Cover tailplane plan with waxed paper and pin in place $\frac{1}{4}$" × $\frac{3}{8}$" spar, $\frac{3}{8}$" × $\frac{1}{8}$" leading edge, and $\frac{1}{2}$" trailing edge with its $\frac{1}{16}$" slots marked and cut out. Sever all ribs in half along dividing line marked, and locate top half of each in place over plan. This enables the whole tailplane to be built on the " flat." Cement jointing gussets T.6 and 7 to one half only. Then add tips T.5 When set, raise from plan and slot spar and insert $\frac{3}{8}$" × $\frac{3}{8}$" diagonals as in Fig. 28 in wing panel. Then add lower halves of all ribs to complete the semi-symmetrical camber.

Sand the whole external structure of fuselage, wings and tail assembly smooth with sandpaper wrapped around a block. See Photos Nos. 4 and 5.

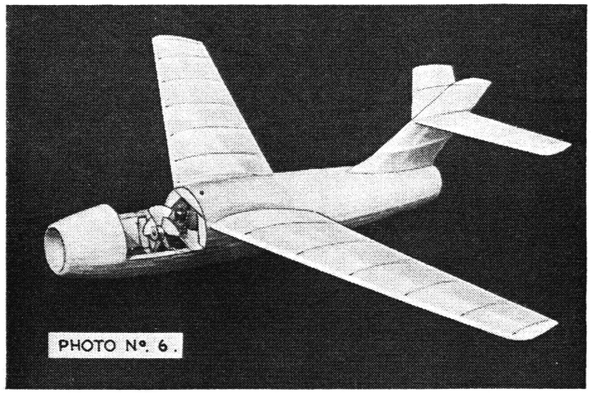


PHOTO No. 6.

COVERING

The fin and two tail-plane halves must now be covered, water-shrunk, and ONCE doped before joining. Cut away tissue between ribs K.4 and K.5 on fin and slot into place two halves of tailplane, liberally cementing gussets and upper surface of K.4 as well as at spar and leading edge joints. Check that two halves are flat to rib K.4. both level with each other, and square to the tail-plane. Support whilst drying to prevent errors of incidence. Fillet the joints with serrated tissue as in Fig. 27, these being doped on.

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, 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. The strips will be joined to the card fillets over the wing centre section to fair in the wing stubs to the fuselage. Double cover with tissue on the nose underside to help prevent damage upon landing. Water-shrink the fuselage, then apply three coats of dope. See Photo No. 6.

Decorative scheme should be very lightly applied. Can be either all aluminium with a coloured nose orifice and black anti-glare panel — see photo of finished model. The five-pointed red stars should be painted on and outlined in white. An alternative scheme is matt camouflage green on all top surfaces. with light grey-green on undersides and lower half of fuselage. Numeral letters are white with a red outline. The coloured nose can vary with the squadron colours—red, yellow, etc.

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 Fig. 30 for two examples of this. All threads on retaining nuts MUST be engaged.

Fig. 31 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. 31. 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.

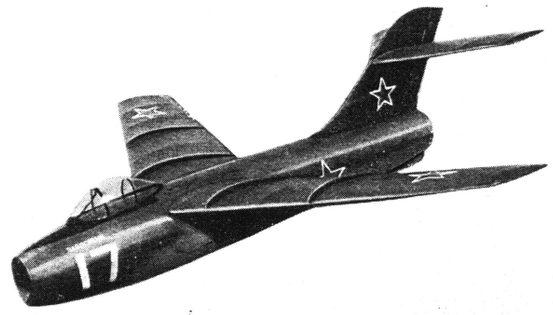
Glide testing must be carried out in windless conditions. The model very rarely comes to any harm by belly landing upon normal terrain, but take precautions and fly over grass. By packing with thin slivers of 1/64" balsa under the leading or trailing edge of the tail-plane the glide must be corrected 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



LAVOCHKIN 17

This flying scale model of a Russian Jet Fighter heralds the introduction to Aeromodelling of 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 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.9 ; and thence parallel to rear, F.9 to F.14. In this way, a duct of correct shape can be made from flat panels of tapered 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 fuselage top elevation (bottom of plan) and pin-prick the four corners of the forward duct panel (F.1 to F.4, heavily outlined on the plan) 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 two sheets. Join 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" × 12", pin-pricking the corners of panel from F.4 to F.9, and staggering two panels per sheet of balsa. The rear duct panels are parallel lengths cut two each from three sheets of $\frac{1}{16}$" × 3" × 12" balsa, again produced by the same method of pin-pricking.

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 the formers, Fig. 2B. Add remaining side panels, cementing firmly to end edges of other panels, but again only " spot " cementing to formers. Note that panels are only just lapping X and Y by 1/32", so that following panels (at F.4 and F.9) 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, trim 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—as in Fig. 11. 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. 9 and 10, 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. Where the upper and lower parts are symmetrical, these are unmarked, but where upper parts (such as those beneath base fin rib K.1) are not symmetrical with the lower parts, these are readily identified with a " T " above the part number. Note that top half of former F.7 is not added till after the wings have been made and the wing tongue added.

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. →

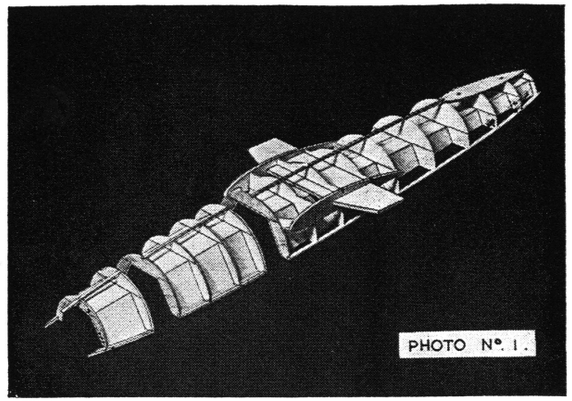


PHOTO Nº. 1.

DECIDING ENGINE to be used

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. These are duplicated, making one complete panel $1\frac{1}{4}$" × $1\frac{1}{8}$" for the top, and the other is divided on the dotted lines to form the two sides. Construct as in Fig. 25 and as marked on top of formers F.5. Its location is shown dotted in side and top aspect of structure.

The piece of $\frac{1}{8}$" × $2\frac{1}{2}$" ply must be trimmed to exact length—$4\frac{3}{8}$". 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 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.5 to fit over the ply (see Fig. 6). Slots are liberally cemented before locating. Again steam two lengths of $\frac{1}{8}$" × $\frac{1}{8}$" 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 $\frac{1}{8}$" × $\frac{1}{8}$" strip extending from F.3 to F.7 (see Fig. 7 and side aspect of fuselage). Then add all side and top formers—these are naturally the " lower " halves, as the fuselage is being built upside-down. The $\frac{1}{8}$" × $\frac{1}{8}$" keel member is added end to end with extensions for fitting of nose-rings. K.10, laminated, is added AFTER covering.

WINGS

At this stage complete the wings, as the wing tongue (see Fig. 17) is required for fitting and checking the wing boxes before building into the fuselage centre section. Lay the strip of $\frac{3}{16}$" × 3" provided under the plan, and pin-prick its outline into the wood. Cut out using sharp balsa knife and straight edge. Cover wing panel plans with waxed paper. Cut $\frac{1}{8}$" × $\frac{1}{8}$" spars to correct lengths, noting angle of root ends as in Figs. 19 and 20. Add also parts B.2 and B.3. Main spar is tapered from $\frac{1}{2}$" × $\frac{1}{8}$" at R.6 to $\frac{3}{8}$" × $\frac{1}{8}$" at R.8. Erect spars in place as in Fig. 18, chamfering joint between spars near R.4. Cut $\frac{1}{16}$" × $\frac{1}{16}$" notches in trimmed lengths of trailing edge, 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. Add $\frac{1}{4}$" × $\frac{1}{4}$" 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.1 and G.2. Add wing tips of W.1—noting their slight angle as indicated on rib R.8. When complete and set, raise from plan and notch spar on underside as in Fig. 28, then insert lengths of $\frac{1}{8}$" × $\frac{1}{8}$" 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. Prop up wing-tips on 1" blocks (for 1" of dihedral each side as in Fig. 22) and 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.

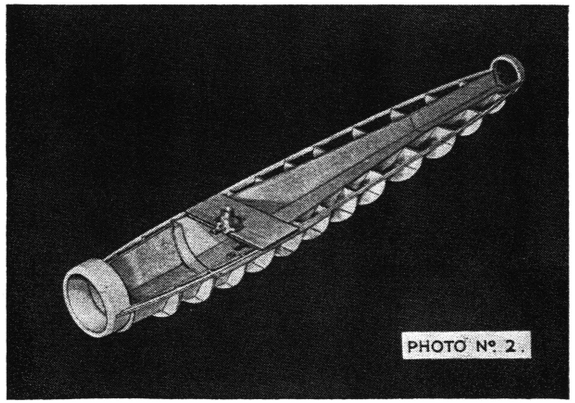


PHOTO Nº. 2.

FUSELAGE CENTRE SECTION AND WING MOUNT

When the tongue has served for the wing box construction, cement firmly to the duct roof and against F.8 by double coating with cement (see Fig. 8). Check its alignment with the fuselage by temporarily sliding rib R.1 into place. If satisfied, then cement the two base ribs R.1 into their respective slots on F.6, F.7 and F.8. Note that base rib has $3\frac{1}{2}$ degrees of incidence when measured from centre of the leading-edge to tip of the trailing edge, the " optimum " for the " Clark Y " section. Add the $\frac{1}{8}$" gussets G.3 and G.4 to leading and trailing edge of centre section respectively. Firmly locate the fin base platform K.1 over formers F.11, 12, 13 and 14. Then add top backbone longeron of $\frac{1}{8}$" × $\frac{1}{8}$" from F.5 to F.11. See Photo No. 1.

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 $\frac{1}{2}$" 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.

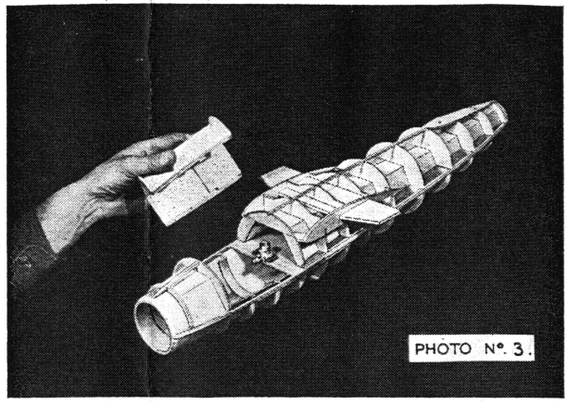


PHOTO Nº. 3.

NOSE AND TAIL RINGS

Cut the 3" wide $\frac{3}{16}$" sheet into strips, cutting ACROSS the sheet so that you have ten 1" wide strips 3" long. Join these into groups of three, end to end, with 1" extra in each case to form $9\frac{1}{2}$" to 10" long strips. Erect pins, as indicated in Fig. 15, to form a complete circle, and triple-laminate strips (after moistening to facilitate bending) around these to form nose-ring. A tight elastic band around the outside will hold whilst drying.

Similarly cut six $\frac{1}{2}$" wide strips 3" long across the grain, and join into groups of three to form two strips 9" long. Laminate these, as in Fig. 16, to form tail-ring. When quite set, remove from plan and clean off surplus cement. Locate these in front and rear end of lower fuselage shell, trimming $\frac{1}{8}$" × $\frac{1}{8}$" longerons by chamfering to fit the rings. When satisfied, cement accurately in place against formers F.1 and F.14. See Photo No. 2.

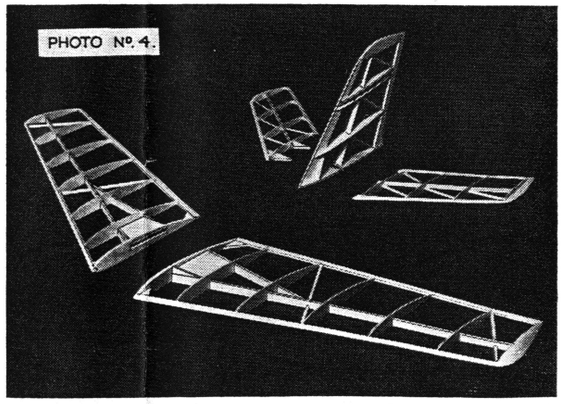


PHOTO Nº. 4.

LINING AND PROOFING THE DUCT

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 and tail-rings, but NOT along the edges of the duct, as proofer will prevent the proper adhesion of cement when jointing 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.

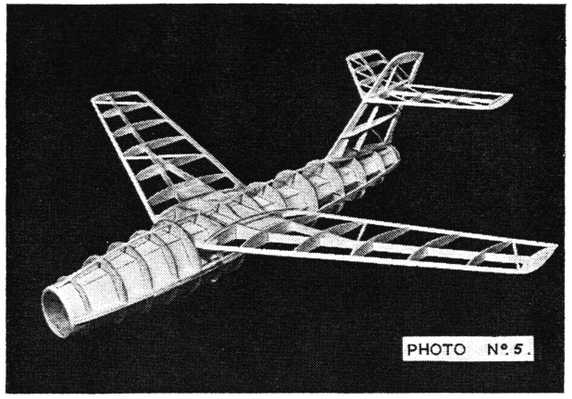


PHOTO Nº. 5.

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.

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. 3.

Cut out two light card fillets to pattern given in Fig. 26, and cement in place over top camber of centre section along base ribs R.1. This is to facilitate jointing of stringers and covering.

The $\frac{1}{16}$" × $\frac{1}{16}$" stringers may now be added from front to rear of fuselage, chamfering their ends to fit against nose and tail-rings as in Fig. 23. Their locations may be gauged from Fig. 11—there being twenty around the fuselage. 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. 24. 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 $\frac{1}{16}$" × $\frac{1}{16}$" balsa should be located under the nose between F.1 and F.4 to strengthen the under-surface for landing.

FIN AND TAILPLANE

Cut the three $\frac{1}{16}$" deep notches in the trailing edge of the fin. Cement fin tip K.8 against leading edge K.6 by pinning both over the plan. When dry, remove and cement K.6 into slot in base-rib K.2. Hold over plan to check its angle. Slide and cement in place three ribs K.3, 4 and 5, then push lower end of trailing edge into slot in K.2, and locate trailing edges of ribs, joining to K.8 at top. Check its alignment. Add gussets and diagonal braces of $\frac{1}{8}$" × $\frac{1}{8}$" ; these braces must NOT be omitted. Make wire saddle through brass tube as in Fig. 29, and locate.

Fit K.9 gusset, then $\frac{3}{8}$" lengths of $\frac{1}{8}$" round dowel for locating pegs are cemented firmly into holes in K.2. Check that these line up accurately with holes in K.1. →