



THE ACE TEAM provides the builder with a choice of model that ranges from trainer to club racer or with an extended wing, a stunt trainer.

The original model was designed to meet the specification for club racing as formulated by Humberside MFC (rules on page 253) the object being to produce attractive, easy flying models which can give close, exciting racing under normal club conditions on a grass site and be equally suitable for use at flying displays. (It is felt that models which are used regularly on the club field are going to be much better for display use than 'Specials' which are only brought out once or twice a year and with which the pilot is, therefore, unfamiliar!)

The resulting models have proved to be very successful and versatile, as, with minor alterations they can be built as trainers or sports-stunt models as well as the original racers. Details are included on the plan for all three versions:

- (1) Trainer with 2.5cc engine
- (2) Racer with 3.5cc engine
- (3) Stunt Trainer (extended wing)

In the past the 3.5cc class of engine was justifiably popular for control-line flying. The introduction of a general 2.5cc limit for FAI competitions led to the regrettable decline of this class of engine but thanks to the Radio Control car and boat fraternity the 3.5cc motor is once again receiving the attention of the engine manufacturers it deserves. Now, with 'Club-20', these motors are readily available in a form appropriate to Control-Line use and there is now a wide choice of engines very suitable for club flying. The club racers presented here are designed to exploit this class of engine on the average club site. The reasonably large wing area will absorb the power of a 'hot' 21 without speeds becoming excessive, while the safe glide and low landing speed makes for comfortable handling in normal club or display use. Control Line Club-20 could open

The ACE Team

Trainer, Racer or Stunter a control line model for everyone by Dave Cowburn.

up a whole new branch of the sport, just as Radio Control Club-20 has for the 'Wireless' fraternity so why not *Circulate With the ACE Team*.

The model shown in the plans has been developed from two previous racers and draws heavily on established 'Goodyear' and 'Combat' practice. Four prototype models have been built in the preparation of the plans, a trainer with a PAW 2.49, two racers, one with an STX 21 'Club-20' and the other with a 3.5cc *Oliver* and finally a stunter using an OS 'Max' 25. All were built 'to the plans' and all fly well, despite the wide range of engine types and resulting variation in balance points (Centre of Gravity) — a very tolerant model which, with suitable choice of engine/version, should appeal to all Control-Line pilots from novice to expert.

Adhesives

Briefly three general types spring to mind, epoxy, PVA and balsa cement. Probably the most versatile for this model would be PVA (except where specified otherwise) this does not have to be mixed and has a reasonable setting time allowing positioning of components — particularly useful when bonding two or more long sections together such as the wing leading and trailing edges and the fuselage core.

Construction step by step

- (1) Bond the 12 x 4.5 mm spruce spine to the 12 x 25 mm balsa fuselage core.
- (2) Bond the 12 x 4.5 mm spruce to the 9 x 37 mm balsa for the wing trailing edge.
- (3) Bond the three balsa strips to form the wing leading edge.

Leave the above assemblies clamped, pinned and/or taped for 24 hours to dry thoroughly.

- (4) Cut out ribs, gussets, tips (glue on edge strips) tailplane, fin/skid, etc.

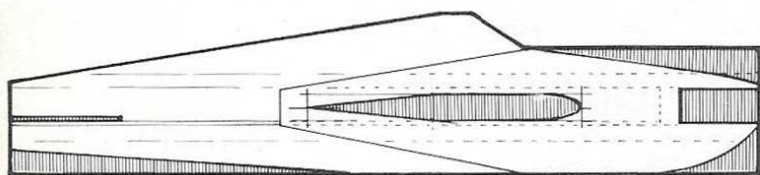
(5) Assemble wheel box (epoxy) and centre section unit, bolt the bellcrank between 3mm ply plates (see section), then cut slots in 6mm ribs to suit.

(6) Prepare the fuselage core to correct width to suit bearer spacing of engine being used. Add bearers (note short section of bearer material at front of core between bearers) and 12mm balsa fill in pieces. Plane up wing trailing edge while this assembly dries.

(7) Laminate up rest of fuselage from 12 and 25 mm strip incorporating the under-carriage box. Bind with adhesive tape and leave under weights to dry flat. (Sandwich between boards with newspaper to soak up the glue which will ooze out.)

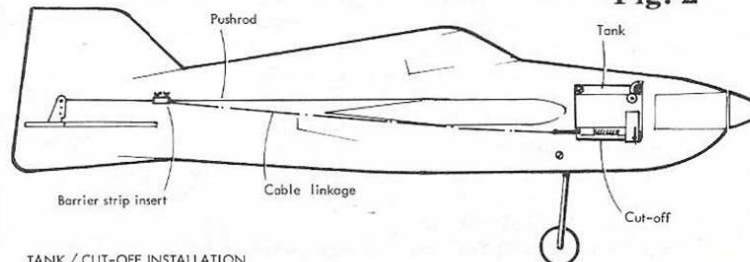
(8) Make a dry assembly of the wing over the plan, arranging suitable packing for the trailing edge (Stunter wing is extended by one rib-bay at each side, increasing span by 150mm). Mark lead-out positions on 'Port'

Fig. 1



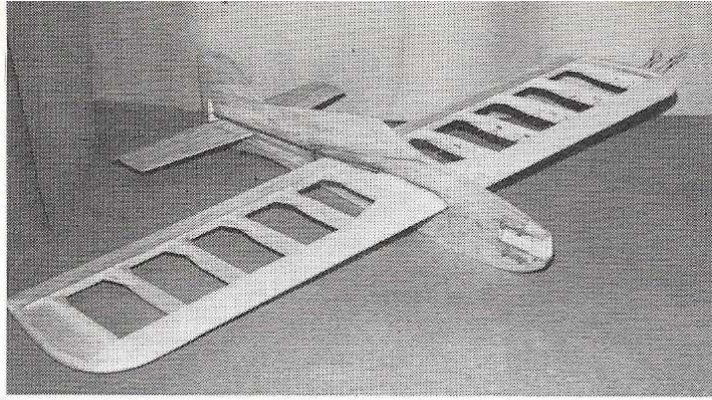
Marking - out fuselage blank

Fig. 2



TANK / CUT-OFF INSTALLATION

Right: the finished framework of the stunt trainer version of the ACE Team, note gusseted wingribs and extra panel on each wing.



ribs. Note the alternative sweep on the lead-outs depending on version being built. Disassemble and drill lead-out holes, elongating those in the inner ribs with a 'rat-tail' file to allow for the swing of the bellcrank. Reassemble wing, fitting lead-outs (double heavyweight 'Laystrait') and lead-out tubes (short sections of plastic tube — R/C 'snake' outer — epoxied to underside of tip) and check for full and free movement of controls. When satisfied, glue all components in position.

(9) 'Clean up' balsa core of fuselage and add 0.8mm ply sides. Hold with adhesive tape to prevent slipping (I should have shares in sticky tape!) and clamp or weight carefully until glue sets.

(10) Add over-length push-rod to bellcrank (retain with Zed bend) and fit centre-section sheeting. Epoxy tip-weight into leading edge recess near outboard tip and add gussets. When dry, plane and sand leading edge to shape, blending into the wing-tips.

(11) Prepare tailplane, joining stunter elevators with 'U'-shaped piece of 14swg wire and sew elevator(s) to stabiliser with terylene thread (Kite line) in a herring-bone figure of eight pattern to form a hinge. Add 0.8mm ply plates to cover joiner and reinforce horn mount.

(12) While fuselage blank is still 'square' carefully mark out wing slot. Note that the bottom flat surface of the wing should just touch the spruce spine (fig. 1). Carefully cut out the wing slot and file out to fit the wing closely. *It is most important that the wing, engine, and tail be fitted at 0° to the datum for a model which will 'groove' well.* Cut tailplane slot and drill for engine and undercarriage bolts while fuselage is still flat.

(13) Mark on profile of fuselage, cut and sand to shape.

(14) Mark vertical centre-line round tail of fuselage and saw slot for fin/skid. Dry fit this unit and plane, sand down the rear of the fuselage to blend into this unit. *Do not* cut into the spruce spine. Feather edges of ply doublers.

(15) The wing may now be permanently fitted. (Racer or trainer wing having previously been covered with *Solartex* — strongly recommended!) Mark a pair of lines round the wing at the fuselage position and use these as a guide for 'square' fitting. Key the area of the joint by pricking through the *Solartex* with a pin. Slide the wing almost into position then spread epoxy over the marked joint area. Push the wing fully home and 'knife' extra epoxy into the joint to seal any gaps.

(16) Add tailplane and fin, fairing the latter into the fuselage with soft scrap balsa. There is no fin off-set on any version, the model relying on speed for line tension.

(17) Temporarily fit the engine, bedding down onto 3mm thick alloy plates and fitting the bolts through from the inboard side of the model, the nuts being above the engine lugs. When satisfied with the installation epoxy the bolts and plates to the model.

(18) Add 12mm cheek cowl, blending into the wing root and spinner. Block in between bearers round the crankcase.

(19) Adjust length of push-rod and fit to elevator horn. Note that the cut-off line on the racer passes from the tank, under the wing (fig. 2) (fit a short tube 'fairlead' where this rubs the wing) and is soldered to a section of 'terminal strip' on the push-rod for adjustment of the cut-off point. This must be fitted before the end of the push-rod is bent to fit the elevator horn!

(20) Reinforce the area around the wing leading edge and cheek cowl junction with nylon and epoxy. Treat the tailplane/fuselage junction similarly. (These areas being prone to 'stress cracking').

(21) Dope tissue onto all bare wood (except wing of stunter) and apply clear dope or sanding sealer, sanding between coats, to give a satisfactory base for the colour finish — probably 5 or 6 thinned coats and a couple on the *Solartex*.

(22) The prototype models were finished with car 'touch-up' sprays as follows:

(i) Blow over with white primer (just enough to mask most of the wood grain) and inspect for any holes, blemishes, pock marks, etc., which escaped the tissue and dope stage.

(ii) Rectify these blemishes with appropriate filler (*Fine Surface Polyfilla is good for this ... Ed.*), rub down and re-prime where necessary.

(iii) Cover stunter wing with *Solarfilm* and mask off before finishing fuselage.

(iv) Build up colour finish with several light coats to avoid runs. (I keep the spray can nozzles in a jar of thinners rather than wasting propellant clearing the jet as suggested in the spray can instructions.)

(v) Decorate with appropriate transfers and paint in the cockpit.

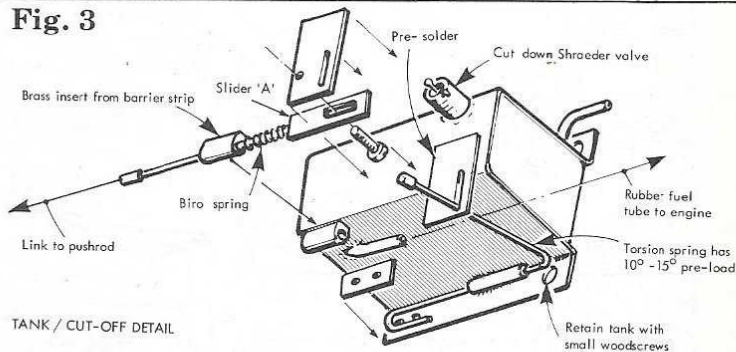
(vi) Leave a couple of days to dry thoroughly then fuel-proof with *Tuf-cote* or *Rustings 'Plastic Coating'* (available from the better DIY stores).

(23) Fit engine, undercarriage, tank and link up the cut-off with *Laystrait*. Adjust cut-off, by shifting terminal strip on push-rod, to 'fire' at 10° to 15° down elevator.

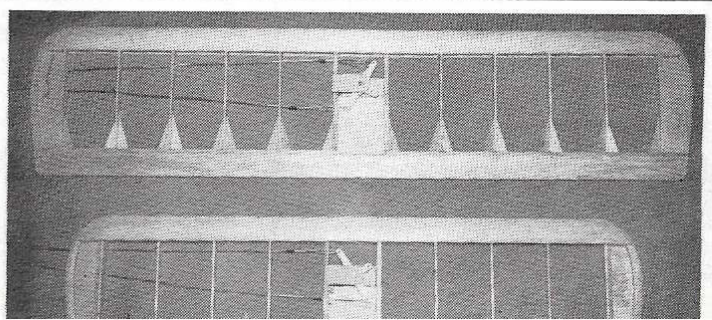
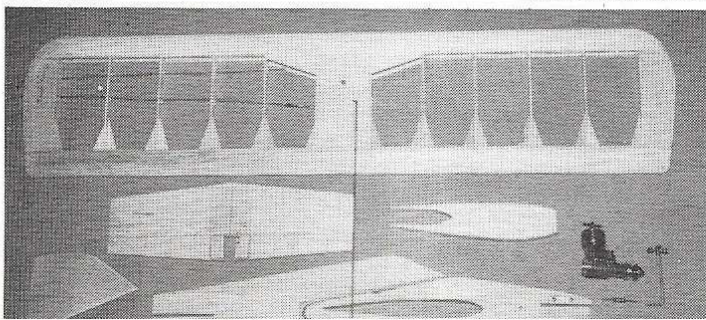
Flying

If this is your first attempt at control-line you would be well advised to enlist the aid of an experienced pilot for your first flights. Let him take off and fly a few laps before taking control while he 'covers' your hand on the handle. If you cannot find an expert then be careful! Check everything twice — Up is up, etc. — and that when the model is held at shoulder height by an assistant and you 'point at it' with the handle, the elevator is at neutral. When completely satisfied that everything is OK start the engine and tune to a good, even power output — slightly rich and compression a little 'soft' i.e. peak out then back off 1/8 to 1/4 turn on needle and compression. Have your assistant hold the model back with the nose tracking slightly out of the circle, pick up the handle and take up the slack in the lines with arm held out straight. (Be prepared to step back a few paces on release to keep the lines tight while centrifugal force builds up.) Hold in a little 'Up' elevator and signal release! As the model climbs away, feed in a little 'Down' to prevent the 'plane zooming over the top of the circle. Level out and point your arm, keeping the wrist stiff, where you want the model to go. If it has been built straight it should 'sit in the groove' and fly out the tank (as the tank shown on the plan is good for 4/5 minutes it may be best to only partially fill it for first flights!). When the motor cuts, just hold the model level and it will land itself. To avoid dizziness, concentrate on the model and try to ignore the background. Fly in an open space so you do not see too many trees, buildings, etc., whizzing past.

Fig. 3



Right: cut-off detail, slider 'A' is pulled back on 'down' elevator releasing torsion spring to squash fuel feed tube. Below left: component parts of stunt trainer prior to final assembly. Below right: comparison of wing sizes on the two basic versions, stunter above, racer below.



Engines

The PAW and Super Tigre engines fitted to two of the prototypes are particularly worthy of note: For the beginner the PAW range must be about the best value out. The standard 2.49DS provides plenty of power for the trainer while the 2.49 contest or 19DS will provide a little more 'poke' for racing or stunting. Being diesels, no extra expense is incurred in starting batteries or plugs which can add greatly to costs when first starting. Some people find glow engines easier to start but as all PAWs are test run, all you have to remember is that if the settings have not been too badly mis-adjusted then the motor should run . . . eventually!

The ST X21 'Club-20' used on the prototype racer is proving to be most satisfactory, after 30 minutes bench running with a 9 x 6 propeller it was fitted with a 8 x 6 and bolted to the model. Starting

for its first flight was almost instantaneous and fellow club members timed the model at well over 80mph despite a slightly 'rich' setting and the standard, very quiet, silencer. Compression, even hot, remains good so the signs for club racing in the coming season look good. With an Irvine 'Super Silencer' and 7 x 6 glass filled prop we may touch the magic ton!

Footnote

If you are lucky to have a tarmac site, the wing tips and base of the fin should be protected with wire skids epoxied into place. They are not necessary on a grass site.

Club/Display Racer Rules

Rules

Racing shall broadly follow the rules of racing conduct as set by SMAE for 'Goodyear'.

Line length: 52ft. 4in.

Heats: 100 laps with one compulsory pit stop.

Model:

(i) Shall be of realistic appearance and represent a typical racing aircraft. It need not be true scale but the Contest Director may ask for documentary verification of 'unusual' models.

(ii) Wing area 250sq. in. (16dm²).

(iii) Fuselage depth 5in. (125mm) measured within wing chord.

(iv) Minimum wheel diameter 1½in. (35mm) balloon tyre for grass flying site.

(v) Fuel system atmospheric only.

(vi) Re-fuelling system 'squash bottle' only.

(vii) Engine 'box standard', 3.5cc as per 'Club-20'.

(viii) Fuel cut-off desirable (but not compulsory).

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