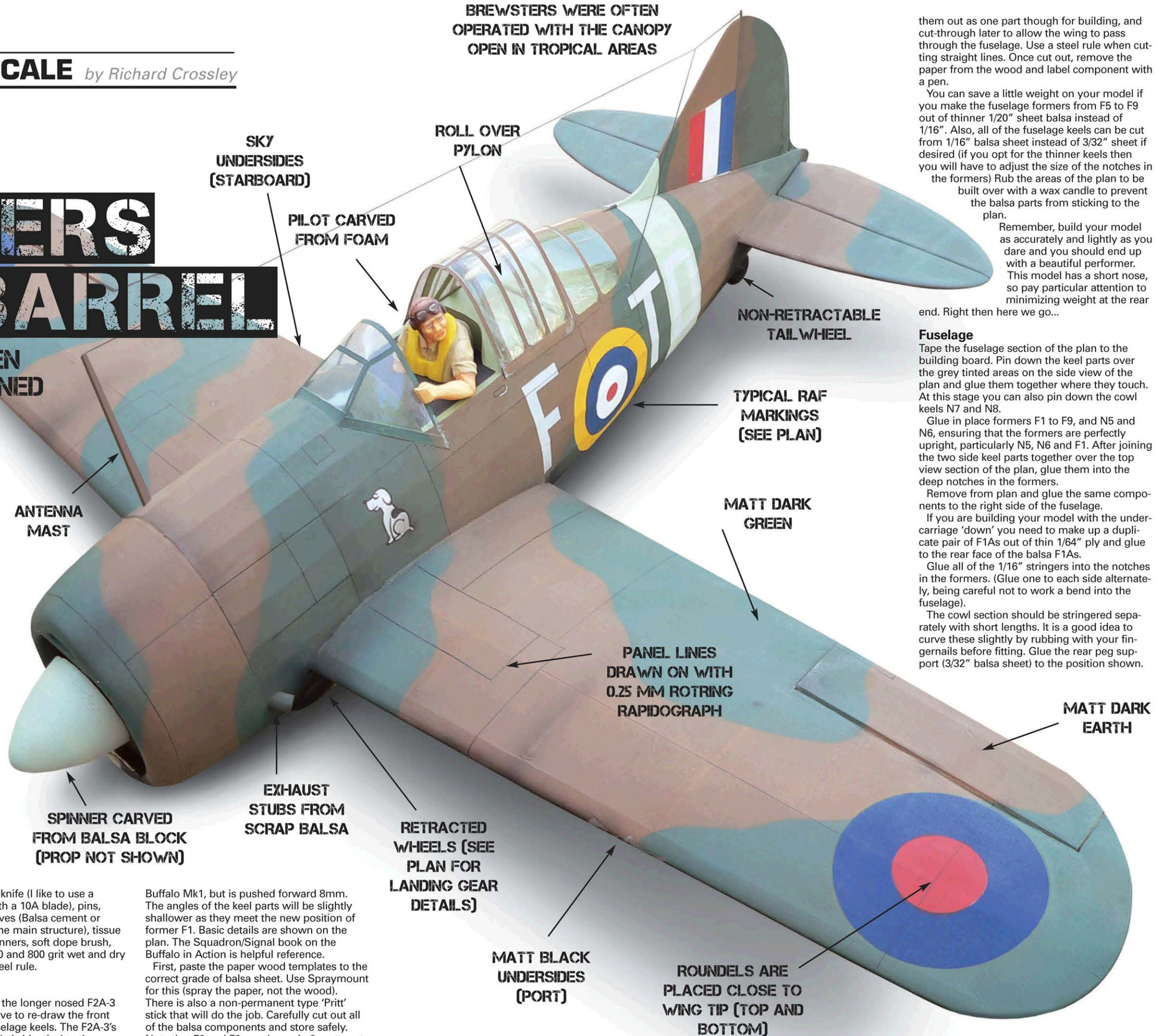
BREWSTERS FLYING BARREL

1/18TH SCALE RUBBER DRIVEN FREE FLIGHT MODEL DESIGNED BY RICHARD CROSSLEY

PART 1

ALTHOUGH OBSOLETE BY THE BEGINNING OR THE SECOND WORLD WAR, THE BREWSTER F2A WAS CUTTING EDGE TECHNOLOGY WHEN IT FIRST FLEW IN 1937. OUTCLASSED WHEN FLOWN AGAINST THE JAPANESE IN THE HANDS OF BRITISH, US AND DUTCH AIR FORCES, THE 'BUFFALO' WAS AMONGST THE MOST SUCCESSFUL FIGHTERS IN HISTORY WHEN USED BY FINLAND AGAINST THE RUSSIAN AIR FORCE. STUBBY BUT SHAPELY, THE 'BUFFALO' HAS BAGS OF CHARACTER, AND FLIES JUST GREAT!



Before you start...

As for most of my scale plans, the Buffalo is not intended for the raw beginner; nevertheless it is quite an easy model to build. Even if you are an experienced modeller I would still advise reading the instructions through carefully as there are a couple of stages where extra care is needed.

Here's a run-down of items that you will need to build your model:

A flat building board, about 1ft by 2ft and soft enough to press pins into (insulation board or rigid foam such as Floormate is good), a modelling knife (I like to use a 'Swann Morton' with a 10A blade), pins, small pliers, adhesives (Balsa cement or Aliphatic resin for the main structure), tissue paste, dope and thinners, soft dope brush, sandpaper (180, 360 and 800 grit wet and dry are best), a short steel rule.

Note

If you wish to build the longer nosed F2A-3 version, you will have to re-draw the front ends of the four fuselage keels. The F2A-3's entire cowl assembly is identical to the Buffalo Mk1, but is pushed forward 8mm. The angles of the keel parts will be slightly shallower as they meet the new position of former F1. Basic details are shown on the plan. The Squadron/Signal book on the Buffalo in Action is helpful reference.

First, paste the paper wood templates to the correct grade of balsa sheet. Use Spraymount for this (spray the paper, not the wood). There is also a non-permanent type 'Pritt' stick that will do the job. Carefully cut out all of the balsa components and store safely. Note that F2 and F3 are shown in 2 parts, cut them out as one part though for building, and cut-through later to allow the wing to pass through the fuselage. Use a steel rule when cutting straight lines. Once cut out, remove the paper from the wood and label component with a pen.

You can save a little weight on your model if you make the fuselage formers from F5 to F9 out of thinner 1/20" sheet balsa instead of 1/16". Also, all of the fuselage keels can be cut from 1/16" balsa sheet instead of 3/32" sheet if desired (if you opt for the thinner keels then you will have to adjust the size of the notches in the formers) Rub the areas of the plan to be built over with a wax candle to prevent the balsa parts from sticking to the plan.

Remember, build your model as accurately and lightly as you dare and you should end up with a beautiful performer. This model has a short nose, so pay particular attention to minimizing weight at the rear end. Right then here we go...

Fuselage

Tape the fuselage section of the plan to the building board. Pin down the keel parts over the grey tinted areas on the side view of the plan and glue them together where they touch. At this stage you can also pin down the cowl keels N7 and N8.

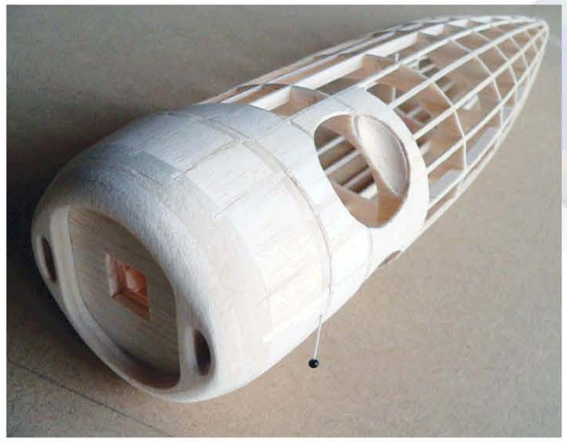
Glue in place formers F1 to F9, and N5 and N6, ensuring that the formers are perfectly upright, particularly N5, N6 and F1. After joining the two side keel parts together over the top view section of the plan, glue them into the deep notches in the formers.

Remove from plan and glue the same components to the right side of the fuselage.

If you are building your model with the undercarriage 'down' you need to make up a duplicate pair of F1As out of thin 1/64" ply and glue to the rear face of the balsa F1As.

Glue all of the 1/16" stringers into the notches in the formers. (Glue one to each side alternately, being careful not to work a bend into the fuselage).

The cowl section should be stringered separately with short lengths. It is a good idea to curve these slightly by rubbing with your fingernails before fitting. Glue the rear peg support (3/32" balsa sheet) to the position shown.



My model was to be a competition scale job, so features realistic cut outs for the landing gear. It's a real fiddle, so if your model is for general flying just paint a black circle here. If you are flying outdoors just leave the gear off and make dummy half-wheels.

Note how the centre rib is a strange shape to allow the rubber motor to pass over the top. This straight-through wing design is very strong. You may also notice that I have 'faceted' the wing ribs between the spars. This makes for a smoother looking wing as the bumps caused by the ribs don't show through the tissue covering.

Now sheet-in the cowl area with 3/32" or 1/16" balsa sheet scraps between N5 and N6: use small bits of wood and cut-to-fit between the stringers. Make up the nose cowl by laminating the 1/8' balsa parts N1 to N4 and Glue to N5. You may also wish to sheet-in the top of the fuselage in front of the windscreen from F1 to F3 for a smoother look (see photos of my model). It may be find it easier to cut the cowl section off the model so that you can preserve the slight 'step' as you sand to shape.

The wing on this model passes right through the fuselage, so an aperture is needed to slide it through. Using scraps of 1/16" sheet balsa, sheet-in around the area where the wing passes through the fuselage on each side, so trace the outline of rib R1 (see side view on plan) onto the sheeted area at the correct incidence angle and cut out the aperture. Now, cut through and remove the sections of formers F2 and F3.

Study the plan and add any other small balsa parts that are shown. Note the soft balsa block at the tail (this should be hollowed for lightness). Also ensure that there is a suitable slot to pass the tailplane through - you may have to adjust the stringer above the tailplane, and add scrap balsa. I also added a 1/32" balsa cockpit floor on my model from F4 to F6.

Sand the entire fuselage structure with 360-grit paper, being careful not to press hard on the stringers. You will achieve a much better covered finish if you 'scallop' the formers between the stringers - this gives a cleaner, more streamlined final appearance. Pay particular attention to the cowl, where you will need to initially carve to shape with a knife. The intake holes above and below the engine aperture deserve some care. I made up the tail wheel using a thin piano wire strut and scrap balsa and foam. Complete by sanding the entire structure gently with 800 grit paper.

Tissue cover the fuselage from F2 backwards in smallish pieces, apply glue only around the edges (don't glue to every stringer) Water shrink and then apply two coats of dope, thinned 50/50 with cellulose. If you are installing the landing gear, leave the bay between F1A and F2 uncovered so you can glue the gear wire to the rear of F1A (described later). Use a different technique to cover the cowl: firstly coat the cowl with three coats of full strength dope, sanding between each coat. Cut strips of tissue that will run from F2 to the front of the cowl lip (about eight pieces should be enough). Damp the tissue, hold in place and then flood through with cellulose. The tissue can be pressed into place as the cellulose soaks through and softens the dope below. When dry, coat with three more coats of thinned dope, sanding between each coat.

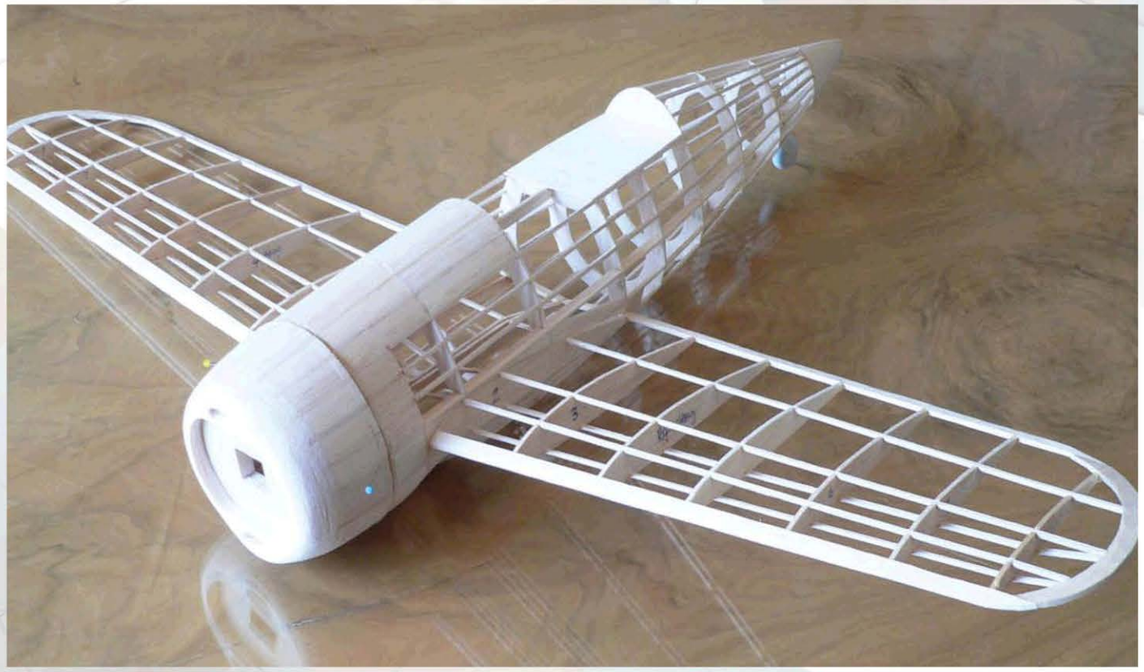
Wings

Before building the wings, ensure the components are a good fit. Lightly sand the spars and edges of the ribs. The trailing edges should also be tapered, notched and sanded now.

The first stage is to pre-glue the two wingtips parts (WT1 & WT2) together for each wing. Apply glue and pin the tips to the plan in the correct position. When dry, remove tips from the plan.

Start by building the right wing panel directly over the plan...

Pin the trailing edge and lower rear 1/16" square strip spar into position (do not push the pins directly into the 1/16" square stripwood,



A test to see how the wing fits through the fuselage. The wing should be covered before you fix it through the fuselage.

push either side), glue and pin ribs R1 to R8 in place. R1 needs 'leaning' using the Dihedral gauge. The ribs glue into the notches in the trailing edge, you may have to sand the rear tips of the ribs slightly to fit. Glue on the 3/16" sheet leading edge (see template on sheet 2), pinning it to the front of the ribs - note that it does not touch the plan. Glue in place the pre-assembled wingtip, this is lifted free of the plan at its front edge, and is angled up very slightly - see front view of wing on plan 2 (you will have to crack the lower spar at R8 and bend it up to cement to the edge of the wingtip). Glue in place the top spars noting that they have to be cracked at R2 to bend down to meet R1.

Repeat for the left wing and when dry, remove the wings from the building board, fix the lower front spar in place, and sand smooth, removing any glue blobs and rough edges. The leading edge is carved and sanded to the typical section shown on the plan.

Next, join the left and right panels together: pin one wing flat to the building board, and glue the two Centre ribs together, ensuring that the raised tip is propped up by 90mm (giving 45mm under each wing tip). This dihedral angle is slightly over scale, but provides stable flight. When dry, remove the structure from the board and ad gussets from scrap balsa. If you are installing the undercarriage, glue in place the landing gear plates between ribs 3 and 4.

Now cover the wings with tissue. Apply tissue paste not only to the edges of the wings, but also to each rib, this makes for a rigid structure and helps prevent warps in the wing when water shrinking. I use clear commercial paper gum obtainable from stationery shops as an adhesive. Ensure the grain of the paper runs spanwise to prevent warps. Cover the bottom of each wing first, removing excess tissue with a sharp knife. Cover the upper surface and trim to leave about 1/16" all round which can be folded and glued over the leading and trailing edges.

Water shrink the tissue of the right wing panel only, and pin it to your building board with scraps of 1/8" balsa under the edges to hold it off the board whilst drying. This should result in a warp-free wing.

Shrink the left wing in the same way and dope with two coats of thinned dope. Glue the wing in place through the slot created in the fuselage, checking for alignment in plan and front view. ■

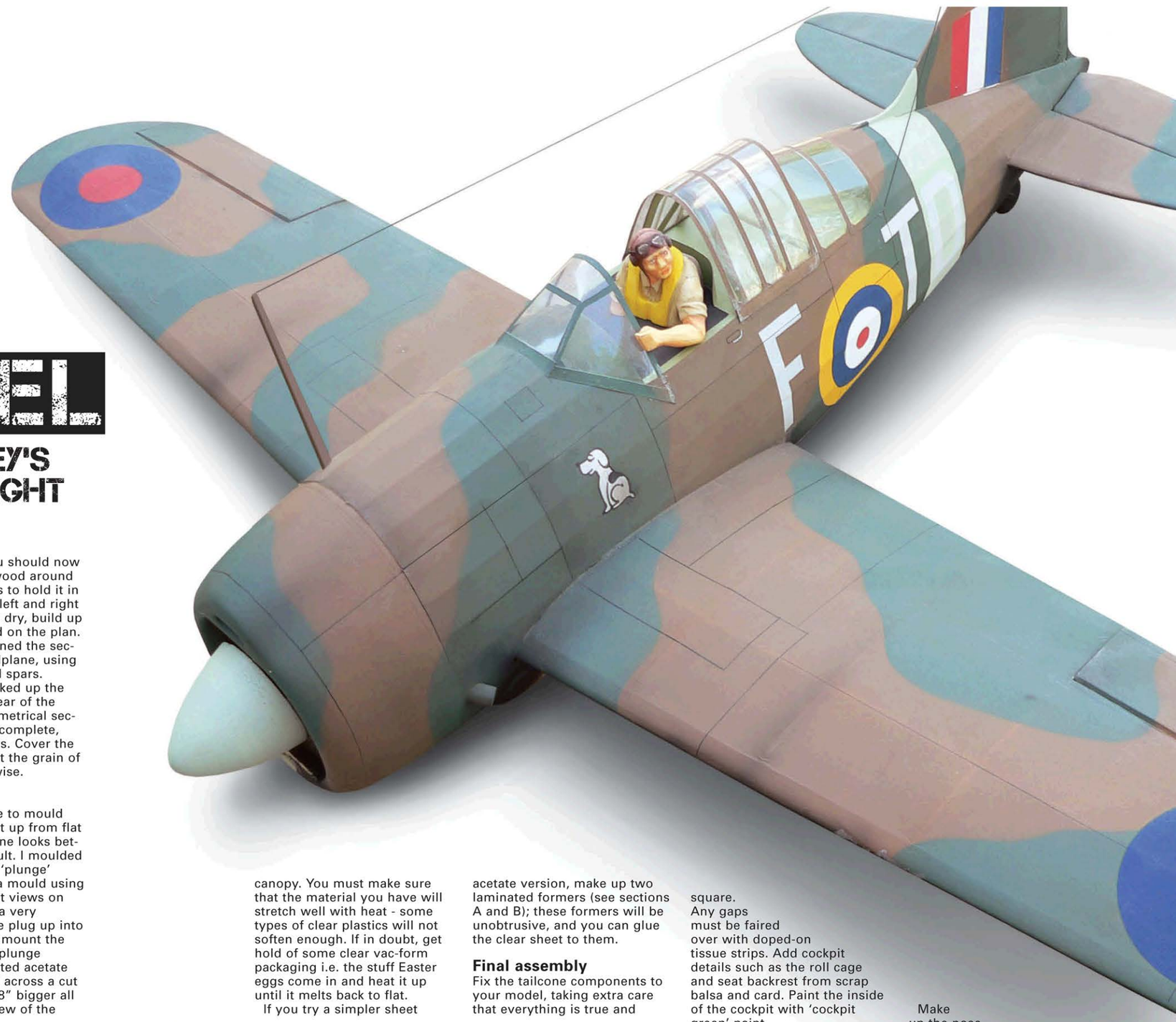
Note how the shape of the wing apperture is cut out of 1/16" sheet balsa in-fill. Note also the fill-in 1/16" soft balsa sheet around the nose. You can afford a little weight at the front end like this, but keep the rear of the model as light as you can at all costs!

Take care to carve and sand smooth profiles on the cowl lip. The intakes take a little care but the end result look good.

BREWSTERS FLYING BARREL

THE FINAL BUILD OF RICHARD CROSSLEY'S 1/18TH SCALE RUBBER DRIVEN FREE FLIGHT

PART 2



Undercarriage

If you intend to fly your model outdoors, you may wish to ignore this section and build it with the gear retracted.

Using thin-nose pliers, bend the 1mm dia. wire components to shape using the plan as a guide. The inner legs are made up from one piece of wire; start bending from the wheel end and work your way up - you will need to slip the two sections of aluminium torque tube on the wire as you progress.

Next, bend the outer sections, slipping into place the tube before you make the final bend at the top. Ensure that you make a left hand and a right hand leg. Bind and solder the three sections together.

Mount the undercarriage into the model, epoxying the aluminium tubes to the wing plates (you will have to remove a section of tissue from below the wing, and patch in later). Note that the assembly also epoxies to the rear of F1A. Thicken the gear legs with sanded scrap balsa and use thin strips of paper around the balsa to replicate the oleos etc. Use soft balsa block for the 'square sectioned' outer legs and fashion the doors from thin card.

Make the wheels from foam or laminated balsa discs and sand to shape. Note that the retainer is recessed and a balsa cover gives a streamlined 'invisible' fixing. Drill and bush with aluminium tube. The wheels are held in place with plastic coating striped from thin electrical flex before the streamlined cover is fixed in place (see plan sheet 3 for details).

Tail surfaces

This design uses laminated balsa outlines. The main benefit of laminated parts is strength with light weight. Surprisingly, these are also quicker and easier to make than using cut sheet outlines.

Let's build the fin first: cut three strips, 1/16" wide from a piece of 1/32" sheet balsa (these need to be long enough to go around the entire fin outline excluding the base). Whilst these are soaking in water for 10 minutes, cut out the former from balsa or mount board, which needs to be the same size as the inner line of the fin outline.

Wax the edges of the former and pin it to the building board. Dab the strips of wood dry and apply white glue between them, sticking all three together. You should now be able to wrap the wood around the former, using pins to hold it in place. Repeat for the left and right tail outlines and once dry, build up the structure as noted on the plan. On my model I thickened the section of the fin and tailplane, using taper shaped ribs and spars. Before building, I packed up the laminated outlines clear of the plan to ensure a symmetrical section - see plan. Once complete, carefully sand the tails. Cover the tails, making sure that the grain of the tissue runs spanwise.

Cockpit canopy

You can either choose to mould the canopy, or make it up from flat acetate. A moulded one looks better, but is more difficult. I moulded my canopy using the 'plunge' method: make a balsa mould using the top, side and front views on the plan and sand to a very smooth finish. Cut the plug up into canopy sections, and mount the plugs on sticks, then plunge through some preheated acetate that has been stapled across a cut out aperture about 1/8" bigger all round than the top view of the canopy. You must make sure that the material you have will stretch well with heat - some types of clear plastics will not soften enough. If in doubt, get hold of some clear vac-form packaging i.e. the stuff Easter eggs come in and heat it up until it melts back to flat.

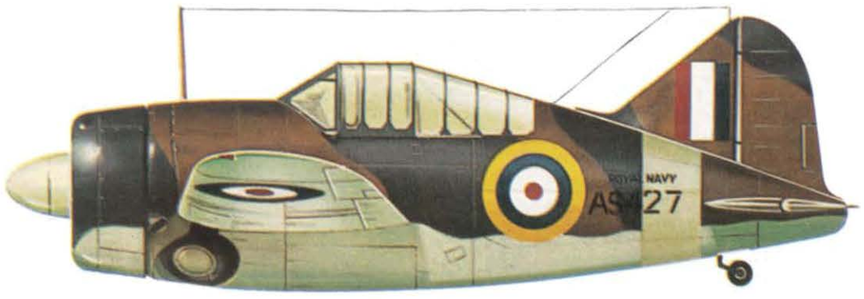
If you try a simpler sheet acetate version, make up two laminated formers (see sections A and B); these formers will be unobtrusive, and you can glue the clear sheet to them.

Final assembly

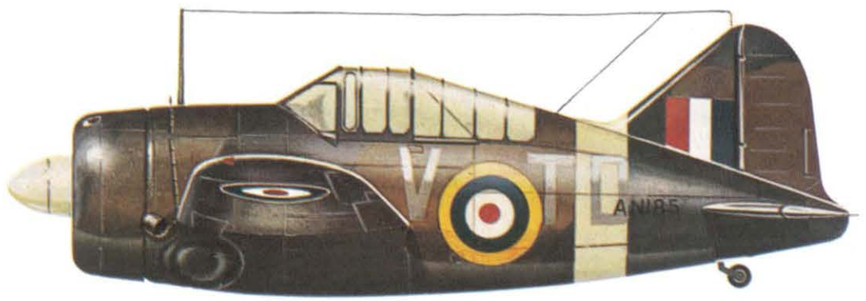
Fix the tailcone components to your model, taking extra care that everything is true and square. Any gaps must be faired over with doped-on tissue strips. Add cockpit details such as the roll cage and seat backrest from scrap balsa and card. Paint the inside of the cockpit with 'cockpit green' paint.

A dummy engine will make a big difference to the realism of your model and details are shown on the plan. Note also the exhaust stubs, cowl panels, gun troughs etc - there are colour schemes presented with this feature, but If you can get a copy of the 'Squadron/Signal' book *'F2A Buffalo in action'*, it also has good colour references, three-views and photographs. The aerial is cut from 1/64" ply and mounted off-centre to starboard on the cowl top.

Make up the nose plug as shown on the plan. Use a wire shaft that matches perfectly the hole in the bearing. I bend an 'S' hook on my shafts as this stops the rubber motor wobbling on the hook. The front of the prop-shaft should be bent over at 90 degrees so that it engages in the freewheel at the front of the propeller (I used an 8" *Peck* prop on my model). The nose plug should be a tight fit into its aperture. Drill out the hole in the peg support to take the alu-



The Royal Nvay Fleet Air Arm received Buffaloes. This one operated by 711 Squadron for trials in early 1941.

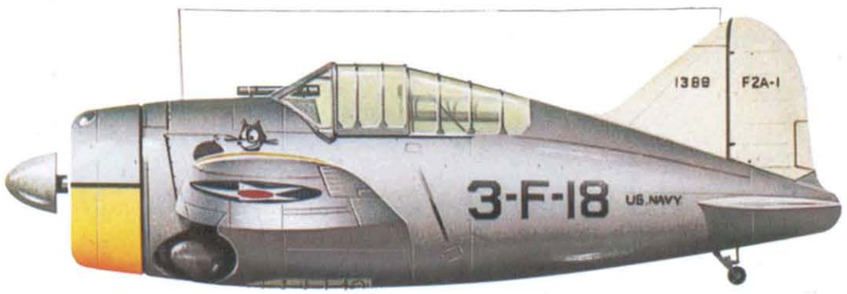


RAAF No.453 Squadron Buffalo 1 based at Singapore December 1941.

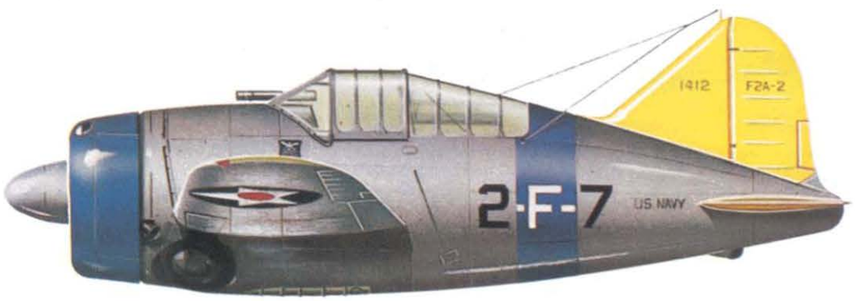
Brewster B-239 variant of the Finish Air Force, 1943. Aircraft of Lt. Hans Wind, top scorer with 38 1/2 victories.

Brewster B-239 variant of the Finish Air Force, 1944.

Another Brewster B-239 variant of the Finish Air Force, late 1941 -personal aircraft of Lt. Jorma Sarvanto.



U.S. Navy Brewster F2A-1 of VF-3, aboard USS Lexington late 1940.



U.S. Navy Brewster F2A-2 of VF-2, also aboard USS Lexington late 1940.

minium tube that retains the rubber motor. Make up a rubber motor from 1/8" or 3/16" flat rubber forming two loops, 22" long.

The ventral window was often painted over on the Buffalo. You can cut the frame from paper and paste to the underside of the model. Once doped, you can cut out wrinkles and add tissue panels - these will not notice if you intend to paint your model.

Colour schemes

The RAF Buffalo Mk1 (or Model 339E) was camouflaged with 'Dark Earth' and 'Dark Green' on top with 'Sky' undersides at the Brewster factory. These colours varied slightly from the official RAF colours, in particular the Sky tone was more like a pale blue, closer to the German 'Hellblau'. When the Buffaloes arrived at Singapore in mid-1941, the port half of the undersides were painted matt black and a sky band (correct RAF colour) was applied to the rear fuselage.

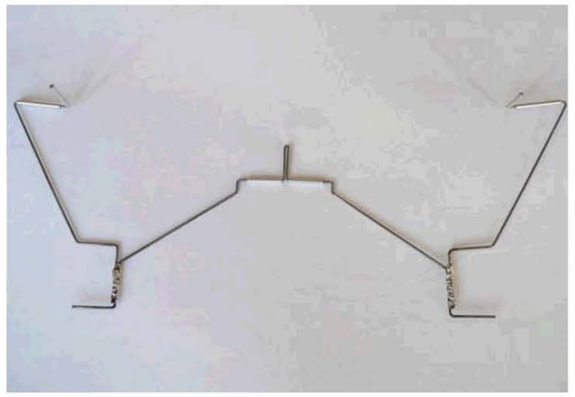
References to National insignia are shown on the plan. The British model 339E was very similar to the US Navy F2A-2, the Dutch 339D and the Belgian 339B, so there are plenty of other colour schemes to choose from. My model was airbrushed with Humbrol enamel paints, using cellulose spirit to thin them. I find a cheap external mix airbrush best for these 'larger' models.

Flying

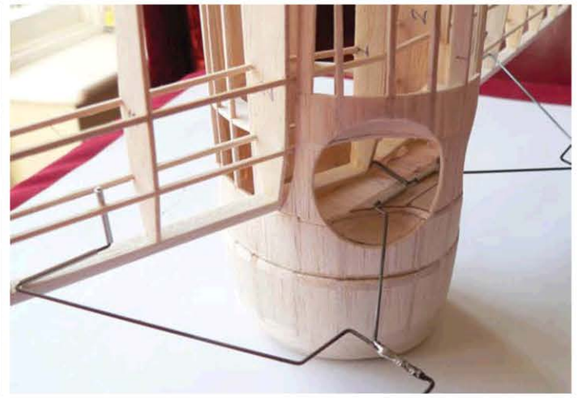
Balance the model before you attempt to fly it. Due to the forward position of the rear motor peg you should not need to add too much weight to the nose.

The tailplane has a slight section. Note the hollowed light balsa block tail cone.

I used blue Floormate foam for the prominent tailwheel. The core is thin wire and details are from card and balsa.



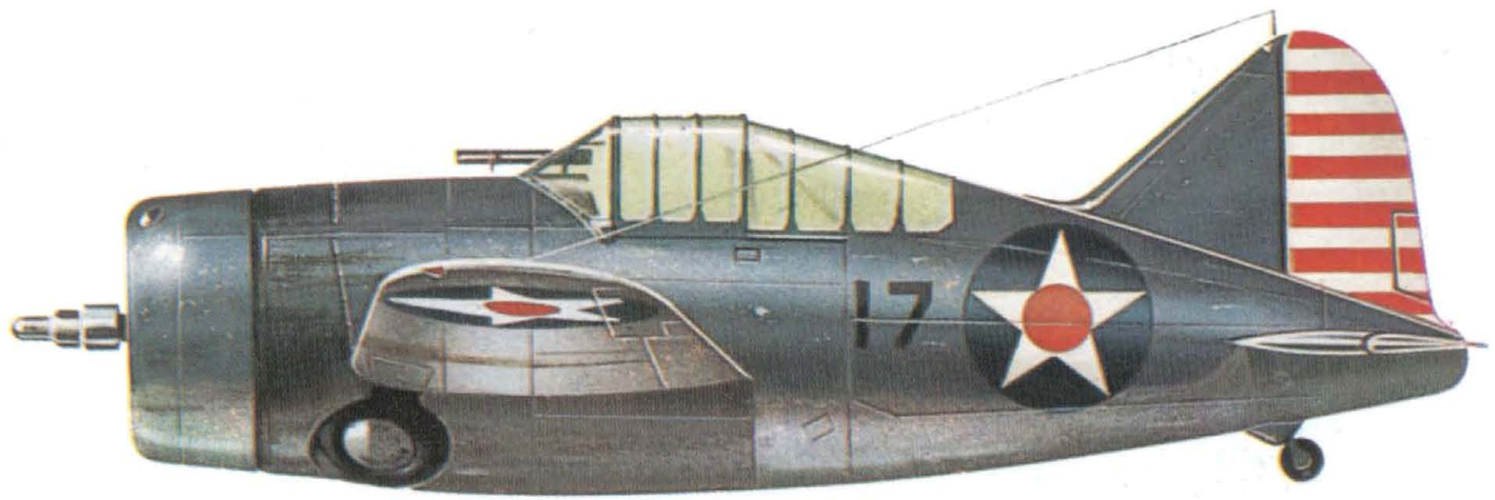
Here is the bent and soldered undercarriage wire. note the alluminium tube slid into place that acts as torque tubes. Use thin fuse wire to bind the joining parts.



Here is the gear wire temporarily in place. I have not yet installed the gear mount plates in the wings. Note also on my model the ply reinforcement plate on the rear of former F1A is not deep enough. Use epoxy resin to glue the tubes in place.

Lubricate the motor, wind on a few turns by hand and launch into any breeze. The model should achieve a stable powered-glide. If all looks good, then gradually increase the amount of turns. You may find that as the power increases, the model tries to 'loop' or stall in the climb. If this happens try a little down-thrust. Any tendency to spiral to the left under the torque of the motor can be offset by adding some right-thrust. Full power can only be achieved by stretch-winding the motor using a geared winder. Aim for a climbing left hand turn, after which, the model may well reverse into a right hand descent on the glide.

The Buffalo makes up into a lovely looking model, one of my all-time favourites, I hope you enjoy building and flying yours. ■



U.S. Marine Corps Brewster F2A-3 of VMF-221, based at Eastern Island, Midway, Central Pacitic, June 1942.