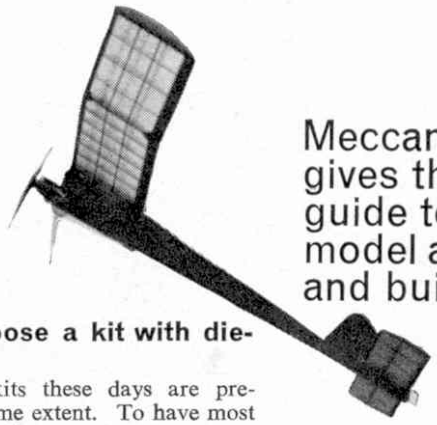
SPECIAL AERO

MODELLING SECTION

FLYING IS FUN



Meccano Magazine gives the beginner a guide to all sides of model aeroplane flying and building . . .

EVERY summer produces a new crop of model aircraft enthusiasts. Most of them are attracted to the hobby after watching a model flying in the local park or on the common, after which they tear off to the local model shop to spend their pocket money on the latest thing in model kits!

At this point, a lot of would-be modellers come unstuck because they haven't the slightest idea of what sort of model they *ought* to buy. Unfortunately, many retailers are unable or unwilling to offer advice on this and it's only too easy to make a poor choice. There are so many different and equally attractive kits on the market, that a wrong selection is, in fact, very likely!

Picking a suitable kit from which to build your very first model is the most important step a modeller ever takes. The model must be easy to build; the design must be tolerant of slight constructional inaccuracies, which will inevitably creep into it because of the builder's inexperience. It must be easy to fly and, above all, TOUGH to resist the knocks and minor crashes, which it will inevitably suffer while you are learning how to fly it.

An otherwise good model, which falls down on any one of these requirements, is a waste of time to the newcomer, for if his first model is unsuccessful, even to a limited degree, he may very well give up the idea of modelling aeroplanes. So, the vital thing is to *get something airborne.*

Rule 1: Avoid all scale models of full size aeroplanes.

Such models ARE attractive and experts CAN make them fly, but more would-be aero-modellers have been lost to the hobby because they started with an unsuccessful scale model, than from any other cause. After building one or two simpler models and proving to yourself that you CAN make a model that flies, THEN by all means try a scale model, but please don't start with one!

Rule 2: Choose a kit with die-cut parts

Most good kits these days are prefabricated to some extent. To have most of the parts ready cut out removes one of the newcomer's main problems and greatly improves the chances of success.

Rule 3: Read the building instructions carefully

As you read them, compare each building stage with the drawing and *mentally* build the model. It's almost as exciting as *actually* building it and the better you understand the method of assembly, the fewer difficulties you will experience when you start sticking pieces together.

The above notes apply equally to free flight and control-line models, but depending upon which types you decide to build first, there are some further points to note.

Free flight models

These can be divided into four types:
1: GLIDER.
2: RUBBER POWERED.
3: ENGINE POWERED
(Diesel or Glow-plug.)
4: JETEX.

The best choice for a 'first model' is without doubt the glider. With this type the novice can learn to trim (balance and adjust) a model for flight much more easily than with any other. Since this ability is vital to success with any free flight model, it is obviously beneficial to master the art at the outset, with a type of model that will forgive the newcomer's errors and yet survive to give him another chance.

The model in the top picture refers to Rule 1. Below is a good starting kit. See Rule 2.

A glider is the answer. NO rubber motors to break, NO propellers to carve or adjust, NO expensive engines and fuel to buy; easier construction and lots of fun-while-you-learn into the bargain.

The glider should never be regarded as in any way inferior to the other types. Some of the world's most advanced flying models are gliders. Many experts build nothing else, and in its more advanced forms the glider or sailplane is a challenge worthy of any master model builder.

When you are choosing your first glider kit, don't choose one that is smaller than 30 in. wingspan. Small models are generally trickier to build and are certainly less tolerant of clumsy handling when flying.

Even a kit for a three-foot wingspan model is not very expensive, and such a model can look very imposing. Towed up rather like a kite and then released, it will stay in the air for minutes on end! You'll need your address on it!

Control line models

Many modellers have nowhere large enough to fly a free flight model and, even if they have, often *prefer* to build

Continued on page 11

control line models. Such a model, connected by two thin steel wires (usually between 25 and 50 ft. long) to a handle held by the flyer is invariably engine-driven. As it flies round the 'pilot' at anything up to 50 m.p.h., he can control its attitude in flight by moving the handle gently up or down. This, in turn, moves the hinged 'elevator' on the tail of the model through a very simple crank linkage and the model responds by climbing or diving in exactly the same way as does a real aeroplane.

It is possible to buy completely finished ready-to-fly, plastic control-line models, but generally speaking, they do not perform as well as a model built from a good kit. Some of them can hardly stagger into the air. There's certainly more satisfaction in building the model yourself. It's lots more fun and cheaper too!

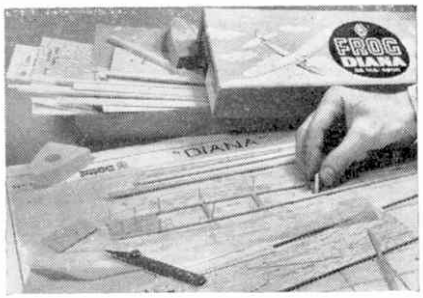
If you are not very good at tissue covering, or have never done it before, you can buy very good beginners' control line kits, which are made all from sheet balsa and therefore require no such covering.

Choosing a kit

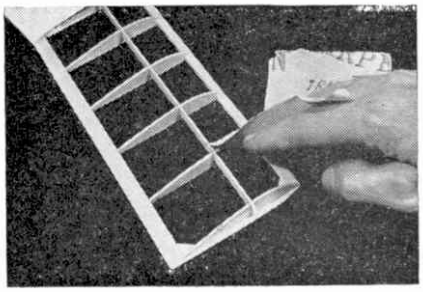
The model you choose will depend very much on which engine you intend to use and, when you go along to your model shop, you will find that the kit boxes always tell you which engine size (specified in cubic centrimetres: c.c.) is most suitable for that particular model. For instance, on the Veron Colt box (incidentally, a good beginner's subject, since the balsa parts are so extensively pre-formed) you will find this note: 'For 0·75 c.c. to 1·49 c.c. Diesels'. The smallest recommended engine (0·75 c.c.) would *just* provide enough power to fly the model, whereas a 1·49 c.c. engine would give a very lively performance! It might even be a bit *too* hot for a learner to handle, so something between the two extremes should do nicely. A 1 c.c. engine would, in fact, be just right and this is a very popular size—economical to buy and easy to operate. Unlike a free flight power model, in which a low powered engine will often simplify the initial trimming problems, a control line model that is underpowered is just as difficult to fly—perhaps even more so than one with a surplus power reserve.

This is because, without sufficient speed the model, flying round you, will have insufficient outward 'pull' to keep the control lines tight—particularly flying across the upwind leg—and slack control lines mean loss of control, very shortly followed by the inevitable crash! Many plastic, ready-to-fly models suffer from being underpowered for their weight and, consequently, are difficult to fly well.

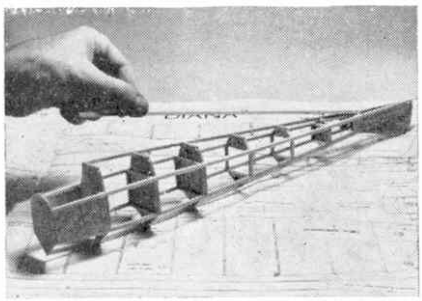
PICTURE TIPS



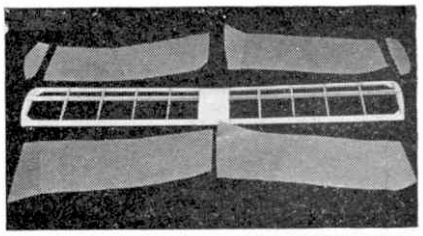
Here the fuselage is being built from strip balsa over the plan. Notice the greaseproof paper to prevent the parts from sticking to the plan



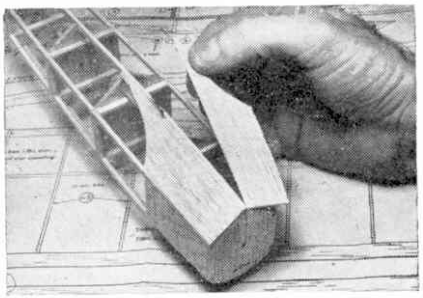
Smooth out irregularities with fine sandpaper



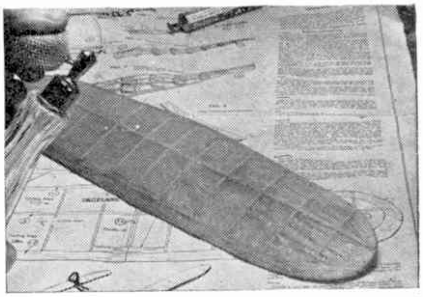
The two sides are assembled with pre-cut fuselage formers and two additional top longerons are fitted



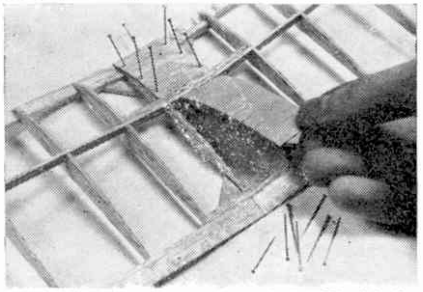
Never try to stretch the covering over two curves at the same time



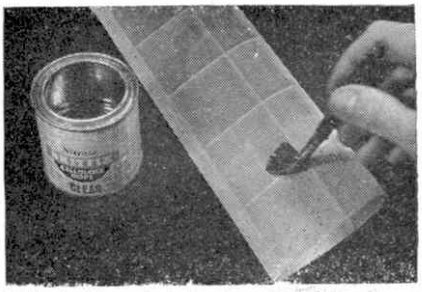
Sheet balsa parts should be "dry fitted" before finally cementing in place



Spray the tissue with water. As it dries out, it will tighten up to give a smooth surface



The centre reinforcing sheet is being fitted to the wings. Pins are used until the cement has dried



Finally give it a coat of clear dope. This strengthens the tissue

FREE FLIGHT TRIMMING

Let's say you have just completed your glider and, having applied the last lick of dope to the wing and carefully positioned the decorative transfers, you are anticipating your first exciting flight. Remember that all new, full size aeroplanes, no matter how big or small, go through lots and lots of testing on the ground before they ever venture near a runway. Even then, they don't just open the throttle and take off. No, they go through hours of taxying tests up and down the runway without ever leaving the ground and then if—and only if—everything is just right, the pilot will gently ease her off the runway for a few yards only, before carefully setting down again. Each time the 'hop' gets longer, until the test pilot is certain his aeroplane is perfect—then he makes the first real flight.

FIRST THE GROUND TESTS

1: Assemble the wing and tail to the fuselage. Most likely, rubber bands are used for these fixings and they should be tight enough to hold everything securely without being *over* tight and thus risking damage to the structure.

Continued on page 17

2: Carefully check that the wing and tail are 'square' to the fuselage and to each other by sighting along the fuselage from the tail end. You will be able to spot immediately if the tail is higher at one tip than the other and, if it is, you must insert packing under one side to correct the fault. Always cement such packing either to the tail or to the fuselage, so that it will not be accidentally lost, should the tail knock off after a heavy landing. At the same time, make sure the fin and rudder are quite straight fore and aft, with no offset at all to right or left.

3: Now look at the model from above and check that the wing and tail are at right angles to the fuselage and not 'askew'. If you're not certain, check by measuring the distance from each wingtip to the rear end of the fuselage. Both sides should be equal. A piece of string or length of strip balsa is useful for this purpose.

4: Now once more sight down the fuselage from the tail and make certain that there are no warps or twists in either the wing or the tail. Any distortion of this kind will certainly affect the flying performance and, if severe, may even make the model impossible to trim successfully. Some warps can be cured by holding the offending surface for a few seconds in the steam of a boiling kettle, twisting it a little *past* the straightened position. Take it out of the steam jet as soon as possible and hold (in the corrected shape) until the tissue cools.

5: Next check the plan and note where the CG (Centre of Gravity) position is to be located. This is the point at which the model should balance. It usually falls about a third of the way from the front (Leading Edge) of the wing, or on the main spar. Support the model at the CG by a fingertip under each wing—quite close to the fuselage. The fuselage should remain horizontal. If the nose or tail drop—even slightly—restore the balance by adding a little lead or plasticene to the 'light' end.

This completes the 'ground checks' and, for the next stage, we need a nice calm day. It is impossible to flight trim a model in any but calm conditions, so have a little patience. Select a spot with fairly long, soft grass and gently launch the model directly *into* the breeze. Don't *throw* it, but release it smoothly at, as near as you can judge, its true gliding speed. Never point the nose *up*, but aim it slightly down at an imaginary spot on the ground about 25 ft. ahead. Your model should glide to earth smoothly, turning neither to right nor left. Should it dive, add a little weight to the tail. A stall (sharp climb followed by a steep dive) means that the tail is too heavy—so add more weight to the nose.

Continue this stage-by-stage process until the model glides smoothly.

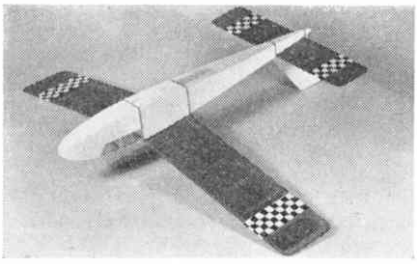
All the trimming steps described above apply equally to all free flight models—glider, power, rubber or Jetex.

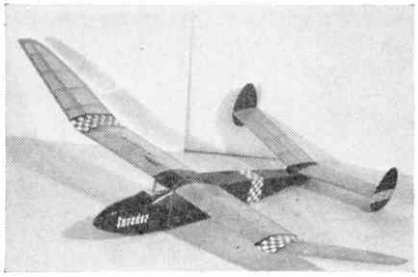
All these models, except perhaps the smaller Jetex powered ones, are often fitted with a device called, rather grandly, a dethermaliser! This is simply a way of untrimming the model after a certain, predetermined length of time—usually set by a short lighted fuse, just before launch. This 'untrimming' is necessary because the model may enter a 'thermal' (a rapidly rising column of warm air) which will carry it upwards, out of sight in a very short time, unless the dethermaliser has been set to upset the flight trim sufficiently to bring the model down faster than the thermal is rising!

LANDING

To do this safely and without risk of damaging the model as a result of *too* rapid a descent, is the aim. The dethermalising device usually depends on the tailplane's being allowed to tip up very sharply at the trailing edge after a fuse burns through a small retaining rubber band. This brings the model straight down like a descending lift, with the wings level and the nose slightly raised, thus the landing is a real 'pancake' one with very little forward speed.

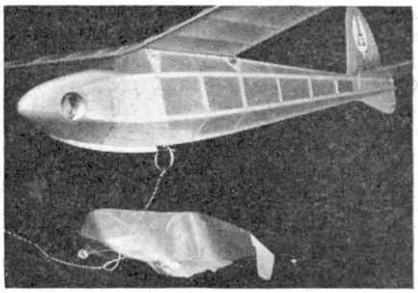
Just in case the fuse goes out, or you forget to light it, it is a wise precaution to dope a little address label to your model, so that, should it fly away, its finder will be able either to bring it back or write to you to tell you of its whereabouts. Sometimes quite small models fly for many miles after being caught in a thermal, so remember that label!





(Above) note the address label on the underside of this model. (Below) An Invader 40" wingspan glider

Flying your glider from a towline is tremendous fun! You will need a helper to launch the model for you and, to start with, a 50 ft. towline is recommended. Nylon fishing line makes an excellent towline and this may be kept neatly wound on a simple fishing line 'gate'. Better still, there are special glider winches on which the line is stored safely wound round a drum or reel which is highly geared to a winding handle for rapid reeling-in. To the 'glider-end' of the towline should be fastened a small curtain ring which slips over the wire towhook beneath the model. Just ahead of the ring, about six inches down the line, you should attach a strip of silk or nylon rather like a flag or pennant. This will clearly show you when the tow leaves the model and also assist in taking the tow ring quickly and 'cleanly' away from the towhook after release.



FLYING

Reel out the line into wind and have your assistant hold the model, with towline attached, above his head and with the nose pointing slightly *up*. When you, at the winch end, are ready to tow up, give a hand signal and walk quickly into wind. The launcher should walk forward as well letting the model rise out of his hand; *he should never throw it*. You should now walk faster until the model is climbing steeply on the end of the line. If it veers sharply to one side or the other, stop walking and slacken off the line immediately. If your earlier trimming has been done properly, you will find that the model will probably straighten out and you can resume towing, without releasing the model. It's rather like playing a fish on a line and you will quickly learn when to let the line go slack and when to increase the towing speed.

When the glider is almost overhead, slacken off the line or walk towards the model and the silk pennant will drag the ring off the towhook, leaving the model high in the sky and in free flight—it's terrifically thrilling just to see it hanging there in the sky, defying gravity for a few minutes and then lazily circling back to a gentle landing. The size of the gliding circle can be governed by *very slightly* altering the rudder and, to

prevent the model from turning on the tow-up, you should aim it just a little 'out' of wind, so that the slight side-wind keeps it straight.

The more advanced models have mechanical devices to keep the rudder straight on the line and allow it to assume a preset turn position when the towline drops away.

MODEL ENGINES

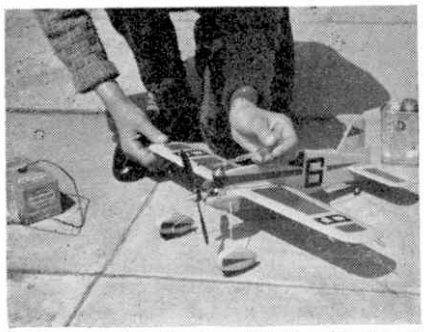
Operating miniature aero engines is great fun and not at all difficult.

There are two distinct styles currently in use. They are:

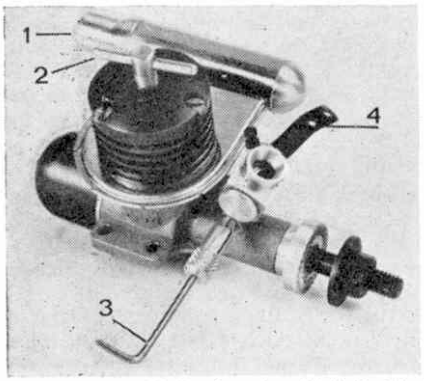
1: Glow-Plug engines.

2: Diesel (or more correctly compression-ignition) engines.

Both are equally suitable for beginners' models, but their operating techniques vary considerably. They all work on the 'two-stroke' principle and are basically similar in operation to motor-cycle two-stroke engines. But, whereas motor-cycle and car engines use a sparking plug to ignite the petrol in the cylinder, our Glow-Plug engines have, in their cylinder heads a glowing element like a little electric fire, which is heated for starting by connecting it to a 1·5 volt battery. Then, when the propeller is sharply flicked over, the engine will 'fire' and, as soon as it is running smoothly, the battery is disconnected, whereupon the element will continue to glow, due to the heat generated by the continually exploding fuel in the cylinder.



Fuelling-up. Note the 1½ volt battery for starting the engine



Typical 1cc model diesel engine. (A.M.10. fitted with silencer.) **1** *silencer;* **2** *compression screw;* **3** *needle valve;* **4** *throttle lever (R/C motors only)*

A diesel engine fires the special fuel merely by the heat generated as the piston compresses the fuel vapour in the cylinder. The faster this compression takes place, the greater the heat generated, so you can see that it is essential, when starting a diesel, to flick over the propeller very quickly, so as to provide enough heat, by fast compression, to ignite the fuel vapour. Some model engines are fitted with 'spring recoil starters', which, though simple, are most effective in helping the newcomer to acquire the new technique of 'starting'. Model diesel engines have a 'contra piston' in the top of the cylinder. This second piston can be moved up and down inside the cylinder by means of a 'compression screw' which protrudes through the cylinder head. By turning the compression screw in a clockwise direction, the compression in the cylinder is increased and this, in turn, increases the speed of the engine. Too much compression, however, will make the engine run 'hard' and it will slow down. This can be very damaging and should be avoided. Misfiring is usually due to too little compression.

All Glow-Plug and diesel engines have a needle valve. This regulates the amount of fuel mixture allowed to enter the engine. Adjusting the needle valve for the correct setting needs practice, but a suggested best position is always given in the instruction sheet supplied with the engine. If it is opened too far, it will allow too much fuel to pass and 'flood' the engine, making it impossible to start until the surplus fuel has been extracted.

Many newcomers find the Glow-Plug engine easier to handle than a diesel, because it only has one control to adjust —the needle valve. The diesel, on the other hand, requires two adjustments to be made in order to achieve smooth running—the needle valve and the compression screw. Against this, of course, the Glow-Plug engine needs batteries to start it and these *must* be good ones, since flat batteries will not provide sufficient power to make the element glow. The glow plugs themselves burn out occasionally, too, and the expense of both these items *can* make the Glow-Plug engine rather more expensive to operate than a diesel. So, you see, each type has its advantages and each its drawbacks—take your pick!

As stated earlier, a 1 c.c. engine is a good a size as any to start with. Perhaps, for free flight, a slightly smaller engine could be considered — say — 0·8 c.c. Remember though, that, generally speaking, the smaller you go, the more temperamental the engine becomes.

Silencers

Your local model shop will tell you whether there are any model flying clubs in your area and it is a very good idea to contact them. They will know of local flying fields and of any regulations governing their use. For instance, it is almost certain that you will be required to fit an efficient silencer to your engine and this fact should be taken into consideration when making your engine choice. For most current models, special silencers are available, but in the model shops there are still one or two older engines, for which the manufacturers do not provide silencers.

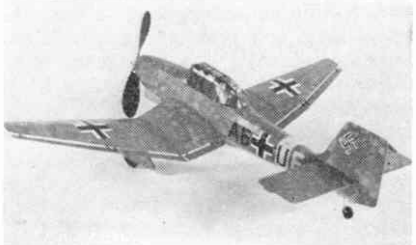
Perhaps 'silencers' is a misnomer. A more correct term would be 'mufflers' since the effect is not to make the engine inaudible (this would be almost impossible) but to reduce the often offensive noise to a tolerable level.

The official body to which it is wise to belong, is the 'S.M.A.E.' There are various classes of membership and your local club will probably be affiliated to the Society as well. They will be able to tell you all about it. Alternatively, you may write direct to The Society of Model Aeronautical Engineers Ltd., 10a Electric Avenue, Brixton, for details. Membership entitles you to Third Party Insurance cover up to a maximum of £50,000 and, if you are competition-minded, there are SMAE model contests all through the season. The highlight of the competition year is, of course, the British National Championships held over two days at Whitsuntide. Hundreds of modellers of all ages attend and all types of models are to be seen there.

Fly carefully

In our enthusiasm to get airborne, we must not forget that power-driven models *can* be dangerous if flown without care and common sense. Dangerous to other people and, sometimes, even dangerous to the modeller himself. For instance, it is surprising how many modellers—particularly newcomers—fly control-line models directly beneath high tension overhead electric power cables. It only needs the model to climb a little to bring several thousand volts searing down the steel control lines to *you*. It is not necessary for a model actually to *touch* a power line—so great is the power being

The 48" Mini-Super complete



Junkers 87 by KeilKraft. The mottle finish was achieved with an aerosol using a cardboard "mask" as stencil

carried that it can jump across an air gap to your model and it is very dangerous indeed. So, just choose your spot carefully. Never fly anywhere *near* overhead lines.

RADIO CONTROL

THE ambition of many modellers is to own a radio-controlled model. Like the other branches of the hobby, radio-controlled modelling is a world wide interest. This year, the R/C World Championships are to be held in Sweden and teams from all over the world will compete with complicated and very expensive models. The manœuvres that they will carry out would in many cases astound even 'full size' pilots and their models will be worth several hundred pounds EACH!

Machines such as these are obviously far beyond the reach of a beginner and even if he had one, he would be unable to handle the complicated controls.

Fortunately, it is possible to build and fly a radio-controlled model far more cheaply. The transmitter and receiver of the simplest kind of 'single channel' outfit will cost you about £16 and a good kit for a model specially designed for radio control can be bought for a further £4 or so.

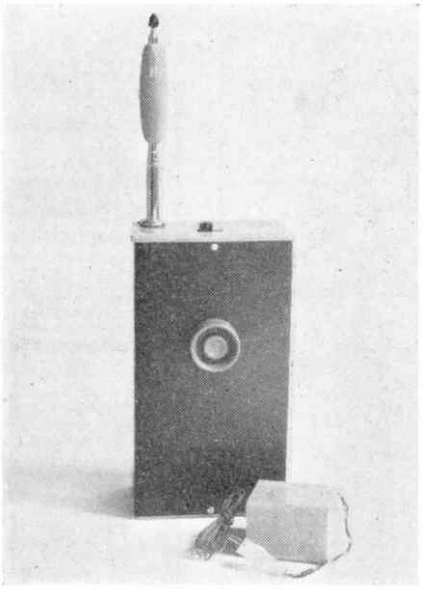
Such a model will be around 4 ft. wingspan and it will require an engine of about 2·5 c.c. This will cost another £4 approximately and a silencer or muffler will be needed.

The basic construction of such a model will be virtually identical to the smaller glider, rubber and power kits described earlier. Far from being more complex, the increased size of the various components frequently makes for easier assembly as a result of the smaller, more delicate pieces being omitted.

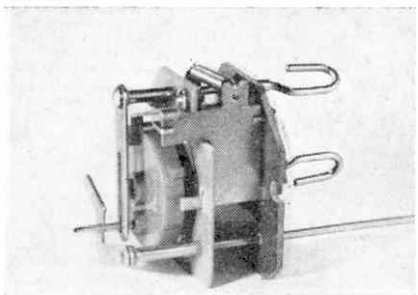
Aeromodelling is really international. This is Shiro Miyawaki, a school-teacher in Japan, who is showing off two of his very original R/C and free-flight designs

When it comes to covering the framework, specially made tissue is the most widely used material for all models up to about 3 or 4 ft. wingspan. Above this, the model is sufficiently large to carry the extra weight incurred by silk or nylon covering. Again the technique of covering with these materials is basically similar to tissue covering, but some practise is generally needed before a really expert job can be produced every time. The additional strength conferred by fabric, together with its resistance to puncture damage by reeds, bush twigs and tree branches, will repay its extra cost and reduce the amount of time you spend doing tedious covering repairs.

The basic single channel radio outfit will enable you to steer your model left and right. As a further refinement, this basic unit can be developed to incorporate a means of altering the engine speed in flight and many such units also provide for a limited degree of elevator control. This latter refinement is not recommended to the newcomer, as it *does* complicate both equipment installation and control.



The R.E.P. Gemini receiver and transmitter. Note the single button on the transmitter and the telescopic aerial



The Elmic "Compact" escapement which is used with the radio receiver inside the model

The modern transmitter is small and quite simple, all transistor and hand-held. It is fitted with a telescopic aerial and usually has one press button which is depressed to transmit the radio signal to the model. When the button is released, the signal is automatically switched off.

Basically all one has to do is keep fresh batteries supplied. In the model, the little receiver, which will probably weigh only a couple of ounces, responds to the transmitted signal by allowing current from a 3 or 4·5 volt battery to flow through an electro-magnet, which in turn, pulls in an armature, allowing a simple escapement to turn through a part revolution. This escapement is driven by a thin rubber motor.

The escapement is linked to the rudder and this surface, of course, now turns the model and continues to do so until the transmitter button is released, whereupon, with no radio signal being transmitted, the receiver 'switches off' the current to the escapement, thus allowing the rudder to return to 'neutral' and the model to resume straight flight.

There are other types of control systems. Some models are fittted with electric driven 'servos' which do away with the need for a rubber powered escapement. These, however, are nearly always more expensive and also heavier. They also generally require a receiver to be equipped with a 'relay'. This is a further complication which can be the cause of some baffling problems which the beginner would do well to avoid.

The golden rule is KEEP IT SIMPLE! Build and fly some free flight models to learn trimming technique before you venture into the more advanced field of radio control. And, when you do go into R/C, start with single or, at the most, two channel, to learn about the basic techniques involved. Later on, with the confidence given by this solid groundwork, you will be able safely to take the big step into multi-channel radio with all its limitless horizons.