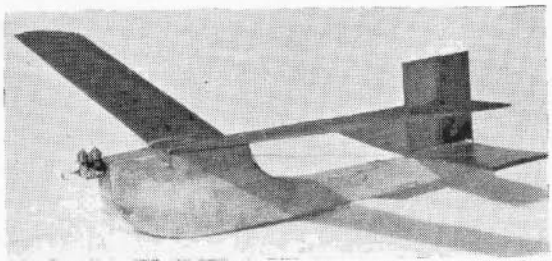
DESIGN PHILOSOPHY of the "Simple Simon" series of radio control models, leading to SIMPLEX starts with Simple Simon Mark II which was a direct two-times enlargement of Mark I, published as *Simpleton,* in AEROMODELLER, January 1963. Because the "Simpleton" seemed to have interesting attributes it was decided that a radio version would be "easy".

The resultant enlargement proved to have exactly the same flight stability pattern as "Simpleton". However, the power was not proportional and was in fact lower. Whereas Simpleton was a low drag profile model, Mark II had some width and drag problems. She was a slow flyer as a result. Even the relatively thin wing could not reduce, or be of much aid in this respect—as a result, the model flew backwards in a 20 knot wind! Dick Stouffer kept the model pointed into such a wind continuously for 10 minutes on one flight, and when the engine stopped he spiralled down rapidly and chased the model a



**Twice-size "Simpleton" with box fuselage for R/C gear and a K & B Allyn twin cylinder .09 glowplug engine, was Mark II in the series.**

flight whatsoever. This developed the feeling that wheels are a superfluous item in any event. Anyway, Mark II lasted about 8 months with about 12 flights total, what with one thing and another.

*So we came to Mark III.*

# case history and construction notes for full size plan

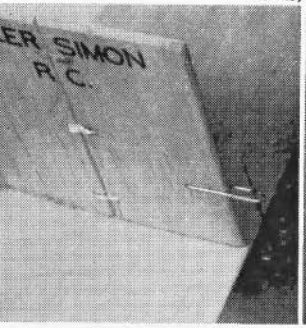
**Cylinders separated! Push-pull twin .049 glow plug engines powered Mark III as a variation on the "Simpleton" theme—with radio control.**

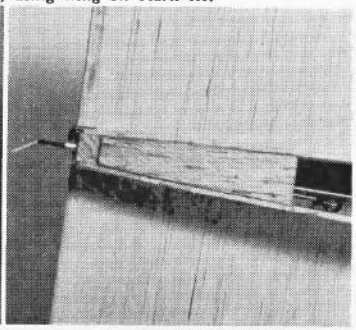
full ½ mile down-wind from the starting point. That day the model had a negative ground speed. At other times, on less windy days there were no serious flight problems.

An attempt to use a thinner wing of 48 in. span proved fruitless since the model could not generate enough speed to sustain flight with the new wing. This was a sparless, planked, all balsa wing. Structurally it proved very sound. It has never failed in any manner.

Mark II used the K & B .049 Twin (.09) with a Duo Diode receiver and Babcock Mark II escapement. The model weighed about 16 oz./sq. ft. of wing area. Wheels were left off in the original but were later installed as a modification. The modifications added enough extra weight and drag so as to make the model all but unflyable. Later, at a contest Dick was forced to remove the wheels to achieve any

**Below: "Simple Simon" is author's name for Mark V as seen on square cut fin and rudder. These views above and below tail show rudder linkage to actuator, as drawn opposite. If tissue covering for .020 power, add sheet in bottom at rear as illustrated. Right: is Mark IV, a sleek version, with large wheels, using wing off Mark III.**

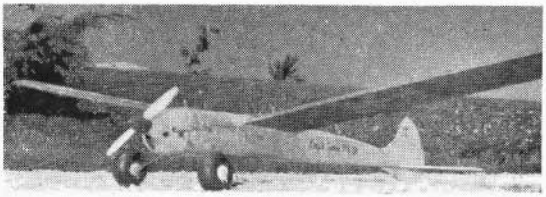


As a result of Mark II Dick all but eliminated a fuselage except for the functional purpose of holding the various parts together and to carry the R/C gear. He wanted to keep the stability characteristics of Mark I and II so that the relative positions of wing and tail were maintained. The fuselage was to be just big enough to carry the equipment so its cross-section measured 2 in. high x 2¾ in. width. The wing was mounted on a pylon. High thrust line was maintained by mounting one .049 Cox engine on the pylon in front of the wing and another on the same line at the rear of the wing on the pylon. This gave the whole affair a configuration much like a sail on a submarine. Because drag was reduced, as compared to Mark II, it used the 48 in. all balsa sparless wing made and tried on Mark II. This wing had ribs of very soft balsa spaced 6 in. apart and a hardwood leading edge. The bottom was perfectly flat and all that was necessary was to lay a 6 in. sheet of $\frac{1}{16}$ in. balsa on the top glued to the ribs, leading edge and feathered at trailing edge so the top and bottom sheets could be glued together to form the trailing edge. Two wing halves were built and the centre section and dihedral were joined and set with glass fibre and resin. The result was one very light, strong wing of excellent characteristics. The wing depth was just $\frac{5}{8}$ in., a very thin, very simple wing to build!

In any event, Dick was by now considered to be some kind of a nut by all his cronies, especially, when he produced Mark III for its first trials. The C.G. proved to be about right and the test glide showed the model would be *very* fast. Rudder movement was limited to $\frac{3}{16}$ in. either side of neutral.

Some difficulty was found in starting two engines. The problem was solved by providing a single jury rig tank to both engines. As soon as they were started and the model ready for launch the jury tank was removed from the top of the wing. The pro-



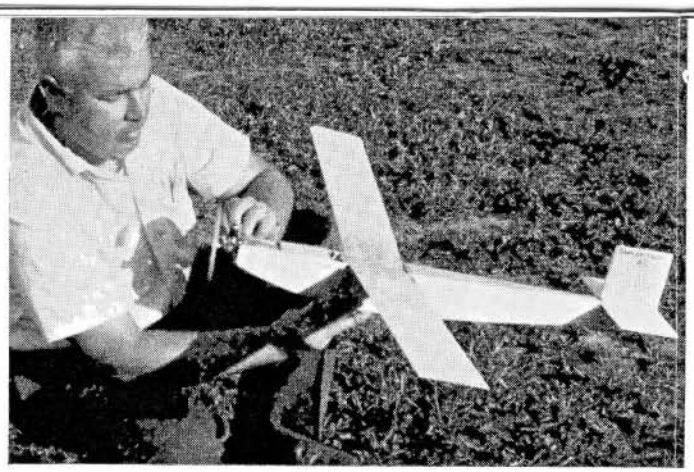
pellers were contra rotating which eliminated all torque problems. Even when one stopped and flight continued on one engine, there was no noticeable change in flight trim.

Again, no wheels were used in the original concept. However, because of the rather sharp nose it was noticed that the airframe took quite a beating upon landing on rough soil. A 3 in. doughnut wheel was later installed such that it protruded in front as much as below the fuselage line. This arrangement permitted the wheel to act as a bumper in all but inverted flight into the ground.

Equipment used in this and all subsequent models was the Bramco Signet Tone receiver and Babcock Mark II escapement. It was during this time that Dick became convinced of the necessity of using 4½ volts for *reliable* escapement operation. All his equipment functioned perfectly until one day Dick didn't. He held the wrong signal, too long, and spiralled, the Mk. III to a finish. He needed a panic button that wasn't there!

*So came Mk. IV*—a marked departure from II and III. Though the fuselage remained functional. It retained the concept of smallest cross-section consistent with the size of the R/C gear to be installed. The sparless wing from Mark III survived with no damages so that Dick merely needed a fuselage and tail assembly. This was to be sleek and cowled. For the first time he used a landing gear mounted well forward on the engine bulkhead. This proved an excellent location. Mark IV never flipped on its back in landing in the roughest terrain and absorbed a lot of shock.

The design aim was an aircraft with good stability, high airspeed, low rate of climb, and little or no tendency to balloon or gallop after a downwind turn into the wind and to have a good glide. To achieve this, the thrust and drag moments had to be kept close together. So the wing was lowered to a shoulder configuration. Since the wing dihedral would raise

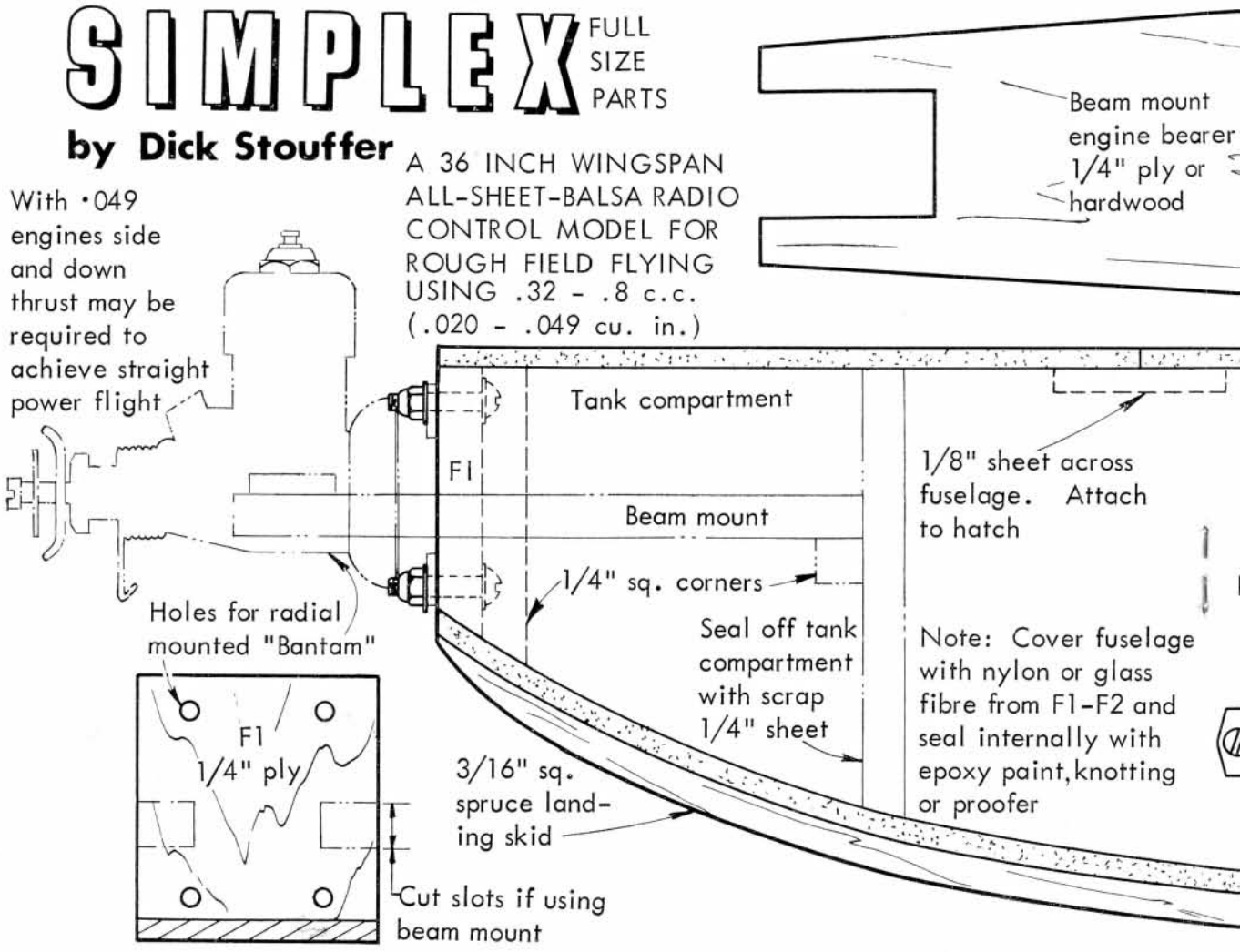


**Above: Dick S SIMPLEX, has a span wing, on'y thick. Usual flig tion is 10 Square rud-der duced with cu SIMPLEX PLAN. shows a Citizen- capement on mounting plate. view shov harness with Ota Pen cell batte plug. SIMPLEX all R/C out**

# SIMPLEX FULL SIZE PARTS

## by Dick Stouffer

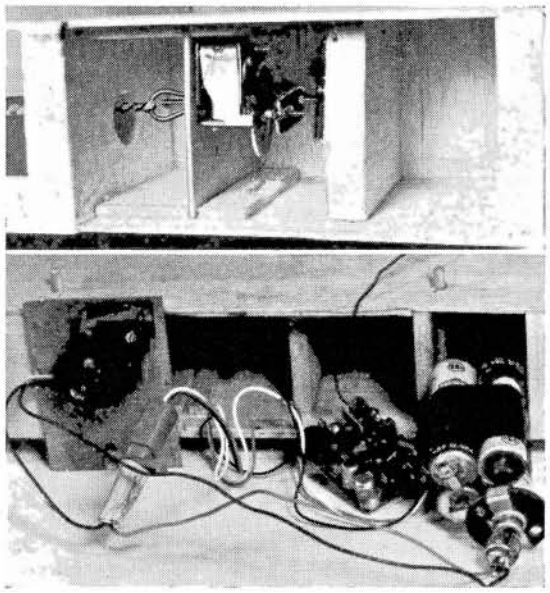
A 36 INCH WINGSPAN ALL-SHEET-BALSA RADIO CONTROL MODEL FOR ROUGH FIELD FLYING USING .32 - .8 c.c. (.020 - .049 cu. in.)



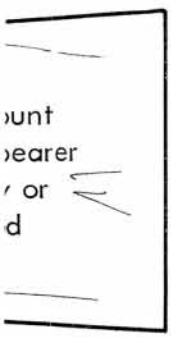
the effective drag centre, wheels were added to balance it out. For good directional control the rudder area was kept large and reduced in height and and a sub rudder with tail skid added to keep the centre of lateral area as low as possible.

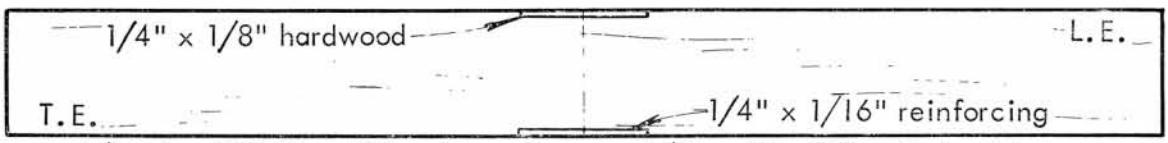
The tailplane was placed at the bottom of the fuselage where it was felt there would be little interference from the wing.

The nose and tail moments were lengthened, for directional stability as well as to prevent ballooning in flight. This model turned out to be more conventional in appearance than the others and performed as expected. Test glides were fast and flat, under power, the model flew at 30-40 m.p.h. with a very slow rate of climb. There was no major trim problem except for need of *slight* downthrust on the engine. Mark IV was, in fact, so close to neutral stability that one could establish 20 deg. banks right or left—neutralise the rudder—and the model would stay grooved in the turn without losing altitude or varying the angle of bank. It could make several 360 deg. turns consecutively in this manner without touching the transmitter. Opposite rudder was required to recover from this manœvre. Mark IV glided at about 30 m.p.h. with a very low sink rate. As a consequence there was always plenty of time to establish a spot landing. (*Cont. on p.* 244)

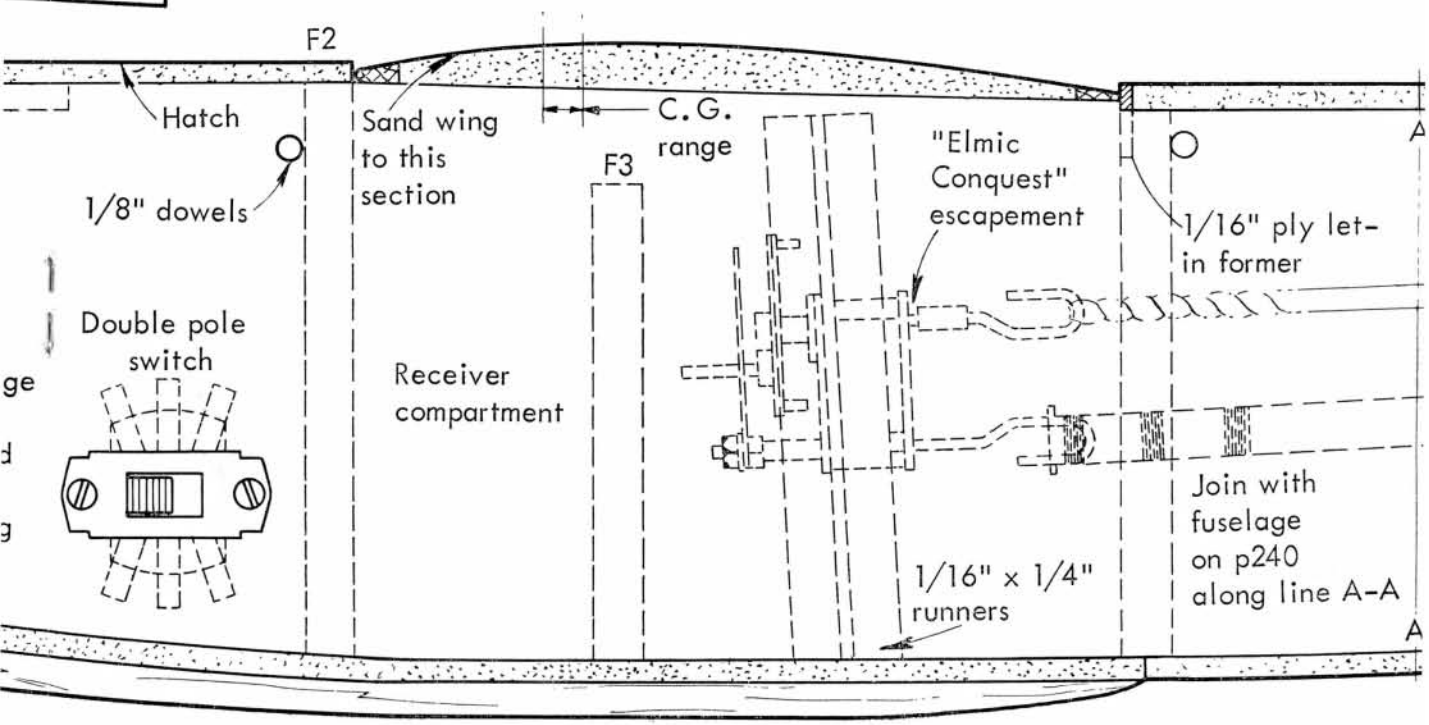


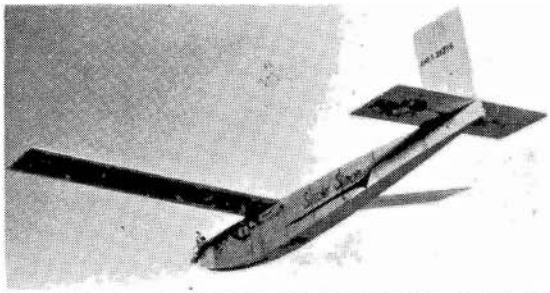
Dick Stouffers' X, has a 40 in. ring, only ⅞ in. Usual flight duration 10 minutes. rudder is re- with curves on X PLAN. Far right a Citizen-Ship es- nt on the ply ng plate. Bottom sho complete with Otarion Rx, ell batteries and SIMPLEX accepts R/C outfits.






1/6 size WING. Wing dimensions are 1/4" x 4" x 36" soft sheet balsa
TAILPLANE is same rectangular shape. 1/8" x 4" x 9" soft sheet balsa
Dihedral under each wing tip to be 2 1/4"





**It may be an ugly duckling; but experience has proved the point that this all-sheet design from the U.S.A. makes a perfect introduction to R/C for the novice.**

From the structure of Mk. IV, next development was SIMPLEX which carries back to Simpleton through these evolutions. Very straight forward, very functional and in a time proven tradition.

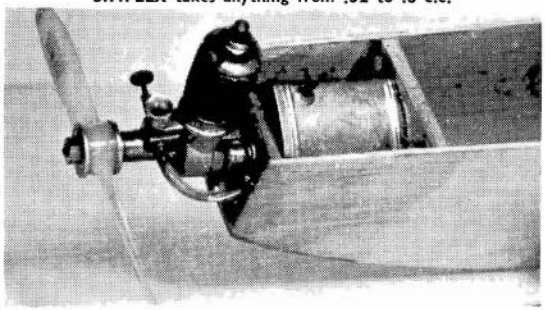
The thin, high aspect ratio wing, for maximum performance, is common to the series. The stubby tail is as simple as it can be. The long nose and tail moments were proven in the Mark IV configuration. The lack of landing gear goes back to the skids of the Wright Bros. as embodied in Mark II and III. Use of minimum number of bulkheads also reduces weight, and construction problems. Having the R/C gear readily removable for repair or adjustment was found to be very desirable in all previous models. In SIMPLEX the units, and the wiring harness, are all removable for inspection. The shoulder wing was proven in Mk. IV as well as the close coupling of thrust and drag moments.

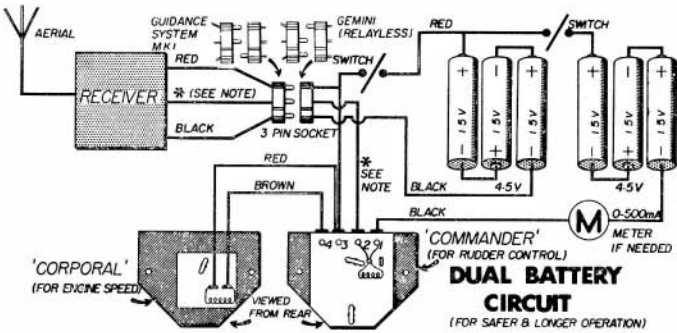
This model maintains a positive ground speed, even in the glide, in 20-25 m.p.h. winds From the first flight, when the model flew under a very rich engine setting and moved out smartly in the 20 m.p.h. wind, its future looked bright and promising for a simple, uncomplicated, rudder only, ½A power, radio control model.

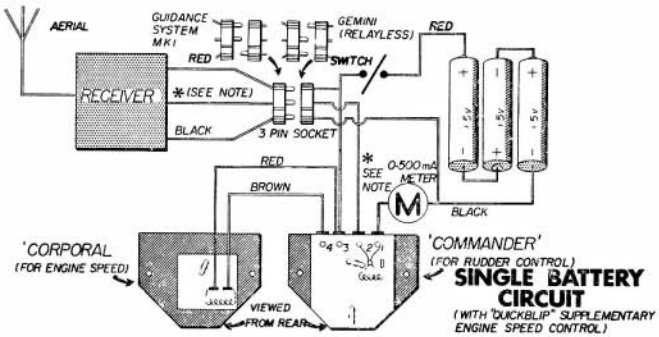
Under power, the flight was straight out and fast with a shallow climb. Rudder reaction was positive —left and right—but not abrupt. There was no tendency to go into wild gyrations. SIMPLEX holds a moderate bank without dropping the nose—a full 360 deg. is required for the model to develop a spiral.

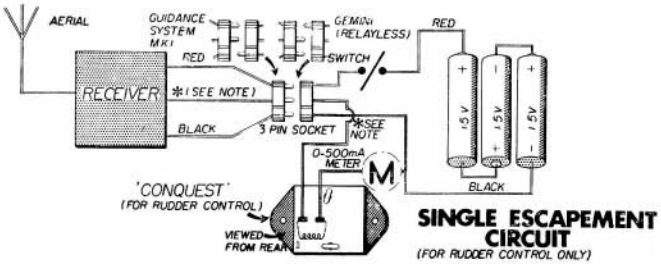
After the initial Anderson powered SIMPLEX, two more were soon made, the second with a Cox Babe Bee and having the wing reduced to 28 in. span for a fast straight forward climb. Considerable downthrust was used—about ⅛ in. under the top mounting brackets and $\frac{1}{16}$ in. right thrust. The model was fully controllable, but "hot". Members of the "old Guard" in the locality had their collective eyes opened as regards model flight speed, stability, controllability, and rate of climb with respect to this type of model in rudder only escapement flying.

**Engine and tank installation for a radially mounted Anderson Spitfire .045 cu. in. glowplug engine. Liberally coat the interior with a proofer before sealing off the tank compartment. SIMPLEX takes anything from .32 to .8 c.c.**





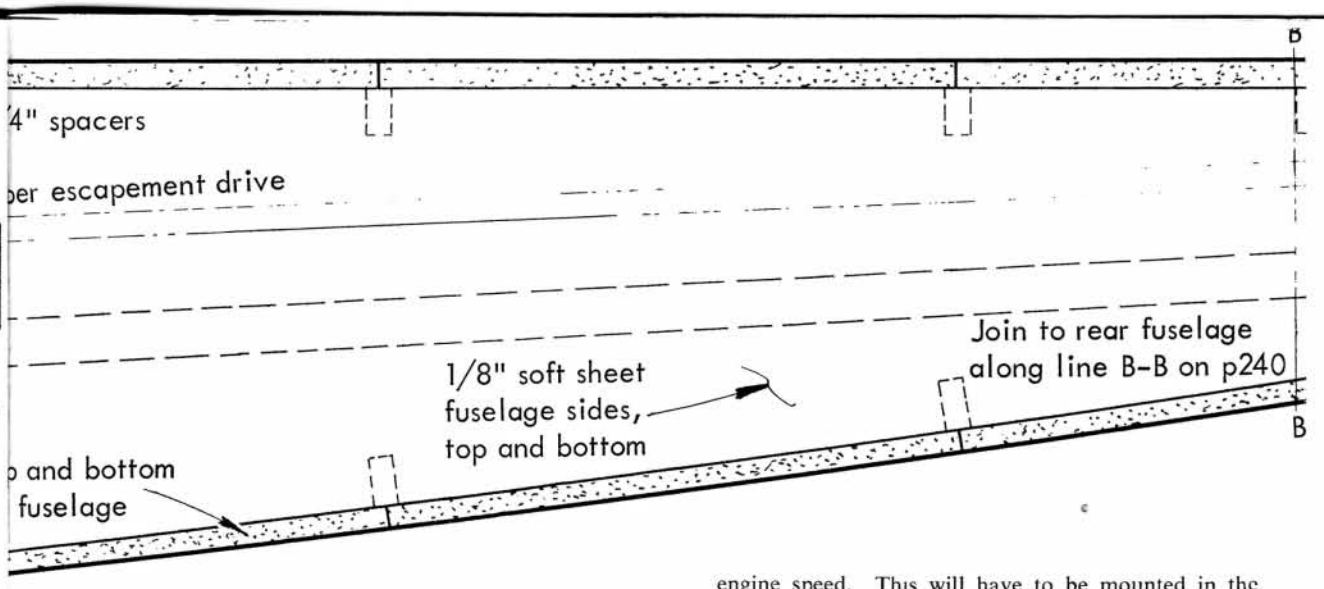




## BASIC WIRING DIAGRAMS (1)

**Three permutations to suit relayless receivers.** When a supplementary escapement is added for motor control, most manufacturers approve use of extra batteries to compensate extra drain. Nickel Cadmium cells are strongly advised in all cases. It should be noted that on the **Elmic Commander**, Tag 3 is a junction only and may be by-passed with direct connection from battery (through switch) to **Corporal**. In the case of **R.E.P. Gemini** receivers, the prepared wiring harness has the switch wired in the Black (Negative) lead. R.E.P. do not recommend the dual battery circuit and also suggest use of a 4½-6 volt 150 mA Bulb or Dial light across the escapement tags as a tuning aid to replace the Meter. **MacGregor's** instructions advise 3 volts for **Terrytone 11 & Minimac** in the dual battery circuit (remove cell nearest Rx in top diagram). **Colours** of output wires vary according to manufacturer of sets which suit these diagrams, as follows :

* **NOTE.** Rx output colour code (centre lead in diagram) EMCO ACE—White R E P GEMINI (Relayless) OAKFIELD SR/3 and R C S GUIDANCE SYSTEM—Yellow MACGREGOR TERRYTONE 1 & MINIMAC—Green

NEXT MONTH Relay, and 9 volt supply circuits.




The third model was of the same design with a 36 in. wing as specified but powered with the Cox .020 Pee Wee. This is a much more gentle aircraft and speed and rate of climb were reduced. Glide is vastly improved over the .049 version. To simplify C.G. problems without adding weight to the nose of the .020 SIMPLEX, the wing and radio compartment areas were moved aft 1 in., a total of 7 in. from engine bulkhead to wing leading edge. Two pen-cells were placed just aft of the bulkhead to bring the C G into place.

## How to build the model

The "anglicised" version of SIMPLEX as presented in the full-size plans and scale details for wing and tail, utilises up to .8 c.c. power. If the engine of your choice happens to be for beam mountings only, it is a simple matter to cement a plywood plate into the nose projecting forwards and secured to the fuselage sides behind the front bulkhead. First join the drawings for the fuselage sides and trace on to soft $\frac{1}{8}$ in. balsa which has been found to be the most suitable shock absorbing stock size, far superior than, for example, hard $\frac{1}{16}$ in. sheet. The sides are joined by the two rectangular, equal size, soft balsa bulkheads which come at wing leading and trailing edges. Pull the nose together to fit the $\frac{3}{4}$ in. plywood front bulkhead which takes the engine and fit a $\frac{1}{4}$ square tail post at the rear. The fuselage has now adopted its own plan shape and all one needs to add are the $\frac{1}{8}$ in. x $\frac{1}{4}$ in. spacers at positions shown.

Now plan the installation of your particular choice of equipment. The electrical circuits we show cover some of the combinations possible with equipment on the British market (also over a popular price range). Arrange the $\frac{1}{4}$ x $1\frac{3}{4}$ x $2\frac{1}{2}$ in. balsa bulkhead to come at the rear of the radio compartment in such a position that you have just enough room to pack around your receiver with sorbo rubber. This bulkhead not only locates the receiver but also forms a crash stop should the escapement fly forwards on impact. The escapement for the rudder is mounted on a $\frac{1}{16}$ in. ply plate, which slips down between the pairs of $\frac{1}{4}$ in. wide balsa rails stuck to the fuselage sides. Get this positioned accurately and then make up the torque rod, which will drive the rudder and fit its bearing which could be a piece of tin plate or brass wrapped around the tail post. The rubber motor winding hook will also run through the same bearing plate at the tail post.

For the moment one should be satisfied with rudder only operation but SIMPLEX is adaptable and no doubt the more experienced modellers will soon be adding a supplementary escapement to control the engine speed. This will have to be mounted in the battery area.

If the engine is not one which has an incorporated tank with the radial mount, than a separate tank can easily be fitted behind the front bulkhead but an extra bulkhead is recommended behind the tank not only as a sealer against fuel seepage, but also as a locator. Now plank the fuselage with soft $\frac{1}{8}$ in. balsa, preferably with the grain running across the width of the fuselage with strips cut across the sheet. On the top side, note that you will need a separate battery hatch with a lip added to its underside at the front to help hold it in place. The wing retaining rubber bands will keep it secure.

If using .020 power, the top and bottom of the fuselage behind the wing position can be covered with strong tissue to save weight. Now make up the tail surfaces and arrange the rudder to have $\frac{1}{8}$ in. movement either side of neutral. The range can easily be adjusted by swinging the loop on the rudder up and down to alter the leverage from the torque rod.

The fin should be permanently stuck to the tailplane.

## Solid sheet wing

The wing is simplicity itself, merely a sheet of $\frac{1}{4}$ x 4 x 36 in. soft balsa carved and sanded to the section, then cut at the centre to give $2\frac{1}{4}$ in. dihedral under each wing tip and reinforced with a bandage or glass fibre covering for at least 4 in. of the centre area. It is advisable to also add reinforcing strips at the leading and trailing edge, which can be made of plywood strips of spruce or celluloid.

Construction is now complete! For finish, it is recommended that the entire model be given a smooth sanding then two coats of sanding sealer followed by another rub down, then either tissue covering or colour decoration and fuel proofing or, if you want to keep it light and simple, simply a coat of fuel proofing with transfers for decoration.

The charm of SIMPLEX is that it is all sheet balsa, can be made and flying within *seven hours* as proven by the designer, it is flexible in its design so that you can alter the fuselage consruction to suit your whims and above all, it has good performance for the typical rough field used by the average model club.

If you want SIMPLEX to last through a long season of hard use, we advise you to proof the interior of the fuel tank and battery areas and to cover the exterior of this section from the engine back to the wing with nylon, or glass fibre.

From here on, SIMPLEX is all yours and we are sure we are going to see a lot of them in the coming season spot landing on the local heath or moor.

**Get started in single channel radio control with this ultra-simple fully proven rough field flyer**

# Simplex