YOU HAVE CONTROL

TAKE THE NEXT STEP IN OUR R/C PILOT TRAINING COURSE WITH THE

58 in SPAN AEROBATIC TRAINER FOR 6·5—1

HOW long a modeller takes to become proficient at the basic skills of flying a radio control model varies enormously from person to person. Some take to it like the proverbial duck to water but, for others, it is a fairly prolonged, and at times anguished, period. Once these basic flying skills have been mastered and the modeller can reliably take off, or control the model from a hand launch, fly around in a positive manner and land safely back. This is the time that he will be contemplating the next challenge.

To most enthusiasts this will mean a model that is more aerobatic and faster than the basic trainer of the *Tyro Major* type. Perhaps some of you will be contemplating branching out to specialised aspects of the hobby such as scale or pylon racing. To jump straight from a basic trainer to serious involvement in one of these departments is, in my opinion, too great a leap. It is much better to progress gradually, through purpose designed sports training models, and build up to a full confidence in flying before going on to more demanding models. The *Sky Rider* is intended as a suitable second step towards the goal of full flying proficiency.

Design criteria for the model included a reasonable degree of positive stability so that, although you must control it to a greater degree than the Tyro Major, it still allows a certain amount of relaxation at the transmitter. With ailerons fitted to the *Sky Rider,* it will give you an opportunity to co-ordinate all control functions i.e. elevator, rudder, ailerons and engine throttle, a task that requires a model that is reasonably easy to fly and without vices. The *Sky Rider* was also designed to have a medium wing loading to allow the model to be flown at sensible speeds on the landing approach without suddenly dropping a wing or falling out of the sky. I slightly over-did this factor on the original prototype where the wing span was six inches greater and the chord an inch more, although the model flew well enough it looked out of proportion and aileron turns were a little on the sluggish side. By using a shoulder wing configuration, as compared with a low wing design, a greater degree of lateral stability is obtained and it also allows the model to be hand launched more easily. A tricycle undercarriage is incorporated for the benefit of those fortunate enough to have a decent take off strip. If you fly from a field with grass that is not too rough and you would still like to have a try at take off's, I would suggest using a longer nose wheel leg and main undercarriage to give plenty of clearance for the propeller on tufts of grass, and to use a size larger in wheels. The greater virtue of a tricycle undercarriage during take off is that it helps to make the model 'track' a lot straighter than the two wheel variety. This can be of considerable assistance during the period when you are getting used to the change over of operating the rudder on the left hand transmitter stick and the ailerons from the right hand stick (when ailerons are not used the rudder is controlled from the right hand stick). Only small rudder move-

By David Boddington

cc. MOTORS

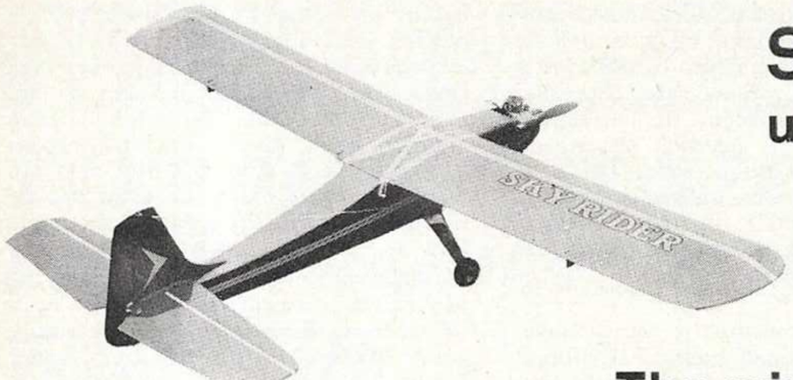
ments will be needed for direction adjustments during the take off run, indeed if the model is launched directly into wind, and the wheels are carefully aligned to track straight, no correction may be required. A steerable nosewheel is not shown on the drawing. This is a refinement that allows steerable taxying, but is not essential for take off and landing, and is therefore omitted on the cause of simplicity.

The wings are secured to the fuselage by the 'old fashioned' method of rubber bands – not such a neat method as the peg and bolt systems used on many multi-aerobatic models but very much more forgiving when the model is inadvertently landed wing tip first. Strip ailerons are incorporated in preference to out-board type, again for reasons of simplicity but the linkage from the aileron servo suggested is built into the wing and connects to a horn in the centre of the strip ailerons. This system of aileron linkage is preferred to the often used centre positioned horns and torque rods. With the latter type of linkage there is danger of damage to the linkage and fuselage sides if the wings are misplaced through a 'hard' landing. The centre horn position on the strip aileron also assists in eliminating aileron 'flutter' when the model is flying at high speed. Flutter occurs when the air flow and pressure on the aileron is sufficient to overcome the force applied by the servo and linkage; the aileron is pushed back and, together with turbulence around the aileron and hinge line, causes the ailerons to develop a high frequency oscillation. Top hinged strip ailerons, using *Kwik Cote* or *Solarfilm* full span hinges tend to suffer less from this problem of 'flutter' as it reduces the turbulence caused by a gap at the hinge line.

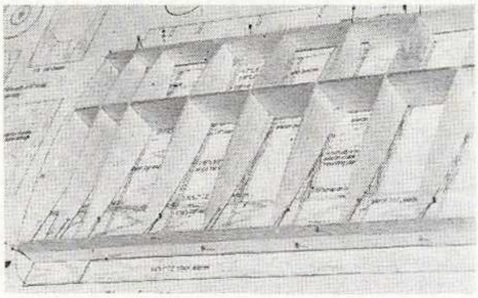
For a 'second step' training model the *Sky Rider* is adequately powered by a .40 cu. in. R/C engine, (or a really good ·35) this will give sufficient power for basic aerobatics and pull the model around fast enough for most modellers at this stage. Remember that excessive power can get you into trouble as well as getting you out of trouble at times. It is a little like a high powered car, once you know how to handle all of the power available, it can assist to obtain maximum manoeuvrability, but in the hands of the novice, this extra power will cause difficulties.

Some modellers may be hoping to progress onto larger models of one type or another and wish to purchase a ·60 cu. in. engine at this stage. Provided one is prepared to limit the power of a larger engine initially it should not prove to be an embarrassment. A simple method of restricting the thrust from the engine is to fit the propellers on backwards, alternatively set the motor servo movement so that it will not open the carburettor fully. Needless to say if

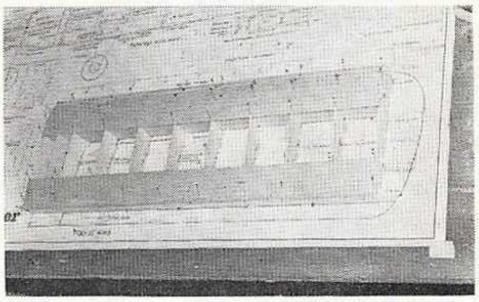
SKY RIDER
under construction



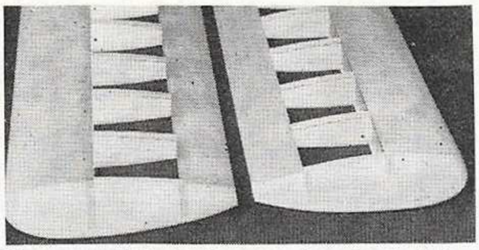
The wing



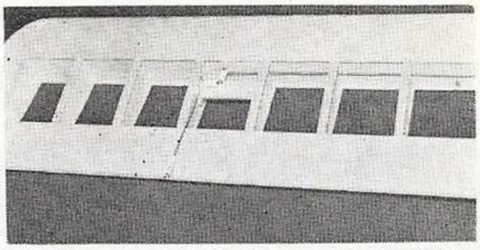
The basic wing construction showing wing ribs slotted on to mainspar egg-crate fashion. Leading and trailing edges are packed up to take account of symmetrical sectioned ribs.



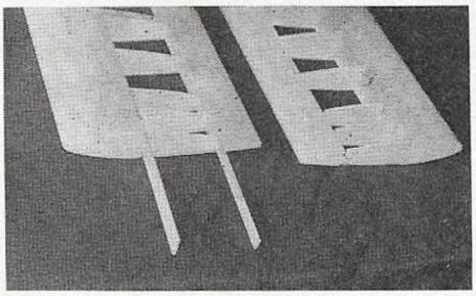
With wing structure still pinned over plan, the leading and trailing edge top sheets are now added, carefully pinned down to the ribs. Ensure that the structure does not move during this operation.



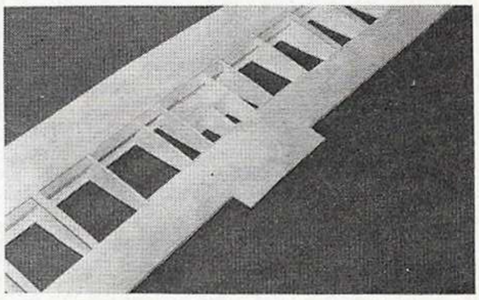
Two completed wing panels prior to joining showing cap strips, are wing tip reinforcement gussets. Addition of cap strips ensures rigidity of structure.



Detail of completed wing panel showing the aileron bellcrank linkage installation. Use of Bellcrank arrangement in place of usual torque rod horns makes adjustment easy.



Two wing panels prepared for joining with plywood centre section braces. Brakes are simply slotted in and glued.



The wing, joined at the centre and ready for hinging of the ailerons after covering.

you are looking for something less than full power there is no point in using anything other than a 'straight' fuel mix. Large capacity engines (·30 cu. in. upwards, except for racing engines) will perform quite happily on un-nitrated fuel although some of the smaller engines prefer a fuel with a moderate nitro methane content.

The *Sky Rider* is not a difficult model to build. The wings do need a little more care in construction as they are fully symmetrical in section and not flat bottomed as with the *Tyro Major*. Take your time over construction and ensure that all the structural parts are square and true – the faster a model flies, the more effect warps and misalignments have. As with the *Tyro Major* I am offering accessory and rib backs in addition to the kit that is available, details are included at the end of this article.

Construction

Some of the methods of construction may not entirely agree with your own but please think twice before amending the form of construction. This is particularly important if improvements' result in a heavier structure and most alterations seem to have this effect. Any increase in weight of a model of this type can only result in a deterioration of flight characteristics, and although the total weight of the model is not critical, additional airframe weight is wasteful.

Before commencing construction, familiarise yourself with the drawing and the instructions and ensure that all stages of the construction of the model are thoroughly understood. Mark accurately on the plan the position of your radio equipment, this will make installation more simple at a later stage. PVA glue is recommended for all construction with exception of engine bearer joints to the plywood former, where an epoxy adhesive should be used and contact adhesive may be used for the doublers. Select balsa wood carefully for suitable grades and matching pairs of spars, fuselage sides etc.

Fuselage

Mark with a ball point pen, on the fuselage sides the position of all doublers, formers etc. When marking the positions on the left hand fuselage side, first transfer the fuselage outline and doublers etc. to the back of the plan by using carbon paper (face up) under the plan and marking through. Glue the doublers and uprights in position, note that formers F2 and F3 fit between doublers and that these should be temporarily positioned when gluing the doublers. Mark the position of the engine bearers on the $\frac{3}{16}$ in. nose doublers and, after cutting the bearers to shape and drilling holes for the nose wheel leg and engine mounting plate screws, glue to the doublers. Screw the anchor nuts to the underside of the bearers.

Before former F1 can be fitted it must be drilled for the drainhole and to receive the nose wheel saddle screws and throttle cable tube. The position of the latter will depend on the particular engine you propose using and the side on which the throttle arm is situated.

When the fuselage sides are completely dry, formers F2 and F3 can be added to both sides, making sure that the fuselage is true and square until the formers have set. Glue F1 in position and temporarily hold the stern posts of the fuselage together with clothes pegs to ensure accuracy at the tail end. Check from time to time whilst the glue is drying that the fuselage sides do not 'spring' apart; a good way of avoiding this is by wrapping around the fuselage, at former positions with masking or drafting tape or by using two vertical hardwood sticks rubber-banded top and bottom.

Taper the stern posts to mate accurately and glue permanently, pinning together until dry. The fuel tank compartment should be given at least two good coats of fibre glass resin or fuel proofer before the fuel tank is fitted, as should the underside of the tank hatch sheeting. Complete the fuselage construction by adding the $\frac{5}{16}$ in. nose sheeting, $\frac{1}{2}$ in. nose doublers, top and bottom sheeting including the 5 mm. plywood for the main undercarriage and 4 mm. doublers. Sandpaper thoroughly, rounding off the corners of the rear fuselage slightly and rather more around the nose area where the doublers increase the thickness of the fuselage. Fuelproof thoroughly around the engine bay both before and after painting; close attention to fuel proofing to all parts where fuel seepage might occur (including the *inside* of the fuselage at the wing seating position) can increase the life of the model considerably.

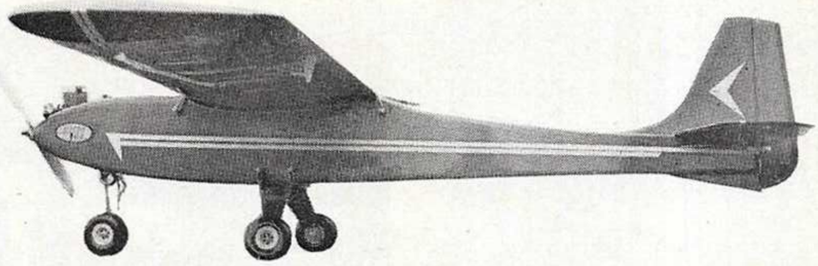
Wings

The full depth main spar together with top and bottom leading and trailing edge sheeting plus capping strips to ribs results in a light but strong wing panel. A big advantage with this form of wing is its rigidity, so important when covering with materials such as *Kwik Cote, Solarfilm* or nylon. Pin the port wing main spar vertically in position on $\frac{1}{16}$ in. packing over the plan (dry soaping the plan first to avoid sticking) and pin the scrap $\frac{3}{8}$ in. sheet leading edge packing in position as shown on the drawing. Cut nine trailing edge packing pieces from scrap and pin them in position between wing ribs under the trailing edge spar. To these packing pieces pin the trailing edge and check that the wing ribs fit correctly onto the main spar and trailing edge, glue all ribs into position noting that the root rib is angled for dihedral. Drill holes in the wing ribs for the aileron pushrods.

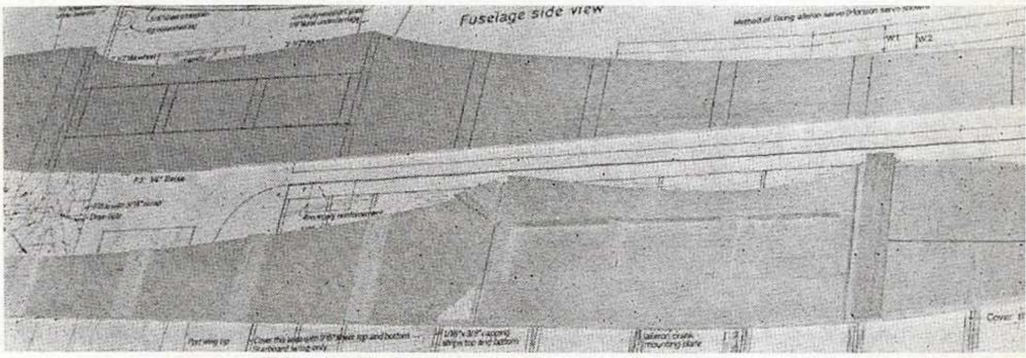
Mark the position of the wing ribs onto the leading edge by holding the leading temporarily in position and marking with a ball point pen. Glue on the leading edge making sure the height of all the wing ribs is identical. Add the trailing edge and leading edge top sheeting top capping strips and centre section top sheeting. Capping strips should be cut from scrap $\frac{1}{16}$ in. sheet. When dry, remove the wing panel and pin and glue in position the bottom leading edge and trailing edge sheeting and rib capping strips. Complete assembly by adding the wing tips and gussets. Trim the leading edge to shape using a razor plane and finally sand the whole of the wing smooth including the root rib which should be sanded on to a flat surface to ensure a true surface.

Repeat the operation for the starboard wing. Glue the two wing panels together, checking for true alignment, and leave pinned together until completely dry. Note: PVA glue can take a long time to dry where there is little air present.

Cut slots with a razor saw in the root ribs for the dihedral braces and glue them in position joining the two wing

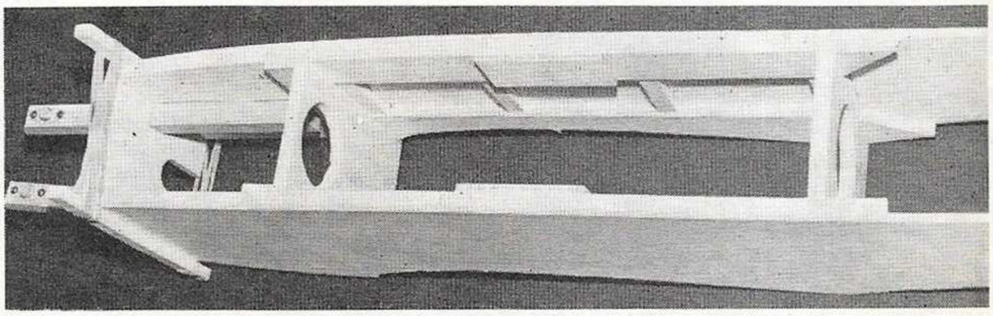


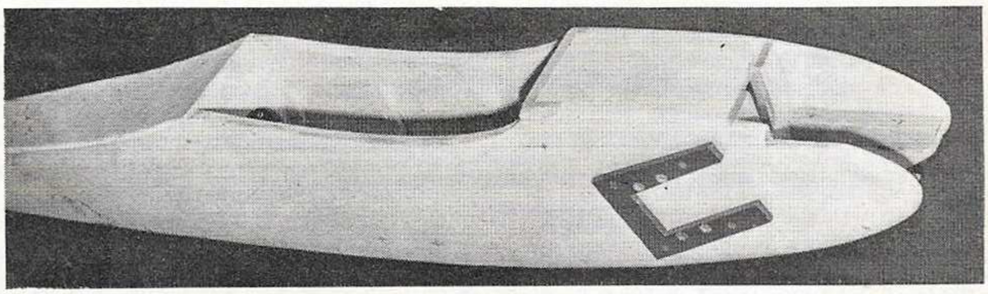
The fuselage



Above: fuselage construction begins by marking positions of braces and doublers on insides of sheet sides. Wood pieces then added. Be sure to build left- and right-hand sides.

Below: basic fuselage structure complete with two sides joined, using formers. Engine bearers are now in place and drilled for motor.





Above: the complete fuselage structure, now fully sheeted top and bottom. Note the paxolin engine mount plate which is designed to break in hard knock. Bent motor mount preferable to bent motor!

halves together. Form the aileron servo box to suit your servo and the method of mounting it. Fit aileron crank mounting plates, aileron cranks, pushrods and rod to horns. Glue aileron stock to the rear of the centre section and, when dried, add microply reinforcement to the top and bottom of the trailing edges and the leading edge. Sheet in the centre section top and bottom. Ailerons may be top or centre hinged using *Kwik Cote, Mylar* or nylon hinges.

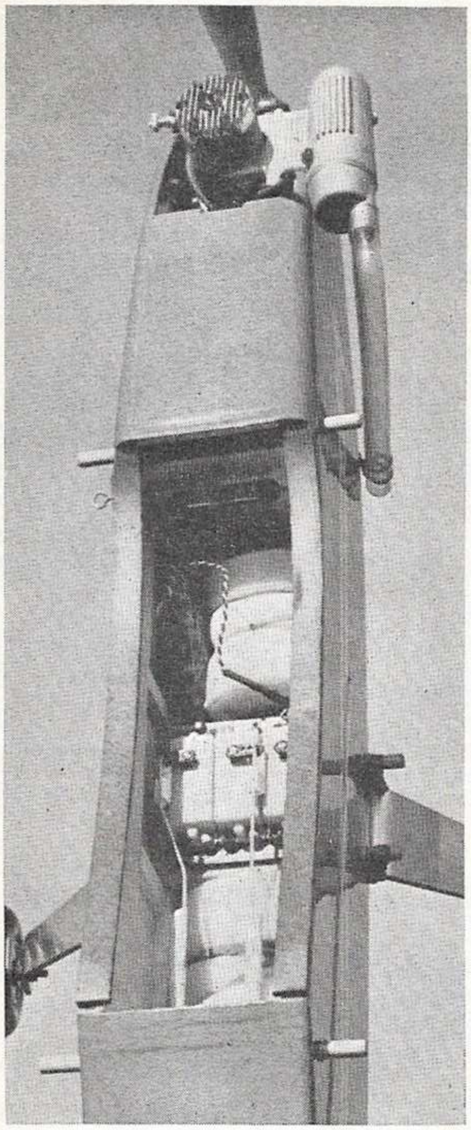
Tail surfaces

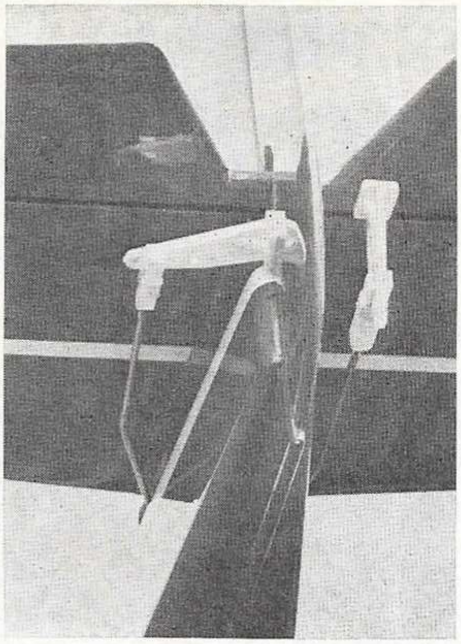
The construction of the tail surfaces is straightforward and should be obvious from the plan. Sand all tail surfaces smooth, rounding off the hinged edges. Whatever form of hinge is used, it is essential that the control surfaces are absolutely free moving. No excessive stiffness in hinges can be tolerated. The hinges should be made *after* the surfaces have been covered and fuel proofed.

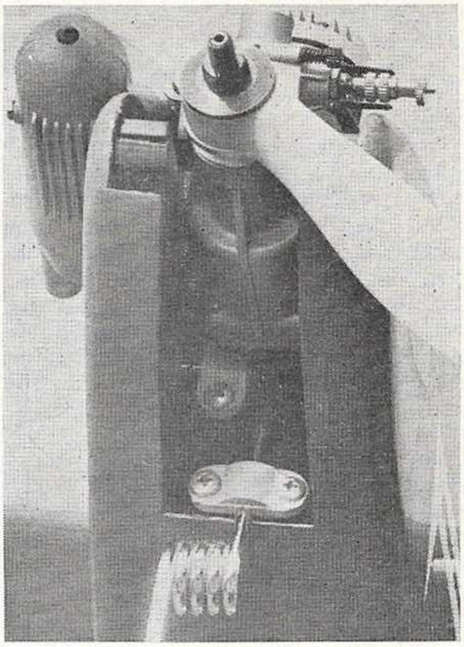
Check for true alignment of fin and tailplane on fuselage before finally gluing in position with $\frac{3}{8}$ in. triangular supports on either side.

Finishes

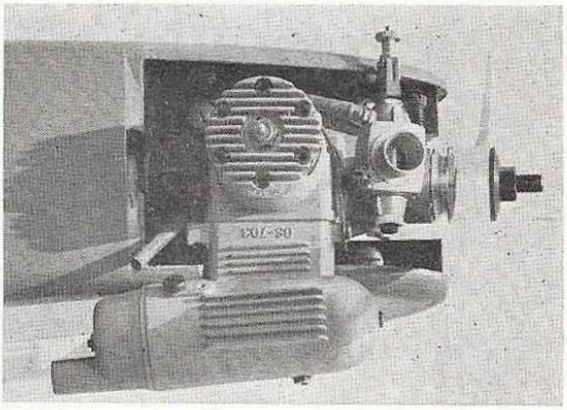
With so many alternative covering materials, paints and synthetic finishes available, no comprehensive instructions







Left: the radio compartment showing that Sky Rider has ample installation space, accommodating three servos abreast of the fuselage. Power pack is wrapped in foam rubber ahead of servos and receiver is behind for maximum protection in event of 'crunch'. Above: rear end showing control surface horns and push-rod attachments.



Engine installation viewed from above showing O.S.40 motor with muffler. Top right, view of nose from below, showing the O.S.40 installed and noseleg strut attached to firewall.

are given here on applying coverings and finishes; most have been dealt with in previous 'You have control' articles – see January 1973 R.C.M.&E. It should be remembered, however, that the two important considerations in applying finishes are strength and lightness. Tissue paper, even the heavyweight ones, are not recommended because of their poor resistance to tearing and if nylon is used, do not overdo the paint decoration otherwise the weight will be too great. The other important consideration as mentioned before is to ensure that the model is well fuel-proofed.

The prototype weighed just 5 lb. when fitted with *Horizon* four function radio equipment and an *O.S.40* engine. A total weight range of $4\frac{3}{4}$ - 6 lb. is quite acceptable. Control surface movements recommended for the trainee are (measured at the extremes of the surfaces): Elevator $\frac{5}{16}$ in. each way up and down, rudder $\frac{3}{8}$ in. each way left and right and ailerons $\frac{3}{16}$ in. in either direction. With these movements the rate of roll is adequate without being terrifying and, by applying full up and full rudder at low motor, it is possible to spin the *Sky Rider* although you may not obtain it at every attempt. Incidentally the model recovers from the spin immediately the controls are centralised. The balance point on the original model was a little aft of that shown on the drawing but I suggest you stick to the indicated point until you have got used to the handling of the model. When you have increased your proficiency the control surface movements may be increased.

Right: simple Quick Link connection to strip aileron control horn – easily adjustable without removing wing from fuselage. Far right, aileron servo installation in well at centre section on wing.