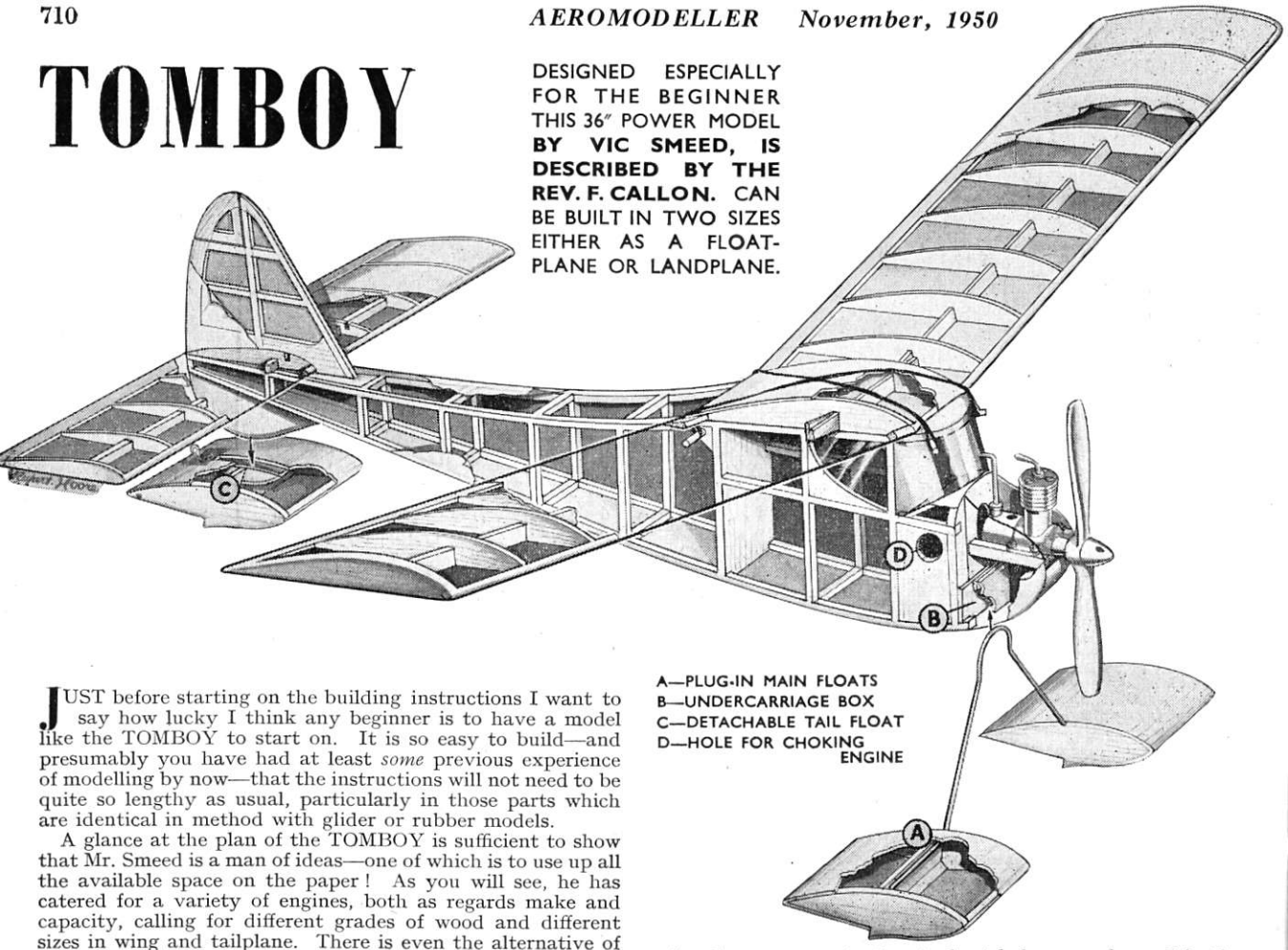
TOMBOY

DESIGNED ESPECIALLY FOR THE BEGINNER THIS 36" POWER MODEL BY VIC SMEED, IS DESCRIBED BY THE REV. F. CALLON. CAN BE BUILT IN TWO SIZES EITHER AS A FLOAT-PLANE OR LANDPLANE.



A—PLUG-IN MAIN FLOATS
B—UNDERCARRIAGE BOX
C—DETACHABLE TAIL FLOAT
D—HOLE FOR CHOKING ENGINE

JUST before starting on the building instructions I want to say how lucky I think any beginner is to have a model like the TOMBOY to start on. It is so easy to build—and presumably you have had at least *some* previous experience of modelling by now—that the instructions will not need to be quite so lengthy as usual, particularly in those parts which are identical in method with glider or rubber models.

A glance at the plan of the TOMBOY is sufficient to show that Mr. Smeed is a man of ideas—one of which is to use up all the available space on the paper! As you will see, he has catered for a variety of engines, both as regards make and capacity, calling for different grades of wood and different sizes in wing and tailplane. There is even the alternative of making the model a floatplane, with interchangeable land or water undercarriage! For the sake of those who are building this as their very first power model, I think that the best plan will be to standardise on the following layout: E.D. Bee engine; 36 ins. wingspan; land undercarriage—the wheels to be detachable or not according to choice. (If they are detachable, they can later be replaced at will by floats without effecting the rest of the model.) Right? Then here we go!

Perhaps the slowest part of building a model is the cutting out and sanding of all the ribs and the fuselage formers. Personally, I always like to get this over with right at the start, so I suggest that we do it now.

First of all the ribs. The method applies to both wing and tailplane ribs. Lay a piece of semi-transparent paper—greaseproof will do—over the rib outline as marked on the plan, and trace it onto the paper, including the place where the spar cuts through the rib. Now use carbon paper to trace this outline onto a piece of thin plywood—1 mm. if you have any, otherwise $\frac{1}{16}$ in. The outer grain of the ply should run from end to end of the rib shape. Cut out the ply rib, and sand accurately to shape, checking by laying it onto the plan rib as you proceed. Use this rib as a template, round which to draw all the ribs needed onto $\frac{1}{16}$ in. medium sheet balsa; 20 for the wing rib, 9 for the tailplane. Cut these out roughly *without* cutting out the spar slot, and sandwich them side to side against the accurately finished ply rib. Push two straight pins from each side right through the "sandwich" to hold them firmly, and sand until they are identical with each other and with the ply rib. Then use a small hacksaw to cut right through all the ribs together at the spar slot; one cut down each side of the slot as already cut in the ply rib is sufficient; the loose pieces can then be scraped out.

Formers. These are traced out first onto greaseproof or similar paper over the plan, and then transferred by means of carbon paper onto the $\frac{1}{16}$ sheet balsa—or plywood in the case of Former 1 and 1A. With balsa, the grain should be running along the *length* of the former, *i.e.*, from end to end, rather than from side to side.

The outlines of the ply formers 1 and 1A are best cut with a small hacksaw; the curve on the top of F1 can be finished off with a rough grade of sandpaper wrapped tightly round a hardwood block. The two rectangular holes for the engine bearers are quite easily cut by drilling a series of $\frac{1}{16}$ in. holes as close together as possible just *inside* the lines traced on the wood. Then remove the inside piece with a razor blade, and use a small file—a nail file will do—to clean up the edges of the apertures. Keep trying the end of the engine bearer into the aperture as you go along with the filing, and stop when it will *just* push inside—a really tight fit. The same method of drilling holes can be used for opening out the circular choke hole in F1.

We are now all ready to start the construction proper.

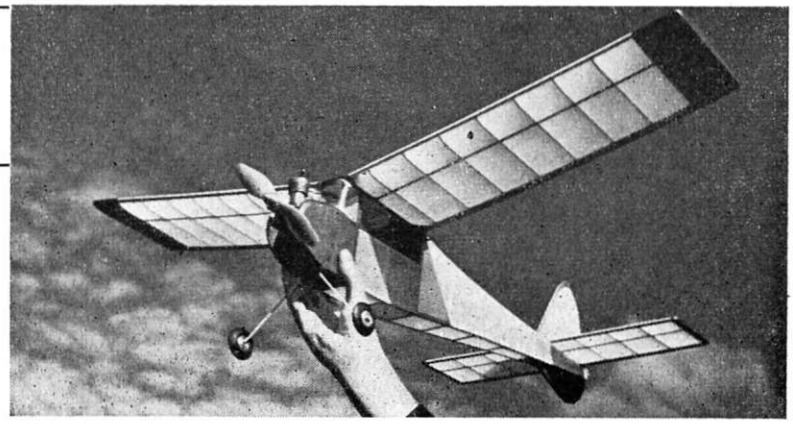
The Fuselage. Cover the plan with grease-proof paper, and pick out five lengths of *medium* $\frac{3}{16}$ in. square strip. The four softest of these should be used for the longerons.

Pin down the first two longerons over the plan, using straight pins on alternate sides, *not through*, the strip. Crack the top one at the point indicated, but if possible do not actually sever it. Add all the spacers, etc., and the $\frac{3}{16}$ in. gusset against the shoulder where the top longeron was cracked.

Work down the next pair of longerons between the upright pins and push down onto the previous pair. Complete the side in exactly the same way as the first one, not forgetting the shoulder gusset. The longerons can be trimmed off accurately at the tail, but should be left overlapping a little at the nose end of the model. Fig. 1 shows the construction at this stage, with the ribs, formers, etc., all laid out ready.

Give the cement a few minutes to dry, then remove from the

TOMBOY is one of the most amazing models we have handled at the Aeromodeller offices. The float version took off without difficulty in approximately half of the width of the Grand Union Canal, and we succeeded in losing it, complete with floats, from a 20 second engine run. It is simple to build, easy to fly and as intended, an ideal beginner's model.



plan, sand edges, and slice the two sides apart. Cement formers 3 and 4 in position to *one* of the two sides, making sure that they are at right angles to it; see Fig. 2. When dry, push the second side into place against the formers and cement it there—see Fig. 3. Now cement the two sides together at the tail, and add all the top and bottom spacers.

Former No. 1 and Undercarriage. You must here make up your mind whether the undercarriage is to be detachable or permanent. If at a later date you think you may want to change over to a floatplane, then you will have to make the wheels detachable. The method for this is slightly more complicated, but is well worth the trouble if only for the extra simplicity of transport.

Detachable undercarriage. Cut three strips of $\frac{1}{16}$ in. ply about $\frac{1}{4}$ in. wide, and use Durofix or some similar hardwood glue to cement them down the sides and across the top of former 1A. Then cement this unit against the *front* of F1, so that the ply strips form a box between F1 and F1A. Since Durofix is slow drying, the unit should be left for some hours under pressure—either in a table-vice or with a weight resting on it. When dry, it should be cemented in position at the front of the fuselage, after which the overlap of the four lower longerons can be trimmed off.

Bend the undercarriage wire carefully to the shape shown on the plan. The " U "-shaped bend in the centre must be a push fit into the ply " box " between F1 and F1A. The arms of the " U " should be slightly splayed out for preference, so as to grip tightly by pushing against the sides of the " box ".

Permanent undercarriage. Cement F1A against the *back* of F1 ; no packing strips are necessary. When the Durofix has set, bend the undercarriage wire as shown on the plan ; the centre section in this case is more rectangular than " U "-shaped. Place this centre section symmetrically against the front of the lower part of F1., and mark its position. Remove, and drill a double row of holes ($\frac{1}{16}$ in. or smaller) round both sides of the marked line. Actually the spots for drilling are marked on the plan. Now replace the undercarriage wire between the double row of holes and use strong twine and a large darning needle to bind it in place, the thread passing through the holes and over the wire. Finish off with a thick smear of Durofix all over the twine and the wire. F1 can then be cemented in position against the front of the fuselage, and the overlap of the four lower longerons trimmed off. The wheels must be attached by soldered cup-washers.

Engine Bearers. Cut two similar lengths of hardwood $\frac{3}{8} \times \frac{1}{4}$ in. spar as shown on the plan, and mark the places (also shown on the plan) where they have to be drilled for the engine bolts. Make sure that you choose the right size of drill for the particular bolts you are using. The hole should be very slightly *smaller* than the thickness of the bolt, so that the latter is a tight screw fit into it. A $\frac{3}{32}$ in. drill will be about right for 8 B.A. bolts, but the safest way is to test it for yourself by drilling into a piece of scrap hardwood, trying various drills until you find the correct one. Then drill the four holes through the engine bearers, making sure that the drill works quite vertically through the wood, and checking the spacing of the holes against their opposite numbers in the metal flanged shoulders of the engine itself. I have found it quite a good idea to widen these bolt holes to $\frac{1}{8}$ in.

Now push the engine bearers into place through former F1 ; they should be a tight fit, and if so will remain rigidly in place. Check them for alignment both vertically and horizontally, and then push the starboard (right hand) bearer about $\frac{1}{16}$ in. further into former F1. This will mean that the engine when mounted will have a small degree of natural right thrust. Liberally cement the joints on both sides of F1.

Former F2 and the cross-grained laminated cabin top should now be cemented in place. Fig. 4 shows the front part of the fuselage at this stage.

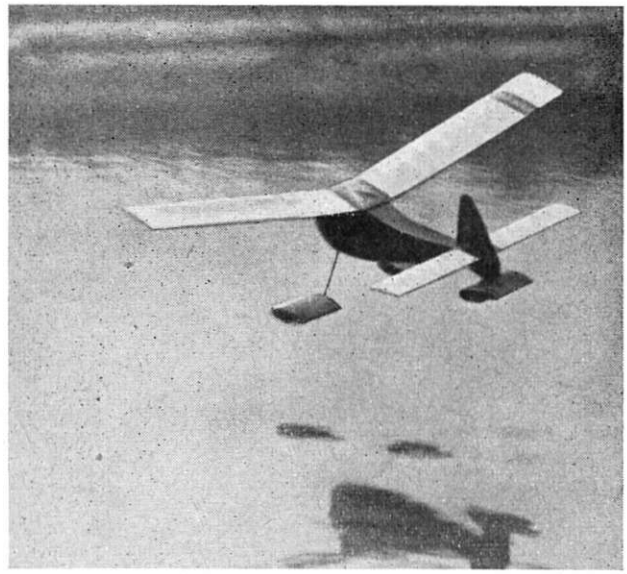
Finishing Off the Fuselage.

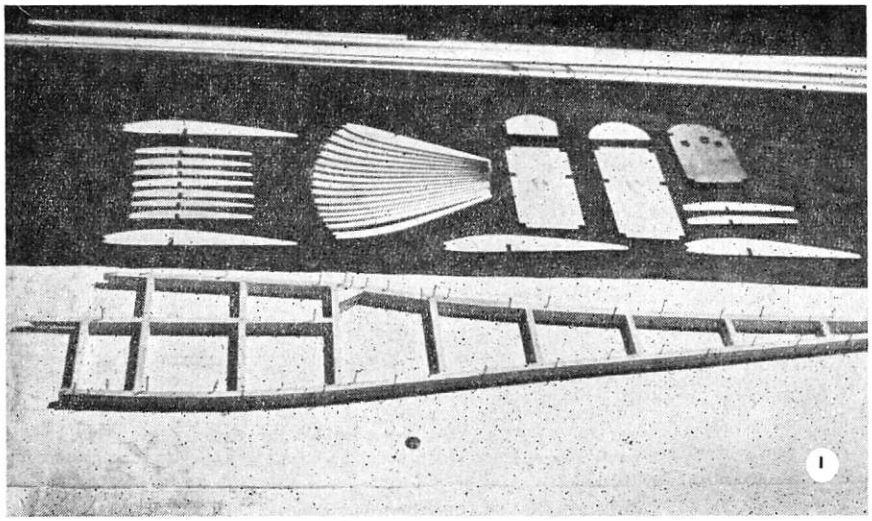
Sheet in the sides and bottom of the front panel with $\frac{1}{16}$ in. balsa, and also the curve of the cabin windows. Cartridge paper or thin card should be used for covering the curve from the top of F1 over F2. Make the choke-hole in the starboard side panel big enough to admit your particular size of first finger without any effort.

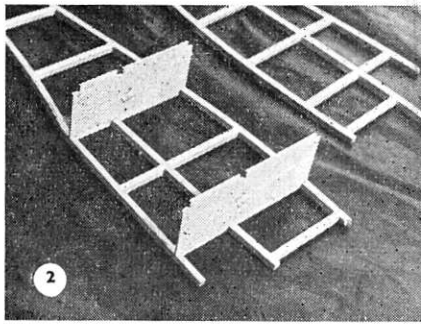
Cement a strip of $\frac{1}{16}$ in. sheet to the outside edge of both the engine bearers ; screw the bolts in place from below, and drop the engine itself into place over them. Then trace the side cowlings onto $\frac{1}{4}$ sheet and cement them against F1 and the packed bearers. If the undercarriage is detachable, the side cowlings will have to be shaped to fit round F1A and the undercarriage box. Fig. 5 illustrates this point, being a shot of the underneath part of the front unit. (Gussets were used here, as an alternative to sheeting in the front lower panel.)

Now sheet in between the lower halves of the side cowlings. It is important to leave the engine in position while this is done to make sure that the space between the bearers is not widened or lessened during the process.

Trace the windscreen from the plan onto grease-proof paper ; cut it out, and paste onto the celluloid ; then cut the celluloid windscreen round the edge of the pasted grease-proof template. The plan suggests cementing the windscreen in place, then cutting two holes for the wing dowels, which are to be pushed through and cemented under the cabin top after the windscreen has been added. Personally I found it simpler







to cement the two front dowels in place *first*, and cut two "U"-shaped pieces out of the top of the windscreen to accommodate them when it was *later* cemented in place. The side-windows of the cabin can be cut out as separate rectangles of celluloid.

The rear wing dowel is pushed through the fuselage after $\frac{1}{8}$ in. holes have been drilled in the gussets at the "cracked shoulder". Sheet in the last two panels at the tail, top and bottom, and add the fairing of scrap balsa to the top of the cabin roof. Trace the sub-rudder onto $\frac{1}{16}$ in. sheet with the grain running lengthwise, and cut it out. Since it is more than 3 ins. long, two pieces of sheet will be needed to cover it when the grain is running the opposite way in making the cross-grained lamination. These two pieces can be cut out as rough rectangles and cemented against the accurately traced first piece; when set they can be easily trimmed to this shape. Cement the sub-rudder in place—and don't spare the cement.

The Fin and Trimming-Tab.

Trace the trailing edge and lower portion of the fin onto soft $\frac{3}{16}$ in. sheet and cut them out. Build the fin, including the trim-tab, as a single complete unit over the plan—see Fig. 6. When quite, dry, cut out the tab—Fig. 7. Then push a piece of soft wire or thin aluminium sheet into the upper part of the hingeing edge of the tab, and replace the tab against the main fin, forcing the projecting portion of the wire or aluminium into the hingeing part of the fin. In Fig. 8, *two* pieces of soft wire are being pushed home, one towards the top, the other towards the bottom of the tab. However, a single piece near the top will be sufficient. Note too the straight pin which is ready to be pushed up through the horizontal spar on which the tab is to rest. This pin will act as a pivot, when it and the tab itself have been pushed home—see Fig. 9. It is a good idea to round off the turning edge of the tab before replacing it, so as to allow of a free side-to-side movement.

The rear peg—a short length of $\frac{1}{8}$ in. hardwood dowel—can be added now. Sharpen one end, and push it firmly into one of upper longeron ends. Pull it out, squirt cement into the hole, and replace peg.

Fig. 10 shows the completed tail unit (less the tailplane) ready for covering, but as a matter of fact the fin should not be cemented in place until both it and the fuselage have been covered.

The Tailplane.

This is perfectly straightforward. Before laying it out, hold the centre three ribs side to side, and cut out a $\frac{1}{8}$ in. square notch for the short top spar.

The Wing.

Trace and cut out the ply dihedral brace, and cement *both* halves of the $\frac{3}{8} \times \frac{1}{8}$ in. mainspar against it, trimming off the lower flat centre section. Pin down the port half of the mainspar over the plan, leaving the starboard half sticking up at an angle, and proceed to the ribs—see Fig. 11.

The mainspar notch of the four centre ribs will have to be modified to fit over the ply dihedral brace—see Fig. 12. When all the ribs of the port side have been put down, add the port half of the leading edge—*hard* $\frac{3}{16}$ in. square. Push it well into the rib noses, and secure it there with pins—see Fig. 13. When set, remove from the plan and pin down the starboard half of the mainspar, propping up the completed port half with a couple of books.

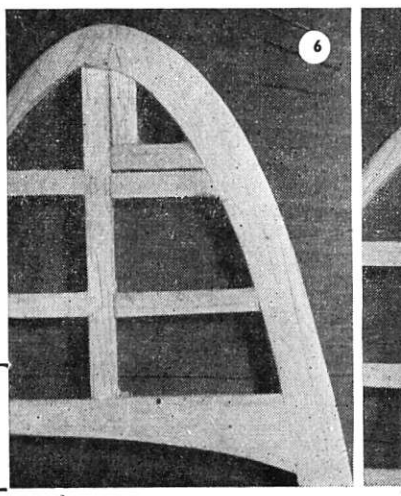
The centre section is best done as follows. When both halves of the wing are completed, pin down the level centre section of the dihedral brace flat onto the plan, propping up the wingtips on both sides. The short missing portions of leading and trailing edges can then be cut to size and cemented in place. Personally I added gussets on both sides of these centre ribs against the leading and trailing edges—see Fig. 14. Remember that the two centre ribs have to have $\frac{1}{16}$ in. trimmed off along their upper curved surface, so that the $\frac{1}{16}$ in. sheeting will not stand up higher than the leading and trailing edges. This trimming should of course be done before the two ribs are cemented in place. Add the $\frac{1}{16}$ in. over the top of the centre section, with the grain running in the same direction as the length of the wing. All that remains is to cement the wing end-pieces from soft $\frac{1}{4}$ in. sheet.

When I had reached this stage—ready for covering—I went over every joint in the entire plane, adding a tiny spot of cement in each corner by way of reinforcement.

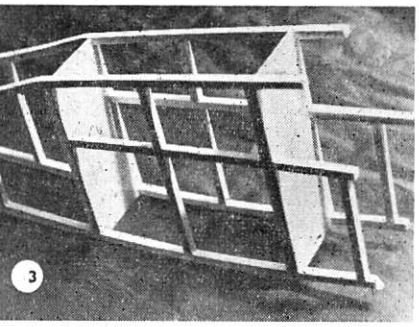
Covering.

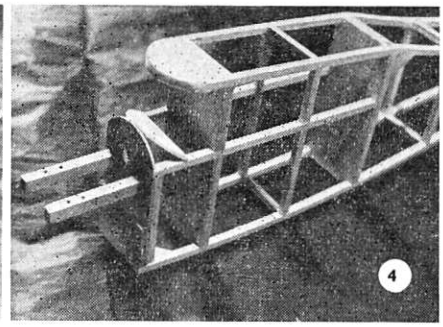
The TOMBOY is as simple to cover as a beginner's glider. Lightweight modelspan will do, though personally I used heavyweight and have not regretted it. Modelspan *can* be water-shrunk, although with the lightweight variety this is not normally necessary, as it shrinks well under the influence of dope.

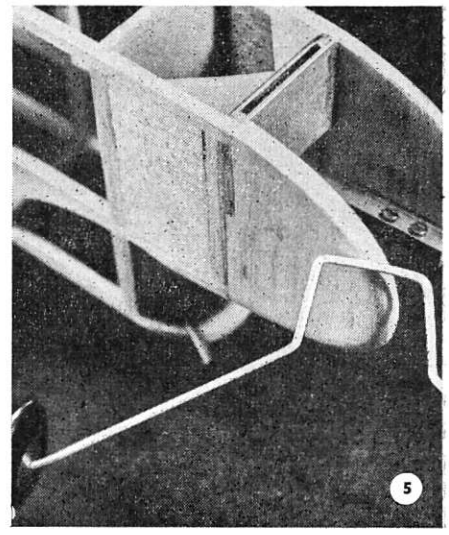
Cover the fin as a single unit, ignoring the trim-tab for the present. The best time to cement the fin to the fuselage is after the whole model has been covered, but before any doping has been started. Check the size and shape of the curve in the fin base by laying the tailplane in position across the rear of the fuselage and lowering the fin over it; the leading and



Figures 6 to 10 illustrate the sequence of making the fin and the trimming tab.







trailing edge extremities of the fin should rest on the fuselage, and the curve should just clear the tailplane. Remove the tailplane, and cement the fin firmly in place.

Two coats of clear dope were given to the entire model, with a third for the fuselage. This was followed by an over-all coat of banana-oil. The colouring (put on before the banana-oil) was polychromatic blue. With a red Tru-flex prop. and white undercarriage wires, the appearance was smart enough to earn favourable comment from a variety of quarters.

The final job is to "cut out" the trim-tab. Use a razor blade to slit through the fabric down the hinge and along the lower edge of the tab on both sides. It will then be possible to move it from side to side as required.

Mounting the Engine.

It is presumed that before this you have had the engine running on a test bench, and have got into the way of starting and regulating it.

The prop. MUST be a Keil-Kraft TRU-FLEX—and I have not got shares in the firm either! This particular prop. is more flexible than most, and so tends to give slightly less thrust. To use a wooden prop. or one of the stiffer plastic ones, such as the E.D., would be to ask for trouble at this early stage. Moreover, for the first few flights even the Tru-flex must be "toned down" by putting it on *the wrong way round, i.e.*, with the more rounded sides of the blades nearest to the engine.

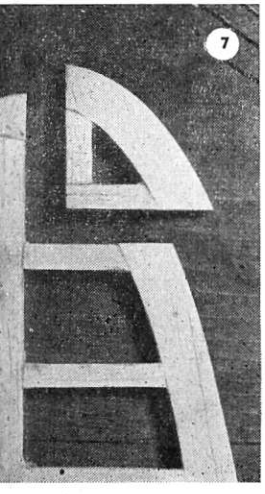
For the actual mounting of the engine, a small tube spanner will be found most useful; buy one now if you have not already got one, and make sure that it fits your size of nut. In the case of my own model, the circular choke-aperture in former F1 was found to be slightly out of position, and had to be enlarged with a rat-tailed file in order to make room for the air-intake of the engine. The only real modification from the plan was the fact that the lower sheeting under the engine and between the side cowlings was left out altogether. This allowed easier access to the engine bolts from below, and also let any excess fuel blow away instead of lodging in the sump. Make sure that the nuts are all screwed down tightly.

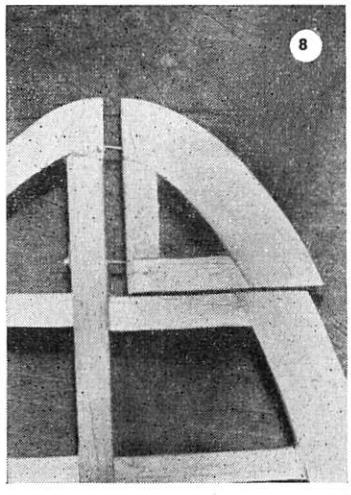
Trimming the TOMBOY.

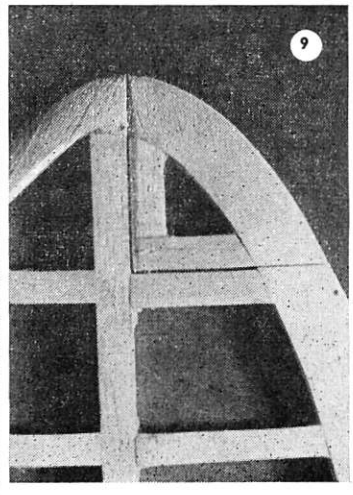
Attach the wing by means of four *strong* rubber bands stretched diagonally across the centre section. Both wing and tailplane must be absolutely rigid. The latter is held by two or three smaller rubber bands. Pass these first over the fin and sub-rudder round the fuselage; then slide the T.P. under the fin, and pull the bands back over the top of the fin and anchor them round the rear peg. Check wing and T.P. for alignment and stability, and ensure that the model balances when supported by two fingers beneath the mainspar.

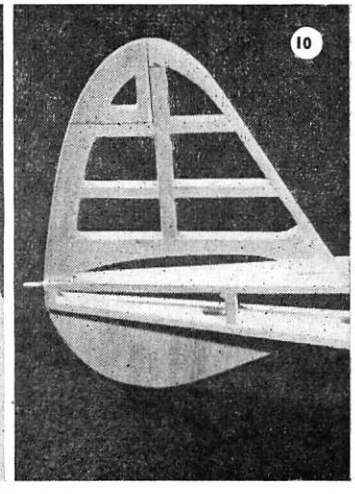
Choose a day when there is very little wind, and hand-glide the model into what wind there is. You will have to throw it quite hard compared with the average lightweight glider or rubber model; the ideal to aim at is of course the plane's natural flying speed, and once it is in the air you will soon find what this is. Don't be over anxious to trim for an extra long slow glide at this stage; the thing to avoid at all costs is any tendency to stall. If there appears to be any danger of stalling pack up the leading edge of the tailplane with a piece of $\frac{1}{16}$ in. scrap. Put about 30 degrees of right rurn on the trimming-tab, and adjust if necessary until a steady glide with a slight right turn is obtained. Only then should you consider trying the model under power.

Flying the TOMBOY. Well, the great moment has come, and if your hand is steady you are better than most! Perhaps the best way of dealing with this section is to describe exactly what happened when I first flew my TOMBOY.









High winds were the order of the day for some time after the model was completed, so it was not until about a week later that the trials took place. The weather then was perfect—warm, with the merest suggestion of a breeze. Hand glides were almost too good to be true, the flight path being quite level and with a slight natural right turn. So the first flight under power was attempted with the trim-tab neutral.

With the Tru-flex prop. the wrong way round, I filled the tank, started up the engine, and tuned it down to half revs.—as slow as it would go while still running evenly. I held the model until there was very little fuel left in the tank, and then launched it into the breeze. The result was a very gradual, steady climb in left-hand circles, followed by a lovely glide in very wide right-hand circles. As these latter were rather too wide, the next flight was made with about 30 degrees of right trim on the tab, and the engine still on half revs, as before. The model climbed slowly in wider left circles, but glided when the engine cut in extremely tight right-hand circles—so tight that most models would have gone into a spiral dive.

The right turn on the trim.-tab was then reduced to about 10 degrees, and a third flight attempted. The result was perfect : a steady climb to the left in 150-ft. circles followed by a right-hand glide in slightly smaller circles. On an engine run of about 25 seconds, TOMBOY climbed to some 100 feet and landed within two or three yards of the place of launching.

The next step was to speed up the engine. With the prop. still the wrong way round, but with the E.D. Bee buzzing as fast as she would go, TOMBOY behaved beautifully : a fast, steep climb to the left followed by the usual excellent glide. The climb was not quite up to contest standard, but fine for ordinary sport flying, and turned in a two minute flight on an engine run of about 20 seconds.

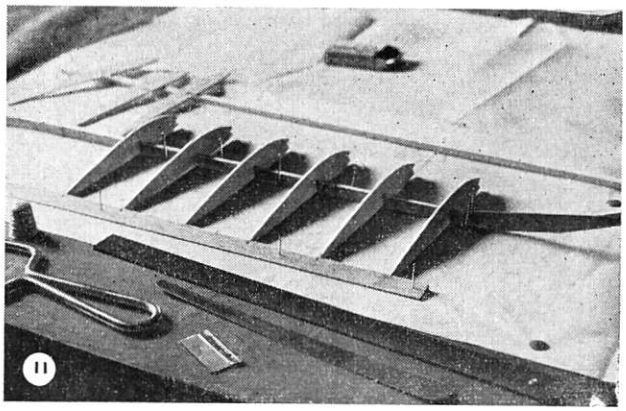
Postscript : Float Conversion.

For more advanced modellers, or beginners with a little experience, details for a floatplane version of the TOMBOY are shown on the plan.

Vic Smeed, who has flown the model in this form with great success, says that it only needs a few feet of water for taking off—a slow-running stream or a clear pond being ideal. The float arrangement is such that the model will alight and ride well on water, so that sea flying may be carried out in safety ; while the robust nature of the float construction permits repeated landings on dry land without damage.

All three floats are of the same size, so that the first step in building them is to cut *six* sides from $\frac{1}{8}$ in. sheet. Join these sides over the plan with the $\frac{1}{2} \times \frac{1}{8}$ trailing edge and the $\frac{3}{16}$ in. square leading edge, making sure that the assemblies are correctly aligned and squared up. Cut the centre formers from ply ; the front ones are " sewn " to the 14 s.w.g. legs after bending the wire over the plan. The rear float cements onto the sub-rudder when finished, so the slot in the ply former should be on top when this is cemented between the sides. A small nick must be made in the inner sides of the front-floats to accommodate the wire.

The formers may now be cemented in place, taking care to align them accurately. When set, cover the floats with medium to soft $\frac{1}{16}$ in. sheet, grain running across the floats. Sand smooth, and dope on rag tissue. Apply two or three coats of clear dope, and any colour that may be desired. The floats are actually reasonably watertight at this stage, but as an additional safeguard a flowing coat of banana-oil or fuel-proofer should be brushed on. If you intend to fly the float version of the model, you may care to fuel-proof it all over as a means of waterproofing. This applies particularly to sea-flying.



The front assembly is now bound to F1. A slot $\frac{1}{8}$ in. wide must be cut in the centre top of the rear float in order to position it on the sub-rudder. Once the fit is satisfactory, it may be cemented firmly in place. Check that all floats are at the correct angle by comparison with the plan.

Interchangeable Landing Gear.

If you have built a " box " between F1 and F1A, then either float or wheel undercarriage may be plugged in at will. The actual box should be liberally cemented and reinforced. It should be constructed as a unit before affixing F1 to the fuselage, when a piece of old silk stocking can be bound round the box to prevent it splitting open under stress. The rear float may be made detachable by opening the slot in the top to $\frac{1}{4}$ in., and fitting in a $\frac{1}{16}$ in. sheet box which fits the sub-rudder. This ensures that the float remains watertight. Two small hooks can be cemented immediately before and behind the ends of the slot/box, and a single rubber band passed from the front one, over the tailplane, to the rear one. The designer's own model used this system, and no trouble was ever experienced.

Trimming the Float Version.

This is just as simple as trimming the landplane version. In converting from the landplane, $\frac{1}{16}$ in. packing under the leading edge of the tailplane and a little less right rudder were the only changes required in the original. It is best to test-glide over long grass before getting everything wet, and for your first hydro take-off PLEASE pick a windless day, when the water is almost unruffled.

Take-off is simplicity itself. Start the motor, place the model gently on the water, and release. TOMBOY, when fitted with an E.D. Bee will hop off in three or four feet, and has the prettiest take-off imaginable, as it will skim for a few feet just above the surface of the water before getting into its proper climb.

A word of warning : keep your motor run short until you are familiar with retrieving over water, and run the engine and wipe it down carefully after each day's flying.