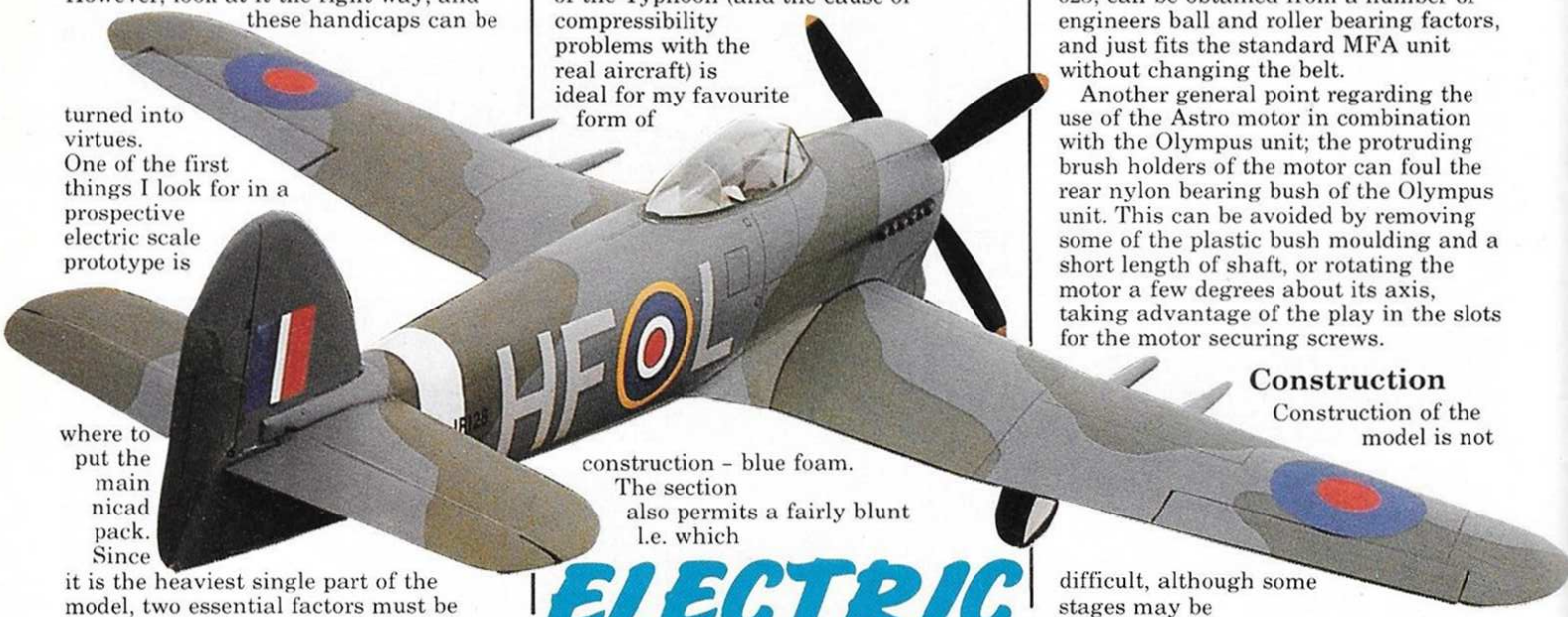
ELECTRIC TYPHOON

Master of the electric scale model, here's Dave Chinery's



"You must be mad!" was the reaction to my proposal to build an electric Typhoon. I have long been impressed by the chunky, pugnacious look of the full-size aircraft, and the choice of colour schemes, so when I wanted to select a "handy size" scale job for my next project I decided to look at the possibilities a little more closely.

At first sight, the "Tiffy" is a strange choice for an electric scale model, with its small, thick wing and cavernous radiator cowling making for one of the bluntest shapes in the fighter business. However, look at it the right way, and these handicaps can be turned into virtues. One of the first things I look for in a prospective electric scale prototype is where to put the main nicad pack. Since it is the heaviest single part of the model, two essential factors must be located to get the model's c.g. in the right place. This is not always right place. This is not always easy in a scale model due to limitations on fuselage shape and the ability to build in access hatches, etc. If the motor leaves enough room, the logical place to put the pack is in the engine cowling, but this often results in the model tending to nose-heaviness. This was the case with both my Spitfire and the much shorter-nosed Typhoon.

In the case of the Tiffy, the deep chin radiator gives plenty of room to put the nicad pack below the motor, and the low location has other advantages! Having found somewhere to put the power pack, you must consider the landing loads, which may be severe in a small, heavily loaded model like the Tiffy. The logical thing to do is to land on the pack, dissipating all its kinetic energy direct to the ground! With this in mind, the radiator cowl on the Typhoon model is reinforced and acts as a skid for landing, the nicad pack being cushioned inside it with foam.

The thick wing that is characteristic of the Typhoon (and the cause of compressibility problems with the real aircraft) is ideal for my favourite form of construction – blue foam. The section also permits a fairly blunt l.e. which makes the stall a little more docile – a useful feature for a heavily loaded model.

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Taking all the above features into account, the model was designed to fit a 540 size motor and a 7-cell nicad pack. Due to the continuous high power output necessary to fly the model sufficiently fast, an Astro Cobalt 05 motor was selected. In addition to its good power output, its superior efficiency (over ferrite motors) would maximise flight time from the finite energy available from the batteries.

The blunt nose entry made a geared propeller drive essential, and the model was designed round an MFA Olympus belt drive turning a 12 × 7 prop. It was felt that, at the expected flying speed, the model might still be undergeared with this combination, so the motor pulley was changed for a 20 tooth type, giving a 2:1 ratio instead of the usual 2.4:1. The new pulley, a Davall 20MP-025, can be obtained from a number of engineers ball and roller bearing factors, and just fits the standard MFA unit without changing the belt.

Another general point regarding the use of the Astro motor in combination with the Olympus unit; the protruding brush holders of the motor can foul the rear nylon bearing bush of the Olympus unit. This can be avoided by removing some of the plastic bush moulding and a short length of shaft, or rotating the motor a few degrees about its axis, taking advantage of the play in the slots for the motor securing screws.

Construction

Construction of the model is not difficult, although some stages may be novel to the average modeller. It is suggested that the wing is made first, as it will be easier to make the wing seat/fillet area of the fuselage if the wing is available to fit it.

The wing is made from 2in blue foam, the straight tapered blank being wire cut in the usual way using the templates shown on the plan. I find it best to cut two blocks to the correct plan view shape (leave tips square) before attaching the templates to the tips and roots. Be sure to set the correct washout using the datum lines shown on the template drawings.

The templates are slightly oversize on thickness, so if inexperienced cutting results in ridges in the cut surfaces, there is a little excess for sanding off. The pair of wing blanks (you did make two opposite halves, didn't you?) can now be rounded off at the tip, and the balsa l.e., t.e., and laminated tips added, p.v.a. glue being best for this.

You can't accuse us of not offering you 'different' models in **RM!** *Extensive use of blue foam in Dave's Tiffy calls for novel techniques you'll enjoy... A glassfibre cowl unit is available for £5.50 from our Plans Dept.*

When the glue is set, mark the position of the dihedral breaks across the chord of the wing, and carefully saw the panels apart with a fine toothed saw, square to the bottom surface. Carefully sand the cut face of the outer panels until they are a good fit to the root panels at the correct dihedral. Don't go for the glue yet, before rejoining the wing panels there is a bit of extra work to do...

First, take the root panels, and cut them carefully into front and rear halves at the point shown on the plan. Add temporary templates to the ends of each piece to give a minimum "skin" thickness of about 10mm. Hollow out the four pieces as shown on the plan, with the wire entering and leaving at the mid-point of the joint surface between front and rear halves. When reassembled, the wing should have hollow areas each side of the "slid" spar in the centre, but with only the spanwise vertical cut showing at the surface.

If proposing to fit a scale u/c for static display, like my version, the centre section is beefed up with a 3mm balsa spar let into the foam as shown, the outer ends of which carry balsa blocks with short tubes in to accept the u/c wires. For purely static display this should be strong enough, but I thought I might try "dolly" takeoffs, so I further reinforced the wing by sandwiching hard balsa skeleton ribs at the joint between the inner and outer panels. Since this requires some very accurate work to ensure a strong joint, it is probably an unnecessary complication in your case.

Whilst the centre section is apart, plan your aileron servo installation. I glued a small rectangle of 1mm ply to the bottom skin in the rear hollow of the wing, to which the servo was secured with servo tape. The ends of each half of the aileron snake (see below) were fixed to a spanwise balsa strip glued to the back of the "spar". It is easiest to make provision for these before the centre section is assembled, although not impossible afterwards if you forget.

Assemble the four centre section pieces using epoxy or p.v.a., making sure the centre joint is beyond reproach strengthwise. Whilst this lot is drying, we can turn our attention to the tips. Shape the tips with coarse abrasive paper, sanding the excess foam down to match the depth of the tip laminations, and blend the latter into the l.e. and t.e. Mark the positions for the ailerons, and carefully cut them from the panels, removing extra material as shown to accommodate the 1.5mm balsa edging strips. Add the latter to the cut surfaces of the pieces to allow downward deflection of the ailerons. Balsa blocks may be added to the ailerons for horns, but are not essential if ply or glass epoxy board horns are used (it's all extra work and weight!).

The next stage is to hollow out the open areas of the undersides as shown on the plan. This is best done by routing, as described in my series of articles elsewhere, but may also be melted out with a hot wire hoop if available. Heavy gauge copper wire bound to the tip of a large soldering iron is one way to do it.

Having decided where the aileron horns will be fitted, mark out the line of the aileron snakes to match the location

of the rear of the centre section spar. Using the hollow areas of the tip panels to best advantage, make the curved tunnels for the snakes, and epoxy the outers into the foam, leaving enough protruding from the face of the dihedral joint to reach the servo in the centre section. The aileron ends of the snake outers can be reinforced by making them poke through holes in small squares of 1mm ply, or epoxy small squares of glass cloth over the areas.

When satisfied all is ready, join the tip panels to the centre-section, preferably using a good gap-filling epoxy to ensure the entire wing profile carries the loads through. The wing structure is completed at this point, and the remaining operations consist of aligning and glueing the servo ends of the aileron snake halves, letting the tubes for the front wing bolt and cannon pegs into the l.e. (epoxy), and skin reinforcing the centre section.

The centre section should be skinned either with light glass cloth and epoxy resin, or a layer of Solartex, or ordinary nylon "doped" on with emulsion paint. The top skin needs to extend about 20mm outside the wing seat area, but the lower skin should finish about the same distance outboard of the dihedral break for improved resistance to landing abrasion. Finally, add a small piece of 1mm ply top and bottom at the t.e. for the rear wing bolt, and two strips to the underside of the l.e. at the root to prevent the cowl cutting into the wing on landing.

Fuselage

In contrast to the wing, construction of the fuselage is much more conventional. Having cut out the various parts, and laminated the ply doublers to the 2mm balsa fuselage sides, the basic box is assembled in the usual way. When cutting the motor plate ensure the 5 degrees right thrust is included - it is essential due to the torque of the propeller. There is no up - or down - thrust.

Having assembled the basic sides and formers, mount the embryo fuselage on the wing (you did make it first didn't you?). Locate and glue the rear wing bolt plate in front of F3. Pack the fuselage sides off the wing surface with scraps of 1.5mm balsa to allow for the facing strips to be added later. After ensuring wing and fuselage are square, mark the position for the wing bolt.

Drill the wing at the ply reinforced location for the bolt, square to the wing lower surface, replace the wing to the fuselage and use the hole in the wing as a jig for drilling and tapping the 4BA hole in the 3mm ply plate. The threaded hole can be tapped either by a proper tap, or by a steel 4BA screw with slots cut in it like the flutes of a tap. Strengthen the wooden thread by soaking some cyano into it. When hardened, insert a screw with a little grease or vaseline on it to smooth over the hairs raised in the thread by the glue.

After covering the wing centre section with some clingfilm, cut the wing facing strips from 1.5mm sheet to the correct plan view of the wing fillets, and Sellotape them in the correct positions on top of the wing. Having applied some glue, screw the fuselage sides down on top of the facing strips, which henceforward should be a perfect fit to the wing. Cut out and add the rear taper outline of the fillets to the bottom of the fuselage sides behind the wing. The rear ends of the facing strips should be glued to the rear taper piece at the wing t.e.

Whilst this lot is drying, cut a large area of 12mm thick "sheet" material from a block of blue foam. This will be used to make most of the remainder of the model, with the exception of the top decking.

Cut two pieces of the foam sheet to the same shape as the fuselage sides. Trim the bottom edge to fit the slight anhedral angle of the wing seat strips, and glue to the balsa sides and seatings. Cut and glue the foam bottom sheet, tapering the front end to fit the angle of the balsa fillet outline. Cut a couple of foam blocks to the top and side profiles of the front and rear top decking, and lightly glue in place for shaping. Add a couple of triangular section pieces of foam to form the basic shape of the wing fillets where the balsa outline protrudes beyond the foam fuselage side pieces. Whilst the above assembly is drying, cut the tail surfaces from the foam sheet, allowing for the balsa edging to be added which is the next step. Pieces of t.e. section or balsa sheet form the trailng edges, with the remainder of the curved tips and tailplane l.e. laminated up from 1.5mm balsa strips of appropriate widths. When dry, cut the tailplane across at the hinge line and remove excess material to make room for the 3mm balsa sheet full-depth tail spar. Trim the foam at an angle as shown in the side view to give an open angle underneath. Cut a similar sheet spar to joint the elevators, angling it the opposite way to the tail spar to give clearance for down elevator. If doubtful about the strength of the sheet to join the elevators, add a doubler behind the joiner over the middle 3in say, recessing the foam elevator blanks to fit. If fitting a moveable rudder, use the same technique, hinging the surface on the starboard side.

Cut nose ring F1 from 1mm ply, and fix it temporarily to the back of a disc simulating the spinner backplate, but spaced about 3mm back from where the spinner will finish. Temporarily fit the Olympus drive unit and mount the nose ring assembly on it to get its position right. Trim the rough shaped upper decking back to let F1 sit in the right place. Glue the ring to the foam decking only and leave to dry. Check the tail seating is level in front view and trim if necessary.

When all fuselage joints are dry, shape the foam to the correct cross-sections, checking the plan and "eyeballing" from photos to get a better idea of oblique profiles. As a rough guide to the correct cross-section, the top and bottom lines of the sheet fuselage sides should be just under the surface over most of the fuselage aft of the c.g. Start by removing the corners with a breadknife or similar, then progressing to Surform or coarse (60 grit) abrasive paper. Wrap some of the latter around something cylindrical and about 30mm diameter to sand the concave shape of the wing fillets, using the balsa outlines as a guide to the complicated shape.

When satisfied with the shape of the fuselage, trim the cockpit canopy moulding and use it to mark its position on top of the fuselage. With a sharp knife, cut out the

Finished model is larger than you think at first glance; span is four feet and prototype's all-up weight was 1.5kgs. Build a scale prop for static display like Dave.

recess for the cockpit interior, forming the shape of the control panel integral with the foam. (The seat back can also be done this way, but is better fixed to the removable pilot).

With a finer grade of abrasive paper, finish shaping the foam parts ready for covering.

The cowl

The major remaining item is the cowl. Unless a ready-made moulding is available, you can make one by the following method, which is useful for other fibreglass mouldings.

Make the male master from a block of foam, shaping it by a similar method to the fuselage. It may help to stick it temporarily to the diagonal facings on the fuselage sides, trimming the block to fit behind the lower half of F1, to which it can be stuck. Do not recess the front for the oval air intake opening, but leave it flat.

When satisfied with the shape, cut the master from the fuselage, cutting F1 in half across the horizontal joint line. Using scraps of foam, build up the joint faces by about 10mm. Using scraps of Solarfilm (any colour will do!) carefully cover the master block avoiding wrinkles. You now have a male master with a Solarfilm standard of finish.

After coating the master in parting agent (washing up liquid can suffice, but the proper stuff is safer), start making the female mould. Use epoxy resin (SP113 or similar) for the first layer since the styrene solvent in polyester resin makes Solarfilm wrinkle. Once the first layer has gelled, the thickness of the mould can be built up using the cheaper polyester resin and glass mat, to a thickness of about 3mm. If the master has been shaped correctly (and you remembered the parting agent), it should be possible to remove it from the female mould with a little persuasion. If this is not possible, it is best to cut the mould in two halves along the centre line using a razor saw. If you do this, remove one half of the mould only, recoat the master surface and the outside of the other half of the mould with parting agent. Replace the removed half mould, and laminate a locating lap strip along the join with a couple of layers of 1in glass ribbon. When cured, this will provide a positive location for the two mould halves. These can now be removed from the master, and the latter discarded.

When satisfied with the mould, laminate up the cowl in the usual way, making the moulding a good 2mm thick at the front (it's the landing skid, remember) and 1mm further back. The 6mm ply cowl former can be fitted and laminted into the cowl before removing it from the mould. When the moulding has cured, remove it from the mould, cut the oval air intake opening, and trim and add 3mm ply strips to the angled faces where it will mate to the fuselage. For those who prefer it, a glassfibre cowl unit is available from **RM** Plans Service for just £5.50 including post and packing. Orders as COW RM 342.

Covering and finishing

With the model more or less complete structurally, it is time to think about covering and finishing! My method is to cover everything except the cowl with silver Solarfilm, which is also used to hinge the control surfaces during the covering process. After painting the cowl silver (with a polyester compatible paint), the rest of the model is primed with matt Solarlac, green on top and grey or silver underneath. The cockpit detail and canopy can be added at this point, and the cannons can be made whilst the primer is drying. My model was decorated as an aircraft giving best scope for an eyecatching colour scheme with the invasion stripes under the wing.

For a small, fast model like this, any authentic camouflage scheme which retains a reasonable visibility will minimise the possibility of disorientation when flying - this can be a problem with really drab colours. I found all the details in *Typhoon at War* by Arthur Reed & Roland Beaumont, published by Ian Allan Ltd., but there are many other sources such as Profiles, and **a full size** aircraft in the Hendon museum.

Painting and installation

Having chosen a suitable colour scheme, you can either carry on and paint the model with Solarlac, mixing to get the colours, or you can use Humbrol Authentic colours over the primed surface. Be careful not to add too much weight! My paint job and pilot accounted for five ounces - so beware! Devoted followers of Ian Peacock's gospels will no doubt wish to airbrush the camouflage on. Spraygun dunces like me can get a good effect by brushing on the matt colours, and then finishing with an overall coat of clear matt lacquer - I used a Letraset product. My roundels and reggy letters were hand painted onto Transposeal adhesive book cover film (after priming it with matt lacquer). These were added to the model, together with rivets and panel lines, exhaust stubs, etc., before the final lacquer spray.

Before this final step, an authentic atmosphere can be enhanced by scratching through the paint to show the silver film underneath simulating the aluminium of the full-size aircraft. This is most effective in strategic places where the real thing would need regular attention, such as the engine cowlings, pilot access area, and re-arming hatches on the wings. The usual "dirtying up" techniques behind exhaust stubs and cannons can also augment the appearance of the final result.

The radio (Futaba 3 channel) and electrics were added at this point. The model requires a fairly powerful motor, and an Astro 05 Cobalt was fitted, as mentioned earlier. Other similar cobalt magnet motors will be suitable, or the better ferrites, such as the PT360, could be used. A Mole Technology radio-operated motor switch was used, saving weight by eliminating the Rx nicad (a safety cutout avoids loss of Rx power when the main nicad is depleted).

Test flights!

After adding the heavy bits such as the radio and electrics, the model scaled 3lb 5oz (1.5kg), and came out nose heavy! Test flights showed an acceptable level flight performance, but aerobatics were limited by the constant airspeed effect of the large prop. This put out of reach the benefits of the usual technique of diving to pick up speed before a manoeuvre. The model perked up considerably when powered by Sanyo Red (SCR) nicads, and all the usual non-rudder aerobatic manoeuvres were possible.

In spite of the rather daunting wing loading and scale tail area, the model flew "off the board" with the c.g. and control surface ranges shown. Because of the torque of the large prop (diameter 25 percent of wingspan) the sidethrust and the permanent right rudder setting was backed up with some permanent right aileron trim - about 1.5mm each side. Given adequate power, the model was not difficult to fly, and should be within the capabilities of the average EXPERIENCED aileron flyer. The glide is fairly steep, although not in the space shuttle class, but remember it's not a floater so keep the speed up!

Well, that's about all there is to say, except that, sadly, my model no longer exists, being finally laid low by a bungee line where it shouldn't have been! (Now what shall I build next?) Meantime, if you feel like a bit of quiet tank-busting, have a go at a Typhoon, but watch out for those pesky Me262s!