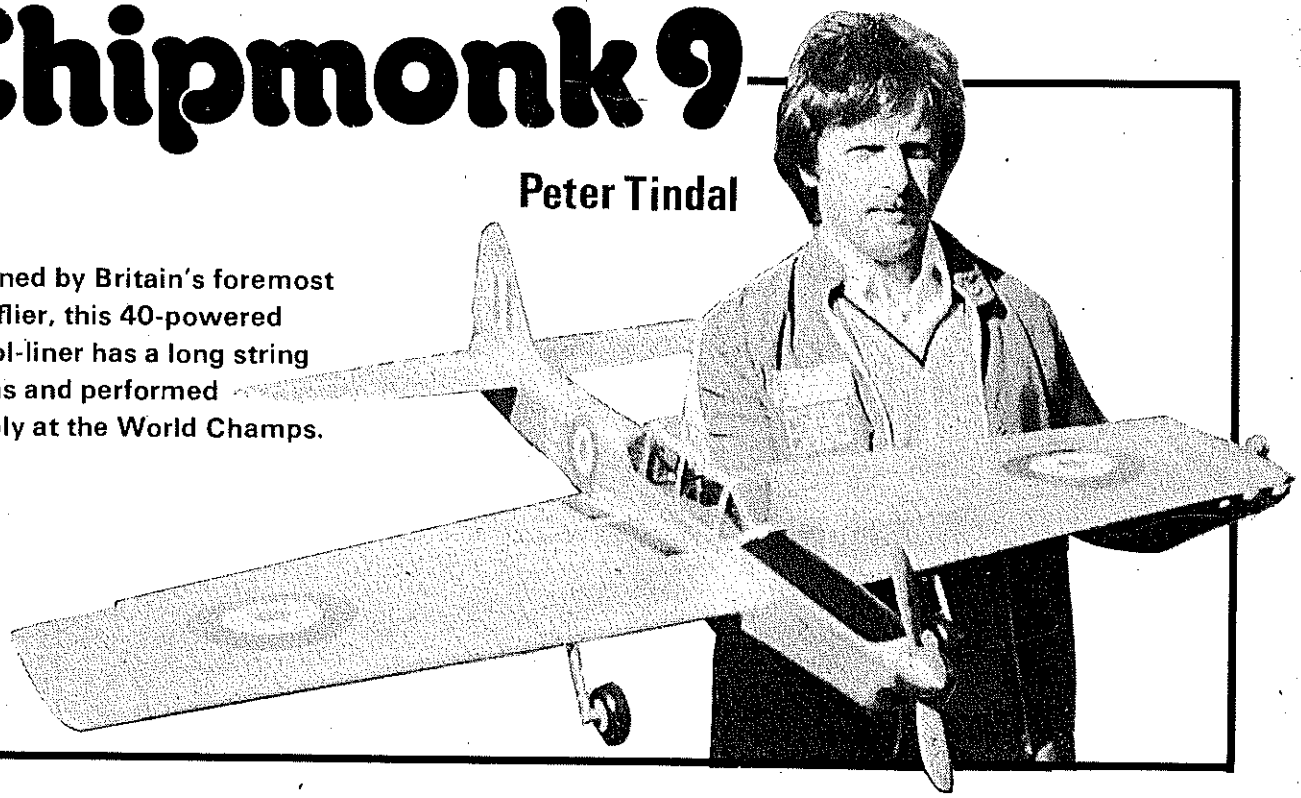
Chipmonk 9

Peter Tindal

Designed by Britain's foremost stunt flier, this 40-powered control-liner has a long string of wins and performed credibly at the World Champs.



I FEEL it is time that my model should see the light in the hands of other modelers, as there appear to be too few semi-scale stunt models on the scene (excluding models a'la Rabe, which seem beyond the average modeler because of time commitments, myself included). I would pass on just two comments, one from Jim Mannall, six times Gold Trophy winner: "It's the first model belonging to someone else that I have flown for a long time that I have felt happy with straight off the ground"; and the second from John Heanen, junior stunt Champion four years ago, now placing regularly in top five—"Beautiful!" This could obviously be said about a lot of models but I think its record over the past couple of years adds weight to the above comments, plus the model has been modified from the number 7, which they both flew, to the number 9.

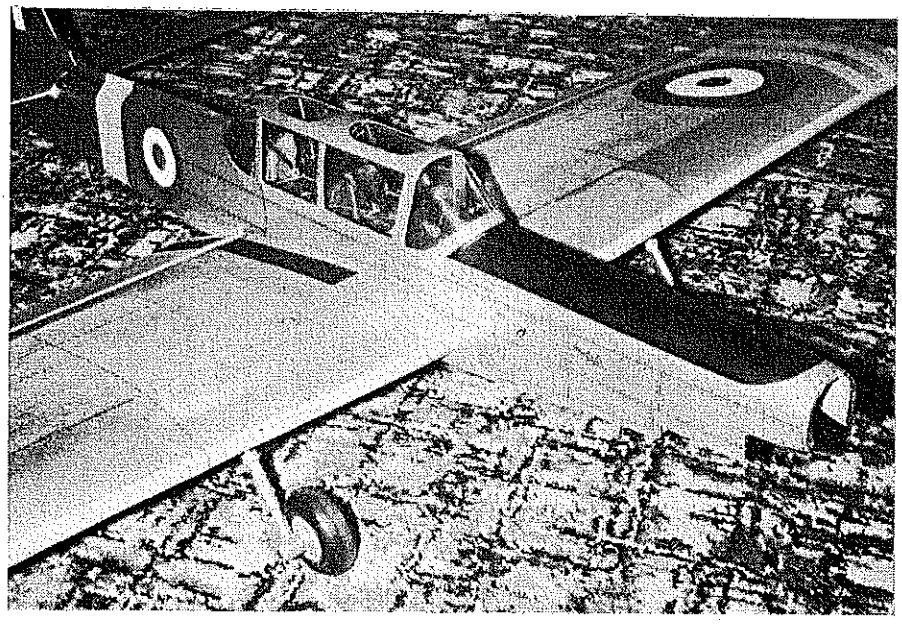
I decided just before the 1975 Nationals that the model I was flying could do with a lighter wing loading and, as I couldn't build any lighter, I decided to build bigger, thus the Chipmonk Number 9 evolved. The root chord went up by 1½ inches. The tail was increased by some 20% and the wingspan was increased to 57 inches from 54, giving a wing area of some 688 sq. in. This meant that even with a weight of 54 ozs. (which is quite heavy but easy to build to) it was still 12.75 sq. in. per oz. which falls well into the 11-14 sq. in. per ounce at which I have always aimed.

The Detroiter style of wing, as explained to me some seven years ago by Neil Billington is still the quickest way of building a wing and, when modified to a D-box section, becomes very rigid as well. The method can be used for any wing design, symmetrical or not. (The only difference being that different templates are required for asymmetrical sections.)

Construction

First decide on the section of the wing to be used and make a template of the section between the leading edge and trailing edge at the point of maximum chord (Sketch A). The template should be at least 3 in. deep which makes it easier to hold and thus becomes less tiring on the wrist when cutting out the ribs. I find with Detroiter style that there is no need to put in any more ribs than normal, so decide on the number of ribs, double it and add 8 for the tips, to give the number of ribs required, usually about 70. Don't be put off by this large number as they can be cut out in approximately half an hour.

To cut the ribs I usually cut two sheets of 4 × 1/16" into pieces, the length of the template, then put them one on top of the other. I then mark (as Sketch B) ¼-in. spaces from the bottom of the sheeting to the top and then cutting can commence. Just lay the template on top of the pile and commence cutting; it will be found, with a



For those who feel happier with an airplane that is based on a real ship, the details on the author's DH add considerable realism. The simulated rivetting, color scheme, canopy, and interior finepoints, life-like landing gear struts and wheels really point it up.

sharp knife, that the ribs come off perfectly good enough to build with and require no sanding, etc., due to the fact that the leading edge sheeting and capping ribs cover them.

Next, take four ribs and lay them flat on a piece of paper where the leading and trailing edge have been drawn in section, first at the center section, second, at the last rib bay, as Sketch C. This will then give the depth of the main spar, measured between the two extremities of the ribs at 2¾ in. back from the leading edge. The main spar is then drawn up straight onto a piece of hard ⅛" sheet as Sketch D. Building can then start when board has been set as follows:

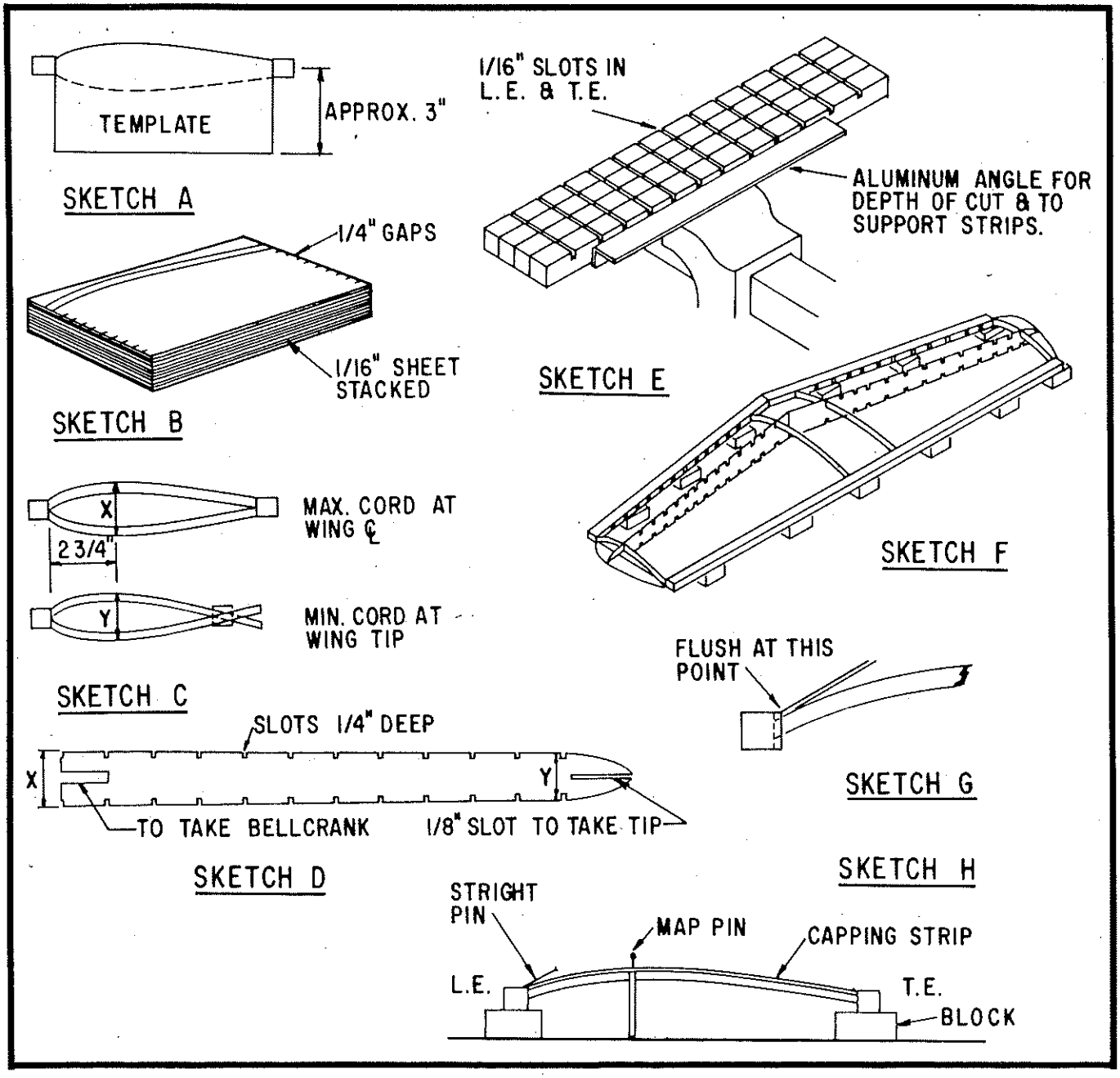
1) Draw outline on board and glue blocks along leading and trailing edge. These blocks should be half depth of main spar at CL of wing minus half thickness of leading edge.

2) The leading and trailing edge for both wings are then cut together, which means a block of four strips that all line up and can be cut accurately. (Sketch E.) To cut 1/16-in. slots in main spar, leading and trailing edges, I use two pieces of hacksaw blade with the teeth going in opposite directions.

3) We now have all the ingredients for a quick, fairly light, and rigid cheap wing which will be perfectly straight providing the building board is. Pin the leading edge and trailing edge pieces onto the packing pieces having first glued the joints (I used PVA throughout). Next, put the main spar in position, having previously applied the 1/32 ply doublers, and hold in the vertical position by putting in the two center ribs and the two tip ribs (top only). It should be found that the main spar will touch the building board in the center and should lift clear at the tip to bring the CL of the spar parallel with the board. Pack this into position and glue tips into place between leading edge and trailing edge and into main spar. This will be sufficient to hold the wing perfectly straight while being built (Sketch F).

4) All the ribs are inserted into the slots on the leading edge and into the main spar. It will be found that an increasing amount of rib protrudes beyond the trailing edge. This is cut off in position with a razor saw and the rib pushed into the trailing edge. Before glue is applied, take a piece of scrap 1/16" sheet and push leading edge and trailing edge of rib down to give a level with the sheeting. (Sketch G.) All joints can then be glued. I water the PVA down slightly to allow it to soak in before drying as I only use a fillet of glue to aid speed in building. The ribs can be glued in one at a time but I have found that it makes very little difference in strength.

5) When all the ribs have dried the lead-



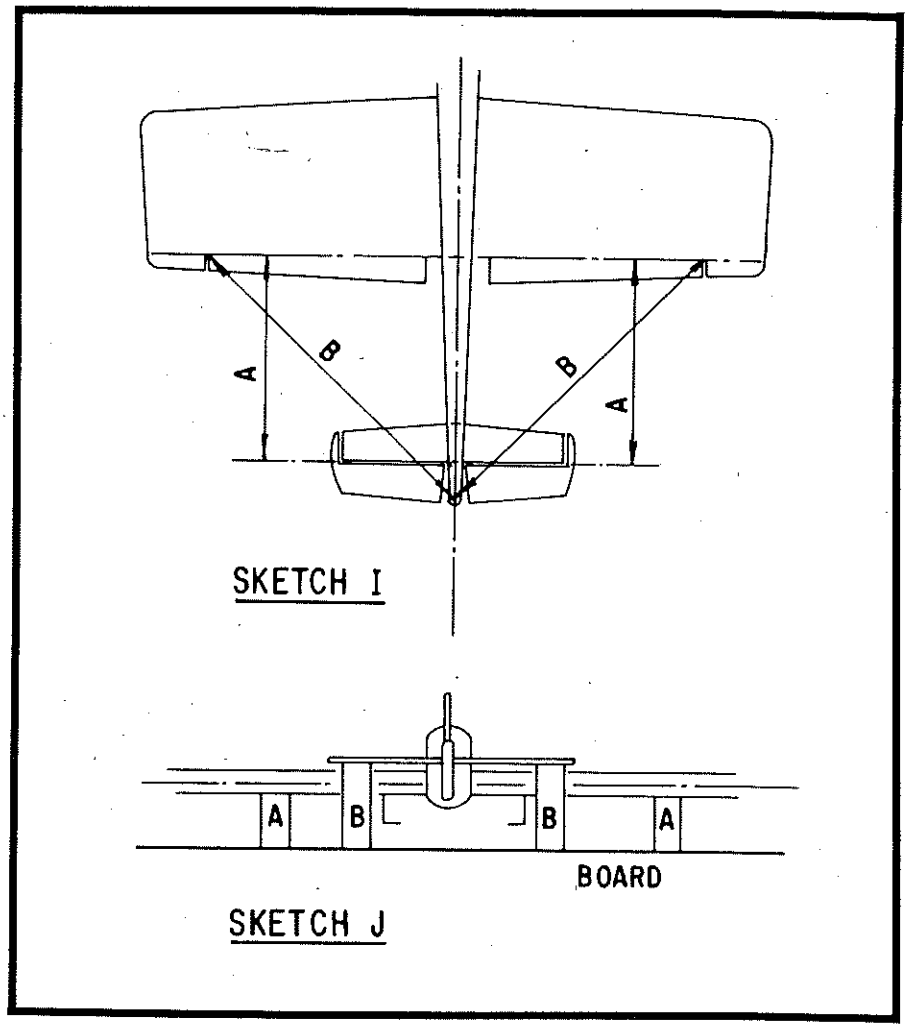
ing edge sheeting can be applied. I cut this from a 4-in. sheet and the remainder goes along the trailing edge. If working fairly swiftly the glue can be applied first to all the ribs then along the leading edge and sheet, then pinned in position. Due to the lip caused by lowering the ribs, I find it only necessary to pin at each rib but not through it. (Sketch H.) Run the glue along the main spar and work sheeting onto ribs, pin to main spar. Here, I use large-head map pins so that the sheet doesn't raise up the pin.

Repeat process on other wing and at trailing edge, then add center section sheeting, capping strips and tip ribs. The tip ribs have capping strips as have the tips; this gives a definite flatness to each rib and reduces distortion of the tissue between ribs. Top of wing is now complete and should be left 24 hours before removing from board.

So far, time taken from cutting out template is in the region of three hours actual work which is normally spread over a few evenings. *Do not trim leading edge or trailing edge as the wing has to be turned over and mounted on the same blocks.*

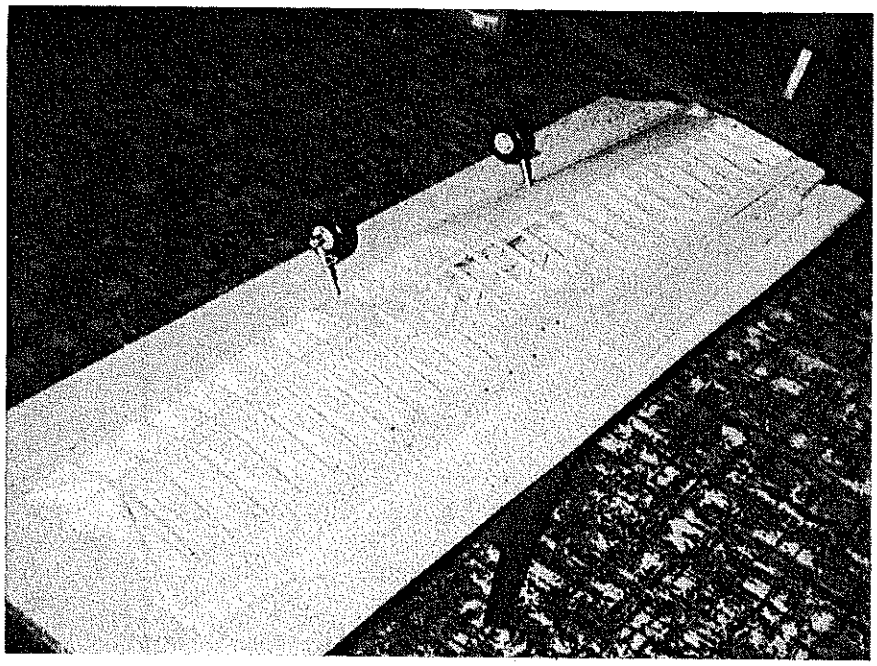
6) The wing is then removed and turned through 180° about the CL and repinned to the jig. The bellcrank is added to the point which also forms the main center section brace and this is epoxied to the rear of the main spar. The leadouts are connected to the bellcrank and the guides fixed to the tip. The undercarriage is bent to shape from 10-swg piano (swg means standard wire gauge—equivalent is .128) wire (should the model be required for use over grass it is suggested that it be at least an inch longer) and wired (soft copper) to the ply brace. This is positioned at an angle from the bottom edge of the main spar to the uppermost edge of the leading edge. The area between the ply and the sheeting is filled with soft scrap balsa. I fill this area then sand it to the line of the two adjoining ribs so the bottom leading edge sheeting adheres to the whole surface. The same process from No. 4 is repeated and, after 4-6 evenings' work, a completed wing is ready for sanding to shape.

This is the process for building any Detroiter-style wing including "Chipmonk 9." Building the rest of the Chipmonk is fairly straightforward, the only complications being the removable wing.

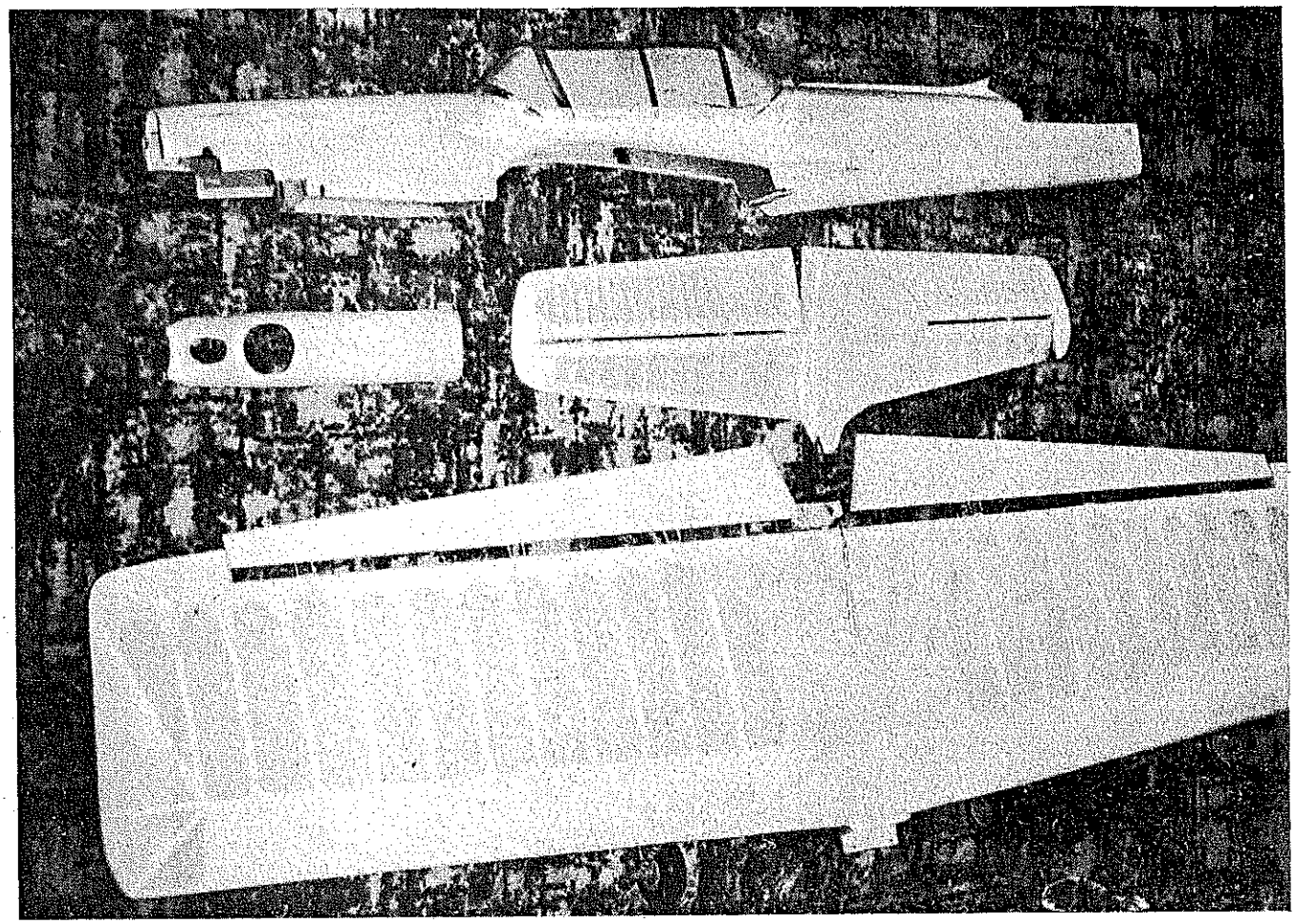


The fuselage is built upside down on the plan as this is the best method of obtaining symmetry. Having cut out the formers, remembering No. 5 is 1/32 ply on both sides of ⅛ balsa (soft) and the fuselage sides (again including 1/32 ply doublers), the bearers are placed in position on the plan. Formers 3 and 4 are epoxied into place, making sure that they are both vertical and square. The fuselage sides are then epoxied onto the bearers and formers, making sure that the top of the sides are flat onto the building board.

Allow this to set while cutting four longerons from ¼ stock. These can be glued in place using PVA or similar. The tailpost is glued into position by pulling sides to meet it. At this point making sure that the sides align with the plan, add former No. 2, again making sure it is square. The two wing seat braces are now glued into position together with the tank bay base (the thickness of this will vary according to the height of the venturi on



The "Detroiter" or "birdcage" type of wing construction is the quickest way to build a wing, thinks the author—he's made many of them. Wanting a lighter wing loading he built larger—57-in. wing yields 688 squares. Gross is 54 oz. but the combination works well.



The finished components ready for painting. The removable wing is a boon to transportation. Using a TopFlite 11/6 wood prop, he likes to fly at a rate of 5.2 seconds a lap on a fast 4-stroke. He trims to fly straight through the reverse wing-over.

the motor but ¼ in. for Fox 40 shown). The vertical braces between the longerons are added before adding the front and rear wing mounts.

It should be pointed out that these are not drilled and tapped until much later, although the dural plates are epoxied prior to fitting. The front fixing is then doweled using ⅛ in. hardwood. The wing seat sheeting is added to the braces followed by the bottom sheeting rear of the wing.

When all joints are completely set, the fuselage can be removed from the board and the engine bolt holes drilled. When aligning engine, I put in just enough offset to make sure there is no inset, in other words the engine should be as near straight as possible. Bolt the engine in position in order to align former No. 1, but remove before adding top block. This is only spot glued into position while the external shape is obtained. Remove top block and hollow out as much as can be easily removed without endangering the strength (3/16 thickness is quite thin enough). With the engine in position (with all openings sealed) block out cowling shape with scrap ½" sheet and sand to shape. When satisfied with the shape, cut cowling through exhaust stack centerline as side elevation, remove and sand internal to shape including air inlet and outlet (to dotted lines). Bend 14-swg (.080) tail wheel strut to shape and bind to ply plate, epoxy into bottom of fuselage and block out with scrap.

When the wing and fuselage are completed the fuselage is turned upside down and the wing placed in its recess. The CL of the wing and fuselage are lined up and a measurement taken from the flap end to the CL of the fuselage at the back. This measurement has to be the same both sides (Sketch I) and then four spots of balsa cement are used to hold the wing in position while the removable section is added. Once the glue has dried, hold the ply plates in position and drill through, tap out dural to required thread (I usually use 6B4), and bolt together. It is then just a simple operation of packing out with scrap block and sheeting to obtain required profile.

To line up the tail, have the CL of the fuselage and the CL of the tail in line and measure from hinge line to hinge line to obtain symmetry. Check the horizontal alignment at all times by laying model on flat board and putting two equal-depth blocks under the wings at approx 6 in. from fuselage and on main spar line. Then place two similar blocks (but deeper by parallel depth) under the tailplane. This ensures a true tail and wing horizontally (Sketch J).

With pushrod soldered into elevator horn only, shape of slot in former No. 5 allows removal of wing but will not let pushrod come out. Epoxy tail into place, again checking alignment. When absolutely sure that all items are square, glue top block into position and epoxy fin making sure that this is vertical and in line with CL of fuselage.

When the model is complete and to your satisfaction, add tip weight. There are no hard and fast rules about tip weight, especially with a symmetrical model. I personally balance the model ¼ in. outside the offside fuselage side and have found that this seems to be the best position for any weather conditions.

Now to finish the model: this may seem a bit old hat but in England we have only recently started to obtain fuel-proof dopes (in the Provinces anyway) and as 6 ozs. on a 700 sq. in. model seems difficult to obtain with polyurethanes or epoxy paints, I'll stick to this method.

Once the model construction is finished, weigh both pieces, e.g. wings and body, then rub entire model with 320 paper dry until absolutely smooth all over. If there are any dents, digs, etc. then fill them now with a mixture of balsa dust (rubbed off rest of model) and dope. Weigh again and see the difference. It may be only an ounce but it is worth removing. Once model has the required finish add two coats of clear dope unthinned to entire model, except for capping strips; if added to capping strips they will tend to curl up and cause a distor-

tion in the tissue (I've done it!).

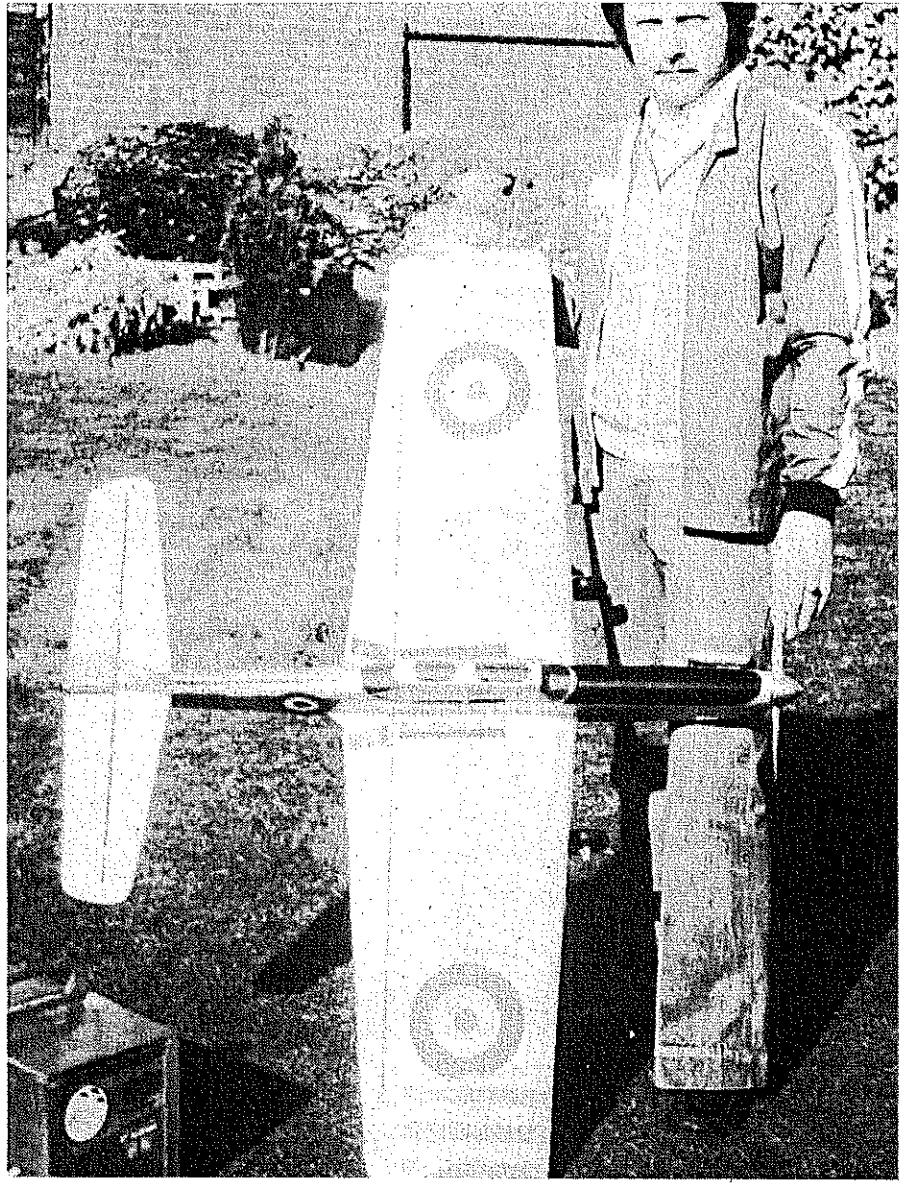
Weigh the parts again and you will be surprised how little weight has been added. Sand entire model with 320 wet and dry—still dry, and when all roughness has been removed (and any new dents filled), check the weight again. There should be little difference to before doping.

Mix 30% dope, 70% thinners, and brush on clear lightweight tissue over entire body and tail with this mixture. (When covering, make sure that where the tissue goes over a fillet or round an inside corner, e.g. tail to body, to join the tissue in the middle of the fillet in the form of a butt joint. Do not overlap because the shrinking effect of the dope will lift the tissue away from the fillet.) The thinners will attack the dope in the wood and will make a very good adhesion; when dry, add another coat of 30/70 and allow to dry completely. The tissue will take on a slightly furry appearance and this must be rubbed down with 320 (use the same piece because it will be slightly finer) until completely dull all over, but do not rub through the tissue at this or any other stage. Mix a 40% dope, 60% thinner mixture and brush on another two coats and leave to dry for 24 hours.

Having coated the wings with two coats of unthinned clear dope (not capping strips) and rubbed down to original weight again, use a mixture of 30/70 to apply the heavyweight clear tissue over entire wing (except bottom of body—use lightweight). Once dry, give another coat of 30/70 to tissue over wood but still not capping strips. This method is far more satisfactory than tissue paste—it is quicker, cheaper, cleaner and lighter! This will dry very quickly and the tissue can be water shrunk almost immediately. When dry add two coats of 40/60 to open work of wings but not to the wooden parts. When dry, add two further coats of 40/60 to entire wing and leave to dry.

Back to fuselage, this is now ready to rub down with 400 paper dry and, when completely matt all over and you are sure there are no dents, etc. (the point of no return has been reached!) spray with a mixture of 30% silver and 70% thinner. It covers all and is an excellent base for any color. Only a very thin coat will be necessary; it has very good covering qualities, so obliterates all manufacturer's stamps and wood grain coloring. When this has completely dried, rub down with 400 dry but make sure not to cut right through the color at all, and the fuselage is ready for its finishing color. I use silver so I apply two more coats of 30% silver 70% thinner to the fuselage, and this is then ready for decoration.

The wings should now be completely dry and should be rubbed down with a piece of 600 dry, Evo-stuck (contact cement) to a piece of foam rubber; this follows the contours of the wing and will not cut into the tissue if careful. The wings are ready for the 30% silver-70% thinner treatment and when dry can be rubbed down again with the 600 dry, making sure not to cut the tissue on the ribs or sheeting edges. This is now ready for finishing coat and again I apply two more coats of 30% silver dope and then leave entire model for at least three days before adding any decoration. A coat of 30/70 clear over the entire model would help stop the finishing color being damaged prior to adding decoration as any slight drips of dope or enamel can be wiped away without the base color being marked.



A happy ending—all that work was well worth it. Pete's the thoughtful type, as you probably will discern in working from his plans.

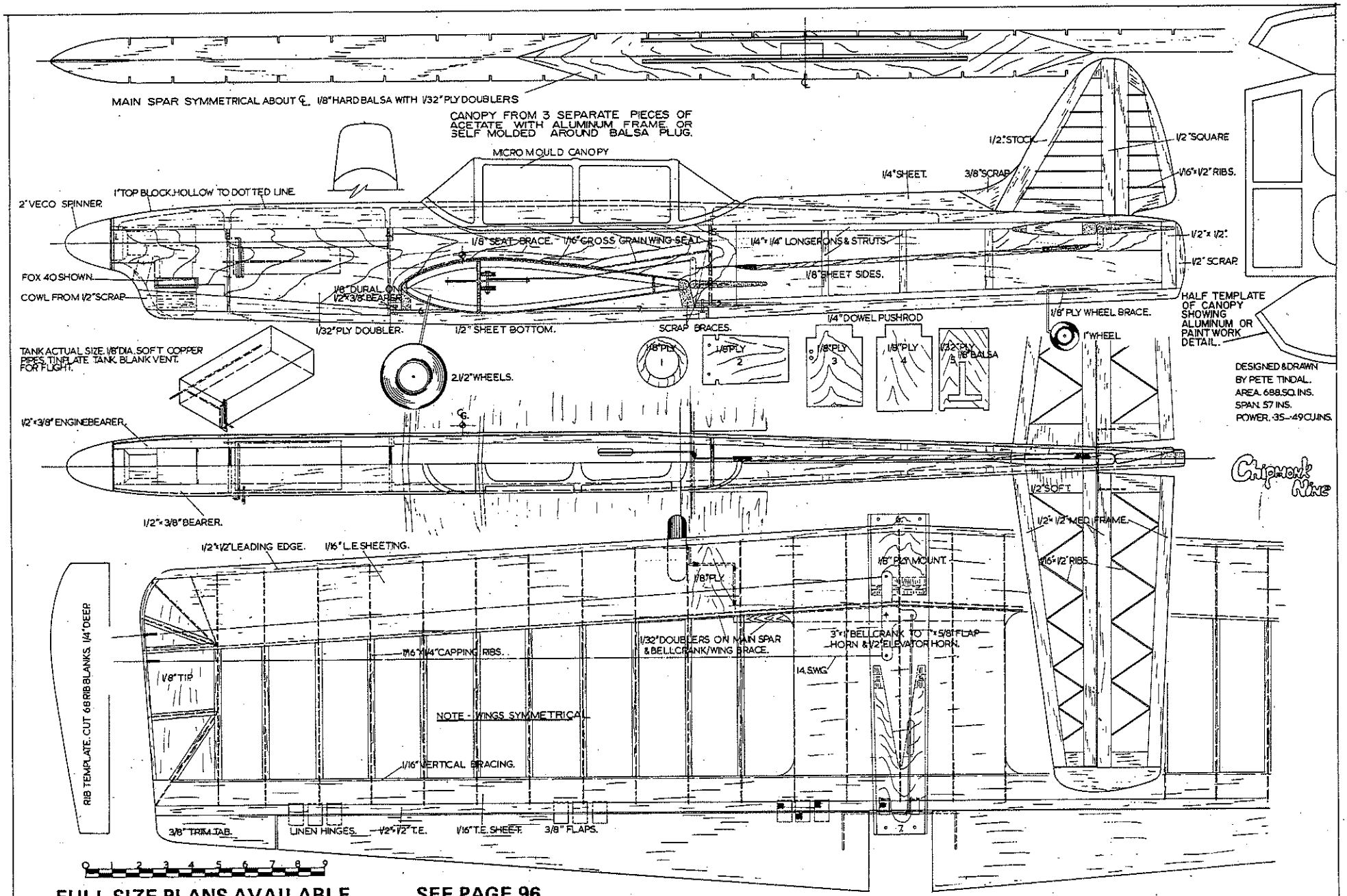
If silver is used as a finishing color then to achieve a good finish it must be sprayed on, and so must the fuel proofer because the dope is particles in suspension and a brush will leave ugly lines. The previous coat of 30% silver-70% thinner need not be sprayed as it has to be well rubbed down so the brush marks will go anyway.

When adding trim and using masking tape to achieve a clear line, it is advisable to run a thin seal of clear dope along the edge of the tape to prevent the color from running underneath. Apply the trim color well thinned—whether sprayed or brushed it should flow out smoothly. As I said before, the last two items, finishing color and fuel proofer are the heaviest; be sparing because you should have had a very good base to apply them to so they only need to be thin.

This method of finishing should only add about 7 oz. maximum to a 57-in. stunt model, so with a heavy motor like a Fox 40, weights of 52 oz. are within easy striking distance. Once the model is completely finished it is well worth making cardboard covers for all flying surfaces; although they may not be damaged once on the flying field, transportation is usually the most injurious to good paintwork.

I will not dwell on the flying of this model, only to suggest that 18½-meter Pylon stainless lines (equivalent in feet is 60.695) be used and that a flying speed of 5.2 seconds per lap suits me perfectly. I use a Top Flite 11/6 wood on a fast 4-stroke and trim the model to fly straight through the reverse wing over.

I would add that I hope this model gives as much satisfaction and success to any modeler who decides to build it as it has given me during the past three years, including a third, first and second place in the British Championships and a team place for the '76 World Championships.



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