

MODEL BUILDING

This section is provided as an introduction to Aircraft Recognition. The building of scale model aircraft should enable the student to become familiar with the salient structural features of an aeroplane.

Models are used at the International Training Schools of the R.C.A.F. for the purpose of helping quick recognition. This training in recognition will prevent many mistakes from being made and the wrong plane being shot down.

There are more than fifty different models to be made to a scale of $1/20$ — $1/30$ or $1/40$, according to the size and type of the aeroplane under construction. Air Cadets make these models as one of their activities, and it is quite within the scope of each unit to make a set for themselves. In this way, they not only become acquainted with the various types, but are able to recognize each model at a glance.

The first model chosen should be an easy one, such as the Spitfire, Hurricane, or the ME. 109. These three aeroplanes have single engines, and are classed as fighters. Fighter models should be made $1/20$ full size. After experience has been gained on this type of plane, some of the twin engine bombers and multi-engine fortresses could be attempted next.

The various steps in model building are as follows:

DRAWINGS.

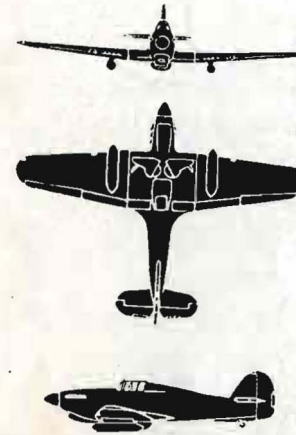


Fig. 1.

Plans or drawings must be made of the desired model. Silhouette and drawings are reproduced here for your consideration. Notice there are three views: *Front View*, *Plan or Top View*, and the *Side View*. From these views and certain dimensions that are always given of the Wing Span, Length, Chord of wing, etc., the working drawings are developed. These dimensions are divided by 20—30 or 40, according to the scale to be used for the drawings.

It is much easier now to obtain information about the various models to be made than could be had at the beginning of the war, and it is suggested that the Officer in Charge of each Cadet Unit write Headquarters asking for the list of drawings which may be had for the purpose of building these models. The drawings are very complete and save the "builder" a lot of time which can be spent on production. Not only should each Cadet Unit make a set of models for his own Flight or Squadron, but continue to make them for the R.C.A.F. schools. They are needed badly, and it is a patriotic duty to produce them.

TEMPLATES.

A *Template* is a pattern. The templates can be traced directly from the drawings, and can be made of ply-wood,

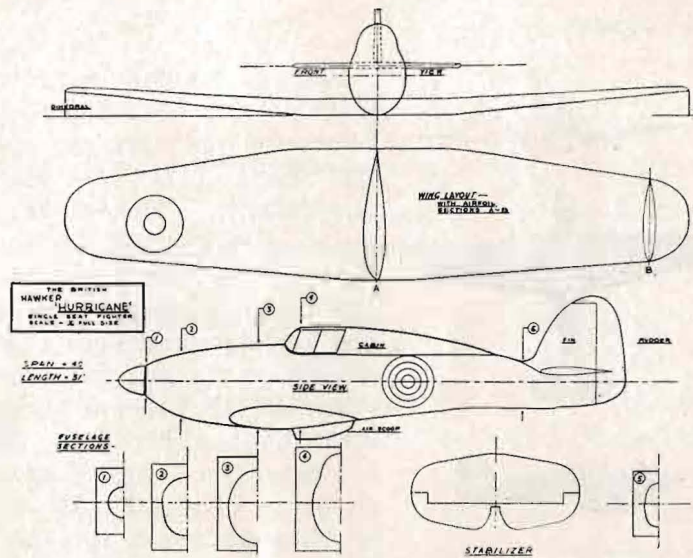


Fig. 2.

Dimensions

FOCKE-WULF KURIER
 Span 108' 3" Length 78' 3"
 HANDLEY-PAGE HALIFAX
 Span 99' 0" Length 71' 0"
 SHORT STIRLING
 Span 99' 0" Length 87' 6"

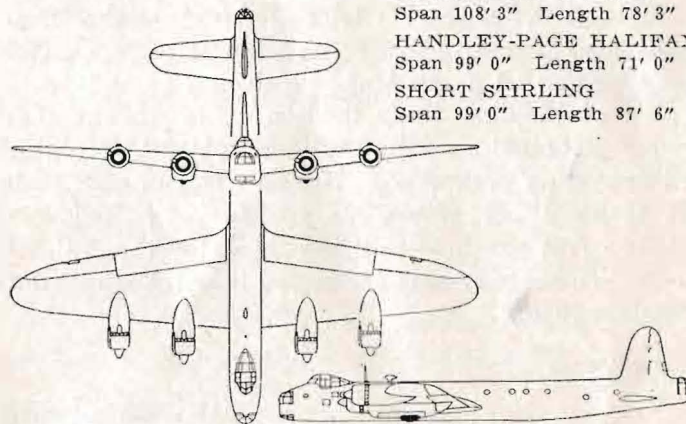


Fig. 3.
THE SHORT "STIRLING"

cardboard, stiff paper or tin. (This is a good use for discarded tin cans). (Fig. 4).

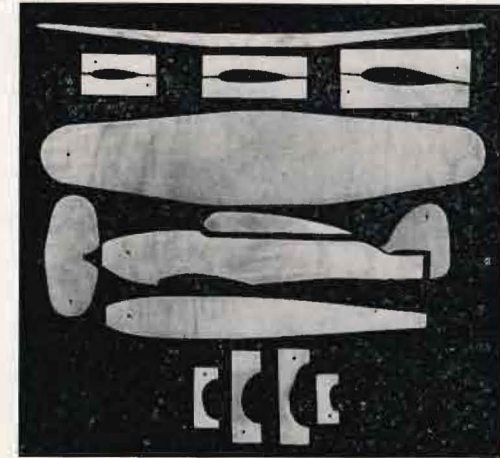


Fig. 4.

- No. 1 template. For the plan or top of fuselage.
- No. 2 template. For the side of fuselage.
- Nos. 3, 4, 5, 6 templates. For cross sections of fuselage.
- No. 7 template. Front view of wings (Dihedral).
- No. 8 template. Plan or top view of wings.
- No. 9 template. For airfoils at top and bottom of wings at the root.
- No. 10 template. For wing tip airfoils.
- No. 11 template. For stabilizer airfoils.
- No. 12 template. For combined rudder and fin.

(See Figure 5)

MATERIALS FOR MODELS.

(1). *White Pine or Basswood.* White Pine or Basswood is suitable (1" x 6" boards). This size will provide for full width of wings of the larger type. It can be

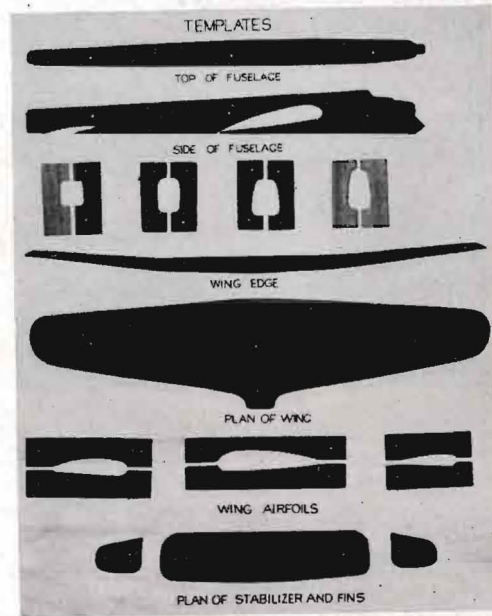


Fig. 5.

ripped down the centre, making 1" x 3" approximately. Two of these pieces glued together will make a block of about 2" x 3", which is suitable for most fuselages. The 1" x 3" can also be resawn, making $\frac{3}{8}$ " x 3" for the rudder and stabilizer, as well as other appendages.

(2). *Casein Glue.* Casein Glue is recommended as the most suitable glue to use, because it is a cold water glue,

easily prepared. It is used in aircraft work generally. The manufacturer's directions should be followed closely when possible, but generally speaking use about 50% cold water by weight, adding powder to water. Mix thoroughly for three minutes, and then allow mixture to stand for ten minutes to allow for chemical action. Then mix again for about two minutes, and the glue is ready to be used.

Be careful to mix only enough glue to serve your immediate purpose, as the glue is useless after about four hours.

(3). *Brads.* Small finishing nails $\frac{3}{4}$ " to $1\frac{1}{2}$ ".

(4). *Plastic Wood.* To form the fillets.

(5). *Sand paper.* Numbers 1, $\frac{1}{2}$ and 0.

(6). *Paints.* In colours of white, dark earth and moss green.

(7). *Shellac.* Orange or white.

(8). *Tools.* If small power machines can be obtained, they are a great help. A circular saw, band saw or jig saw, drill press, lathe, and sander are suggested for this work. Bench tools for handwork include: rule, pencil, try-square, tenon saw, hand saw, coping saw, draw-knife, plane, spoke-shave, paring chisel, gouge, gauge, wood-rasp, nail set and sanding blocks.

PROCEDURE.

(1). First make the templates, tracing directly from the drawing using carbon paper and tracing the lines, or by piercing holes with a pin to mark the contours and lines on the material from which the templates are to be made. As the template is the pattern, it must be cut out accurately.

(2). Next, cut the material to the length for the fuselage and wings. If the fuselage needs thicker material than 1", it will be necessary to glue two pieces together to make the proper thickness. The wings of some types need a piece glued on the edge to give width for the flare at the root of the wings. Any gluing that is necessary for this purpose should be done at the beginning, as the glue will take 24 hours to set thoroughly.

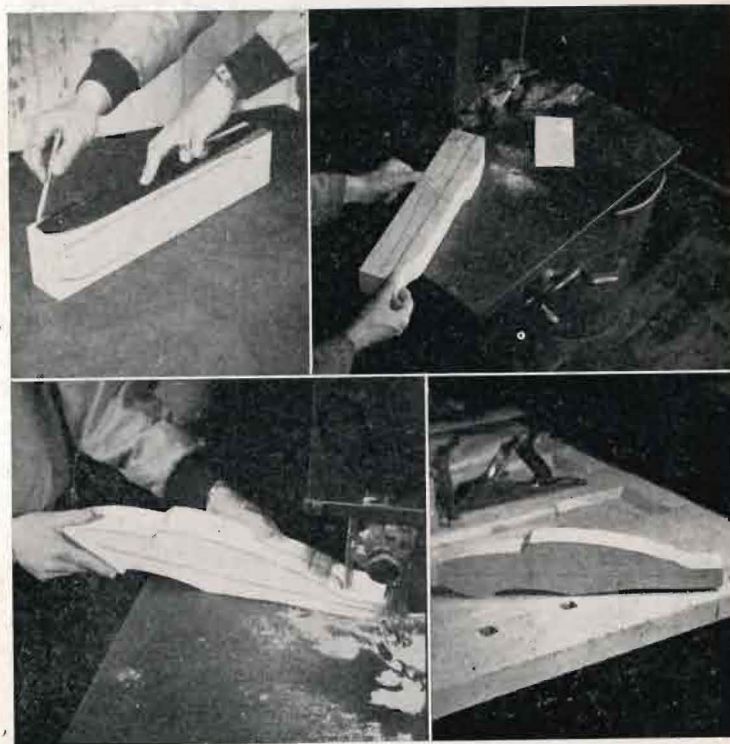


Fig. 6.

(3). *Marking, Cutting, and Shaping Fuselage.*

- (a) Plane block of wood truly.
- (b) Place the side view template in position on the block, holding template firmly; or, if preferred, use pins to hold template in position, mark round the edge of template and position of datum lines at each end.
- (c) Square datum line across front end.
- (d) Mark vertical centre line at each end and top side of block.
- (e) Lay top view template to centre line and mark round edge.
- (f) Band saw close to top lines.
- (g) Tack side pieces back temporarily, and cut close to side template line.
- (h) Put working guide line on shaped block.
- (i) Rough to shape, using spoke-shave and wood rasp.



Fig. 7.

Check shape frequently by applying fuselage section templates at their respective positions. Work up to guide lines. (Do not remove these lines until you are ready to finish with sandpaper. In this way, perfect symmetry can be obtained.)

(4) *Wings.* Two methods can be used to make the wings—either in one whole piece, or in two halves. There are advantages in both methods, and the type of model under construction may decide which method shall be used.

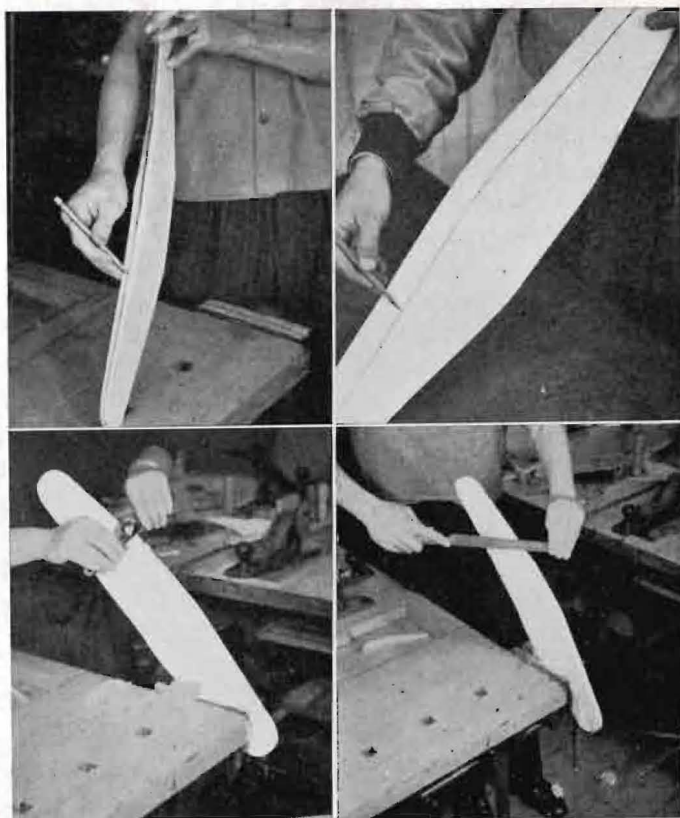


Fig. 8.

Procedure:

- (a) Place front view of wings template (Dihedral) on the edge of wing, again holding firmly. Mark around edge of template and position of centre line.
- (b) Square centre line across the wing.

- (c) Remove surplus material with band saw, or with draw-knife and plane if done by handwork.
- (d) Place plan view template in position, after marking around edge of template. Cut and trim to lines.
- (e) Make working guide lines at centre of leading edge. The trailing guide line should be about two-thirds down from the top side. The top front guide line is approximately one-third the chord from the leading edge and drawn straight from tip to tip. The top rear guide line is about two-thirds of the chord from the leading edge.
- (f) Plane block down to these guide lines.
- (g) Ease off the sharp corners with spokeshave and test by airfoil templates. Sandpaper wing to finished stage. The trailing edge should be left at least $1/32''$ thick.
- (h) The ailerons should be scored on the wings by using a scribe or knife, with very slight pressure.

(5) *Tail Assembly.* Two templates are needed, one for the combined stabilizer and elevator, another for the Fin-Rudder combination. The method of marking and making is similar to that of the wing. The thickest part of the airfoil of these two parts is about one-third the chord from the leading edge. Remember to use working guide lines on the edges.

The camber of the rudder is the same on both sides, whereas the camber of the stabilizer is only very slight on the under side.



Fig. 9.



Fig. 10.

The lines of the elevators and rudder should be scored in the same manner as were the ailerons on the wings.

If the stabilizer sits high on the fuselage, it will be a much easier job to fasten the rudder and stabilizer together first, by glueing and nailing from the underside of the stabilizer into the rudder, before attaching them to the fuselage. This would require a corresponding cut away at the tail end of the fuselage to form a seat for the tail assembly. The whole assembly can then be glued, and nailed into the fuselage.

(6) *Engine Nacelles.* These can be turned in the lathe, if one is available. If made by hand, the following method is suggested.

- (a) Square block to size required.
- (b) Mark both ends of the block from corner to corner.

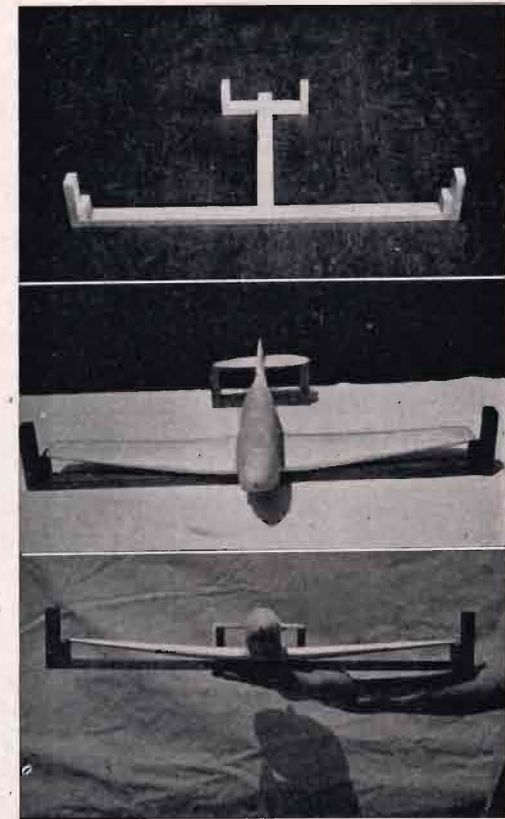


Fig. 11.

- (c) From the centre strike a circle to the size required.
- (d) Plane the four corners off up to the circle line. There will now be eight corners.
- (e) Plane the eight corners to circle line.
- (f) Finish making cylinder by sanding.

Fitting Nacelles to Wings. The clothes-peg fitting is

perhaps the best method to use, because it is easier to fit, and is more secure when fastened to the wing. A template is made to fit the wing airfoil, at the centre point,

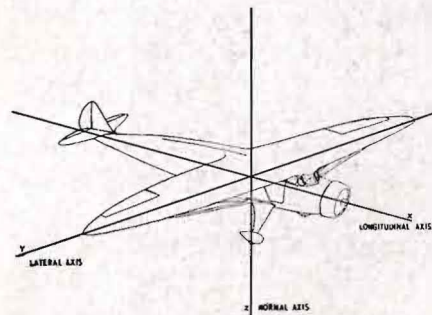


Fig. 12.

where nacelles will rest. The cylinder, in turn, is marked, cut out, and slid on the wing from the tip towards its position. A wood rasp will help in the rough fitting, but to make a tight fit, it is suggested that a piece of sandpaper be placed on the wing and between the nacelles. Rub nacelles to and fro until a good fit is attained.

(7) *Dihedral Board and Assembling Jig.* These should be made before attempting to fit the various parts together. There are many ways of making dihedral boards and assembly jigs. The accompanying illustrations show a combination of both dihedral boards and assembly jigs. One of these should be made for each type of model.

(8) *Fitting Parts.* The set up of a model is of first importance. An understanding of the three axis: the longitudinal axis, lateral axis, and normal axis, will be a great help in aligning the model, because all parts must be centred along these lines. The fitting of each part must be done with this in mind. (Fig. 12).

(9) *Assembly.*

- (a) First prepare the glue. If Casein glue is used, remember to prepare only enough for the job in hand.

- (b) Attach the wings to the fuselage, making certain that they are lined up according to the assembling jig, before nailing. This forms the foundation for the rest of the assembly.
- (c) Attach tail assembly, glueing and lining the leading edge of the stabilizer parallel with leading edge of wing. Use brads of suitable length to fasten to fuselage.
- (d) The appendages such as radiators, coolers, turrets, blisters, wheels, etc., can now be attached to the model.



Fig. 13.

- (e) Set all nails, and clean off thoroughly with sandpaper.
- (f) Using Plastic wood, build up the fillets gradually, as this makes a better job than making a large fillet with one application of plastic wood. With the same material fill all nail holes, etc. When the plastic wood has dried thoroughly, use a fine sandpaper to bring it to a smooth finish.

The model is now ready for painting.

(10) *Painting.* Before discussing the actual painting, a word of warning is in order. At this particular stage of progress, it is usual to be anxious to get at the painting of the model, and very often an otherwise good model is spoiled for lack of more time being spent on the sandpaper work. Slight flaws and little rough spots stand

out when the paint is applied. Therefore, examine the model carefully, and remember that a little extra time spent on the finishing touches will prevent a good work from being spoiled.



Fig. 14.

Paint colours. For priming coat, shellac is sometimes used, but a thin white coat of paint is preferred.

For Allied Country Planes, the following paints are applied, in the order named:

Dark Earth for the foundation colour.

Moss Green for Camouflage work.

Dead Black for underside of Night Bombers.

Sky Blue, Twinkle Blue, Robins Egg Blue for the underside of reconnaissance and other planes used in daylight.

French Grey for cabins, turrets, etc.

For Enemy Planes, the colours are the same as above, but reversed in application. For example, Moss Green is used for the foundation colour, and Dark Earth for camouflage work.

The steps in painting are as follows:



Fig. 15.

- (a) Remove any dust from model before starting to paint.
- (b) Apply priming coat. When dry, rub down with fine sandpaper.
- (c) Remove dust, and apply foundation colour. Allow this coat of paint to dry well before applying the camouflage colours.

The camouflage scheme of the Allies varies considerably from that of the enemy, and it would be well to obtain a sketch of each before this work is started. The Allied Nations follow a pattern type of camouflage, while the enemy planes have spatters of an egg shape put on at random.

Cabins, turrets, etc., are painted after the camouflage work is completed. Masking tape is a useful aid in this work, where straight lines are required.

AIRCRAFT RECOGNITION.

The object of this section is to picture a few of the service types of aeroplanes, and to teach the student how each may be identified. With considerable additional study of models, photographs, silhouettes, and the rare glimpse of the occasional operational aircraft which may cruise overhead, the individual may become expert at aircraft identification and perform a useful service as an airman, a member of an anti-aircraft battery, or a roof-top spotter. The ultimate aim is the same in all cases—the immediate identification of all aircraft, enemy and allied.