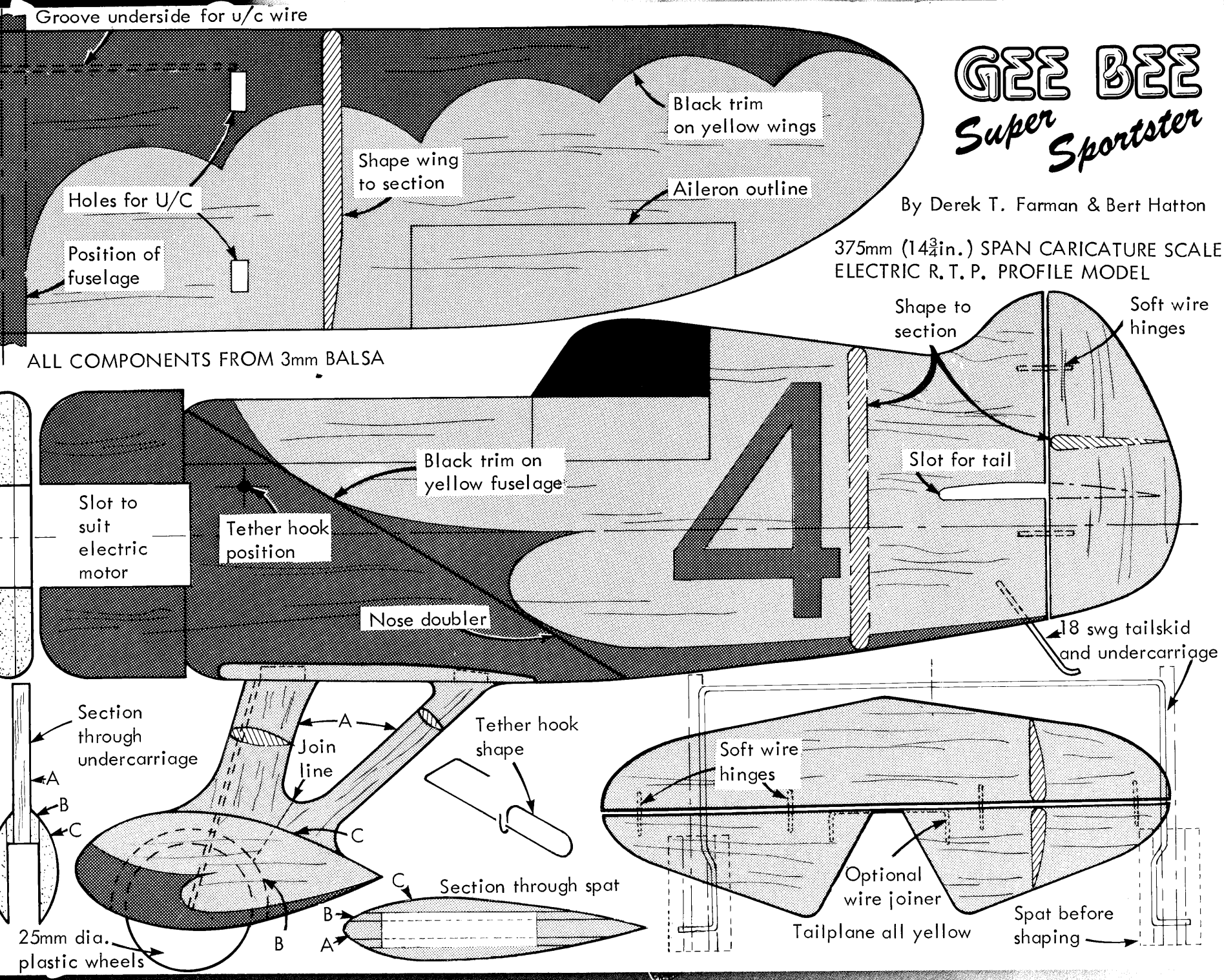
GEE BEE Super Sportster

By Derek T. Farman & Bert Hatton

375mm (14¾in.) SPAN CARICATURE SCALE
ELECTRIC R.T.P. PROFILE MODEL

ALL COMPONENTS FROM 3mm BALSA



RTP Combat action out-of-doors as a profile Messerschmidt 109 is chased by a Spitfire both flying round the same pole. Target crepe streamers can be towed to record cuts on the oponent, or models can be raced or flown in formation.

ELECTRIC ROUND THE POLE FLYING

by Derek Farman

Well known for his prize-winning models at the annual Model Engineer Exhibition, Derek Farman teaches at Stalham School, Norfolk. Naturally enough, Derek also runs a school model aero club which frequently gives flying displays. You may have seen one such display which recently appeared on the BBC1 Blue Peter programme on November 13th. Based on his experience with RTP flying and arising from the continuous barrage of questions he is asked by those interested in getting started, Derek presents a short series progressing from the fundamentals through how to convert standard kits, build from plans and even design your own models.

WHAT EXACTLY IS Electric Round-the-Pole flying? Well, it's not a new idea, it started more than 30 years ago simply by tethering models, originally rubber or jetex powered, to a short fixed pole to give the flight circle some altitude, to enable them to be flown indoors in a limited space, or even outdoors. Flying in a 'captive' circle prevents collisions with walls and ceilings, although initially no control was possible other than the inherent 'trim' of the model which permitted take off, flight and landing when the power source ran out.

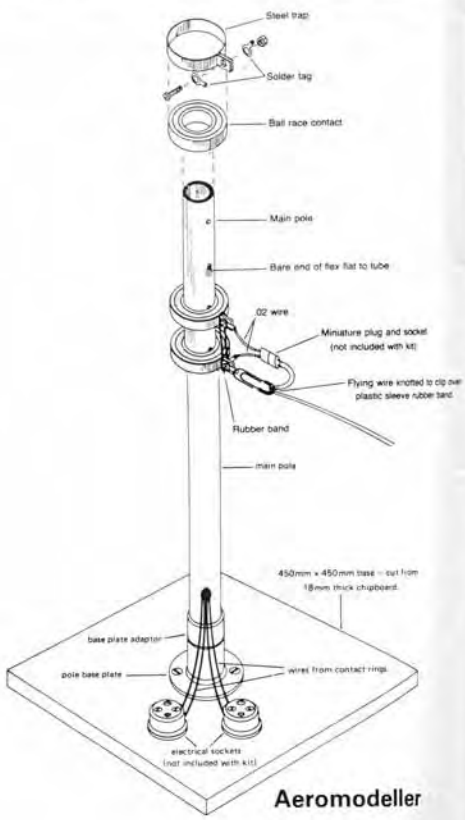
More recently the development and use of small lightweight electric motors has allowed the tether line to be utilised as supply lines for D.C. electric current from a transformer. Control can be achieved by varying the current using simple hand controlled rheostats similar to trigger operated slot car controllers. Take offs, landings, almost limitless duration, climbs, dives, even loops can be performed in this way. A very wide range of aircraft can be flown successfully from simple single engined 12in wing span all-balsa sheet trainers to 40in plus multi engined, highly detailed scale models,

RTP is in fact one of the safest and most convenient of all types of aero-modelling. The current from the mains is reduced via the transformer to just 12 volts (as for slot car racing or model railways). The models are firmly attached to the pole head by not only the two copper electrical supply wires but also, if desired, by an extra safety line of 20lb+ 'Pull' fishing line. Even if by a freak chance, a model did escape the lines, it is so light that if it did hit anything, the chance of damage is extremely slight.

Essentially, it is an indoor activity, and is really very safe. The smell, mess and noise associated with miniature Glow-plug and Diesel engines, are eliminated with the use of electric motors which are virtually silent, emit no exhaust fumes and of course need no liquid fuels. In fact in this noise and pollution-conscious age, RTP can do a great public relations job for aeromodelling in general by providing a counter to the often exaggerated adverse publicity given to Control Line and powered Radio Control flying.

My first attempt to introduce aeromodelling to pupils of my school was a little disappointing. I soon realised that most of my recruits were highly skilled and experienced plastic kit modellers, used to highly prefabricated kits and a very high degree of detail. When faced with the prospect of building flying models they all plumped for "aeroplanes that looked like aeroplanes". Thus, they chose small rubber-powered scale models so attractively illustrated on box covers, which when opened revealed two die-printed balsa sheets, a few 12in lengths of strip, a pair of wheels, a piece of wire, and the plan – a far cry from the mouth-watering model they were anticipating. My ex-plastic kit builders soon discovered a need for a whole new range of skills. Obviously what is required are a few simple all-sheet trainers first. Quick to build, easy to fly and once familiar with balsa glue, tissue, etc., progress towards more interesting models,

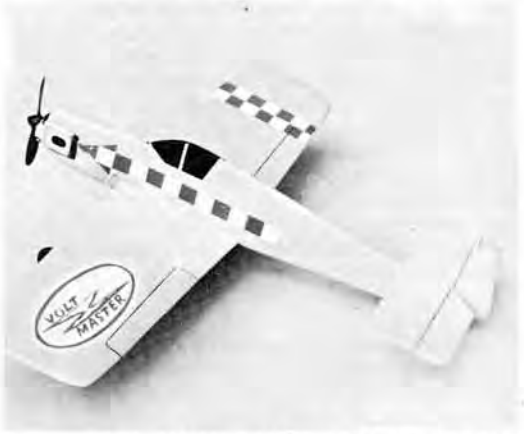
RTP offers many advantages, being an indoor activity, it's weather proof and can be carried on throughout the year whatever the weather, in a large room or small gym room. Profile sheet trainers can be built in an evening and are virtually "bend proof". Weight is by no means so critical as with free flight models, so the elaborate authentic colour schemes so beloved of scale plastic kit modellers are immediately possible. Motors will start instantly at the



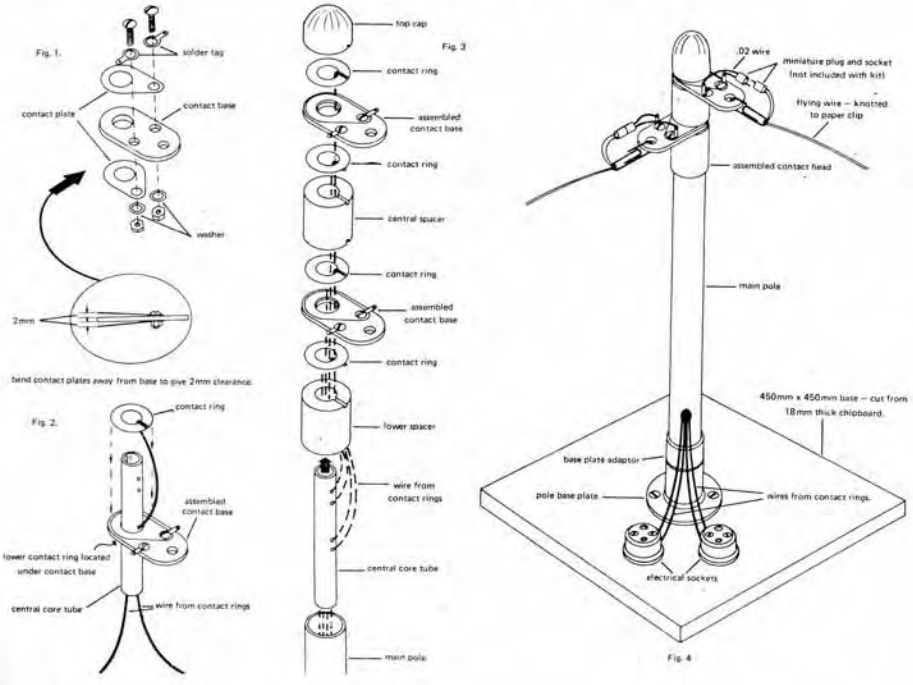
flick of a switch with none of the problems of an engine that won't start. With a minimum of pre-flight trimming, success is almost guaranteed, a vital ingredient to generate the ambition to tackle more demanding subjects.

If all they did was buzz round in a circle the novelty would soon wear off. However, once basic piloting techniques are learned, the great versatility of RTP reveals itself. Simple balsa profile models flown two at a time in the same circle can race, fly in formation and fight combat. The latter consists of highly manoeuvrable light weight models, such as Camels and Albatrosses or 'Spits' and ME 109s or Corsairs and Zero's trying to 'shoot each other down' by cutting a paper streamer towed by the opponent or even 'chewing up' the opponents tail with your propeller. Spills, crashes, forced landings are common while the worst splintered model can be instantly repaired with glue or spare sheet tails. Aerobatic flying is possible by models fitted with more powerful geared motors. Racing competitions based on similar aircraft and engines can do much to encourage careful building, pre-flight trimming and piloting, with compulsory 'pit stops' say every 20 laps to add take off and landing skills and drama to a race. Even balloon bursting, spot landings and 'carrier-deck' landings using arrester wires and hooks on the models are all possible. Fragile, early flying machines can be made to fly with the incredible wealth of scale detail the sight of which can become an end in itself. The scope is limited only by the imaginations and enthusiasms of the flyer. RTP offers far more than a glorified 'Magic Roundabout'.

The cost of flying comes with the initial outlay for the pole, transformer, rheostats, with the motors and models being quite inexpensive. You can build your own equipment with a little knowhow (to be dealt with later) or I would strongly recommend that you choose from the specialist range of equipment such as that advertised by Harry Butler models. Thoroughly reliable equipment is vital, for nothing is more frustrating than continual circuitry faults. To purchase all the equipment needed including the largest transformer available will cost about £50 although you can start for as little as £20 This might seem expensive but, the real cost-effectiveness comes with the years of flying following initial purchase. Certainly it becomes very economic for a model club or group of flyers. Models can cost less than 60p and even the motors are cheap, some under £1. Moreover, the equipment, if looked after, will last virtually indefinitely so the cost per flight becomes minimal.



Left to right above: ***Close up standard geared electric motor and press button rheostat hand controller both from Harry Butler Models. Typical all sheet profile trainer, motor fits in slot at nose, note line tether hook.*** Below: ***polehead details.*** far left, ***utilising ball races and metal straps, with commercial plastic version below.***



If you're thinking of starting on your own, the best idea is to enquire at your local model shop or ask Harry Butler if they know of an established RTP group in your area. If there is, don't be frightened to get in touch with them, for most modellers are only too pleased to have the opportunity of demonstrating their wares to an interested audience and offering help and advice.

If no local group exists, don't fear, all is not lost. You will be in exactly the same position as my colleague Chris Blanch and I when we began RTP at Stalham in 1975. Knowing little about electricity is by no means a disadvantage. If you buy purpose built parts from an established source of supply, you will only need to know how to use a soldering iron and a screwdriver to provide a virtually fool proof, durable system.

The system consists of a pole equipped with a series of freely revolving electrical contacts. The model to be flown is fitted with a small 12 volt DC electric motor which is connected by two finely insulated

Above: ***selection of mains transformers to suit various needs.*** **Left to right:** ***small 15 volt DC 2 amp output unit for single model up to 9ft lines; Medium 20 or 30 volt DC 3 amp unit for single or dual flying on 10-15ft lines; Heavy duty multipurpose transformer for 18, 22, 30, 36 or 46 volts DC 6 amp output for single models on 10-30ft lines.***

electrically conductive flying wire to the pole mounted contacts. The contacts in turn are connected to a low voltage D/C power source, normally a purpose built mains transformer unit, through to a hand held controller. The controller allows power to the motor to be varied over a wide range and it is by carefully timed and gauged power alterations that the motor can be made to speed up or slow down to enable the model to take off and perform airborne manoeuvres under complete control. Buy the best that you can afford, bearing in mind that you will get what you pay for and sturdy, forgiving equipment gives less trouble in the long run.

The Pole

Obviously the most important unit, settle on a suitable pole kit preferably one which permits two-model flying. If using one supplied with ball races first wash in paraffin to remove protective grease. Assemble pole kit as instructed and note that the lower contact of each pair has two tags – one for the electrical supply wire connection and one for an extra tether line anchorage. Fix assembled pole to some form of 'base' which can be weighed down with bricks or weights to prevent the models pulling it over.

The Transformer

Second in importance only to the pole itself, a purpose designed power-supply is ideal. If you try to use transformers from train sets or slot cars you will receive only very poor performance. As they are usually not powerful enough, they will not push enough current through the system to overcome the resistance imposed by the flying wires. A good commercial RTP transformer will permit dual model flying on line lengths from 3 metres to about 10 metres. The unit consists of a heavy duty mains transformer, bridge rectifier and smoothing capacitor. Voltage selection (to compensate for different line lengths) is controlled through a snap action rotary switch which may be used with a model in flight. There is a 'reverse polarity' switch and it may be used for braking effect for landings. Finally a built-in ammeter provides a constant current reading to monitor performance and to be referred to as a guide when matching voltage output to line length.

Control Gear

Control of the model is achieved through a hand held rheostat controller through which power from the transformer to the model motor may be varied. As with all power units and motors, rheostats are built to cope with varying loadings and one suitable for the intended application must always be used. Overloading the rheostat will cause overheating and could result in early breakdown, so match your equipment to suit expected load. A hand grip rated at 5 ohms, is suitable for intermittent use with small units but not for use with large high powered models where a 15 ohm-rated unit is appropriate.

Motors

These are rated at 12 volts D/C although current loading varies with type. For the motor to develop full power, it is essential that a power supply of at least equivalent output be used. The choice of motor depends upon type and size of model to be flown. Before examining types of motor and usage please remember the following: Never connect a motor direct to the mains.Apart from being dangerous, you will fry it! Never overload the motor by using a propeller that is too large, follow the recommended sizes. Choose your motor to suit your proposed model size, and remember motors can be removed and fitted to different models so reducing cost.

Fittings

Wire, plugs and sockets are required to complete your circuit; single strand PVA coated flying wire (30 swg) for carrying current to model; twin core PVC insulated flex for power unit to pole connections; two-pin plug and socket sets for power unit/pole wiring connections; two part flex connectors for joining wires; miniature lightweight plug and sockets for model to flying line connections.

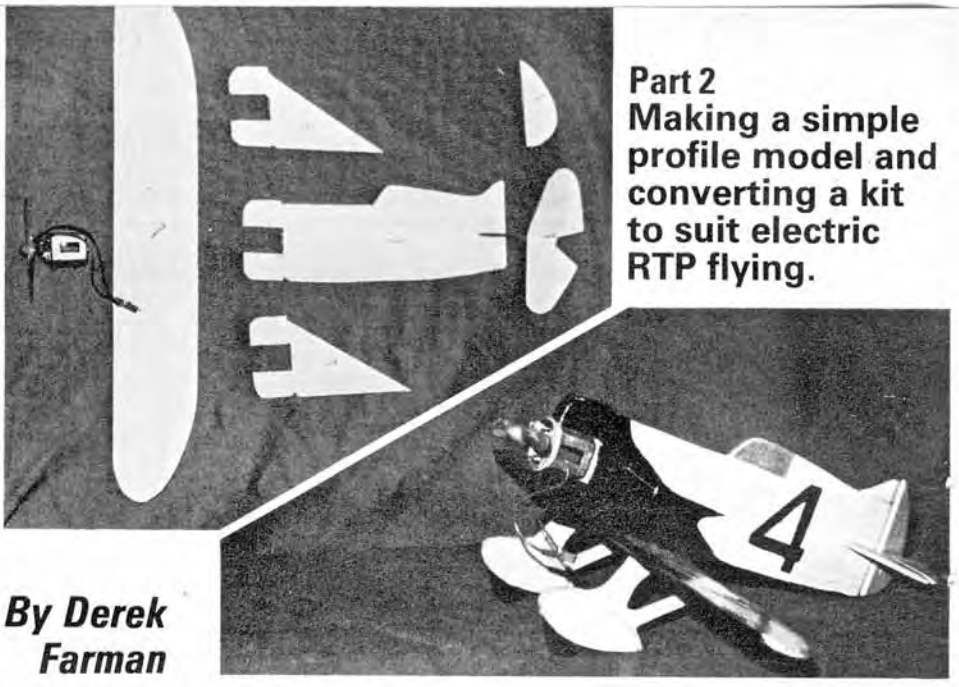
Next month

Full size plans for a profile Gee Bee racer based on the famous original full size American racing plane.

Derek continues with details of building the model, installing the motor and how to make it fly. Details, too, on how to convert simple quick build kits for use with electric RTP.

Here is the taste of the super scale models ideal for electric RTP flying which will appear in future chapters. Many of the lightweight rubber powered kits make ideal subjects for conversion to electric flying.

ELECTRIC ROUND THE POLE FLYING



Part 2
Making a simple profile model and converting a kit to suit electric RTP flying.

By Derek Farman

THE 'GEE BEE SPORTSTER' some may think, is not the most attractive of designs but the profile model does possess many positive virtues. It is easy and quick to construct and can be built entirely out of one sheet of 1/8" balsa plus a pair of 1 in diameter wheels and some 18swg piano wire. The thick fuselage will stand up to any number of 'tail heavy' landings and can easily be repaired.

Construction sequence is simply as follows: trace fuselage, nose doublers, wing and tailplane onto the balsa sheet. Note the vertical grain on the detached rudder. Cut out all parts, glue both cheek pieces to the fuselage and when dry sand them to exact shape of fuselage, use clothes peg to hold cheeks in place until dry. Round off all edges on wing, tail and the fuselage except on the underneath section where the wing is to be fixed. Try-fit elevators, then re-attach with fuse wire dipped in glue, preferably Epoxy, and push fitted elevators into place. Glue tail plane into fuselage slot – check that it is square. Cut out rudder and push fit that into place with fuse wire. Glue wing to bottom of fuselage, make sure everything is square and hold in place with pins until dry. Bend 18swg wire to undercarriage shape and epoxy to underside of wing, reinforce with small patch of nylon. Bend and epoxy wire tail skid into place. Attach wheels to undercarriage using short lengths of rubber tubing (stripped from electrical flex). If you wish to decorate the model, do so at this stage, using felt tipped pens or paint. Check that the elevators are adjustable – vital for trimming. Shape wire tether hook, push through fuselage, bend the end over and epoxy into place. Enlarge gap in nose for snug fit of a Johnson SP7 motor. Cut two pieces of electrical flex 90mm long. Remove insulation and solder each to the sockets in the miniature plug. Then solder the other ends to the contacts on the motor. Your Gee Bee Sportster will now be ready to fly as soon as you have fixed the motor in place with glue.

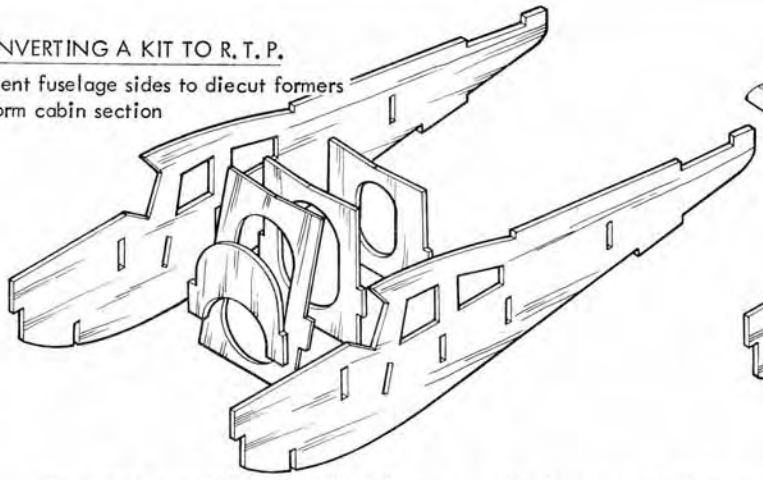
A model flyer has two 'friends' to help him – Thrust and Lift and two 'enemies' that he must overcome – 'Drag' and 'Gravity'. Thrust is of course provided by the power source – the engine. Lift is a little more complicated, being provided by the 'aerofoil' section of the wing, the angle it passes through the air and its speed. Opposing Thrust and Lift are 'Gravity' i.e. the total 'all up' weight of the finished model and 'Drag' i.e. resistance to the air by non-streamlined elements in the design. Thus in practical terms you can understand the need for a suitably powerful motor; the use of an aerofoil shaped wing, cleanliness in design and keeping the model as light as possible.

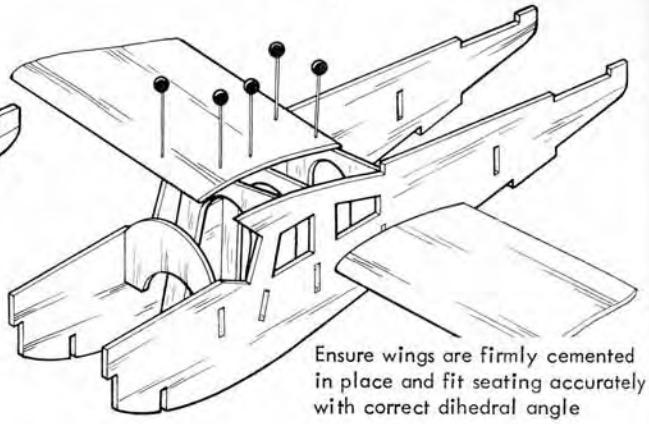
Plug the model onto the flying lines, offset the rudder 20° to the right (to ensure the model flies outwards) and set the elevators at neutral. Now hang the model, wings vertical dangling from the lines to check position of tether hook, by adjusting its position fore or aft until model hangs correctly. Thus hooked up, you are ready to fly, slowly depress the hand controller and the machine should roll. The aim is to achieve level flight, but in the event of anything proving unsatisfactory, refer to the 'Trouble Shooting Chart' below.

Trouble Shooting Chart

Symptoms	*Probable cause*	*Remedy*
Engine does not work	Fault in circuit/loose soldering.	Re-check everything. As a last resort, try another engine in case of a burn out.
Model runs inwards on take-off circuit	1. Rudder with insufficient offset. 2. Wheel sticking on undercarriage. 3. Engine pointing inwards Weight of lines dragging light model.	Bend rudder more to right. Lubricate wheel, ensure free movement. Realign outwards. Add tip weight to outside (starboard) wing.
Model tips over on nose	1. Wheel sticking on axle/undercarriage. 2. Centre of gravity too far forward. 3. Wheels too far behind C.G.	Lubricate. Bend tether hook forwards. Bend u/c unit forward.
Model flies 'tail heavy'	1. Centre of gravity too far back. 2. Too much 'up' elevator.	Bend tether hook back. Bend elevator down.
Model fast on ground, won't take-off	1. Too much 'down' elevator. 2. Too much negative angle of incidence on engine.	Bend elevator up. Re-align engine upwards.
Model flies outer wing high	Tether hook bent up.	Bend tether hook down.
Model flies outer wing low	Tether hook bent down.	Bend hook up.
High wing model 'wobbles' on line	Line rubbing against port wing tip.	Hold wire in place with small piece of masking tape on wing tip.

CONVERTING A KIT TO R. T. P.





Assuming everything is well and you succeed in achieving level flight, experiment by varying the throttle, the handheld rheostat. Don't worry if your model assumes a mind of its own, going into a series of initially uncontrollable climbs and dives, The Gee Bee is a sturdy animal and will take plenty of knocks until you have mastered the controls.

Practice your newly acquired piloting skills – take offs, climbs, dives, landings etc. Once proficient, try some two plane flying with other pilots – or racing over a set number of laps; formation flying and even combat! For those who prefer combat flying, why not build some profile 'Combat Doubles' e.g. Spitfires and FW190s: Hurricanes and Me109s: Corsairs and Zeros? Combat is far more interesting when fought between realistic looking aeroplanes bearing national insignia.

Left: ***Steven Haynes with his Keil Kraft Cessna Skylane converted for Electric Round the Pole flying.***

Having learned the basic principles, many of the all sheet built-up kits make good subjects for conversion to Electric RTP. Typical of these models is the Keil Kraft Eezebilt range; models like the Cessna Skylane are ideal. The model is simple to build; all parts being die cut, the fuselage is built up into a balsa box but not the wings and tail surfaces. These models are quite attractive and although designed for rubber power are easily converted to RTP. Cut out the die cut parts from the balsa sheets, don't press them out as they might split. Compare them with the diagrams on the plan and make sure that all parts fit 'dry'. The balsa parts are precoloured; either leave them like this or adopt your own colour scheme. Begin building the first steps as detailed on the plan, by assembling fuselage and adding the wings. The nose section of the model will require modification to suit the electric motor and tether hook. Make a tether hook from 18swg wire. Push the end through the left hand fuselage side and epoxy to fuselage former reinforced with a patch of nylon. Take the front fuselage former, place your electric motor, such as a Johnson 222 motor over the former and draw round it and cut out this engine hole.

To fit the motor you will require a duplicate former made from 3/8" balsa or laminated from 1/8in. Place front former on the balsa and draw round it and cut out duplicate. If using 3/8" sheet, gradually hollow out the central hole until the engine is held with a tight push fit. Now glue from formers together as per plan backed by extra 3/8in former and add onto fuselage.

Continue construction to complete model. Cut the fin across rudder line and glue it in place, angled 20° to the right. Cut the tail across the elevator line and hinge with fuse wire as before. This adjustable tailplane is vital for flight trimming. When everything is dry, you can finish the model by glueing the tail surfaces into place as directed and putting the windscreen in place by using clear Bostik glue. This will hold the acetate on the balsa without disfiguring it.

If you wish to paint the model, prepare surfaces using sanding sealer. When dry, the balsa will feel very rough to the touch as the sealer has filled the grain. Take fine glasspaper on a sanding block and gently rub down the balsa until the roughness disappears. Repeat until smooth before adding your chosen colour scheme. The colour scheme of the kit should still be visible to use as a guide. Humbrol enamels are quite suitable. Masking tape can be used to achieve straight paint lines, mark out pattern with 1/2in wide paper masking tape, make sure edges are stuck down well. Apply the paint and leave the tape in place until the paint is thoroughly dry. When you do remove it, you should have a good, straight line. Always paint lightest colours first as these can be overpainted with darker colours after but this won't work the other way round.