speed and count the laps per tank, work out the time taken for 100 laps and allowing 10 sec. for the start and 20 sec. for each pit stop.

When the race is started the models are handicapped, the slowest model being allowed to start off a certain number of sec. before next and so on. The result was a lot of fun with keen competition and a win for our new club member Mike Bassett. Second place and 5 sec. slower, was a dead heat for Dick Edmonds and Paul Morris.

We would also like to thank the anonymous "Kind Gent" who sent the money for the can of dope he accidentally took away at our rally !

NORTH DUBLIN A.C.

We had eight members at the recent Butlin's C/L Rally at Mosney. Weather was better than usual and we collected two firsts, two seconds, and a third placing. The team of Heirevan-Brennan-Rafter won class B, proxy flying T. Morelli's model (ETA). P. Brennan won the ½A T/R with a *Tiger Cub* model and placed second in F.A.I. (Oliver Mk. III). E. Redmond placed second in scale with a well-made T.A.152h.

Much of the enjoyment of this meeting was impaired by the lack of a competent controller. The controller who was in attendance had scanty knowledge of even the basic rules. At one stage he wanted to fly ½A heats over 90 laps, and B heats over 100 laps. He did not even have a copy of the rules and claimed to have them in his head! Surely the contestants should not have to supply a copy of the rules to the organisers ? An otherwise perfect day was thus spoilt for a lot of people.

We are still on the lookout for new members so if you are interested contact P. Brennan, 39a, Castle Ave., Clontarf, Dublin.

ROTHERHAM & D.M.A.C.

At a recent general meeting there was a considerable re-shuffle of officials (see change of sec. para).

We now have the use of the A.T.C. headquarters, William Street, Rotherham, every Tuesday night from 7.0 onwards, newcomers are welcome, and a whole new range of indoor activities are planned for the winter.

ST. ALBANS M.A.C.

Our F/F Gala was dampened by much rain and mud at Chobham but was not unsuccessful thanks to the sporting spirit of many competitors—many thanks, chaps. In our own club Tony Young is in the Power Team for the second year in succesion.

Results were as follows:

Power: 1—G. French, Essex; 2—P. Manville, Bournemouth.

Rubber: 1—F. Boxall, Brighton; 2—A. J. Payne, Stevenage.

Glider: 1—A. Wisher, Croydon; 2—J. Wright, Northern Heights.

½A: 1—D. Posner, Surbiton; 2—M. Dilly, Croydon.

Radio: 1—R. Saunders, Country Member; 2—A. J. Holloway, Reading.

Slope Soaring: 1—D. Nelson; 2—S. Fynn, Country Members.

ESHER & D.M.F.C.

Speed man Malcolm Waddle tied for second place with Pete Wright at the S.M.A.E. speed comp. at R.A.F. Oakington. Speed was 115.3 m.p.h. using Supre Tigre G20V "standard" and S.M.A.E. standard fuel. His previous best has been 122.4 at Hendon but alas without a pylon.

We meet at the Lynwood Rd., Thames Ditton Scout Hut on the third Wednesday of each month and new members are welcome.

NEW CLUB

BRISTOL UNIVERSITY A.S. J. R. W. Smith, 16, Congleton Rd., Macclesfield, Cheshire.

CHANGE OF SECRETARY

ROTHERHAM & D.M.A.C. G. E. Stringwell, 11, Green Lane, Wickersley, Nr. Rotherham.

Stability of Model Aircraft

continued from page 316

model. This explains why so often the "slab" model, will perform better than the streamliner. Fuselage depth aids lateral damping, as tail area aids longitudinal damping.

The Centre of Lateral Area

It has been suggested that, by cutting a profile of a model from card and finding its c.g., the centre of pressure of sideloads on the model may be determined. To justify this, it must be assumed that the air loads on the model are distributed evenly, as is the mass of the profile. Unfortunately, this is far from true. The effect of such an assumption is shown in Fig. 4 (a). Compare this with 4 (b) where a true distribution of load is shown, note especially the direction of loads on the wing. The centre of lateral area (c.l.a.) somewhat underestimates rolling moments. As mentioned before, the fin is fairly efficient in providing yawing moments compared with the fuselage, so that c.l.a. also underestimates yawing moments. In general then, the lateral c.p. is above and well behind the c.l.a.

Stability in Turns

In a steady turn, as opposed to straight flight, there is a sideload on a model, due to the turn. It is not an aerodynamic load, but is dependent on mass in the same way as weight. This is the centrifugal force, it is shown acting in Fig. 5, marked C. In order that the steady turn may continue, the centrifugal force must be balanced. This is often achieved by the model banking. The lift L is then inclined inwards as shown. The lift must, of course, still balance the weight W of the model. The lift may be regarded as two parts, Lc and Lw balancing C and W respectively. In level flight L would be Lw, so that in the turn the lift must be increased. This accounts for the added elevation required to trim a model in a turn.

Some people prefer their models not to bank, this having the advantage that the lift is not increased. This is achieved by washing-in the inside wing, or fitting dummy ailerons, as shown in Fig. 6. However the centrifugal force still exists and must be balanced if the turn is to continue. Furthermore, the ailerons have introduced a rolling moment which must also be balanced. The model provides both the force and rolling moment by sideslipping (or skidding) out of the turn—see Fig. 6.

Some people regard a spiral climb as a combination of looping (pitching nose up) and rolling. With a little thought, it will be seen that in a spiral a model is climbing at constant bank and is therefore not rolling at all. However, the model is pitching and thus a spiral climb provides a means of controlling a model, which would otherwise loop.

Polyhedral is not necessary in order to spiral climb, but is useful in providing a quick rate of roll, to aid recovery from a spiral. This is most true for power models, where the engine cuts suddenly. It is not so significant for rubber models, where the power dies slowly. For gliders it is simply a waste of time, tip or straight dihedral being quite adequate.

Power-On Effects

The following applies to both power and rubber models. The motor provides torque to turn the propeller clockwise, while at the same time tending to roll the model anti-clockwise via the mounting lugs or motor peg. This banks the model, which results in a turn, usually to the left. Often this is compensated by rudder offset to the right, or thrust offset the same way. This does not balance the torque, however, only a rolling moment can do this and in flight the model must either have a rate of roll (port down) or fly with a slight sideslip to the left, to do this. A power model should be trimmed in a right hand turn at full r.p.m., then, should the revs decrease, the turn will widen, because torque increases with reduction of revs at high r.p.m.

A gyroscopic moment only exists if a model is pitching and/or yawing. The result is that a model pitching nose up (spiral climb) will also tend to yaw to the right. A model yawing to the right will tend to pitch nose down. Since a motor should be running flat out initially, from the gyroscopic point of view, a model should climb in a right hand spiral, so that when revs drop off, the turn will widen and steepen, rather than lead to a spiral dive.

Conclusion

No hard and fast rules have been offered, but it is hoped that the principles of stability will now be better understood. The only honest advice I can offer is that referred to in the introduction.

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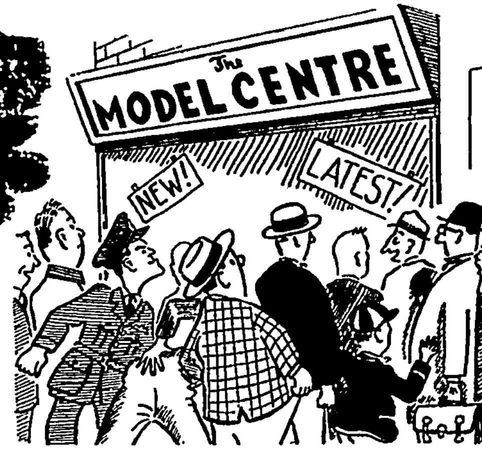

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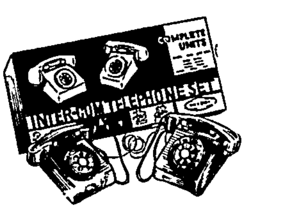

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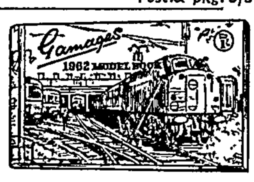

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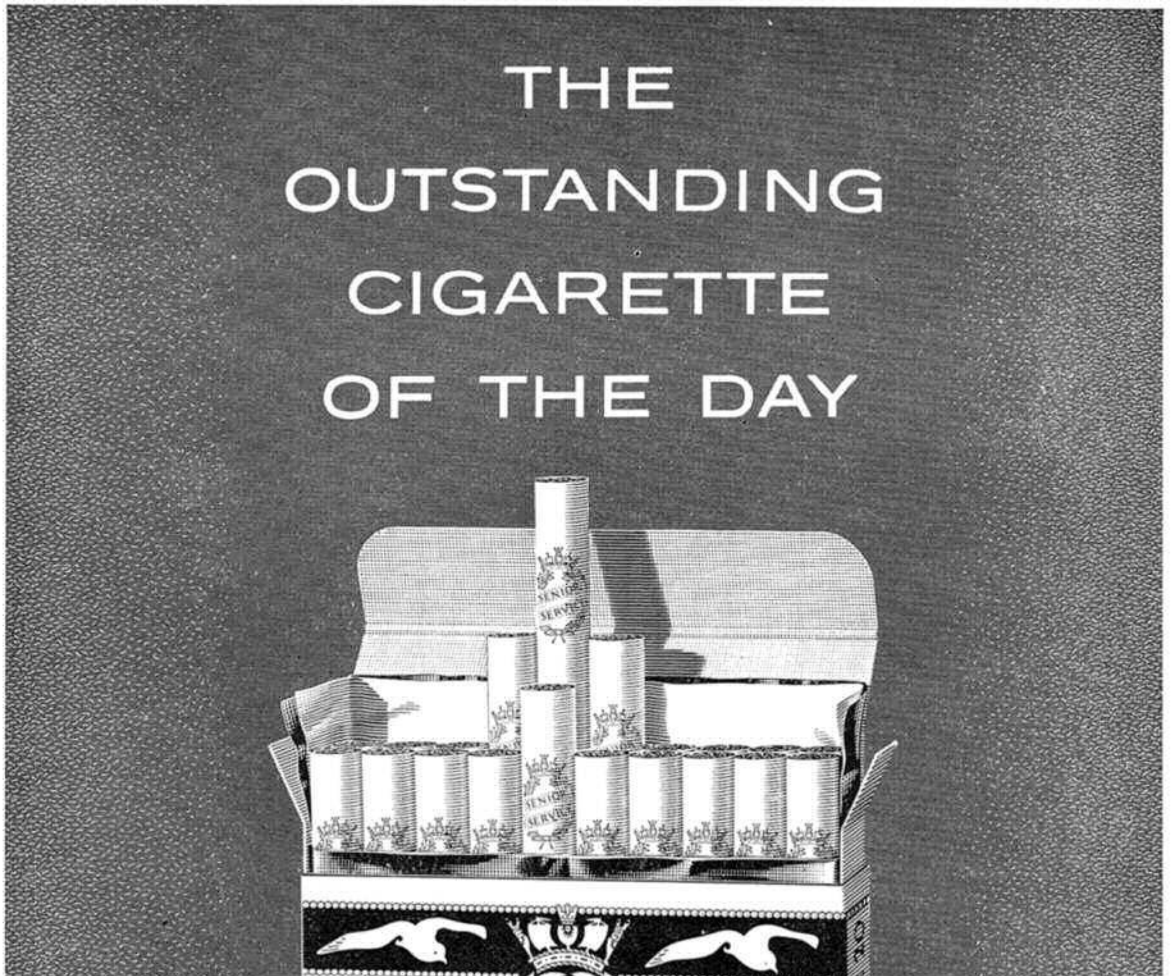
Registered for transmission by Magazine Post to Canada including Newfoundland.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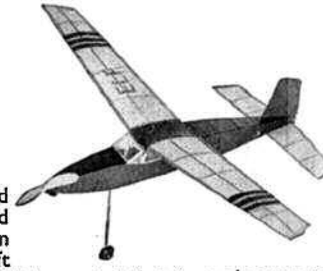

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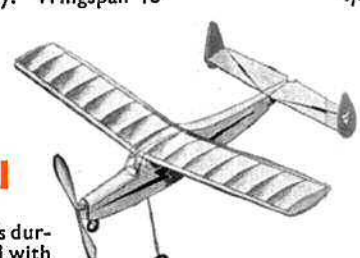

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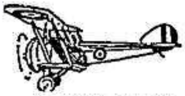
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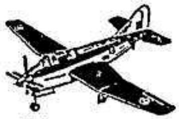
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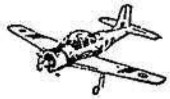
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