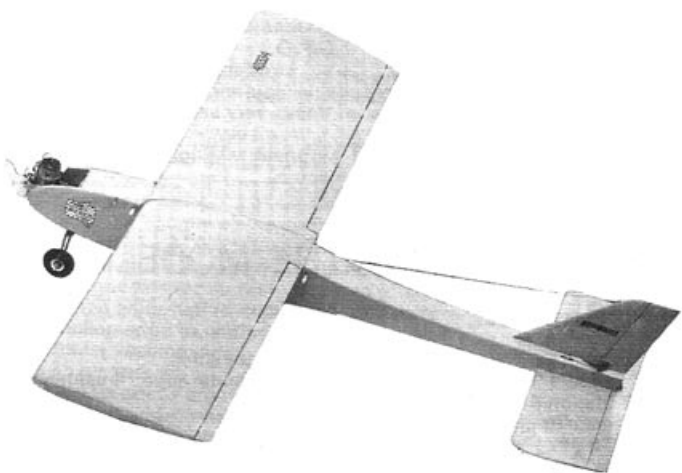

KEIL KRAFT

STUDENT

56 in. Wingspan

RADIO CONTROL MODEL



**BUILDING and FLYING
INSTRUCTIONS**

E. KEIL & Co. Ltd. WICKFORD, ESSEX.

INTRODUCTION

The Student has been designed for the radio modeller who finds himself between the advanced single-channel model and the complex low-wing multi which he is capable of building but not flying. It is realised that this gulf is ever-widening and without the help of other proficient multi flyers it is very difficult to cross.

For the person without such help the Student will prove to be a docile trainer flown on rudder, elevator and engine control, progressing to ailerons when the first steps have been mastered. With the more immediate response that ailerons give, it is strongly recommended that for the first flights these are not used by the new multi flyer.

BEFORE YOU BEGIN

Read these instructions fully, study the plans and be sure that you understand the method of construction.

Plan your radio installation from the beginning by laying the components in their respective place on the plan ensuring that everything will fit where recommended.

The Student may be powered with any .29-.35 cu. ins. motor. The larger size having adequate power for ten channels.

Remember that to operate radio-controlled models in Great Britain it is necessary to hold a licence. This costs £1 and is valid for five years. Obtainable from:—

The Postmaster General,
Radio Department,
G.P.O.,
London, E.C.1.

It is also advisable to carry suitable insurance against damage to persons or property. The cost of this is very small and details can be had from:—

Society of Model Aeronautical Engineers Ltd.,
10A Electric Avenue,
London, S.W.9.

BUILDING THE MODEL

FUSELAGE

- 1) Make sure you are building left and right sides.
Glue $\frac{1}{4}$ " x $\frac{1}{4}$ " longerons on bottom inside edge, finishing at station F1 and leading edge of tailplane.
- 2) Glue in place doublers F3 and F4.
- 3) Fit $\frac{1}{4}$ " x $\frac{1}{4}$ " top longerons in place from trailing edge of wing seat to rear.
- 4) Glue in rear doubler F5.
- 5) Install diagonal $\frac{1}{2}$ " x $\frac{1}{8}$ " spacers and uprights.
- 6) Cut to length and glue with P.V.A. engine bearers checking with slot in bulkhead F1. (Radius inside corners of bearer to fit slot in F1).
- 7) Join fuselage sides together with bulkheads F1, F2 and spacers at rear of wing seat, making sure that framework is square.
- 8) Fit noseleg in place on F1.
- 9) If necessary enlarge cut out in motor plate to suit motor to be used retaining the 3° right thrust and screw in place on engine bearers.
- 10) Draw fuselage sides in at rear and fit all spacers behind wing.
- 11) Glue in place F6 and F7.
- 12) Position F8 and glue in place.
- 13) Trim to shape $\frac{1}{8}$ " sheet for floor of tank compartment and glue to tops of engine bearers.

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- 14) Drill holes and fit $\frac{5}{16}$ " dowels for wing and main undercarriage-retaining bands.
- 15) Make tank hatch from $\frac{1}{2}$ " sheet and fit short pieces of $\frac{1}{8}$ " dowels each side.
- 16) Sheet rear top fuselage and under nose from F8 forward with $\frac{3}{32}$ " sheet cross grained. (Leave rear of F8 at this stage for easy installation of push rods.)

TAILPLANE AND FIN

- 1) Pin on to plan $\frac{1}{4}$ " x $\frac{1}{4}$ " leading and trailing edges of tailplane.
- 2) Glue in place $\frac{1}{4}$ " x $\frac{1}{8}$ " diagonal ribs and $\frac{1}{4}$ " sheet tips.
- 3) Install gussets and $\frac{1}{4}$ " x $\frac{1}{4}$ " doublers at elevator hinge points.
- 4) When dry remove from plan and sheet top and bottom with $\frac{1}{16}$ " sheet balsa.
- 5) Sand $\frac{3}{8}$ " x $1\frac{3}{8}$ " elevator to shape and fit $\frac{1}{16}$ " ply pieces at centre for control horn.
- 6) Glue R1 and R2 together, pin on to a flat board and leave to dry.
- 7) Sand fin flat and round leading edge.
- 8) Carve and sand R3 to section.
- 9) Fit elevator to tailplane using hinges provided and do the same with rudder.
- 10) Tailplane and fin can now be glued to fuselage ensuring that whole assembly is square and true to centre lines.

WING

- 1) Pin $\frac{1}{4}$ " x $\frac{1}{2}$ " front bottom spar flat on plan.
- 2) Rear bottom $\frac{1}{4}$ " x $\frac{1}{4}$ " spar is packed up $\frac{1}{4}$ " off plan and pinned in place.
- 3) Glue in place 13-W2 ribs making sure that they are parallel with each other and upright (omit W1 at this stage).
- 4) Fit and glue both top spars in place.
- 5) Cement in place $\frac{1}{4}$ " x $\frac{3}{4}$ " leading edge allowing edges of wood to protrude equally above and below ribs.
- 6) Attach $\frac{1}{4}$ " x $\frac{3}{8}$ " trailing edge in place checking that wing is still true and that you are not building in any warps.
- 7) Cut gussets for tip rib from scrap $\frac{1}{4}$ " sheet and glue in place.
- 8) When wing half is completely dry carve and sand top side of trailing edge to conform to section.
- 9) Sheet leading edge, trailing edge and tip section with $\frac{1}{16}$ " sheet and add $\frac{1}{4}$ " x $\frac{1}{16}$ " cap strips.
- 10) Follow above procedure for other wing panel.
- 11) Cut away sections of ribs between spars to fit W3 and W4 and sand sheeting to correct angle for dihedral ($1\frac{1}{2}$ " per side—measured at tip).
- 12) Set wing at correct dihedral on board by packing under tips, liberally coat all joining surfaces with cement, bring together and check wing for warps, if satisfactory leave to dry.
- 13) Add W1 and fit $\frac{1}{16}$ " sheet to complete servo cut out.
- 14) Complete underside wing sheeting, cap strips, add tip blocks and sand leading edge to contour.
- 15) If it is decided at this stage to not fit ailerons, strip provided should be glued to trailing edge to complete wing.

AILERON FITTING SEQUENCE

- 16) Cut two short pieces of aileron strip (one from each) to length of centre section shown on plan.
- 17) Mark on trailing edge, position of aileron horns and cut a semi-circular hole into trailing edge on top surface to clear horn in the fully forward position.

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- 18) Mark the position of these holes on the short lengths in their corresponding places and cut two further holes to clear horns in their fully rearward position.
- 19) Groove the front edge of the short pieces to clear the wire and tubes of the horn.
- 20) Glue the brass tubes of the horns in place with epoxy resin making sure that no resin gets on to the wire itself and glue the centre section pieces in place, trapping the tube in place but leaving the horn itself to move fully backwards and forwards.
- 21) Cut the ailerons to length, sand the shallow Vee on the leading edge of strip. Drill holes in aileron to accept horn and attach with hinges provided.

RADIO INSTALLATION

The Radio installation is fully illustrated on the plan but if a type is used other than that shown, the maker's recommendations should be followed. Pack the receiver well in foam rubber and install batteries under tank through former F2.

Servos should not be screwed down too hard but allowed to move slightly on the fixing grommets.

Pushrods to elevator and rudder are made from $\frac{3}{8}$ " x $\frac{3}{8}$ " Balsa, using a clevis at the control end and servo end terminated in fitting made as detailed on plan. (Do not use clevis at each end.)

Use nylon tube and cable for throttle control, the tube being easily attached to side of fuselage with contact adhesive.

Switches should be fitted in area shown on opposite side to exhaust. Run aerial out through side of fuselage under rear wing dowel and up to fin, attaching with rubber band.

FINAL ASSEMBLY

Having made sure that pushrods do not bind or rub against structure or each other during operation, complete sheeting of rear fuselage.

Assemble wheels to main undercarriage with bolts provided. Fit wing to fuselage and check that everything is aligned and working satisfactorily.

COVERING AND FINISHING

The method recommended for covering and finishing the Student is as follows:—

- 1) Give the entire model two heavy coats of clear dope, sanding lightly between each.
- 2) Cut a panel of heavyweight Modelspan to the size of part to be covered. Crumple the tissue into a loose ball, hold under water tap and squeeze out excess water until just damp.
- 3) Lay tissue over panel to be covered and smooth out gently avoiding creases. Dope through tissue around outer edge of framework and allow to dry.
- 4) When tissue and dope have dried the result will be a taut covering strongly adhered to framework.
- 5) Any blushing of dope that occurs due to dampness of tissue will disappear when next coat of dope is applied.
- 6) Proceed in the same manner for the rest of the model.
- 7) When entire model is covered give two full coats of clear dope.
- 8) From this point the degree of finish applied is a matter of choice, sanding sealer can be added to sheeted parts and more dope to open areas but caution is advised against the too enthusiastic use of coloured dopes, these will raise the overall weight of the model considerably.

- 9) Fuel Proofer must be applied if cellulose dope has been used as a finish. If Polyurethane paint has been used no further treatment is necessary.
- 10) Apply transfers at this stage.

It is best to allow a few days for the fuel proofer to fully harden and this time can be profitably spent doing the pre-flight check.

PRE-FLIGHT CHECK

The success of this model will depend very largely on the thoroughness with which these checks are made.

Providing the model has been accurately built and is free from warps the trim for the initial flights can be reasonably well determined.

Firstly assemble the model and stand on a level surface.

Position the elevator at exact neutral, block up the nosewheel until the tailplane is exactly level with the table. This is ascertained by measuring from the centre of the leading edge and the trailing edge to table, these must be equal.

Next measure from the trailing edge of wing to table, and from the centre of leading edge of wing to the table, the leading edge must be $\frac{3}{8}$ " higher than trailing edge, correct if necessary. These measurements are IMPORTANT.

Having done this to your satisfaction mark c.g. position shown on plan on centre section of wing and check balance. If this is not within $\frac{1}{4}$ " either way radio must be moved, or, in extreme cases, weight added to nose or tail to achieve this.

Stand well back behind model and sight along fuselage across tailplane, check again for warps, don't leave anything to chance, if warps are present remove them.

Check under carriage tracking, make sure model runs in a straight line by pushing along on a level surface, correct if necessary.

Finally, check for tightness of motor mounting, security and protection of radio, freeness of hinges and generally anything that could possibly cause trouble on the first flight.

For the person who is unable to recruit the services of a competent flier to help with the first flights, the subject of flying this model is covered subsequently in these instructions.

FLYING THE MODEL

It is assumed that the builder of this model whilst having little or no experience of flying multi-channel models, has had some experience of either single-channel radio or free flight, and is familiar with the principles involved, i.e. what makes a model climb, dive or turn. Assuming this, these instructions are included in an effort to reproduce what the multi-flyer could expect to encounter on the first few flights.

The beginner should not concern himself initially with any manoeuvre that is unnecessary, or indeed dangerous, with regard to the model, even a turn can be disastrous, if the nose drops and the pilot is unable to recognise the reaction required to counteract and return to straight and level flight.

It is suggested that whilst the first few flights will not be exact replicas of the one detailed, if this is read thoroughly and an effort made to commit it to memory, then the pilot will have a good chance of success. Remember, if flying with reeds, quick pulses of the switches are all that is required ($\frac{1}{4}$ - $\frac{1}{2}$ second), it is far easier to give two or three pulses to get enough control than one of too long a duration, and find that you have over-controlled and are faced with giving opposite control to counteract.

If the model is coming towards you and you get muddled with left and right, quickly turn your back to the model and look over your shoulder at it, whereupon lefts and rights will be quite normal.

Providing the model is allowed to get fairly high before trying any tight turns, if you over-control don't panic, try to sort out in your mind just what is needed to counteract, before pushing everything!

So the batteries are charged, everything checks out 100% and we have run out of excuses, there is nothing left but to fly it.

At the field the model is assembled (don't rush it! double check everything), and a range check carried out as per radio manufacturer's instructions. When satisfied that all is correct, place transmitter by nose of model with both T/X and R/X switched on. Open throttle on engine and start. Getting your helper to hold the model, run engine at all speeds from idle to full speed, checking radio for vibration.

If everything checks O.K. you are now ready for take-off. Set elevator trim fractionally above neutral. Run engine at full speed and, when ready, get the helper to release, if the model veers to one side or the other correct with opposite rudder.

Do not try to lift the model off too early, allow plenty of speed to build up and give one tap of the up elevator, this should be enough for it to become airborne, if not, give another tap, on no account hold elevator for any length of time as this will only mean that model will try to lift and leave the ground in a semi-stalled condition.

Allow the model to climb at a gentle rate, *NOT* too steep, and counteract any turning tendencies with opposite rudder.

The model is climbing steadily away from you and the time has come to make a turn, say to the left. Gentle pulses of left rudder will make it come round and if the nose starts to drop, a pulse or two of up elevator will hold the height. If the turn tends to get too tight a touch of opposite rudder will cure this.

As the model comes back towards you straighten out with opposite rudder. The model will still be climbing. Do another gentle turn to the left, back into wind, straighten out and now the climbing trim can be removed with a tap or two of down elevator, TRIM until the model is flying straight and level. DO NOT endeavour to trim for level flight until sufficient height has been gained.

Continue to make very gentle turns to left and right, and confine yourself to this for the first few flights until the reaction becomes automatic.

So now we have to bring the model down. Try to position the model so that it is flying into wind overhead at about 200' altitude, and blip the throttle down to about half speed, at this setting the model should slow a little but not lose much height.

When you have flown about 300' up wind at this setting, make a gentle turn to the left through 90°, if the nose drops a little don't counteract as it will come up again in straight flight, fly for about 200' and make another left turn of 90°. This will put the model heading down wind, if it is not losing sufficient height another tap of slow engine should do it. When the model reaches a point approximately 300' down wind, another left turn of 90° across wind until it reaches a position immediately down wind from you. The last turn to the left will put you on a heading for landing. Ideally, the model should now be at about 50' altitude coming straight towards you. Select full slow engine speed, and this will mean the nose will drop a little and the angle of descent will increase. Allow the model to sink in this attitude until about 3'-4' above ground, when a tap of up elevator will bring the nose up, this is probably the hardest point to judge as too much will make the model balloon up, so don't overdo this.

On this your first landing, don't be tempted to stretch the glide and risk a stall, or if overshooting, don't put the nose down as this will have the effect of putting speed up and prolonging glide. Good landings are a matter of height judgment at the right time.

MULTI-FLYING IS A LOT OF FUN BUT DON'T TRY TO RUN BEFORE YOU CAN WALK.

GOOD LUCK.