Why Control Line?

On a fun/£ basis Control Line must be hard to beat; a model like 'Akro-kat' can be built for about £25 *including engine and control system.* You would pay more than that for a R/C model kit and still have to pay at least £80 more for engine and radio!

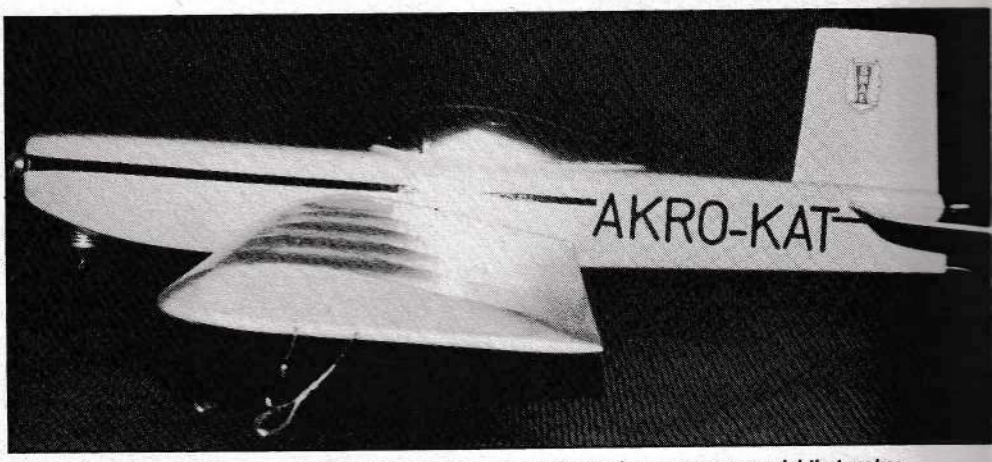
C/L models are easy to build: the components are durable enough for the most fumble-fingered to handle without 'dissolving into dust' and the skills learned can be passed on to other branches of the hobby if/when interests change or finances permit.

Almost any patch of grass (playing field) is a potential flying site and a pint of diesel fuel lasts all week-end.

For the budding designer, almost anything will fly (even if not very well) and, once again, skills learned stand you in good stead for later projects in other areas.

The scope for C/L models on the contest scene is wide, in short C/L is good in its own right as well as being an excellent introduction to other areas of model flight. Many of you wire-less types don't know what you are missing, why not build an 'Akro-kat' to play with when your frequency is full or your batteries are flat?

'Akro-kat' is *tame* enough for a novice to fly safely yet aerobatic enough not to be boring for the more competent pilot - all a 'sport' (ie fun) model should be!



Above, the 'squared off' lines of 'Akro-kat' make for a straightforward no nonsense model that makes an ideal trainer for the novice stunt man. Below right, an earlier 'Kat' with club stunt trophy...

AKRO-KAT

Do you want to move into control line aerobatics? Then build this no frills stunter by Dave Cowburn.

The wingspan is not enough to cause transportation problems but the area is large enough to provide good flying characteristics...

The model

A trainer with aerobatic capability may at first sight seem to be a contradiction in terms. However, experience has shown that a model of this type is in fact much easier to fly than many traditional trainers which are often over-weight and under-powered and require constant 'nursing' from the pilot to remain air-borne. High wing loading often causing an abrupt return to earth at the slightest mistake on the part of the (inexperienced) pilot.

A well developed racing model is better but in this case dizziness becomes a major problem for the trainee pilot and once again the earth has an unfortunate habit of getting in the way.

The easiest models to fly are undoubtedly the *full-stunt* models, being smooth, responsive and slow. Their only drawback being their inherant fragility and long building time. Improve the strength and reduce the building time and, to my mind, you have the ideal trainer.

Properly designed (and built) it will fly level easily without having to be coaxed into the air, and its inherant manouverability will allow the pilot the chance to recover from the kind of desperate situation in which a *solid* trainer would be removing divots from the flying field. Also, the model will still be interesting to fly once the first hurdles of C/L flight have been crossed.

With these thoughts in mind 'Akro-kat' was designed. A constant chord wing was chosen for simple building, flaps being deleted from the *full-stunt* specification as the model would not be required to perform square manoeuvres. A simple box fuselage was chosen for several reasons, firstly they look better than a profile (and most people like their models to look like a real plane); secondly they need not be more difficult to build than a well developed profile fuselage (e.g. Goodyear racer with ply doublers, spruce spine etc.); thirdly the model was thought to be a *building* trainer as well as a *flying* trainer.

Engine size was set at around 2.5cc as a model of this size will fly on standard F.A.I. lines (52ft 3in./15.92m) with lower rotational speed for the pilot than a smaller size model and engine which has to fly on shorter lines and causes dizziness for the pilot. The 2.5cc engine is also likely to be of more use for later models and will not necessarily be more expensive to buy than its lower capacity counterpart. A 2.5cc *P.A.W.* was thererfore chosen for the prototypes.

'Akro-kat' has proved satisfactory on all counts. *Abinitio* pilots have flown it with success (with a bit of dual-control for the first flew flights) while more experienced pilots can perform all the normal *round* manoeuvres. In essence, a good 'sports' model well able to cope with the rough and tumble of club field flying. It should appeal to many C/L pilots, and perhaps to some of our 'wire-less' brethren too..

Adhesives

For most gluing jobs I like to use Aliphatic resin, a pale yellow carpenter's adhesive. It has a faster *grab* (i.e. is stickier) than PVA. while having a sufficiently long working time to permit the working of large areas (good when laminating). When dry it is somewhat *crisper* than PVA. and sands down more easily.

For highly stressed areas I tend to favour epoxy adhesive. Other glues may have limited and specialised application but are not strictly necessary except when speed of building is of utmost importance.

Building

1 Laminate leading edge (L/E) and trailing edge (T/E) strips. Laminate 0.8mm ply doublers to fuselage sides as plain rectangular blanks and weight down between boards to keep flat.

2 Cut out formers F1 and F2, bend the undercarriage (U/C) and epoxy between two F2s (cut grooves into the formers for a neat fit) sewing together with strong thread.

3 Cut out the wing ribs, bell-crank mounts etc.

4 Assemble *power pod* of bearers, bearer top plate (0.8mm ply) and formers. Check all is square and clamp carefully while adhesive (20min. epoxy) sets. Drill for engine mounting.

5 Plane and sand T/E to section (razor plane) and assemble 6mm centre section ribs and bellcrank mounts with bell-crank and leadouts (double heavyweight *Laystrait*) fitted.

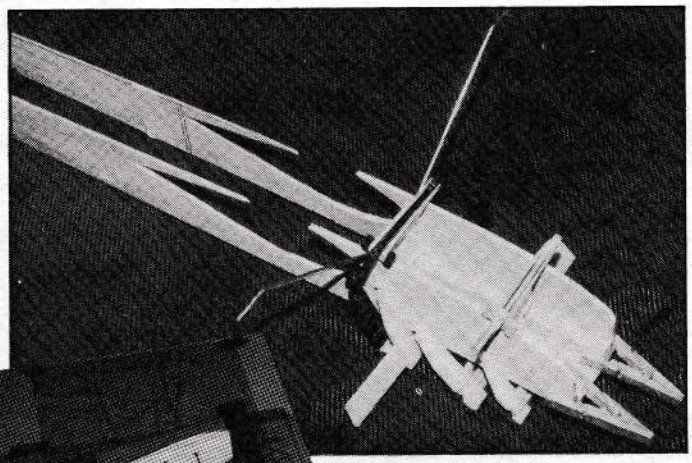
6 Either build up starboard tip and three rib bays over the plan then move partial assembly along to complete rest of wing over plan, or, trace off tip and three rib bays to extend the plan to the required span before starting to build. Assemble the wing over the plan, packing up centre ribs by 2mm to allow for centre section (C/S) sheeting. Mark off position of leadouts onto port wing ribs and drill 6mm holes for lead-outs, elongating as necesary with a round file.

7 Fit *overlength* push-rod (retained by 'Z' bend) and C/S sheeting.

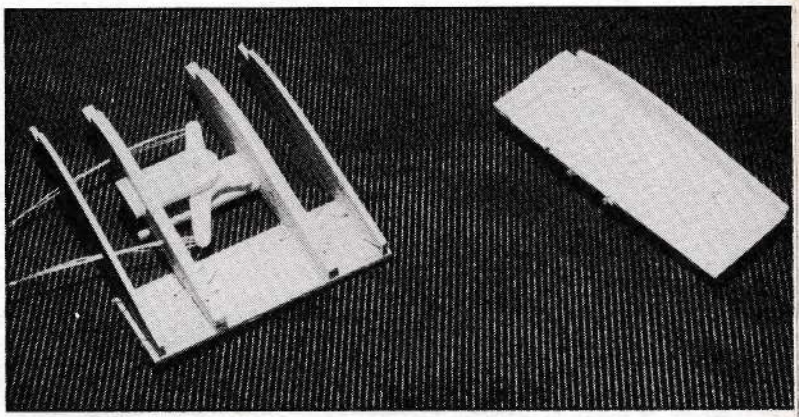
8 Carve, plane and sand the L/E to the section shown on plan, blend in tips and give an over-all sanding. Cover the completed wing with *Solartex* (recommended) or nylon. (*Solartex* covering instructions are supplied with the material and are quite explicit; nylon should be stretched tight over the wing and held with *many* pins, stick with dope brushed *through* the fabric.)

9 Carefully mark out one fuselage side using the top edge as a datum and your rib template to help mark out the wing cut-out. Hold sides back to back when cutting out and use a fine saw to cut the wing seat where there are ply doublers. The wing seat is, perhaps, the most important part of the whole model as any mis-alignment or incidence incorporated at this stage will effect the flying qualities.
Cut free and save the small triangles of wood at the rear of the wing seat to assist fitting the wing.

10 Epoxy fuselage sides to power-pod clamping together over a flat surface to ensure a *square* structure. Pin this unit down over the inverted plan and carefully fit the wing. Replace the triangles cut free and add F3 and the 3 × 6mm 'longerons'.



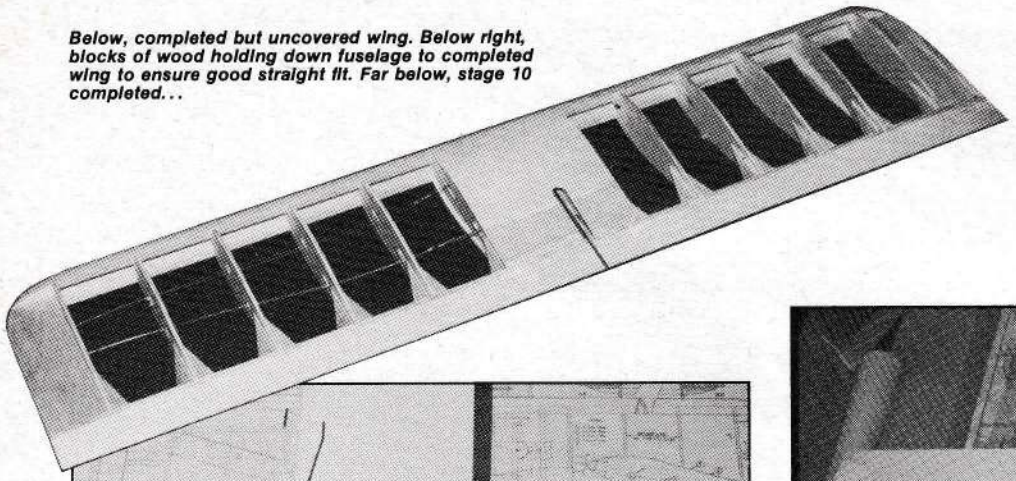
Left; fuselage sides are clamped and epoxied to the 'power pod' (stage 10). Make sure you do this on a flat surface to ensure wing cut outs are square.

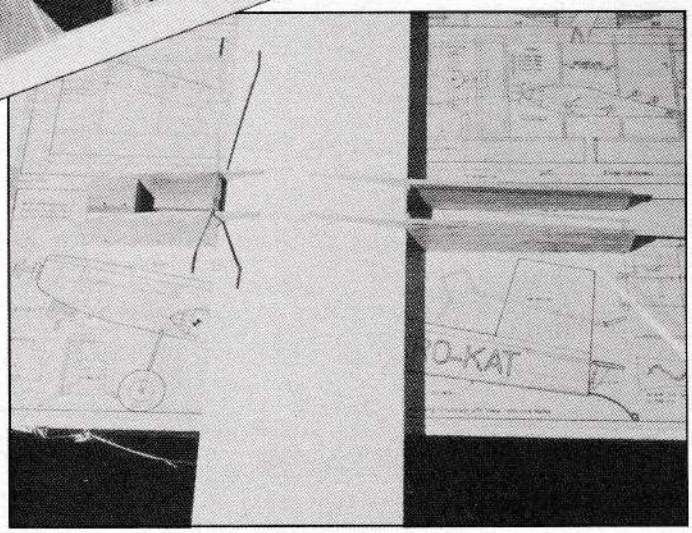


Right, two 'sections' showing bellcrank mounting and inboard wing tip with lead-out 'snakes' sandwiched between two 1/8in sheet tips. Left, wing nearing completion note leadouts already in place.

11 Make up the tailplane and hinge the elevator by your chosen method. Fix the elevator horn and then slide this unit into place at the rear of the fuselage. Bend push-rod to length and, if necessary, adjust for true neutral by sliding tail unit backwards or forwards slightly.
Pin tailplane in position on board then

Below, completed but uncovered wing. Below right, blocks of wood holding down fuselage to completed wing to ensure good straight fit. Far below, stage 10 completed...





pull in fuselage sides to line indicated on plan and glue to tailplane. Now sheet over fuselage bottom with 2mm balsa cross grained and fit tail skid and mount.

12 Remove model from board and fit engine. My preferred method is as follows:- Place mounting bolts through pre-drilled holes from top of bearers with a smear of epoxy on their shanks, add alloy plates to underside again glued with epoxy.

Put the motor in place and add washers and nuts, screwing up firmly to hold all in place while the epoxy cures. The engine may then be removed by slackening the nuts, the bolts being firmly embedded in the bearers and remaining as mounting 'studs'.

This is one of the most reliable methods of mounting that I have found so far. The only drawback being the need to use a 'nut driver' or a box spanner to get to the nuts.

13 Temporarily fit the top block, squashing down onto the bolt heads and marking in the taper of the rear fuselage. Remove from model, counterbore for bolt heads and carve in the taper at rear of block.

Round off top edges at rear as the tailplane makes this difficult with the block fitted. re-fit top block, *after* cutting slot for fin, and carve/sand to shape. Finish sand whole fuselage (protect wing roots with a wrapping of tape) and fit fin.

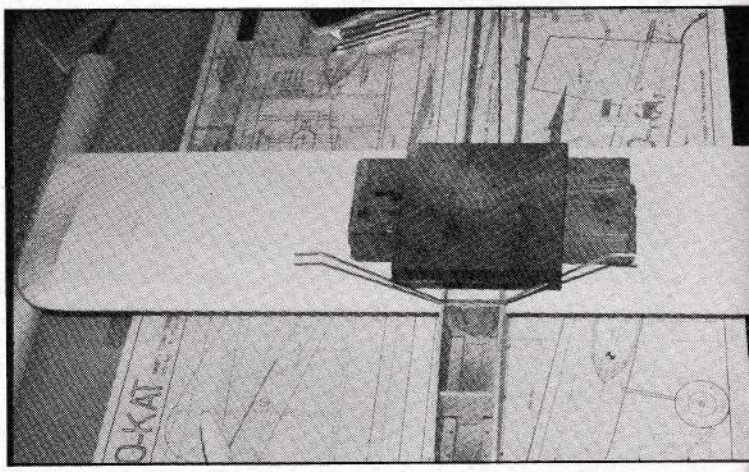
14 Dope all bare wood and cover with lightweight tissue brushing more dope through the tissue to hold it in place. Build up a satisfactory finish with further coats of dope, sanding down as necessary to remove 'fuzz' and loose tissue. The tailplane is easier to cover if the elevator horn is removed.

15 Fit the cockpit canopy by carefully trimming with sharp scissors and *bedding down* onto a piece of abrasive paper held over the model's top deck. When a satisfactory fit has been achieved a groove is cut into the top deck around the perimeter of the canopy. The area within this groove is painted black and the canopy glued in place. Mask off the canopy about 2mm above the joint line and cover the joint line with strips of tissue and dope to form a neat fillet.

16 Finish the model by spraying *lightly* with primer (wing should not need priming if covered in *Solartex*) and colour scheme of your choice. Leave for a few days for the paint and transfers to dry before fuel-proofing then fit wheels, tank, engine etc. and form and solder loops on the lead-outs.

Flying

If this is your first attempt at control line flying you would be well advised to seek the help of an experienced C/L pilot for a little *dual-control*. We in Humberside M.F.C. would be pleased to see anybody in the Hull area wishing to take up this fascinating hobby and your local library should be able to give you a contact address for a club near you (or contact the *SMAE*). If you have to 'go it alone' the following notes may help.

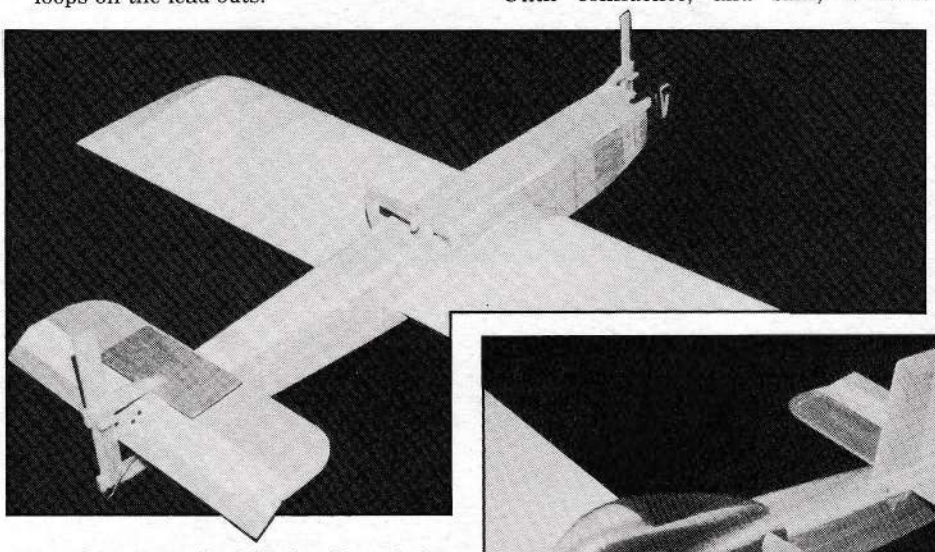


Become thoroughly familiar with your engine, run it 'on the bench' (screw it to temporary bearers, **DO NOT** clamp it in a vice by the crankcase) with a few tanks of fuel *off* the model before you even go to a flying field.

The tank pipes are arranged for the conditions which exist in circular flight when the fuel is subjected to centrifugal force and you will have to hold the model at an angle when 'ground running' to get all the fuel out of the tank.

On a suitable smooth grass area, such as your school playing field (ask your head teacher first!), lay out your lines and hook up the connections. Check lines are straight and free from 'kinks' and that the elevator moves easily and correctly in response to handle movements (i.e. *up* with up, *down* with down and exactly level when you point at the model).

Until confidence, and skill, is built



Above, stage 13, top block fitted and tape at wing root to protect wings during subsequent sanding of fuselage. Right, abrasive paper taped to fuselage to enable canopy to be sanded to correct fit.

up...only fly in calm weather, but try to organise things so that the model will run round the down-wind side of the circle as it takes off so that speed is built up to *penetrate* the wind on the up-wind of the circle. Wind should be on your *right* cheek as you wait for the model to be released.

When completely satisfied that all is in order, fill up the tank, start and tune the engine. Peak out the settings with the nose of the model raised, this will simulate flying high, when you *need* peak power, and should give a slightly rich setting in normal level flight.

Place the model on the ground tangential to the flight circle and have your (one) helper hold the model back by hooking his/her fingers round the L/E of the tailplane while squatting on the ground behind the model.

Now *walk* to the handle, pick it up and step back gently to take up any slack in the lines. Wiggle the elevator as a final check that the controls are correct with the 'up' line to the top of the handle, raise your left hand above your head to signal readyness to your helper, hold in a *little* up elevator and point to the left with your left hand to signal release (during this period a diesel engine may have 'hardened off' but unless badly set to start off with should recover as the model accelerates in the air).

The model should run forward a few metres and bounce into the air. Don't let it climb too high or too steeply but try to avoid 'over controlling' which would probably push your pride and joy into the ground! Aim at maintaining level flight at about 3 to 5 metres (point your arm at the desired altitude while keeping your wrist stiff (rather like aiming a pistol) and the model will automatically level out where you want it).

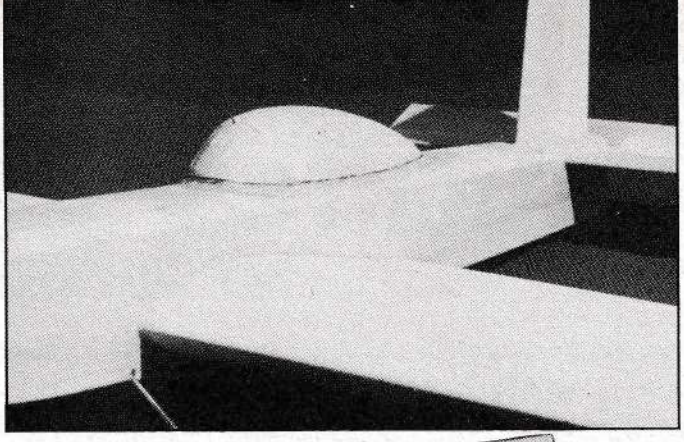
When the engine finally stops - the tank shown is quite large for an economic diesel, about right for a glow - simply let the model glide down by itself and 'run aground' while you keep pointing at your pre-set altitude (continue to rotate with the model).

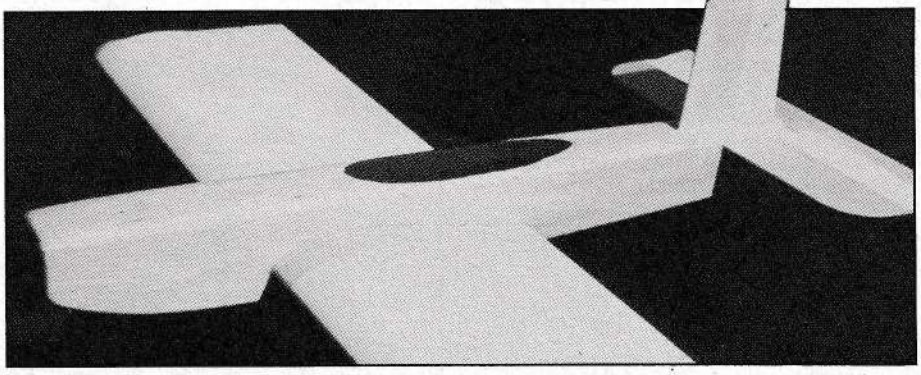
As experience is gained landings may be improved by 'flairing out' as the model nears the ground but don't try to hold it off too long, as once speed is lost so is control and the model will probably stall (SPLAT).

Dizziness can be a problem for early flights, as can wandering about. The former is helped by keeping first flights *short* (you don't have to fill the tank to the brim) and by focusing your eyes on the model, try to ignore the background. The latter by having a clear marker for the circle centre - place it a couple of metres back from the handle when laying out the lines so that you move away from your flight box and helper when the model becomes airborne, it is most embarrassing to have an otherwise perfect flight terminated by hitting the flight box when gliding in to land!

Brief your helper as to the potential dangers involved, a kilo of model flying at about 100 kph will raise quite a large bruise! Ask him to keep all spectators out of the flight circle (you will not be able to see anybody who might be in the way until it is too late to take avoiding action).

Above all — enjoy yourself. C/L rules OK...OK





Below, paint inside area where canopy will be fitted. Right, canopy is masked off after fitting, and a fillet of tissue built up around the base, stage 15. Far below, two suggested variations to 'Akro-Kat' - only the top decking and canopy are affected...