Give tail structure two thin coats of dope then add fairings K.6. Tissue is then doped in place from K.5 and stretched between K.1 and K.2 to K.6 to form a tissue fairing of the fuselage structure into the tail assembly. A small peg of $\frac{1}{8}$" dowel is now cemented to the underside of K.B.1 to form a rear attachment hook for rubber bands securing the tail.

The wings are covered top and bottom sides, ensuring even tension on both surfaces to prevent twisting. Water-shrink the tissue, and when dry, dope the underside ONLY. When dry, pin to the board with $\frac{1}{16}$" packing under the wing-tip end of the trailing edge, then dope and allow to dry in this position. Repeat this procedure till each wing has three coats of thin dope on top and bottom surfaces and permanent slight " wash-out " or decrease of incidence towards the tip.

The fuselage is covered with strips of tissue wrapped round from one side keel stringer to the other, top and bottom sides alternatively. The strips should be 1" wide where the greatest curvature takes place at the nose to $2\frac{1}{2}$" wide at other parts. Tissue paste need only be applied on the side longerons, as later doping will join the overlapping tissue strips. Double cover with tissue on the nose underside to help prevent damage upon landing. Water-shrink the fuselage, then apply three coats of dope.

Decorative scheme should be very lightly applied. Alternative schemes for American, Canadian and British markings are given on the plan. Use thin coloured dopes and spray where possible.

COCKPIT

Remove any traces of oil or dirt from cockpit by gentle rubbing with clean rag. Adhere to the hatch, using cement lightly applied. Line in the details of cover support with black dope. It will be realised that it is cemented ONLY to the hatch whilst the overlapping portion to the rear is in close proximity only to the fuselage. It will be necessary to trim the lower edge of the cover to achieve a correct fit to the curvature of the hatch before adhering in place.

ENGINE INSTALLATION AND IMPELLER

Before any engine is fitted to the model, IT MUST BE TEST RUN ON THE BENCH TO ENSURE COMPLETE FAMILIARITY WITH ITS SETTINGS WITH THE IMPELLER AND ITS BEST RUNNING SPEEDS ; ALSO STARTING TECHNIQUE.

Although the engines used are all under 1 c.c., it must be realised that the power available varies considerably, and must be regulated by the pitch of the impeller blades. The capacity of an Amco .87 c.c. is almost twice that of a Frog .49, and is like comparing an E.D. " Bee " 1 c.c. to an E.D. Competition Special 2 c.c.

The impeller centre hole must be drilled out to accurately fit the driving collet ; similarly, the hole in the starting pulley must be drilled out to fit the shaft size, and recessed to fit over the protruding collet. See illustration for two examples of this. All threads on retaining nuts MUST be engaged.

Fig. 28 shows a template which must be cut out and mounted on thin card. The greater angle of 30 degrees represents the pitch of all blades of the impeller when suited for the " Dart," Amco .87 c.c. and Mills .75 c.c. The finer angle of 20 degrees is for the smaller engines. Check by holding against the impeller side, so that the base is parallel with the disc centre and level ; then check the alignment of the blade edge with the template as in Fig. 28. Slight variance can be made between these angles dependant upon the power involved and fuel used. Speeds vary between 12 to 14,000 r.p.m. Before mounting the impeller, lay down flat on a level surface and ensure that the tips of all blades are in contact and the disc centre level, then turn over and check the other side. Accurate pitch is essential to ensure balance and complete absence of vibration.

When quite familiar with the starting and running of your motor on the bench with the impeller fitted, mount securely in the model, using bolts sweated to a tin strap, to prevent turning as in Fig. 14. Use double nuts as a locking device against vibration. Fit fuel system, binding joints between jet tube and neoprene (P.V.C.) tubing with thread. →

GLIDE TESTING AND FLIGHT TRIM

The model must be very accurately balanced and hang slightly nose down, — in its normal gliding attitude when supported on the C.G. line given on the plan. As engine weights vary, it may be necessary to add ballast to the model at either tail or nose end. In any case CORRECT BALANCE IS IMPERATIVE ! Plasticine will suffice.

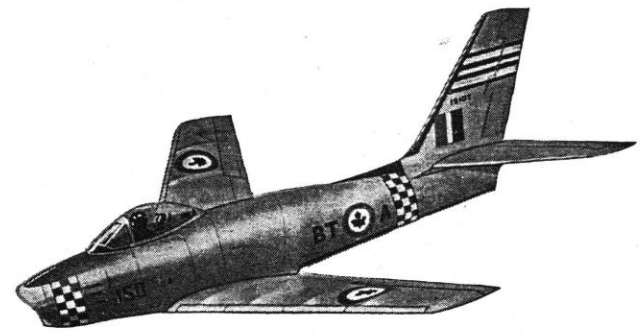
Glide testing must be carried out in windless conditions. The model very rarely comes to any harm by belly landing upon normal terrain, but take precautions and fly over grass. By packing with thin slivers of 1/64" balsa under the leading or trailing edge of the tailplane the glide must be corrected till there is ABSOLUTELY NO TENDENCY TO STALL ON THE GLIDE. The reason for this setting is that there is no " down-thrust " to eradicate over-incidence with its stalling tendency in flight. The flight is a long gradual climb in wide circles, resembling true jet flight. After glide testing in a straight line to check the incidences add a little trim tab of gummed paper tape to the rudder trailing edge to create a slight right turn. Torque reaction is negligible. To start the engine the starting cord, about 24" of stout string, is wrapped around the pulley in an anti-clockwise direction (same as direction of rotation of engine). Then putting hand flat over the centre section of the fuselage and supporting firmly upon the ground, make the necessary needle and compression adjustments, and by pulling quickly upwards on the cord, the engine should start very easily. Ensure that you pull upwards and FORWARDS to ensure you clear the revolving impeller blades. Adjust to best running condition then replace the hatch with fingers extended beyond the sides so as to centralize before dropping completely home and clipping in place. When launching, ALWAYS launch level (and never upwards) at its normal flying speed.

The realistic form of ducted fan propulsion will really thrill you and endear you to this true scale form of model flight. VERON are always glad to hear of your successes, so write and let us know !

MAY YOU HAVE MANY HAPPY LANDINGS.

Model Aircraft (Bournemouth) Ltd.
Norwood Place, Bournemouth.

VERON



SABRE F.86E

This flying scale model of the Sabre F.86E, now in service with the American, Canadian and British N.A.T.O. Forces, heralds the second design in a series introducing to modelling a new and intriguing method of propulsion, the " IMP SYSTEM," being a diesel or glow-plug powered ducted impeller. This brilliant innovation devised and developed by Veron designer Phil Smith, enables you to make a faithful replica of a modern jet fighter and power it with your small motor without the propeller being visible, so preserving the characteristics of pure jet flight.

Designed for diesel and glow-plug motors from .5 c.c. up to .9 c.c., the impeller included in the kit is made to suit all capacities of motor by variance of the blade pitch. Details are given on the plan for the installation of beam-mounted motors such as the ALLBON " DART " .5 c.c., AMCO .87 c.c. and MILLS .75 c.c. Details are also given for mounting an ELFIN .5 c.c. The FROG 50 can also be adapted. Owing to the high running speeds required, a well run-in engine must be fitted or one which has had AT LEAST HALF AN HOUR TEST RUNNING on the bench.

This kit, although essentially simple, is NOT recommended as a beginner's model.

The model is designed as a rigid and torsionally strong sheet balsa tube, built as a hexagon for ease of construction and with a fuselage structure of formers and stringers. The fuselage is built in two halves, upper and lower parts separately over the plan to ensure a correct line-up, greatly simplifying construction.

Before commencing construction, cut out all the parts on the printed balsa sheets and identify these on the plan. Study the plan carefully and familiarize yourself with these and all other instructions, together with the complete sequence of detailed assembly.

THE DUCT

The duct is made up in three sections from front to rear ; nose to engine bay, F.1 to F.4 ; engine bay to aft of wing, F.4 to F.10 ; and thence parallel to the rear, F.10 to F.13. In this way, a duct of correct shape can be made from flat panels of tapering lengths of $\frac{1}{16}$" sheet balsa joined together forming a hexagon duct. Take one length of $\frac{1}{16}$" × 4" × 18" and cut into three 6" lengths. Lay each panel in turn under the duct panel plan and pin-prick the four corners of the forward duct panel F.1 to F.4 on to the sheet, staggering the edges to permit two panels per sheet. See Fig. 1a.

Likewise pin-prick the same corners on to the remaining sheets of $\frac{1}{16}$" × 4" × 6". Join the pin-pricks with a straight-edge, and cut out the six tapering panels with a sharp balsa knife.

Similarly, cut out six panels from the three sheets of $\frac{1}{16}$" × 4" × 14", pin-pricking the corners of the middle portion panel from F.4 to F.10, staggering two panels per sheet. The rear duct panels are parallel lengths cut two each from three sheets of $\frac{1}{16}$" × 3" × 9" all produced by the same method of pin-pricking and laid out as in Figs. 1B and 1C.

FUSELAGE CONSTRUCTION

(UPPER HALF FIRST)

Cover the plan top elevation with waxed tissue. Erect the basic formers W, X, Y and Z over the plan, holding erect by temporarily pinning (See Fig. 1). Ensure these are centrally placed by keying the relevant centre lines marked. Chamfer the edges of the two side nose panels (F.1 to F.4) as in Fig 2A and locate against W and X only by " spot " cementing to the edges. Check that chamfered edges of sheet are level with tops of formers, Fig. 2B. Add remaining side panels, but again only spot cementing to formers. Note that panels are only just lapping W and X by 1/32", so that the following panels (at F.4 and F.10) can be likewise lapped on to X and Y and butt jointed edge-to-edge.

Similarly, erect remainder of top duct panels, (Fig. 3) and when quite dry, turn the edges flush (Fig. 2C). Gently steam two lengths of $\frac{1}{8}$" × $\frac{1}{8}$" to gentle curve and lay over plan to form side keel longerons, pinning either side to locate.

At this stage, lay out all the six parts for each set of formers in groups, top and bottom separately, so as to readily identify these. Note that all the top parts have a small " T " above the part number, and the bottom parts have a small " B " below the part number. Note that there are two complete sets of parts for laminating top formers F.2 and F.5. These are laminated over the plan Figs. 10A and 10B, laying the fuller parts first with the " A " parts on top. When dry, remove and laminate the second set of each. It will be understood that these are to permit construction of the removable access panel. However, cement only one set of top formers F.2 and F.5 (with their bigger edges facing each other) in their respective locations fore and aft of the hatch position. Check that these are a close and accurate fit over the half duct and to the $\frac{1}{8}$" × $\frac{1}{8}$" longerons. Add the remaining side pieces of all formers as in Fig. 4, and all the top pieces. The rear former F.13 has extra laminated parts F.13A to permit eventual flush fitting of the $\frac{1}{16}$" × $\frac{1}{16}$" stringers.

The fin base K.B.1 of $\frac{1}{8}$" sheet is cemented firmly in place to the upper surface of the rear duct above formers F.11, 12 and 13. Add $\frac{1}{8}$" × $\frac{1}{8}$" strip from F.5 to F.11 and fin fairing F.F.1. Secure with small fairing braces F.F.2 either side. (See Fig. 9).

Now, when all the formers are located and checked for alignment and quite dry, the duct is severed with a sharp-pointed balsa knife on the inside surfaces of formers F.2 and F.5, as in Fig. 5. This is quite easily achieved with the duct still in place over the plan and supported on the building board with a little care and patience. Then add second set of upper halves of formers F.2 and F.5 to the central portion of severed duct to complete the removable access panel. Next cut and add top lengths of $\frac{1}{8}$" × $\frac{1}{8}$" from F.1 to F.2, and from F.2 to F.5 on the access panel only. Note that end of strip protruding in front of F.1 prior to fitting of nose ring is chamfered later. See Photo No. 1. (Upper Illustration). →

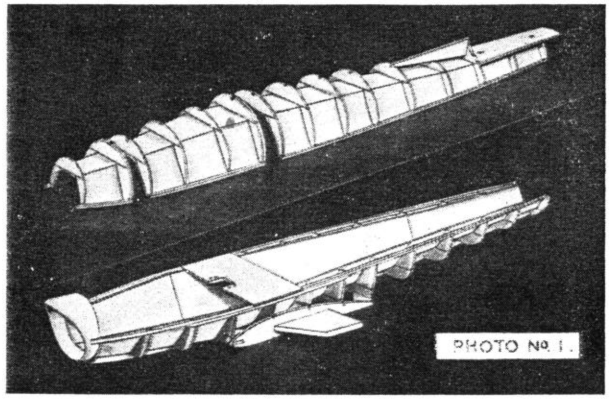


PHOTO No. 1.

It must now be clearly decided what motor is to be fitted, firstly to check its accommodation within the access panel, and secondly for fitting of motor to ply mount. The Amco .87 and Mills .75 need extra "headroom," so complete small box from parts C.B on the $\frac{1}{16}''$ printed sheet. Construct from top panel C.B with side and end panels marked. These are located against former F.5 in the access hatch portion as detailed by dotted lines in the plan side elevation and illustrated in Fig. 15. The former and duct wall are trimmed away to suit.

The piece of $\frac{1}{8}'' \times 2\frac{1}{2}''$ ply must be trimmed to exact length—$4\frac{1}{16}''$. Fret out a slot to house engine to be used, and locate and drill the bolt holes. Details of certain engine mounts are included in Fig. 13. If fitting an Elfin .5 c.c., see the relevant details in Fig. 14. The extra ply and balsa parts are not supplied for this engine mounting in the kit. Thoroughly dope the ply all over with two or three coats of dope thin enough to soak right into the wood to initially proof it, especially round the slot and bolt holes.

FUSELAGE CONSTRUCTION

(LOWER HALF)

The procedure for constructing the lower half is in every way similar to the top half with the exception of the motor mount. Lay the ply mount across the plan first (shaded on the plan). Pin in place with pins around it, but not in any position under the duct. Erect second set of basic formers W, X, Y, Z as before, and add the duct panelling except that two slots are created in side panels between F.4 and F.6 to fit over the ply (see Fig. 6). Slots are liberally cemented before locating. Again steam two lengths of $\frac{1}{8}'' \times \frac{1}{8}''$ to a gentle curve, and then pin in place. There will naturally be a break where these butt against the ply mount, but these are bridged by a $\frac{1}{8}'' \times \frac{1}{8}''$ strip extending from F.2 to F.7 (see Fig. 6 and side aspect of fuselage). Then add all side and top formers—these are naturally the "lower" halves marked with a "B" as the fuselage is being built upside-down. The "bridge" portions forming the wing centre section should have their location checked by temporarily positioning the base ribs R.1. These are slotted for "keying" with the extensions on formers F.5, 6, 7 and 8. Only when satisfied that their locations are correct should the two base ribs be cemented in position together with their $\frac{1}{8}''$ gussets G.1 and G.2. See Fig. 7.

As will be seen from the duct panel plan, a slot is cut in the lower face of the forward duct panel to permit extra air to flow into the impeller chamber as the nose orifice is small as governed by the necessity to retain scale proportions. The edges of the slot are now edged with parts F.L. (See Fig. 7). The lower side portions of formers F.2 and 3 are cemented against the outside of these, whilst parts F.N and F.M are cemented within at an angle (as shown in the plan side view) to create a "scooped slot." The edges of F.N and F.M are chamfered as indicated by the dotted lines printed on them. (See Fig. 8). The rear formers F.13 have their laminated parts F.13.A cemented against them as with the top half of the fuselage. The $\frac{1}{8}'' \times \frac{1}{8}''$ keel member is steamed and added from F.M. (against which it is chamfered) to F.13 at rear. Note that it fits flush into slot in F.8, but $\frac{1}{16}''$ above all other formers.

The two halves of the fuselage structure are now complete and raised from the board. The basic formers W, X, Y and Z may now be cut free. Add segments 4.X to inside of duct joint at F.4, then line with $\frac{1}{8}''$ wide strips of balsa (grain crosswise) as in Fig. 12. Note that two segments are divided at the hatch joint. Face the surface of the ring with tissue doped on.

Cut the 3" wide spare $\frac{1}{32}''$ sheet into $1\frac{1}{8}''$ wide strips ACROSS the sheet so that you have eight strips in all. Join these into groups of three—end to end to form $8\frac{1}{2}''$ to 9" long strips. Erect pins, as indicated in Fig. 16 to form a complete circle then triple laminate the strips (after moistening to facilitate bending) around these to form a nose ring. A tight elastic band around the outside will hold whilst drying.

When quite set, remove from plan and clean off surplus cement. Locate against former F.1 in lower fuselage shell, chamfering protruding ends of $\frac{1}{8}'' \times \frac{1}{8}''$ side longerons. When satisfied with the fit, cement firmly in place. See Photo 1.

The interior surface of the duct is lined with tissue doped in place in strips over the individual panels of the hexagon. Flow the dope on (well thinned) with a full brush, and as it evaporates, rub the tissue flat to the wood to prevent wrinkles as it stretches. Give an extra two coats, and when quite dry, give one coat of "PAX" or Marjonos fuel proofer. This should naturally be applied all over the engine platform and all around the nose ring, but NOT along the edges of the duct, as proofer will prevent the proper adhesion of cement when joining the two halves. However, the gap between the duct wall and the side longerons in the lower fuselage half at the access hatch, may be filled in with spare $\frac{1}{16}''$ sheet balsa and likewise doped and fuel-proofed, as also the faces of the formers F.2 and F.5 on both the fuselage and the hatch itself. Fuel proofing may be applied in any place where excess fuel seepage may be expected.

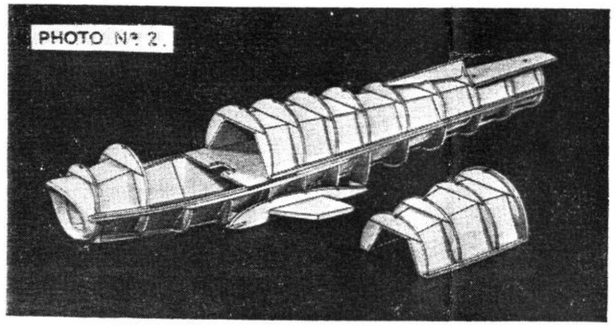


PHOTO No. 2.

FUEL TANKS

It will facilitate fitting of the tank for the "DART" if it is installed before the two fuselage halves are joined. A 15 c.c. tank is ample, and the designer used a small P.V.C. Capsule from a Kodak D.K.20 Developer Pack fitted with two tubular rivets through holes drilled each end with extensions of normal $\frac{1}{8}''$ diam. transparent fuel-proof tubing (P.V.C.). This sits upright upon the mounting beam, and is trapped permanently in place when the two fuselage halves are joined. The upper tube projects through the duct wall and up to the upper surface to permit external refuelling. See mounting details of "Dart" on side aspect of fuselage.

The larger of the "M.S." Calibrated free-flight plastic tanks may be fitted. The cap must be cemented on and an extension tube for the filler added. The side attachment lugs must be removed and a hole cut in the top duct wall to accommodate the diameter of the tank—or the tank shortened to suit before adhering the plastic cap.

JOINING THE FUSELAGE HALVES AND SEALING

Cement is now liberally applied to all jointing edges of the fore and rearward portions of the upper fuselage, and the whole joined up. Clip the side $\frac{1}{8}''$ longerons with paper clips or spring-type clothes pegs whilst drying, and ensure the correct line-up of the whole structure. The parts should be joined with the hatch portion IN PLACE to ensure it being a correct fit. When dry, examine the duct joint minutely, and fill in any gaps with cement. It may be necessary to lay narrow strips of tissue along the outside of the joints and dope into position. See Photo No. 2.

The nose ring may now be carved to correct contour, using a very sharp balsa knife, to create the "sharks-mouth" appearance of the prototype. Sand the forward edges round.

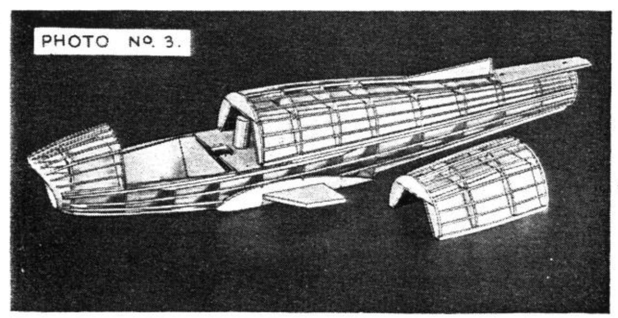
The $\frac{1}{16}'' \times \frac{1}{16}''$ stringers may now be added from front to rear of fuselage, chamfering their ends to fit against nose ring as in Fig. 18. Their locations may be gauged from Fig. 11—there being twenty around the fuselage. Their respective positions are marked on the printed formers. These will butt flush to the external edges of F.2 and F.5 on both the fuselage and hatch. Make two small spring wire clips for retension of hatch as in Fig. 17. These are inserted into two small scrap blocks cemented in place. Make the clips of 22 s.w.g. wire. A piece of 16 brass or aluminium tube let into the longerons acts as the engaging hole. Surplus lengths of $\frac{1}{16}'' \times \frac{1}{16}''$ balsa should be located under the nose betweeen F.1 and F.4 to strengthen the under-surface for landing.

Small gussets W.2 should now be located against F.8 between the former and the adjacent $\frac{1}{16}'' \times \frac{1}{16}''$ stringer. NOTE THAT UP TO THIS POINT, THE WING TONGUE HAS NOT BEEN MADE NOR FITTED AS THEY ARE REQUIRED FOR MAKING THE TONGUE BOXES WITHIN THE WING STRUCTURE.

Trace out on to thin light card, the outline of the tail-ring as in Fig. 19. This is then cemented right round K.B.I and the edge of F.13.A. See Fig. 9.

At this stage complete the wings, as the wing tongues (see Fig. 20) are required for fitting and checking the wing boxes before building into the fuselage centre section. Lay the strip of $\frac{1}{8}'' \times 3''$ provided under the plan, and pin-prick its outline into the wood, as in Fig. 20. Cut out using sharp balsa knife and straight edge. Cover wing panel plans with waxed paper. Cut $\frac{1}{8}'' \times \frac{1}{4}''$ spars to correct lengths, noting angle of root ends as in Figs. 21 and 22. Add also parts B.2 and B.3. Main spar is tapered from $\frac{1}{8}'' \times \frac{1}{4}''$ at R.2 to $\frac{1}{8}'' \times \frac{1}{8}''$ at R.7. Erect spars in place as in Fig. 23, chamfering joint between spars near R.4. Cut $\frac{1}{16}'' \times \frac{1}{16}''$ notches in trimmed lengths of trailing edge, tapering from $\frac{1}{2}''$ at root to $\frac{3}{8}''$ at tip, and likewise lay and pin in place. Cement and locate all ribs by slotting in position. Base ribs R.2 are butt-jointed against ends of spars, temporarily pinning in place and checking angle with template mounted on card. See Fig. 27. Add $\frac{1}{8}'' \times \frac{1}{8}''$ leading edge to diagonal nose slot on all ribs. Leading edge will later have to be sanded thinner towards the tip rib. Add gussets G.3 and G.4. Add wing tips of W.1—noting their slight angle as indicated on rib R.7. See Fig. 25. When complete and set, raise from plan and notch spar on underside, then insert lengths of $\frac{1}{8}'' \times \frac{1}{8}''$ as torsion struts to prevent diagonal movement when covering and doping—these struts must NOT be omitted.

Then add LOWER B.1 members of tongue box, noting their position on rib R.3. With tongue in place, check parts B.1 are accurate. Then slide in upper parts B.1, thoroughly cementing. Double coat all these "stressed" parts with two coats of cement, the first being well rubbed in. Again check the location of the parts B.1, temporarily pinning through the spars whilst drying. Move the tongue in and out to ensure there is no surplus of cement inside. DO NOT LET THE BOXES DRY WITH THE TONGUE IN PLACE—as the tongue may get stuck! When dry, sand edges of B.1's flush with end rib R.2. See Photo No. 4.



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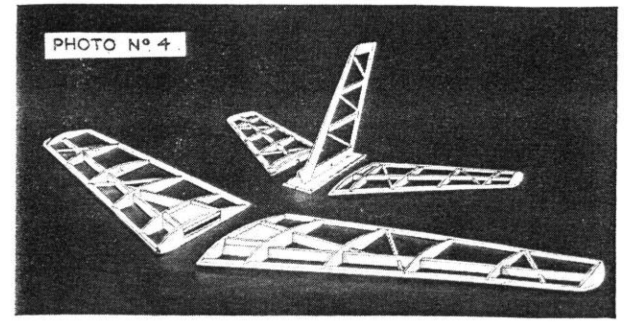

PHOTO No. 4.

The wing tongues may now be fitted to the fuselage centre section. As the wings have a large dihedral angle, $3\frac{1}{2}''$ to each tip, the tongue will lie at a fair angle when slotted through ribs R.1, so chamfer out the LOWER edge of slot in R.1's. Slide the tongues home with former F.6 in $\frac{1}{16}''$ slots as in Fig. 20. Position wings onto tongue and with dihedral raised on $3\frac{1}{2}''$ blocks and the centre section flat to the building board, trim away inner edge of tongues so that they fit right home and lie firmly against the duct wall to ensure 100 per cent adhesion when cemented in place.

When satisfied, cement firmly in ribs R.1, against formers F.5 and 6, and against the duct wall. See Fig. 11 and relevant photographs.

FIN AND TAILPLANE

The fin is built directly over the plan and on the flat. Pin all four parts of fin outline above plan over waxed tissue, K.1, K.2, K.3 and $\frac{3}{8}''$ trailing edge. A thin sliver of scrap $\frac{1}{16}''$ balsa under the trailing edge section will ensure its alignment with the fin. Note that the trailing edge protrudes $\frac{1}{8}''$ at its lower end to fit in slot in K.B.2. Add flat ribs of $\frac{1}{8}'' \times \frac{1}{8}''$ and diagonals of $\frac{1}{8}'' \times \frac{1}{8}''$. Then gusset K.4.

Prepare small wire saddle within brass tubing as in Fig. 24. Raise the fin structure from the board and erect in slots in K.B.2, trapping the saddle in place and covering with cement to secure the tubing. Add gusset K.5 and check fin for squareness with its base. Add small $\frac{3}{8}''$ lengths of $\frac{1}{8}''$ round dowel for locating pins into fixed base K.B.1.

Cover tailplane plan with waxed paper and pin into place the leading edge members T.L.7. Taper the $\frac{1}{8}'' \times \frac{1}{4}''$ spars to $\frac{1}{8}'' \times \frac{1}{8}''$ at outer tips and pin in place. Slot the $\frac{3}{8}''$ trailing edges with $\frac{1}{16}''$ slots for ribs and pin in place. Sever all ribs in half along dividing line marked and locate top half of each over plan. Then add corner gussets G.5 and tip pieces T.6. This method enables each tail section to be built on the flat over the plan. When set, raise from plan and add undersides to complete the symmetrical camber. Note that rib T.1 does not have a lower part. $\frac{1}{8}'' \times \frac{1}{8}''$ diagonals are added, butt-jointed against spar and not slotted as with the wing.

Sand the whole external structure of the fuselage, wings and tail assembly smooth with sandpaper wrapped around a block, rounding all leading edges of flying surfaces.

COVERING

The fin and two tailplane halves must now be covered, water-shrunk, and ONCE doped before joining.

Cement strips of $\frac{1}{8}'' \times \frac{1}{8}''$ along outer edge of fin base K.B.2, as marked by dotted lines. See Fig. 26. These strips will automatically give tailplanes dihedral when cemented with their base ribs T.1 flush against K.2, having their spars and trailing edges correctly located. Liberal cementing will join ribs T.2 against the raised edges of K.B.2. The dihedral is $1\frac{1}{4}''$ each side. Support whilst drying. →