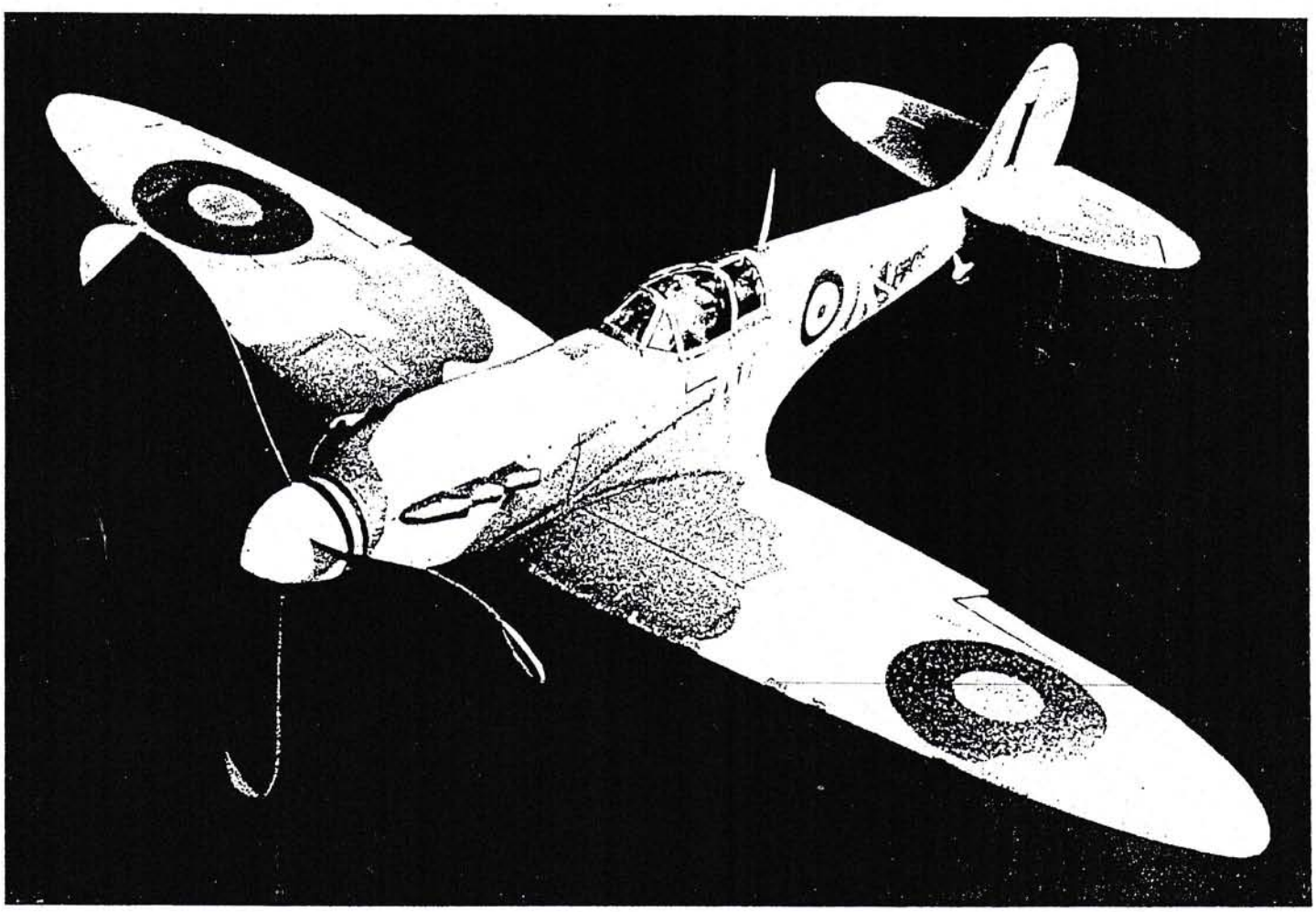
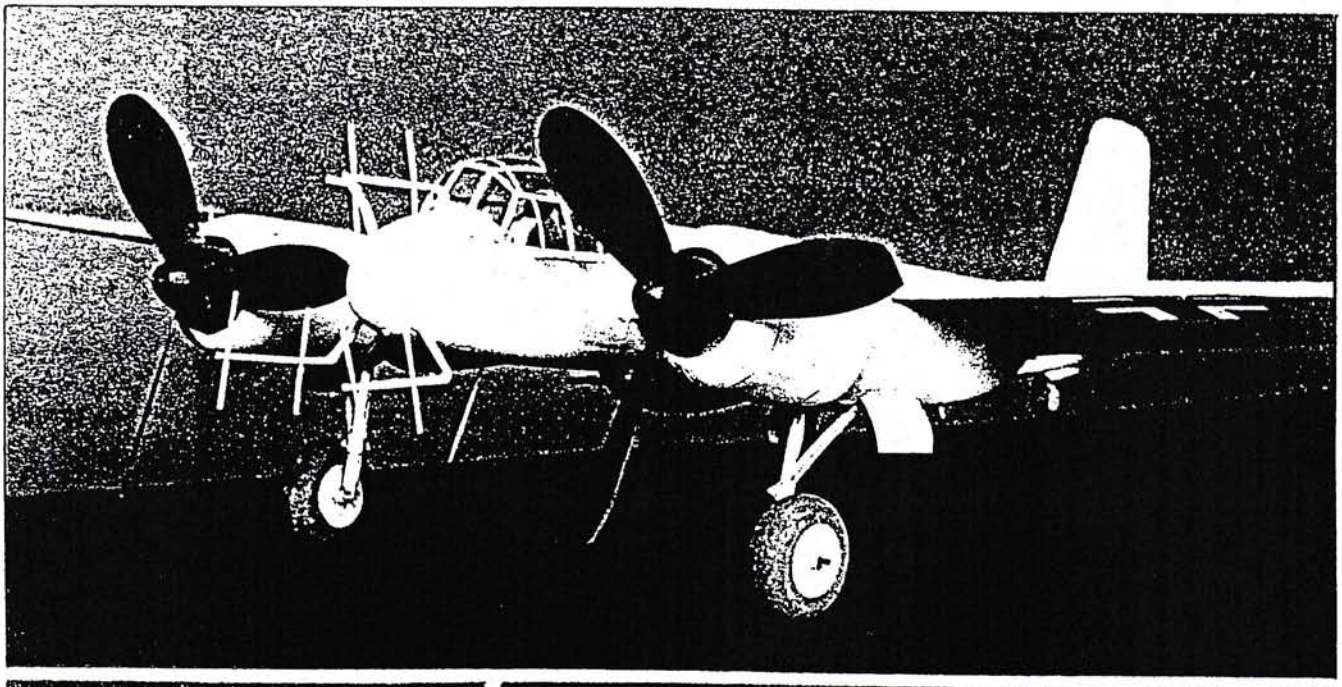
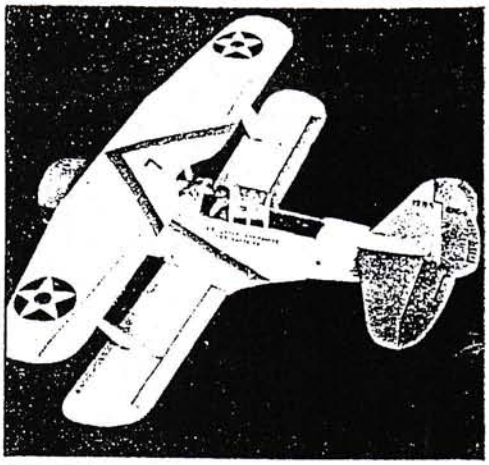
Indoor Foam Scale Flying Models

HOW TO BUILD AND FLY THEM



DAVID DEADMAN, PETER SMART
AND RICHARD CROSSLEY





Cover: Peanut Spitfire by Dave Deadman.

Richard Crossley's JU 88 spans 19ins (480mm). Places high in Open Rubber.

Peter Smart's amazing TU95 Bear. 32ins (810mm) span. Will be a strong contender in Open Rubber. Weighs 50gms (2oz).

Lavochkin LA7 peanut by Dave.

Pistachio Curtiss Helldiver by Peter. Struts are thin acetate and flexible.

INTRODUCING FOAM

So many people have asked how we make our foam scale models that we thought an information sheet might persuade more modellers to try the material for themselves.

Foam is the ideal way to reproduce stressed skin aeroplanes such as those flown in WW2, or any structure where compound curves appear.

The skills required to work foam are different from stick and tissue, but they are learned quickly with practice. The material is cheap, readily available and of a consistent quality. Foam is lighter than balsa but not as satisfying to work. However models in foam do take shape very quickly and they can be cut and modified easily. Foam is also flexible and forgiving in a crash, with the benefit of easy repair.

Stick and tissue will always have a charm all its own but, choose the right subject, and the foam model will have much more realism and improved performance. Our Peanuts and Pistachio models have achieved close to 1 min 30 sec flights in competitions and we have proved that 2 and even 4 engines are perfectly practical.

You only need a 3 view to start building. There's no need for any construction drawings and this makes available a whole range of prototypes. Do give it a go!

THE MATERIAL

In the UK we use **Floormate 200** blue foam from Dow, but it has a different brand name in the States. Thanks to Richard Spurgeon of Philadelphia who did some research into the subject we can recommend Dow Styrofoam **Highload 60** which is fractionally heavier than our European Floormate 200.

Highload 60 is used for insulation in the construction industry. The lighter Highload 40 does not have the the right qualities of sandability.

CUTTING

Basic shapes are best cut out with a Hot Wire cutter. You can make one yourself (see later). Alternatively a Dremel or a Vibro saw may be used. You can get by with a hack saw, Stanley knife, fret or coping saw.

Richard Crossley's peanut Hawker Tempest was built and hollowed out using only hand tools - and it can do 55 seconds indoors.

SANDING

There will be an awful lot of sanding and we strongly recommend you wear a mask. Inhaling minute particles may prove a health hazard, so why take the risk?

Also when using grinding or sanding drums in a mini drill, take care to wear eye protection.

You will need a range of sandpaper from very coarse to 1200 grit for finishing. Make a range of sandpaper files including some half round shapes. Large flats, say 50mm (2in) wide, are useful as they can 'plane' away material quickly.

For final finishing work with the paper in the hand and cut it to an oval shape to stop scuffing the material. The foam is very fragile and it needs practice to get a good surface. It helps to work on a soft work surface - a rubber sheet or a spare piece of foam - to avoid denting the smoothed surface. Keep brushing away fragments and dust—off the work and off the work surface.

Static makes this difficult, but it helps to lay off for a while so that the static will gradually subside. Like balsa, foam will take on a curve if you sand only on one surface. It will straighten again if you give a few strokes to the other side.

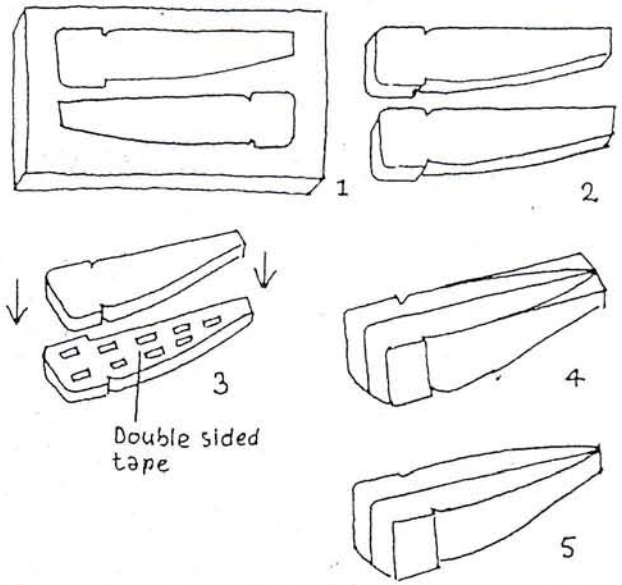
You will find that Hot wire leaves a welded surface, which has to be sanded through before you can get a very smooth finish.

ADHESIVES

A good sandable white glue or aliphatic resin will do for most joints. Cyno must be the odourless type and avoid accellevator - it melts the foam. Epoxy is fine but heavy.

FUSELAGES

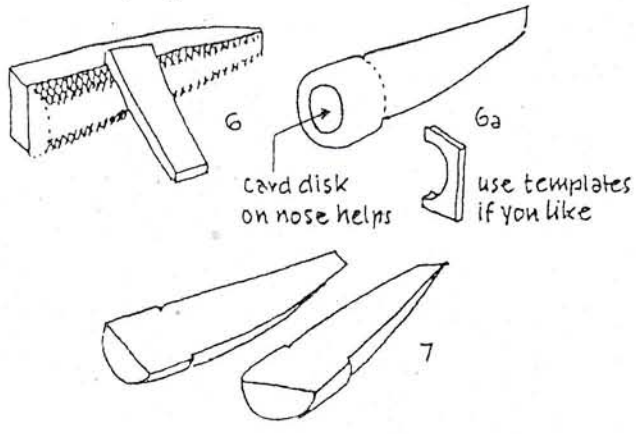
Draw the side elevation on the foam and repeat-handed (1). We make card templates and draw round them, or use spare Xerox prints cut out and spray mounted onto the foam. Cut out the side elevations (2) and stick them together with small patches of double sided tape (3). Draw the plan view on the block (4) and cut out the plan (5)



Now cut and sand the block to shape (6) with constant reference to photos and plans.

Omit all details like intakes, canopies, radiators etc, just try to get the basic shape.

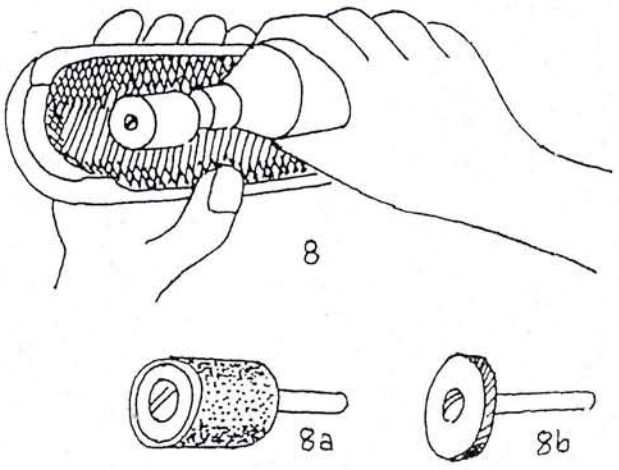
Use a new scalpel blade to carve and then work with the sandpaper down to the finest. Make templates if you want, we find it better to work by eye.



When satisfied with the shape and finish, separate the halves. If they are reluctant, spill lighter fuel on the joint. (7)

(8) The two halves must now be hollowed out to a thickness of approx 1·5mm (1/16in). or even 1mm (1/32) at the tail end. With practice this is not as difficult as it sounds. Our early models were hollowed by hand by making deep V cuts in the foam and slicing out wedges, finishing off with coarse, then fine paper.

These days we use a small power drill (8) starting with a carborundum drum (8a) and smoothing with a grinding wheel (8b) holding the job up to a light constantly to check on progress and feeling between thumb and fingers. You can tell when the foam is very thin because it begins to look white as the light shines through. Use the tools like a brush and you will soon get the hang of it. Don't worry if you get too thin in places - so long as you don't burst through. (If you do you will have to put a patch inside)

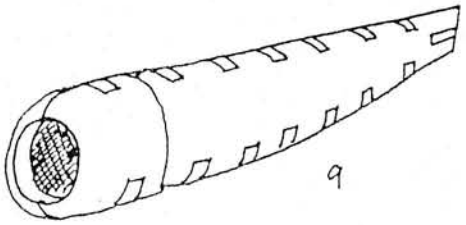


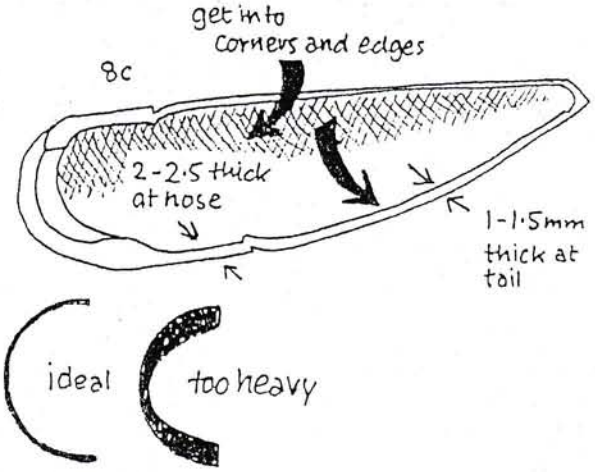
Aim to get the tail areas as light as possible but leave the nose a little thicker to help with the C/G. (8c) Do try to get into the edges and corners so that it is all thin

Finish off by stroking with fine paper feeling for any high spots.

The secret of the success of these foam models is largely due to this hollowing out. If you do it well it will pay dividends in sheer performance.

When both sides are hollowed clean up the edges and smear both edges with white glue. Assemble the two halves, holding with strips of masking tape. (9)



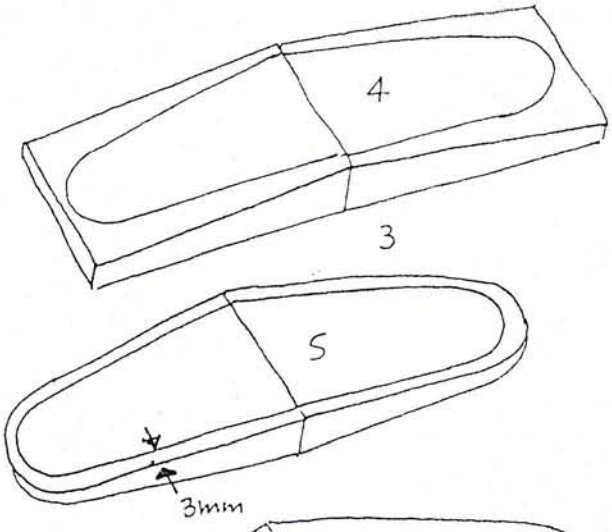


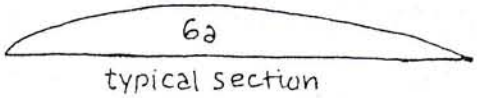
WINGS

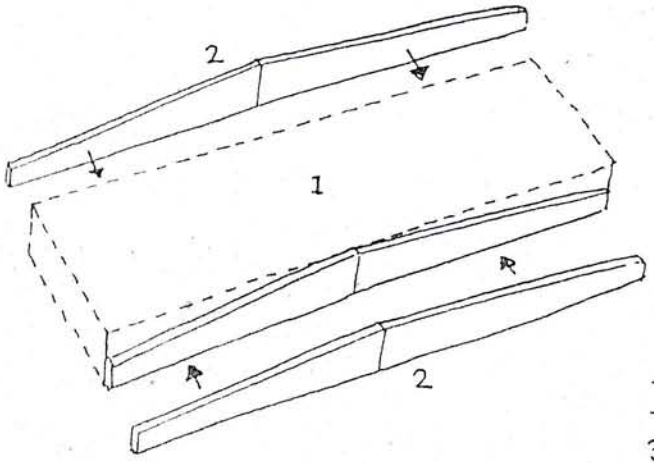
Cut a block of foam (1) about 5 mm (1/4in) larger than the wing. Make card templates to create the taper of the wing (2) and hot wire (or sand) the blank to shape (3). Draw on the outline of the wing (4) then cut away to leave 3mm (1/8 in) all round. (5)

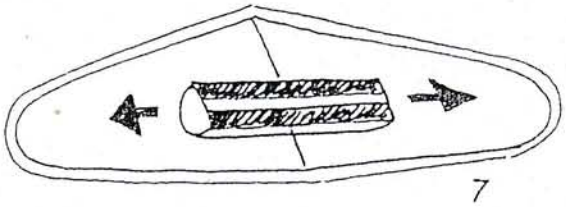
Using a coarse sanding file sand away the top surface to create a section (6a).

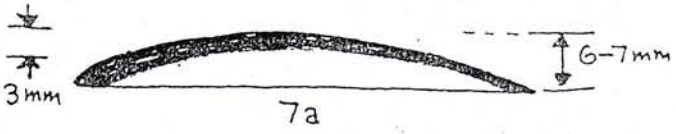
When the top surface is finished you must now make the undercamber by (7) using half round files, or paper wrapped around the fingers. Aim for a section like 7a and extend the undercamber out to tips. Feel all over with the fingers to find high spots. Do try to get the wing as thin as you dare but don't go too far near the tips.







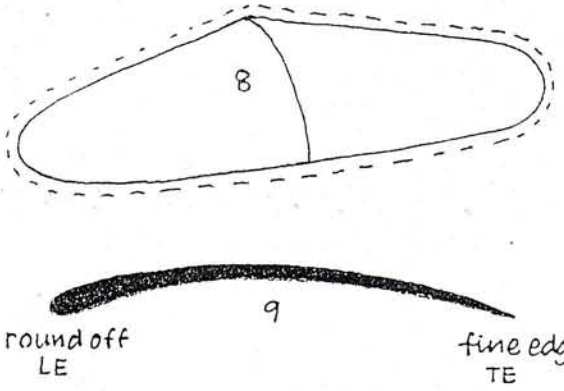




On a typical peanut wing the depth of the section would be approx 6-7mm (1/4in) but the thickness at the point of maximum camber might be only 3mm (1/8in), tapering to 1·5mm (1/16) at the tips.

When satisfied cut the wing out to its (8) final shape, round off the LE and taper the TE to almost a knife edge (9)

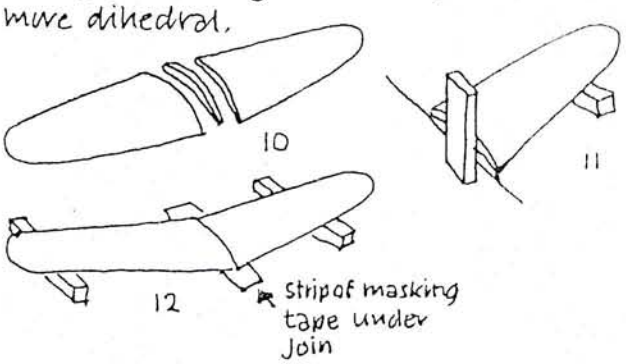
Finally balance the wing on a knife edge to see if one wing is heavier and sand accordingly.



Now cut the wing in half in such a way as to leave a thin 'rib' of the section. This will be useful later on (10).

Prop up the wing halves to the dihedral you want and sand in the root angle (11). Prop up both tips and join the wing permanently (12).

The amount of dihedral is important if you are to have a reasonably stable model. We go 'overscale' on a subject with a fairly flat wing, but scale on one with plenty of dihedral. One advantage of foam is that you can cut it all apart and try again if test glider show you need more dihedral.

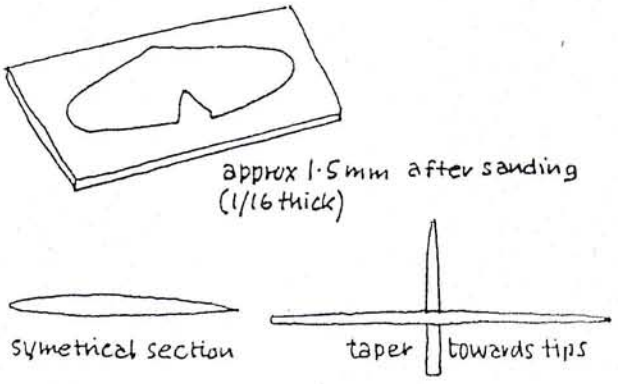


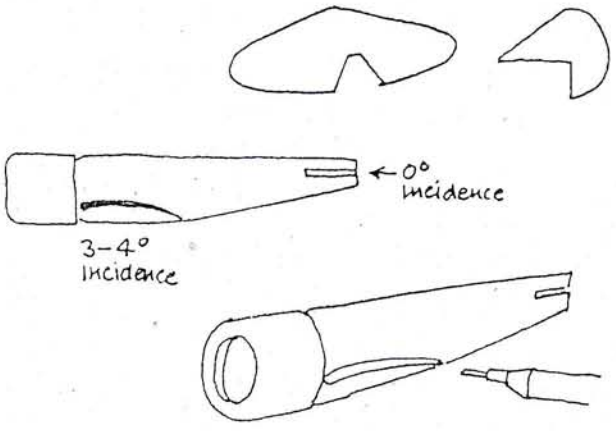
TAIL SURFACES

Cut or sand some thin sheets (say 2mm (3/32in), and draw on the shapes. Cut out and sand to section, with some taper towards the tips.

We tend to enlarge tail surfaces - 5or 10% to aid stability. If you do enlarge areas adjust the chord and the span to keep the same proportions.

Rudders and elevators will be bent for trimming later, so keep them thin.

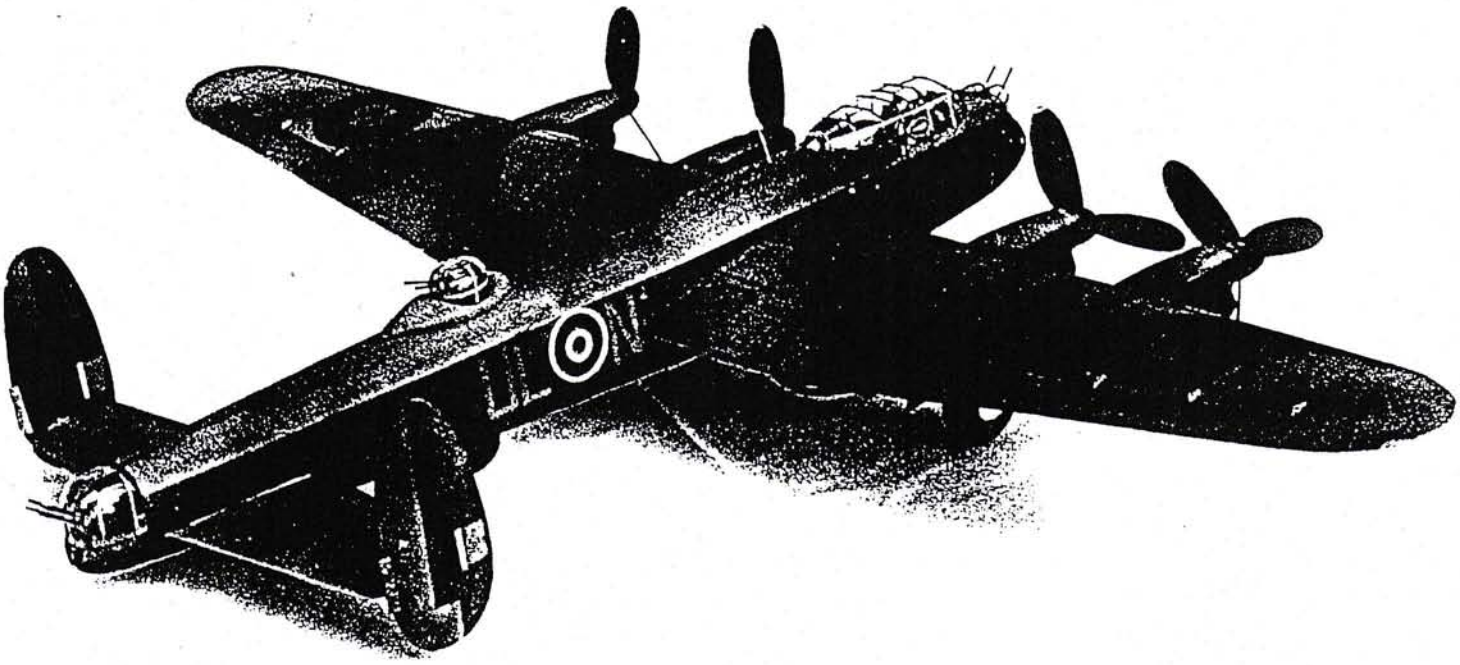


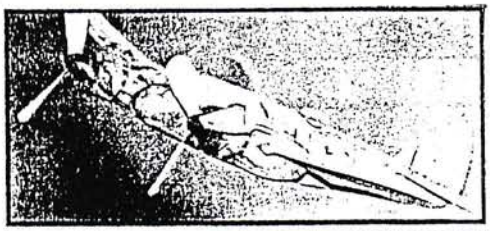


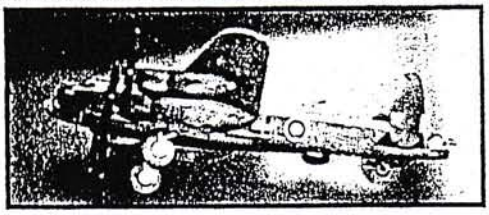
ASSEMBLY

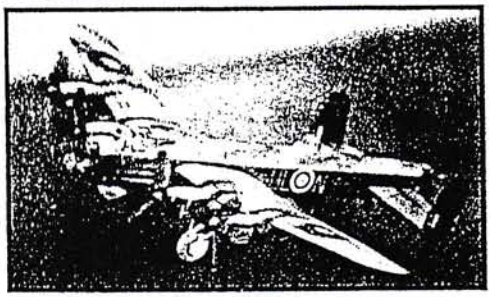
Cut away the bottom of the fuselage (for a low winger) using the discarded 'rib' as a guide. Because of the compound shapes this can be difficult to get right. Adjust bit-by-bit and take your time.

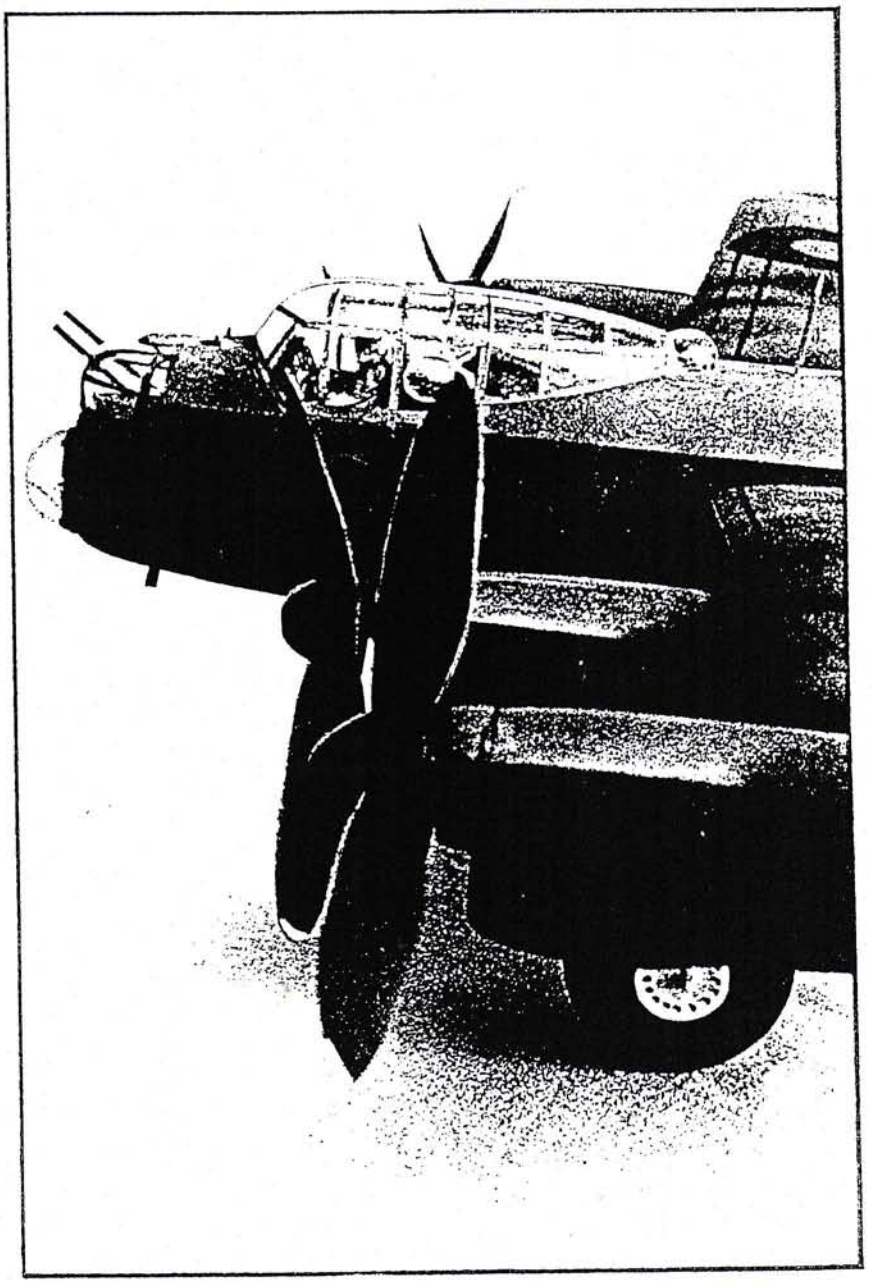
Keep the piece of fuselage to refit later on. The wing should have an incidence of 3-4°. Cut slots for the tailplane or fit it to the fuselage top if more appropriate.









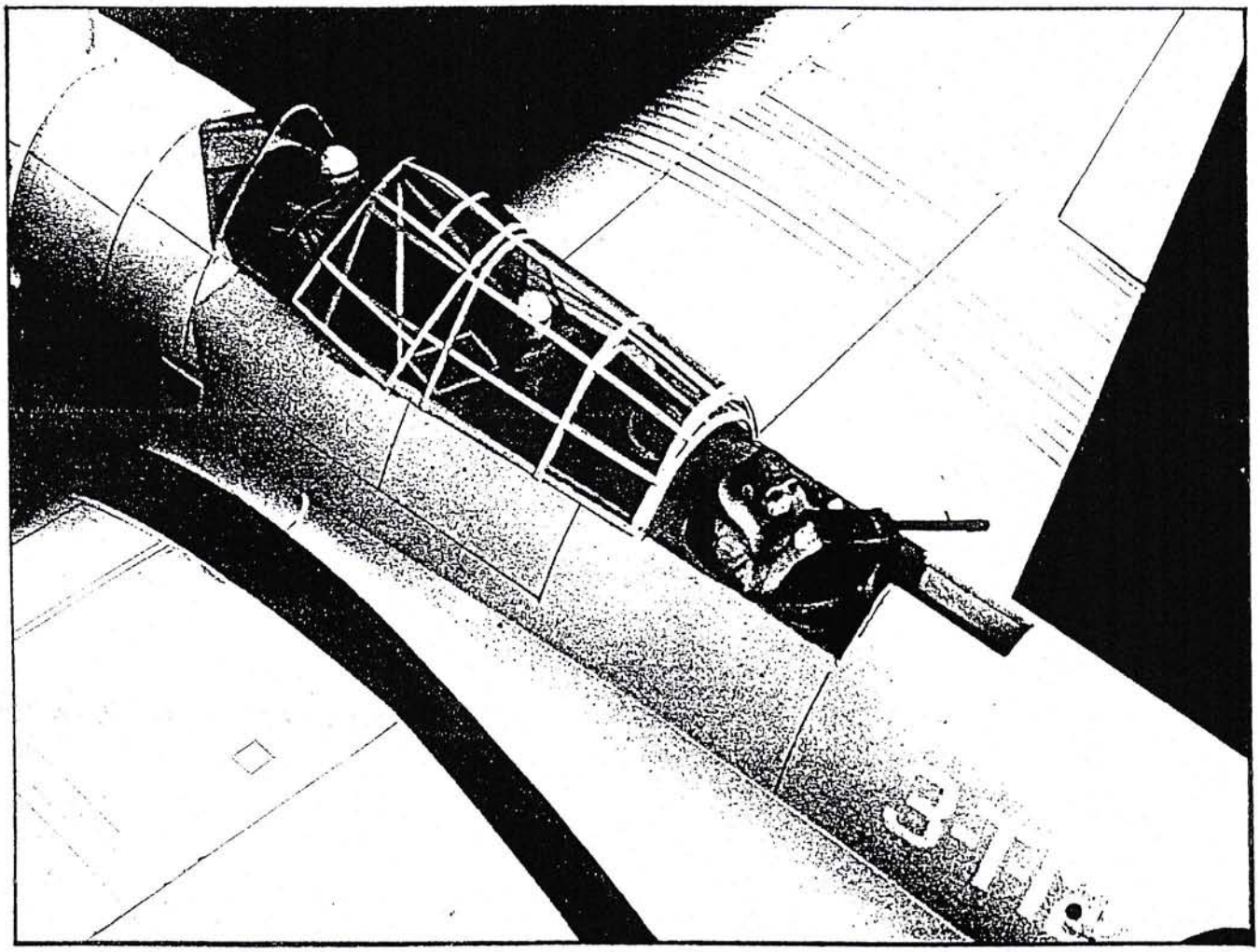


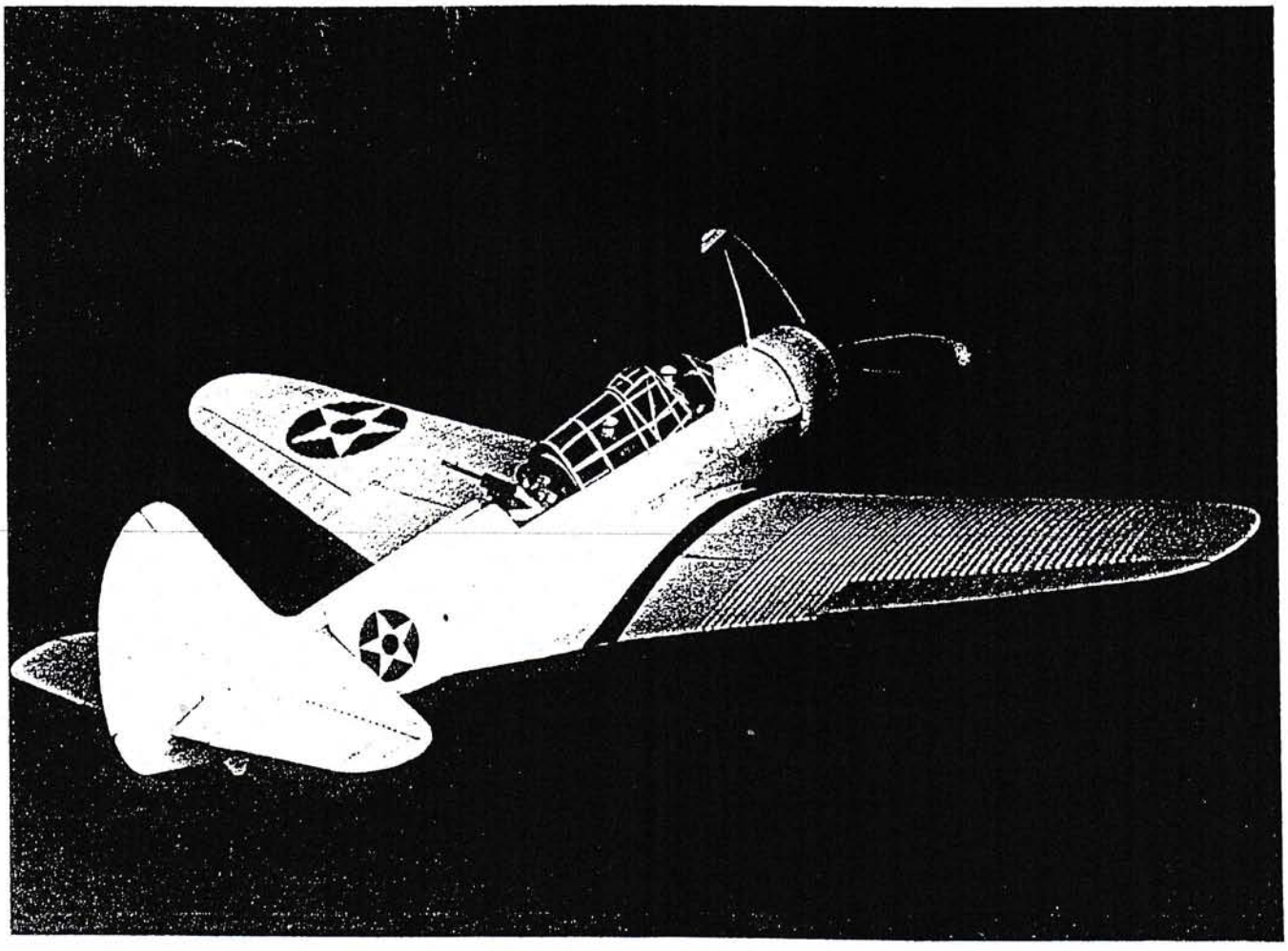
Peter Smart's Lancaster has won Open Rubber and was awarded the Evic Coates Tvophy 1996 for most outstanding model in any category. Model spans 28 ins (710mm) and makes super realistic take offs and landings.

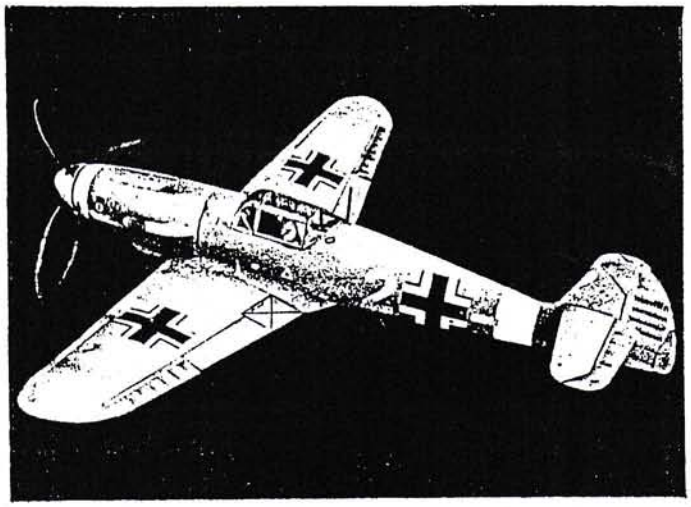
Above: The Lancaster climbs away.

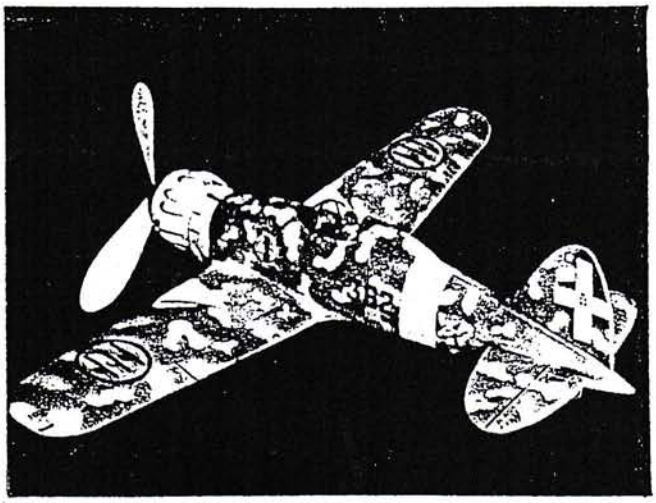
Top: Dave Deadmans Beaufighter

Years ago we would not have contemplated such complex models in stick and tissue, but Foam has made it all possible.







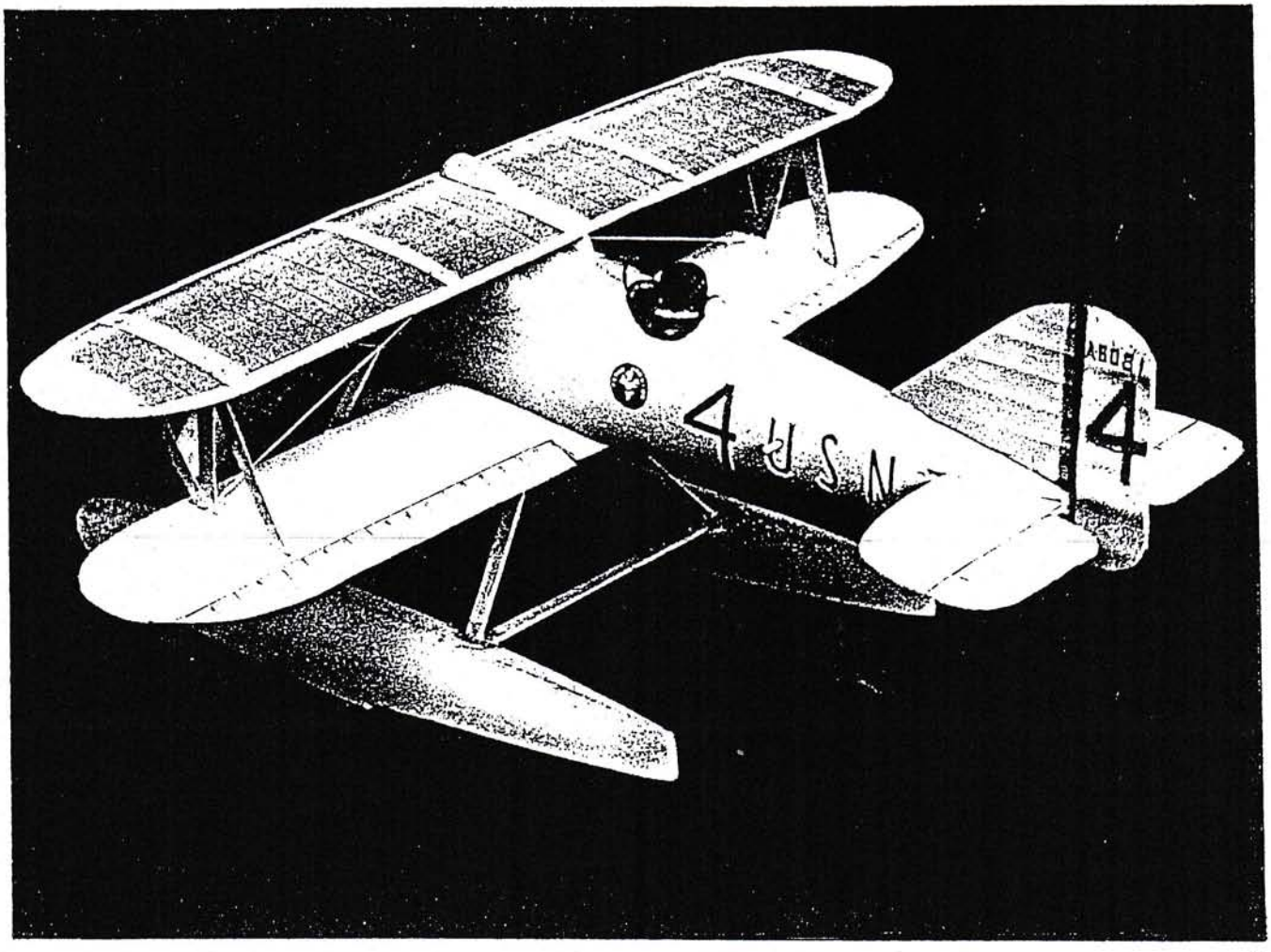


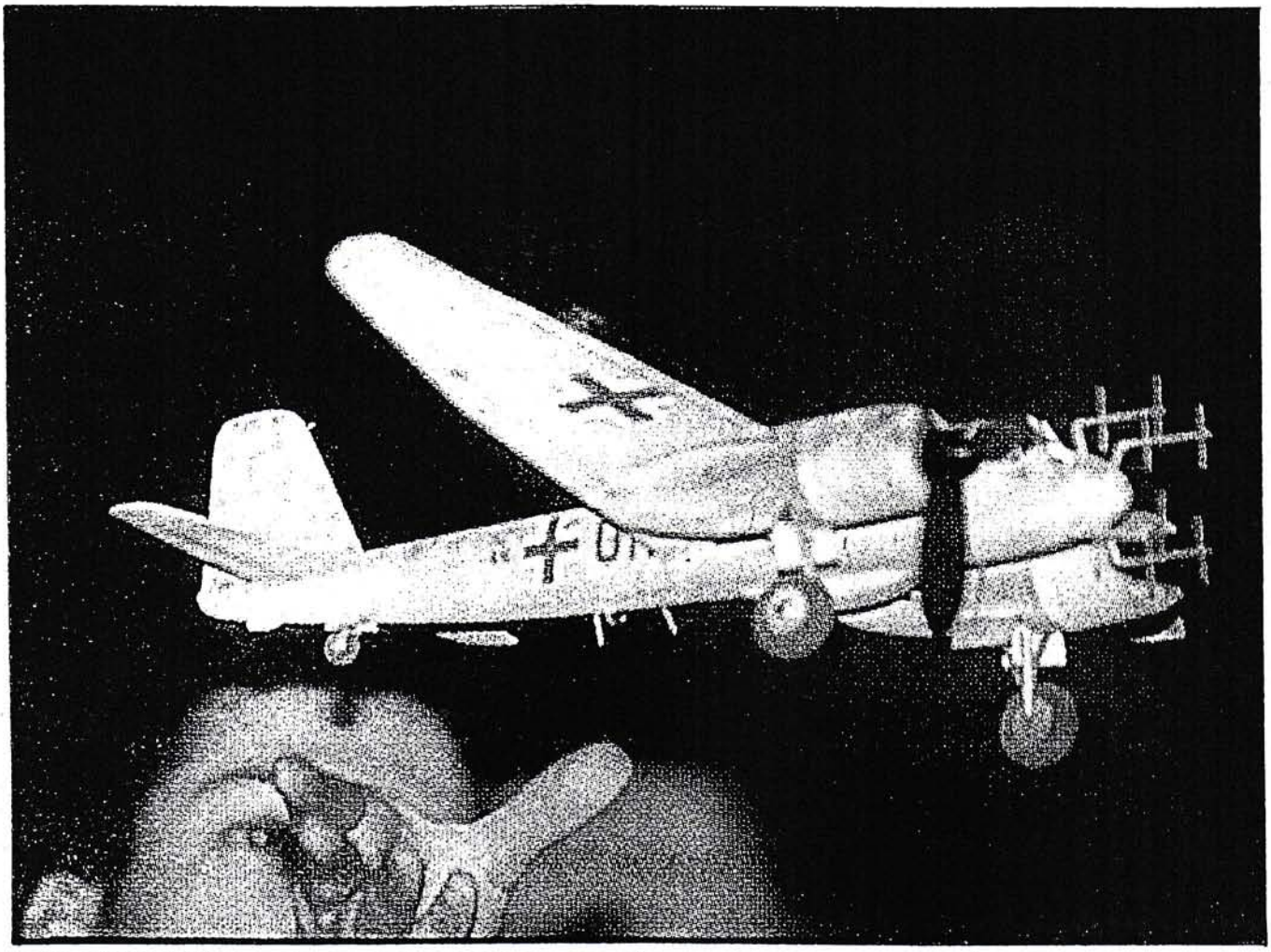
Opposite: Richard's superb Devastator. 21½ins (545mm) Even the crew are hollowed out foam, to save weight. Corrugations are strips of foam applied individually and then sanded.

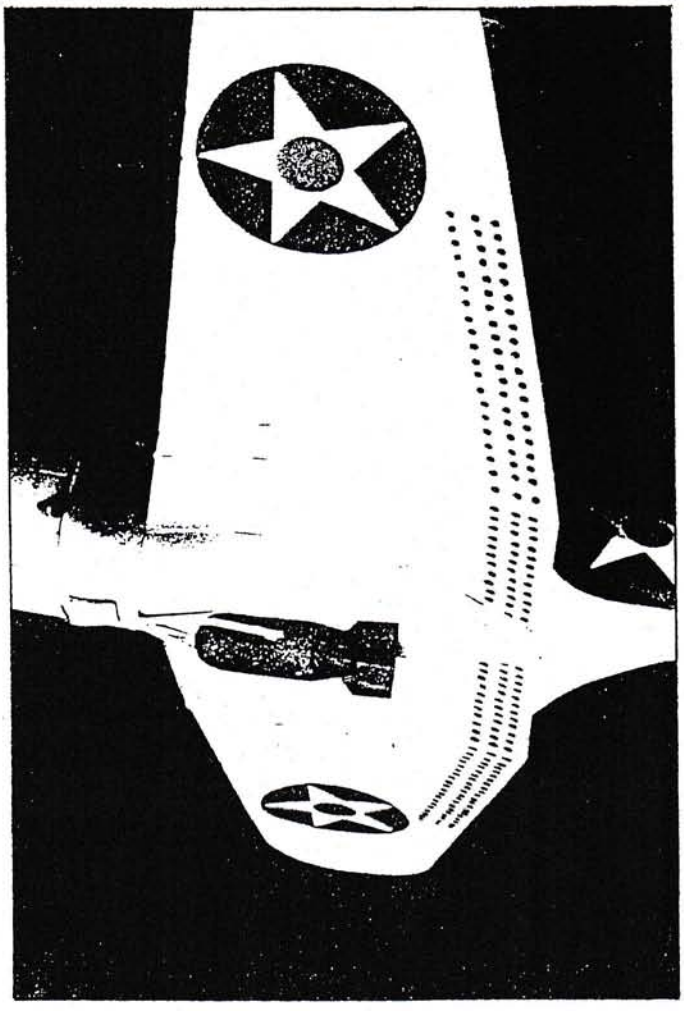
This page: 2 peanuts by Peter and David respectively, a BF 109F and a Machi C200 Saetta.

Dave Deadman launches Marauder.

Delightful Curtiss Navy Racer on floats by Peter Smart. 8ins (203mm). Pistachio model has balsa float struts but acetate interplane struts, which give flexibility. Floats are, of course hollow foam. A picture in the air and very stable.



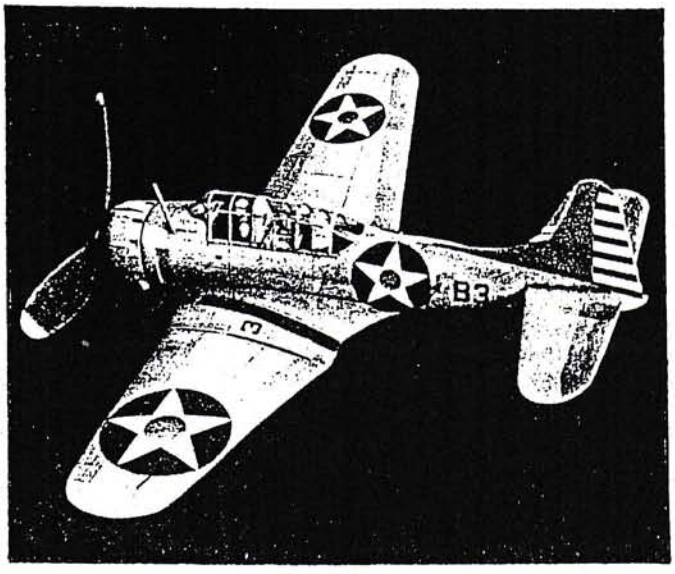




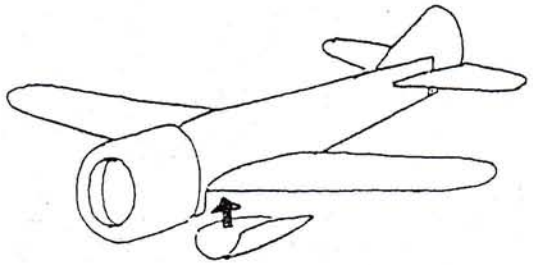
Richard's JU88 gets away on another sortie. Model is highly realistic and flies at scale speed.

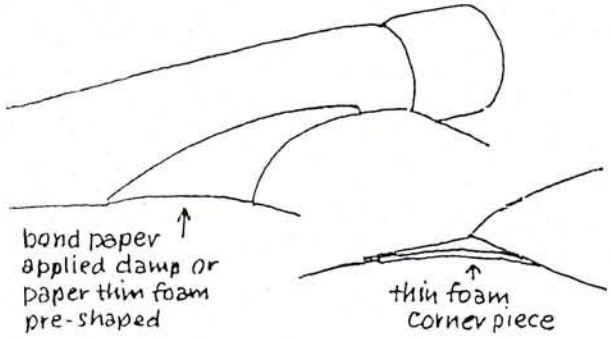
Foam models benefit from some details on the undersurfaces. Richard's peanut Dauntless weighs only 10gms (1/2 oz) and achieves 1min 25 secs with ease. He builds even lighter now!

An airbrush is a necessity to get a good finish on Foam models. We use matt Humbrol enamels or Tamia Acrylic paints and we make every effort to spray as light as possible.



Now you have made a foam model aeroplane you can weight the nose and do some test glides. If you have made it very light you will be amazed how slowly it will glide. Aim for a nice smooth glide and note the C/G position should be at approx 20-30° chord.



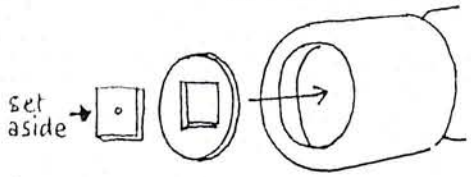


WING FILLETS

These are tricky to make but worth the effort. Some of us work with blue bond paper worked damp with white glue. Others cut paper thin foam and bend it to shape by stretching it in the fingers.

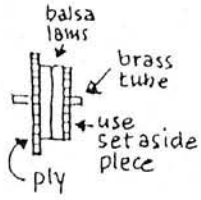
NOSE DETAIL

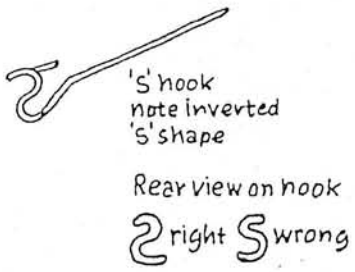
For a radial engine cut a 1/32 ply disk to fit the nose aperture and glue in place, recessed slightly.



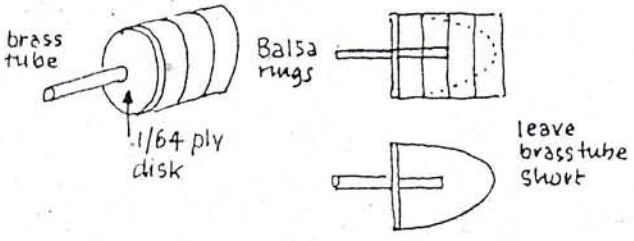
Make the nose bearing from laminated hard sheet balsa with ply facings.

Form an 'S' hook in piano wire to fit the brass tube and put aside.



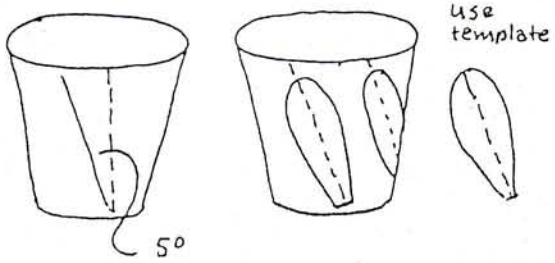


Make a blank for the spinner and 'turn up' the spinner in an electric drill. Alternatively cut and sand to shape.



Prop blades are cut from Yogurt cartons, or cream tubs. Don't chose the thinnest but the slightly firmer variety. You can get 6 blades from a carton.

Mark a vertical on the pot and step off 5° to the left (for a prop that will rotate anti-clockwise). Use a template to mark out the blade shape and cut with scissors. A good blade shape can be got from a Peck or Tern prop, but make the root a little wider to prevent weakness at the root. The natural curve of the pot will provide the correct helical shape to the blade.



Peanut prop
128mm approx (5in) diameter

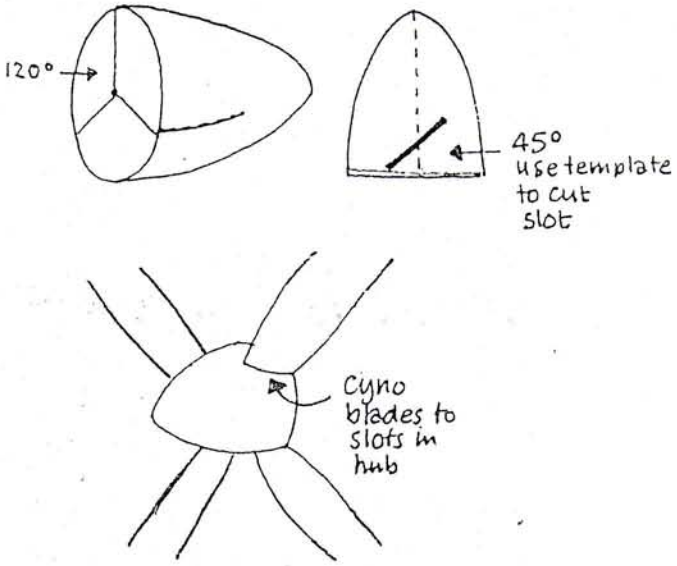
Pistachio prop
80mm approx (3¼in) diameter

Note: Recently we have used the Knight and Pridham nose block which incorporates an adjustable thrust line. They are very good for Peanuts and larger models.

For a 3 bladed prop mark-up the spinner at 120° and step off an angle of 45° from the vertical, using a template.

Cut a slot for the blades with a scalpel trying to keep a true angle as you cut. You might want to make a rough jig.

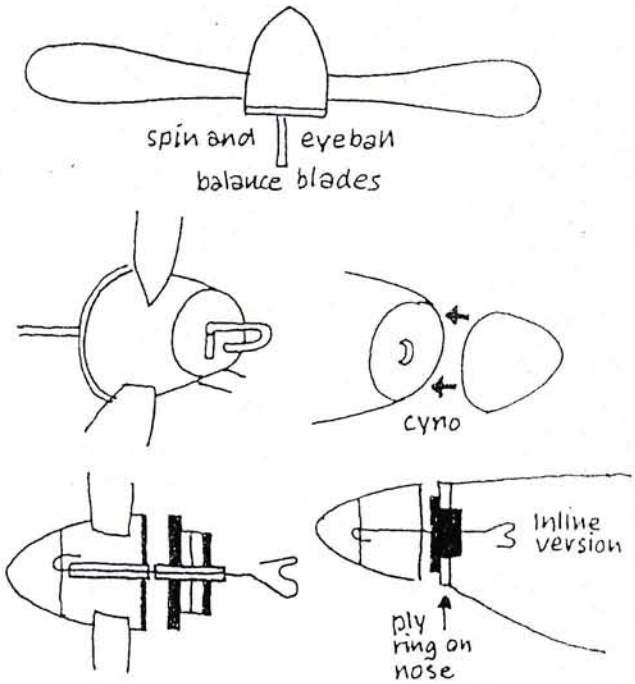
Fix the blades with a drop of cyno after first spinning the prop and getting good alignments and symetry.



Cut off the extension of the brass tube behind the spinner and assemble the prop and nose block as in the diagrams.

Using this method we have made props with from 2 to 5 blades as required.

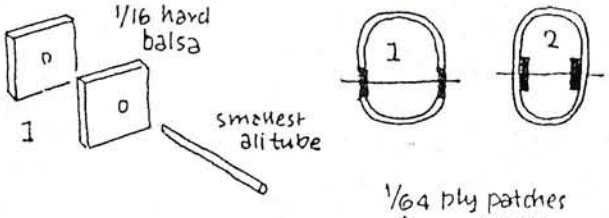
For inline engine types adapt the method slightly to suit.



REAR MOTOR PEG

We find it helps the C/G to place the rear peg not too far back. As a guide we would place the peg half-way between TE of wing and LE of tail.

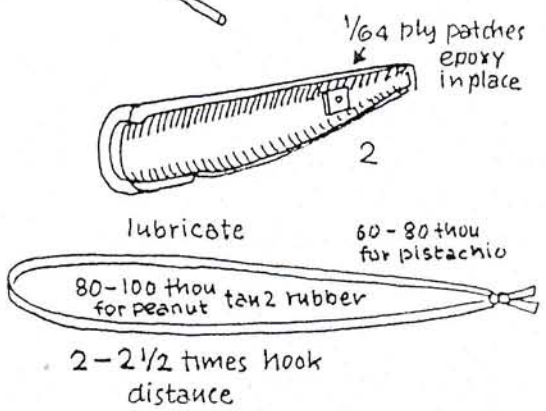
We have used two methods: (1) make small squares of 1/16 hard balsa, and let these into the sides with a sharp scalpel. or (2) Before you join the two halves epoxy squares of 1/32 ply in place. Drill the holes to suit the smallest ali tube used for the peg.



RUBBER

Use Tan2 rubber, available from SAMS, in thicknesses from 15 thou up to 1/4 in. As a guide a peanut of average weight will require rubber of approx 80–100 thou. but it all depends on weight and drag. The only way is to try.

Use a single loop approx 2–2½ X the distance between prop and the rear peg. and lubricate lightly.

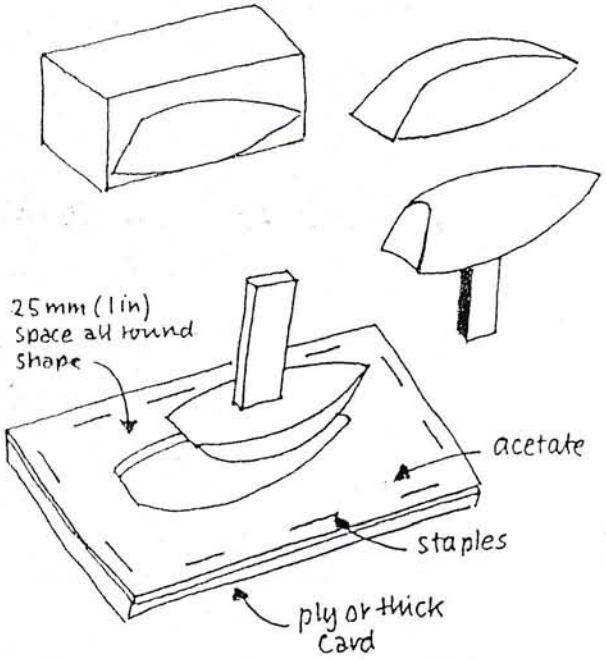


CANOPIES

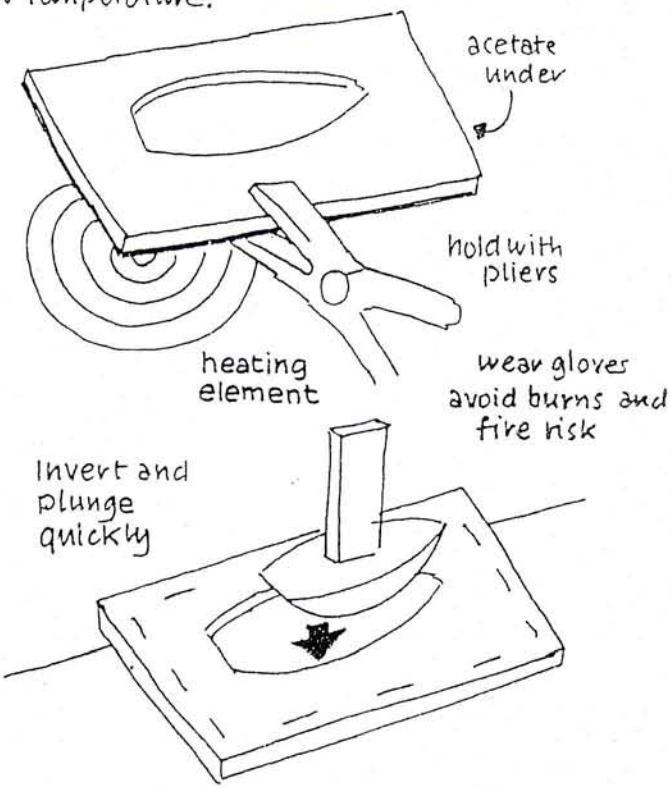
Carve a balsa pattern for the canopy and finish with fine sandpaper. Do not paint or seal the pattern.

Mount the pattern on a handle and make a base plate from ply or even thick card. The apperture in the base should be 2mm (3/32) wider all round than the pattern. Round the edges of the apperture.

Choose a piece of moulding quality acetate (old bubble pack) or clear polystyrene and staple it to the base.



Invert the base over an electric hob, wait till the acetate smokes and sags then quickly turn over and plunge the pattern through. Go too far and the acetate will go too thin. Plunge at an angle and it may be thicker on one side. You may need several goes and it helps to use a material that softens quickly, and moulds at a low temperature.



PAINTING & DETAILING

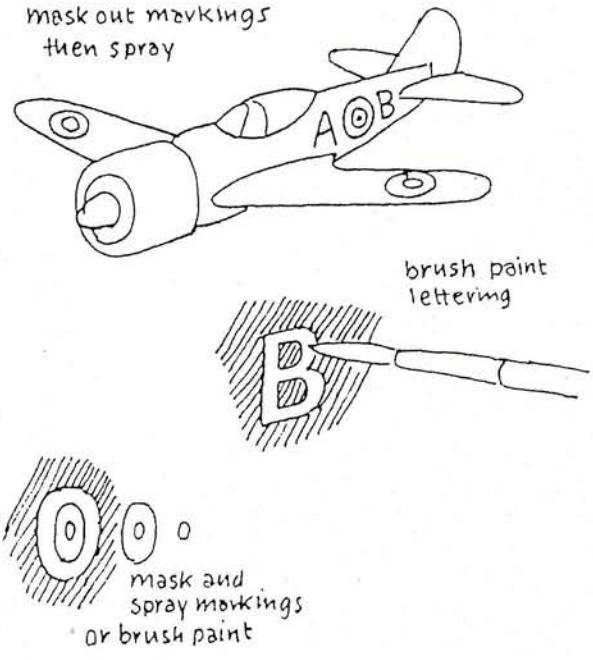
We use Humbrol matt enamels, thinned with white spirit and airbrushed on with very light coats. Do not use gloss paints.

Do not get cellulose anywhere near the foam. It will just melt it away.

Tamia acrylic is also suitable for foam.

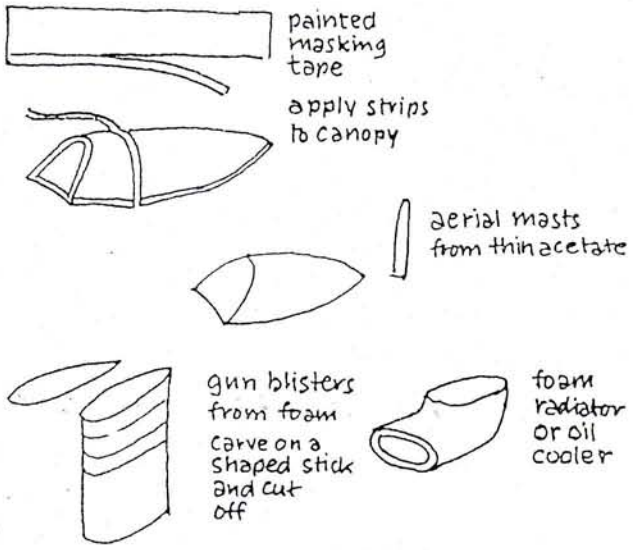
Light colours, like white or cream in large areas, are a problem because the basic blue shows through. On the other hand greys cover very well and the natural blue is a close match to Hellblau used on German or Russian undersides.

Silver models are difficult but Tamia Polished Aluminium acrylic gives a fair result if sprayed over a pale grey.

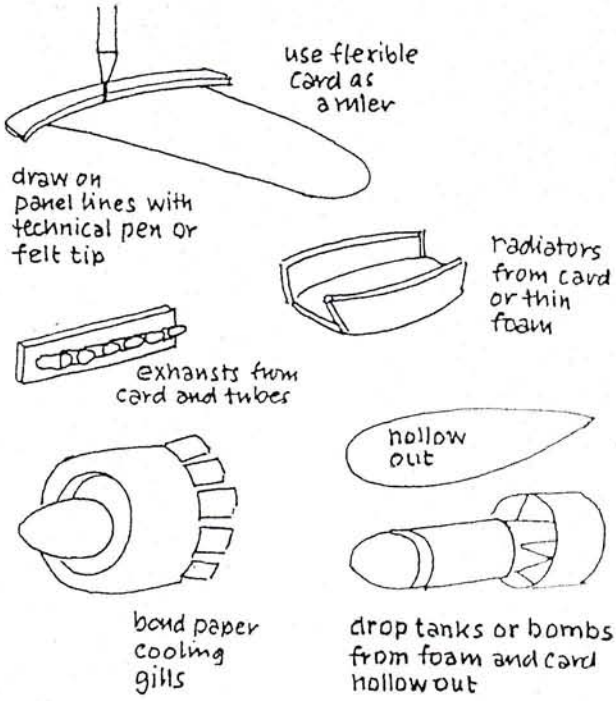


Cut masks from tracing paper and apply using Spraymount, but do wait a few seconds for the propellant to evaporate. Masking tape is fine. Only a waft of spray colour is applied to help keep weight low.

You could paint by brush if you haven't got an airbrush but you will pay a small weight penalty.



Sometimes after spraying you get a build up of paint that feels rough and powdery. It may rub-off on the fingers. When this happens we burnish with paper towel to get rid of the fuzz.



FLYING

Balance the model so that the C/G is 25-30% of the chord, Now try say 350 turns. If it dives try less nose weight, or a little up elevator. It will more likely stall and if it's a bad stall it may even turn on its back. Don't despair - add more nose weight until you get a powered glide. Use left rudder to induce a left turn. Increase turns to say 500, watch very carefully and cure any zooming tendency with more nose weight - unless the model is obviously overpowered in which case use thinner rubber by say 5 thou.

If the model just flops and wallows or won't climb even with 1000 turns it probably needs thicker rubber - increase 5 thou at a time.

If you achieve a steady left turn the model may drop its left wing and tend to spiral in. Try moving the left aileron down to hold the wing up. Bending the right aileron up will have a similar effect.

Add more turns. The maximum will be 1000 to 1300 turns. If the model flies well but doesn't climb, experiment with a little up elevator.

You may be surprised by the length of our motors - 2 - 2½ times the distance between prop and rear peg. This is the only way to achieve the longer durations.

Most of our single engine foam models have the C/G well forward (say 1/4 of the chord) and a little up-elevator. Rudders are usually giving full left turn while the left aileron is bent down to hold the inboard wing up in the turn.

A well built foam model may exceed a minute duration indoors, flying at scale speed with a great air of realism which is, for us, what it's all about.

David Deadman 6 St Mary's Close
Great Plumstead, Norwich NR13 5EY, England

With thanks to Peter Frostick who showed us how!

Make the uprights from 3/8" dowel and drill into the base. Use the spring in the dowel to make the nichrome wire taut – like a bow string.

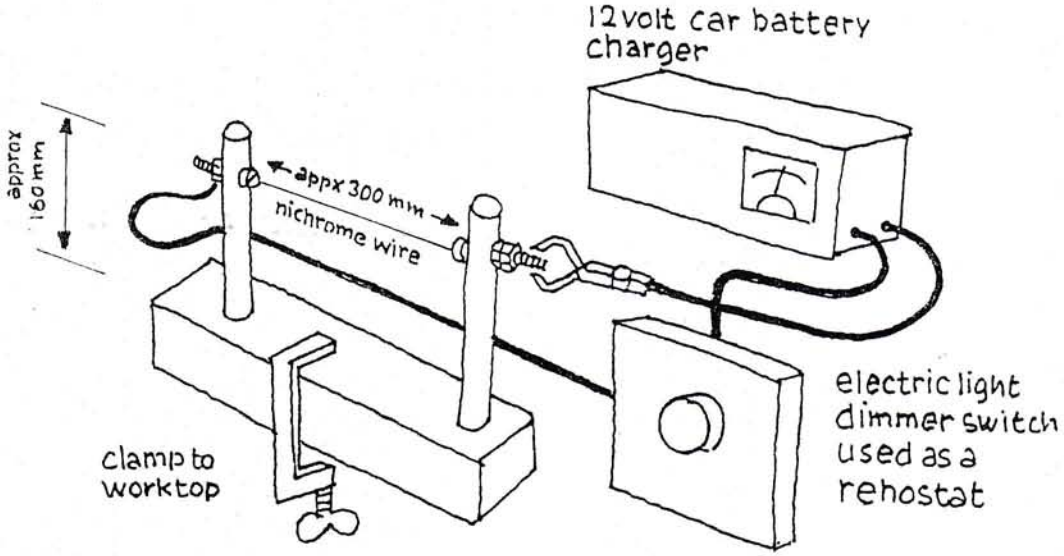
Use 6ba brass nuts and bolts to make the terminals. Nichrome wire can usually be obtained from an electrical repair man.

A rehostat, to vary the current, can be made from a lighting dimmer switch.

Adjust the power so that the wire is just hot enough to cut the foam without too much pressure. Use card templates both sides of the workpiece to make a good guide.

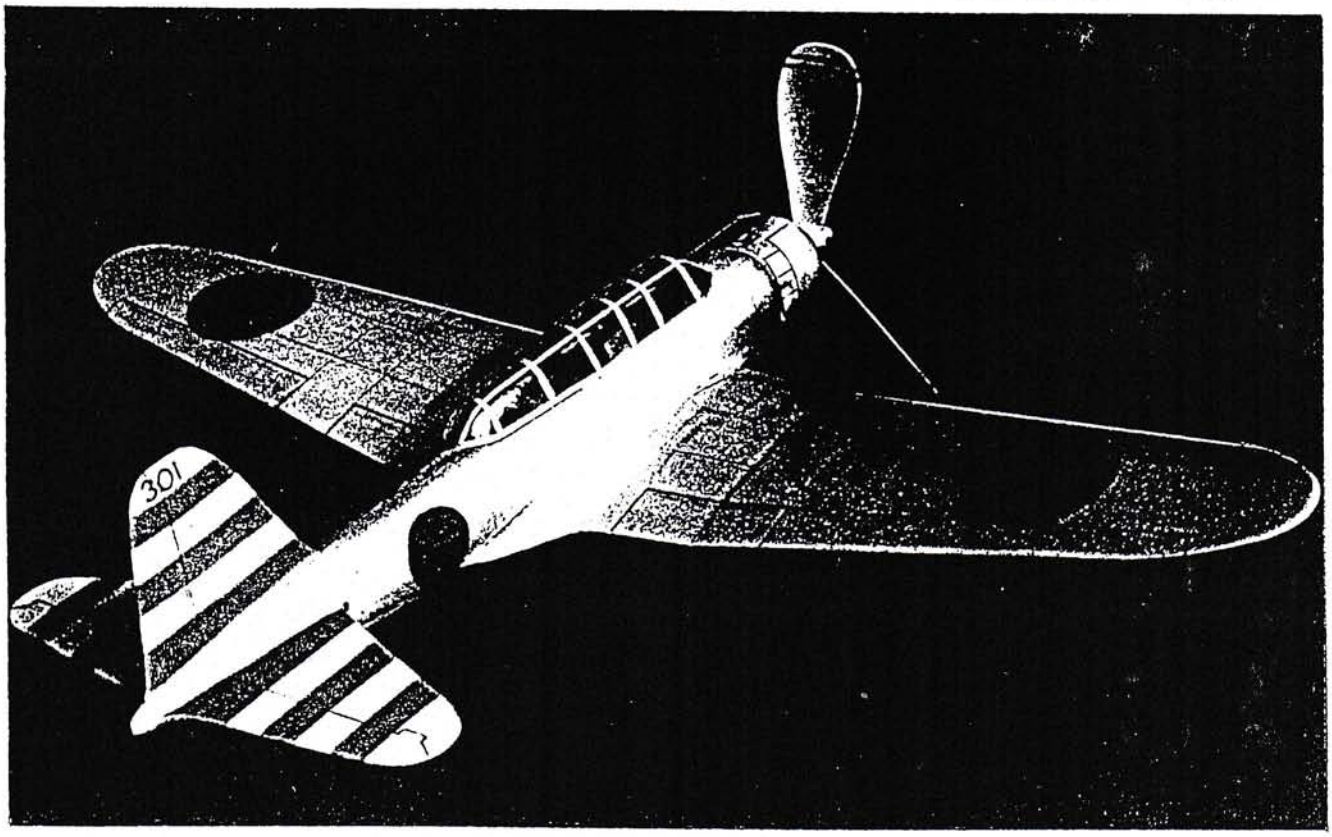
You will probably want to improve the design to incorporate an adjustable guide to enable square cuts, or thin sheets to be made.

Do read the SAFETY FIRST precautions on page 16.



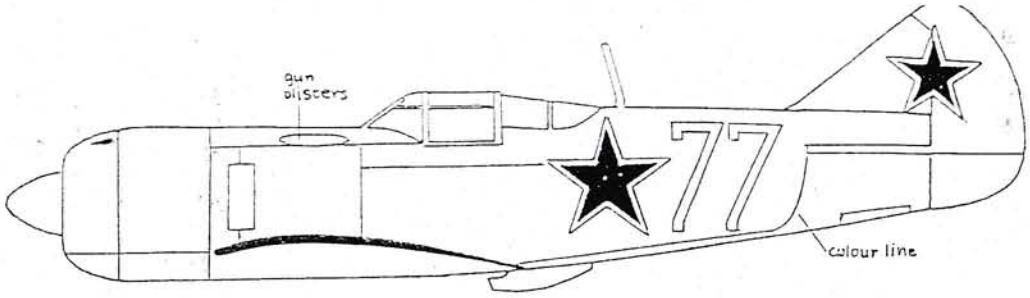
I/m may not need a rehostat.

Nakajima Kate by David. 17ins (430mm) span. Built light this kind of model becomes easy to fly in Foam.



Further references:

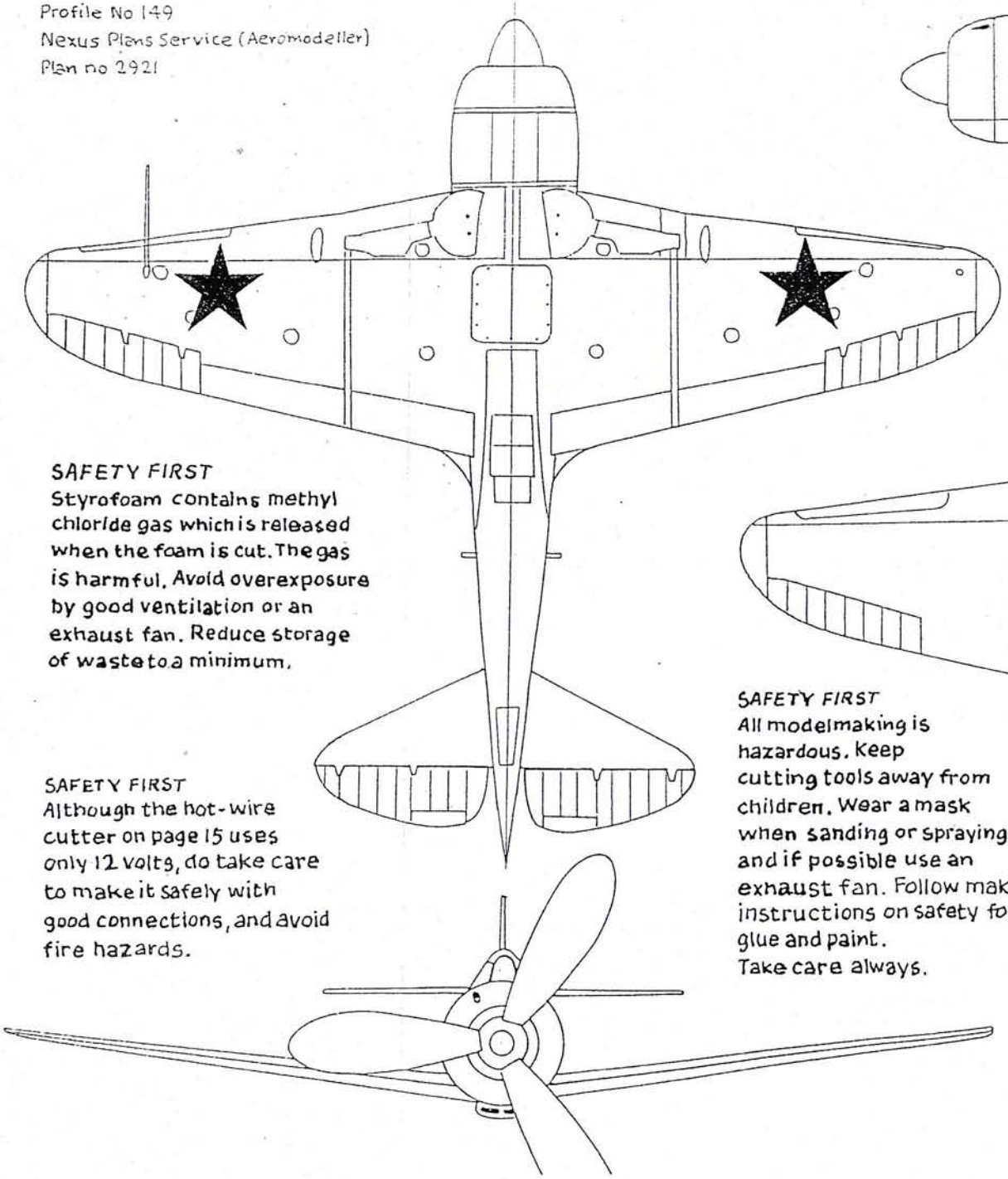
St Michael Books: Aircraft of WW2
Profile No 149
Nexus Plans Service (Aeromodeller)
Plan no 2921

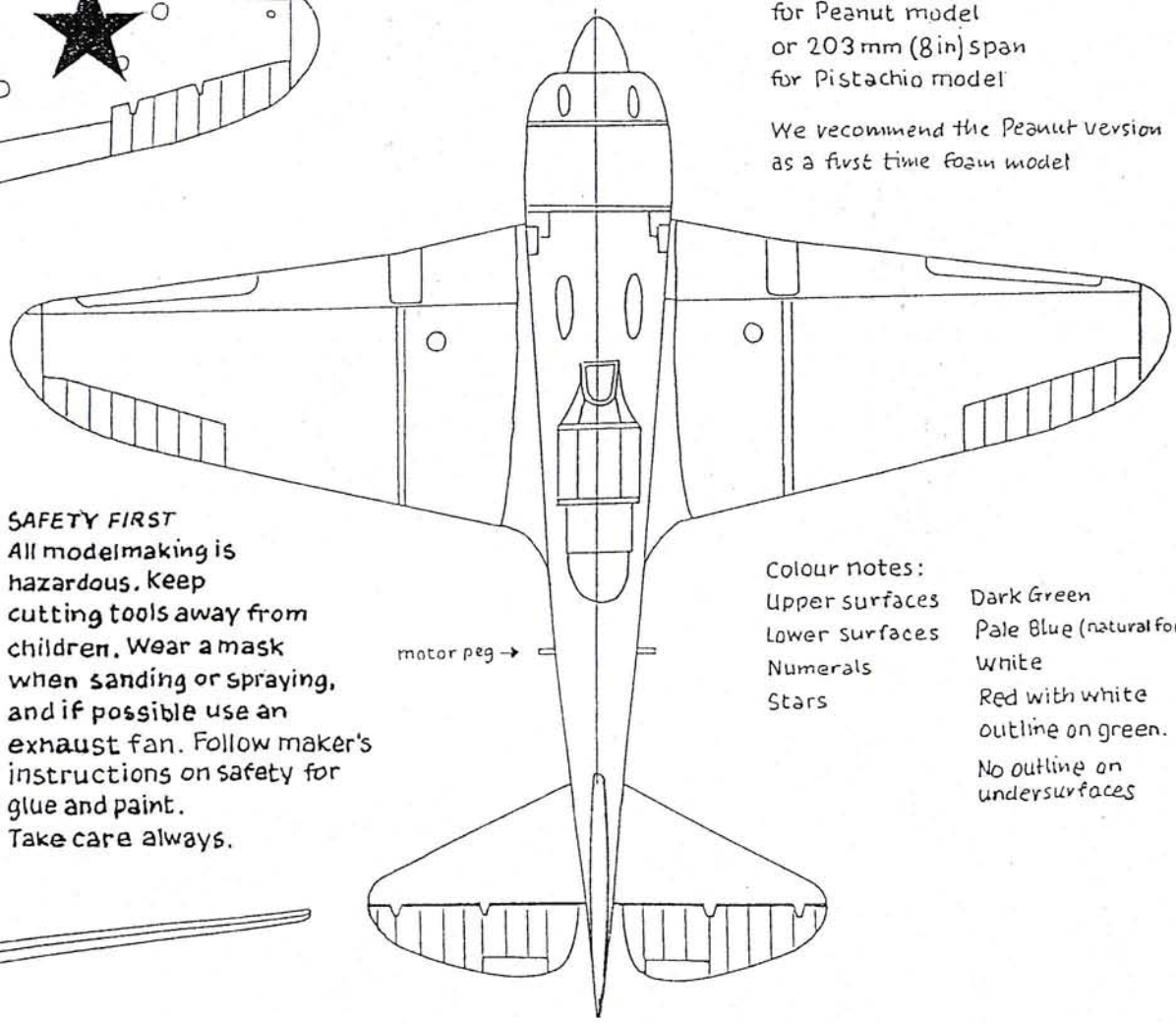


Lavochkin LA7

Enlarge to 330mm (13in) span
for Peanut model
or 203mm (8in) span
for Pistachio model

We recommend the Peanut version as a first time foam model





SAFETY FIRST
Styrofoam contains methyl chloride gas which is released when the foam is cut. The gas is harmful. Avoid overexposure by good ventilation or an exhaust fan. Reduce storage of waste to a minimum.

SAFETY FIRST
Although the hot-wire cutter on page 15 uses only 12 volts, do take care to make it safely with good connections, and avoid fire hazards.

SAFETY FIRST
All modelmaking is hazardous. Keep cutting tools away from children. Wear a mask when sanding or spraying, and if possible use an exhaust fan. Follow maker's instructions on safety for glue and paint.
Take care always.

Colour notes:

Upper surfaces	Dark Green
Lower surfaces	Pale Blue (natural foam)
Numerals	White
Stars	Red with white outline on green.
	No outline on undersurfaces