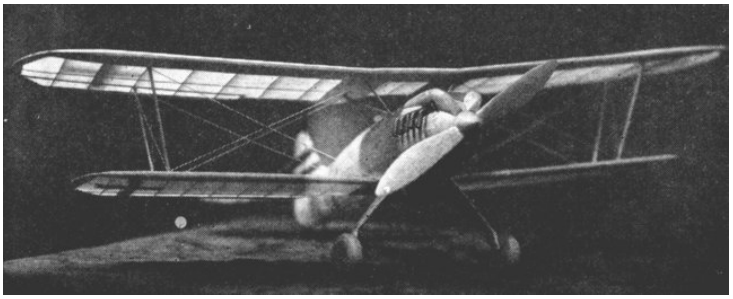
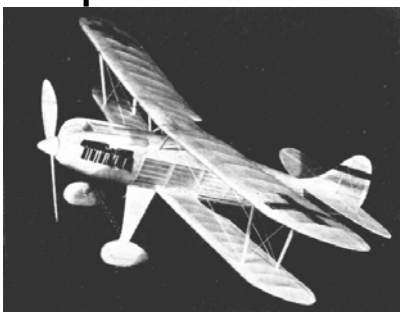
Building The Heinkel "Pursuit"

By JESSE DAVIDSON

How You Can Build a Carefully Detailed Flying Scale Model of a German War Plane That Has Gained Fame in Spain



The finished plane with a scale propeller, worthy of any builder.



As realistic as any ship you have ever built and a fine performer as well. Note the refinements of structure.

SPAIN, the proving ground for the aircraft and ordnance of the mighty powers of the world, proved to some military observers in that unhappy war-torn country that Germany's much vaunted pursuit planes, which the Fascist forces were using, were strikingly inferior to the Loyalist manned Russian "P" model pursuit ships.

Since the beginning of the war in Spain, Germany has been feeding planes and pilots to Franco, and the Heinkel He 51 is an example of the type of aircraft supplied. This ship was designed three years ago when Hitler built the huge air force Germany now boasts. The He 51, particularly, served as the nucleus around which pursuit squadrons were to become the striking arm of the air force.

The Heinkel received its aerial baptism under fire in actual warfare in Spain when squadrons of them engaged in combat with the Loyalists' Russian Model P. The Russian P pursuit (cover design July, 1937 issue of M.A.N.) is the Soviet version of the American Boeing P-12-C, and its superiority in outmaneuvering the Heinkel manifested itself in the heavy damage inflicted upon the Heinkels. The Heinkels were quickly withdrawn from service and replaced with a more formidable fighter, the low wing Heinkel pursuit. Now the withdrawn models are used in the "Fatherland" as pursuit pilot trainers.

The Heinkel He 51 is a single seater pursuit-fighter normally powered with a 630 horsepower B.M.W. V1 engine. It is entirely of metal structure and fabric covered. It is also stressed to take an engine delivering 750 horsepower. Used in naval training, the He 51 is equipped with pontoons. Details of its military armament are unknown. However, its top speed at sea level is reputed to be in the neighborhood of 220 miles per hour.

It is interesting to know that Colonel Ernst Udet, former leading World War ace and now head of the technical section of the recently revived German air force, has the final say on all military planes adopted for the service. No new plane is accepted into the air service which Col. Udet has not personally test flown and approved.

Our scale model has been designed from various photographs, inasmuch as no three-view drawings of this ship were available. To Ben Shereshaw, the writer is indebted for the use of his original drawings which he designed from that source. And to Martin Faynor, for his splendid workmanship in constructing the original model.

The model possesses excellent flying characteristics, having an extremely short take off, and it is consistently capable of flights over sixty seconds duration. Not many models will do this.

Fuselage Construction

The first step is to make a full size drawing of the fuselage framework which is constructed of 1/16" square medium balsa. Select the longerons especially for their even bending qualities. The uprights and diagonal members are fitted between the upper and lower longerons with utmost care to insure perfect alignment and maximum strength. When both sides of the framework are completed they are joined together with cross members, which are cemented at right angles to all upright members. This also includes cementing cross members at right angles to all diagonal members forward of the cockpit. To the tail end of the fuselage frame a triangular tail post is cemented into position as shown. See full size drawings on plate 4. The rear hook is inserted afterwards into this post and cemented securely. Another piece of sheet balsa, wedge shaped, is fitted snugly between the lower longerons and cemented. This serves as a rest for the tail skid.

All formers with the exception of B-1A are cut to shape from 1/32" sheet balsa. Former B-IA is cut from 1/8" sheet. The notches in all bulkheads are cut to a depth of 1/16" and a width of 1/32". Care must be exercised in cutting the notch recesses, as much of the beauty of the framework lies in perfectly aligned stringers. Formers numbered with the letter T preceding, indicate its use as the top fuselage former. B indicates bottom former and S for the sides. When all the formers have been cemented into position note how the body hereon assumes an elliptical cross section. For the present, place the fuselage unit aside.

Lower Wing Detail

All ribs used in the lower wing are cut from 1/32" stock. These ribs are identified by letters D, E and F. Cut out the required amount of the ribs, noting in particular that rib E requires two additional members, each having an extra spar notch which is shown in dotted lines. The lower wing panels are constructed in halves, and are made in the following manner. The center wing spars measuring 1/16" x 1/8" are cemented in their respective notches on top and bottom surfaces of the ribs. Allow the rearmost spar to extend 1-1/4" beyond the double butted ribs F.

The same procedure is employed in attaching the leading and trailing edge spars. The leading edge spar is inserted diagonally into the notches, leaving it untrimmed at present in order to provide a gluing surface for the balsa sheet covering of the leading edge. The trailing edge is cut, notched, sanded to shape and then cemented into position. The next step is to cut to shape two joiner spars from 1/16" sheet, as shown on plate 1. The leading joiner spar is cemented into the notches especially provided in ribs E and F. The wing tip pieces are cut to shape from 1/16" sheet and attached as illustrated.

The leading edge and center section (top and bottom) are covered with 1/32" sheet balsa. After the sheet covering along the leading edge has dried thoroughly, sand the forward edge carefully to conform with the airfoil section. The remaining wing panel is constructed in the same manner; being mindful of the fact that the extending portion of the leading joiner spar must be cemented into position before the lower surface of the center section of this wing is covered with sheet balsa. The rear joiner is cemented into position between the extending portions of the rearmost spar. Now, the entire wing panel is covered with fine Jap tissue, water sprayed, but left undoped for the present time.

The next procedure is to apply cement generously to the joiner spars and also between the double bulkheads B-2 and B-3 before sliding the wings upward into position. This detail is shown on the side view drawing of plate 1. Study the perspective sketch on plate 2 for clarification of this procedure.

A full size drawing for the landing gear wire is given on plate 4. The wire is bent to the shape shown from No. .018 piano wire. Attach with cement to former B-1A allowing it to dry in that manner first. Afterward, it is made doubly secure by threading it with strong white cotton with an additional coat of cement over it. This detail is shown by the perspective sketch on plate 2 and by the side view drawing on plate 1.

Rudder and Elevator Detail

The rudder is constructed entirely from 1/16" sheet. Measurements for the various members making up this unit are taken from the plan and doubled for full scale. Both sides are covered with Jap tissue and water sprayed. It is not necessary to dope either rudder or elevator surface. The elevator is constructed in one unit entirely out of 1/16" sheet. When completed it is placed directly on top of the longerons and cemented. Not until this unit has hardened into position is it covered on both sides with Jap tissue, and water sprayed. The rudder however, is not attached until all the fuselage stringers have been inserted and the body covered. Between formers T-1 and T-3 all stringers inserted must measure 1 /32" x 1/16". The remainder of the stringers used throughout the fuselage measure 1/32" x 3/32". These stringers protrude 1/32" above the formers themselves. A tail skid is shaped as shown, faired with a small piece of sheet balsa and cemented into position as indicated.

Windshield and Door Detail

The windshield is constructed mainly from small pieces of celluloid patterns cut to the shapes shown. The framework to which these pieces are cemented are cut from slivers of bamboo, 1/32" thickness. Build up the frame first and later carefully cement the patterns into position.

To facilitate easy insertion and removal of the power plant a door is provided at the rear of the fuselage. It is cut to shape from a soft piece of balsa measuring 3/16" x 1" x 1-1/2". The forward end of the door retains the contours of former S-7. From this point on the contour gradually assumes a more flattened effect until, at its termination, it is flush to a balsa plate, as shown in the fuselage drawing on plate 1. In other words, the exterior shape of the door simply retains the merging elliptical and rectangular shape of body at the rearmost portion. Hinges for the door are made from bond paper to which cement is applied.

Nose Detail

The nose unit is constructed in halves. Two blocks of semi-hard balsa, each measuring 1-1/8" x 3" x 4", are selected and the outlines of the nose traced upon their surfaces. Study the cross sectional views on plate 3 of this unit before attempting to shape. Work slowly and use extreme care in doing so. For the moment leave the outer surfaces unsanded. The inner portions of each half are scooped out to the wall thickness as indicated by the dotted lines. Clean out thoroughly with sanding and upon completion, cement both parts together. When dried, a sanding is applied to the outer surfaces of the nose, followed by a couple of coats of dope and completed with a final sanding with smooth paper. The cylinder banks are shaped from soft balsa measuring 1/2" x 1-1/2" x 4". Views for shaping the banks are clearly indicated on plates 1 and 2. The undersides are given a concave form which facilitates their attachment to the rounded portion of the nose block. Use plenty of cement in mounting these pieces.

The air scoop detail is constructed with two pieces of sheet balsa whose dimensions are given on drawing plate 1. The larger of the pieces is cemented in a slanting horizontal position between the cylinder banks. At the forward end a smaller piece is cemented, also slantwise, as shown in the side and top view drawings of the nose detail. Twelve exhaust ports are next to be cut to size and shape. Six are attached to each side of the nose. Though no two (on one side only) ports are alike, nevertheless they are all cut to the same length at first and resized to fit, because of the varying contours of the nose. This procedure will soon become apparent as you attempt to cement the ports into position. A close study of the photographs of the model will be of material assistance.

The nose plug, which is shown in full scale, may be made up either from a single piece of wood or with a rear plug attached separately. A hole is drilled in the center and to each end a small brass eyelet bearing is inserted and cemented. Be sure the plug fits into position quite snugly, yet is easily removable. The radiator formers are also shown in full scale. They are assembled as shown and afterwards covered with 1/32" thickness sheet balsa. Apply a couple of coats of dope to this balsa covered unit. Next, onto stiff paper, draw a honeycomb radiator design large enough to cover the area of the front radiator former. Cut this to the desired shape and cement to the front former. Cement the entire unit beneath the belly of the fuselage, in the position shown on the side view drawing. Do this only after the fuselage bottom has been covered and doped.

Landing Gear Details

Four pieces of medium strength balsa compose the landing gear legs. These parts are given in full scale on plate 4. The larger of the legs is identified as L-1 and the smaller as L-2. The wheel pants are L-3. Both L-1 parts are cut to shape and streamlined with smooth sanding. Into the inner sides of both landing gear parts L-1 cut a 1/32" deep groove along the entire length of the leg as shown by the dotted lines on this part in plate 4. Apply cement generously into these grooves, and then attach the landing gear leg as shown in the side and front view drawings. Note carefully that the legs themselves are not attached flush to the sides of the body. A narrow space is provided to allow for spreading action. The same procedure is used in attaching the lower landing gear legs L-2 to the wire shock absorber and at the same time is securely cemented to the bottom of L-1. See front and side view landing gear drawings on this.

The wheel pants are made in the conventional manner. To the inner sides of both wheel housings cut out a slight hollow which is used to accommodate the lower ends of landing gear legs L-2. Apply an ample amount of cement when attaching these parts together. A bit of wood filler placed around the cemented area will assist in making a smooth fairing of both joinings. The perspective sketch, as shown on plate 4, illustrates this detail clearly. In mounting the wheel pants onto the shock absorbing wire, it is first necessary to place the wheel into the pants itself and line it up so that the wire ends may be slipped directly through them. Apply a bit of cement to the outer ends of the shock absorbing wire where they fit flush to the outer surface of the wheel housing.

Next, two lengths of 1/32" square rubber are required to serve as additional shock absorbers. These extend horizontally between the landing gear legs in a position just below the joinings of the upper and lower legs. Attach these with a slight tension, inasmuch as their primary purpose is to prevent the landing gear wire from spreading too much with repeated landing impacts.

Top Wing

The required amount of ribs necessary for the top wing is cut to shape from 1/32" stock and notched for spars accordingly. Each panel is constructed in the typical manner of the lower wing. The center section is assembled in the manner shown, though requiring its outer ribs to be slanted inward 3/64" in order to obtain the desired dihedral angle. All panels are covered with 1 /32" sheet covering at the necessary portions, and afterward are completely covered with Jap tissue and water sprayed before given a coat of dope. Now the right and left panels are cemented securely to the sides of the center section. Use small prop blocks placed at the extreme ends of the wing tips to assist in maintaining the dihedral angle until the cement dries thoroughly. All wing and center section struts are shaped and streamlined from 3/32" x 1/8" medium strength balsa, cut to proper length. Full sizes shown on plate 4. The outer bay struts are identified as W-1 and W-2. The center section struts are assembled from three pieces as one unit, as shown. This set is identified as W-3.

Propeller

The propeller is cut from a selected block measuring 1-1/4" x 2" x 9" long. On the face of the block draw two diagonal lines extending from corner to corner. In the center place a fair sized pinhole. Mark off the area that is to be fitted into the spinner cap. This is shown on the drawing on plate 1. Use care in cutting the prop to shape and do not cut the blades too thin. Leave that for the sanding to take care of. Round off the tips and lastly cement flush to the spinner cap. Before inserting and cementing the prop shaft, balance the prop carefully. Apply a few coats of dope over the blades to insure additional strength.

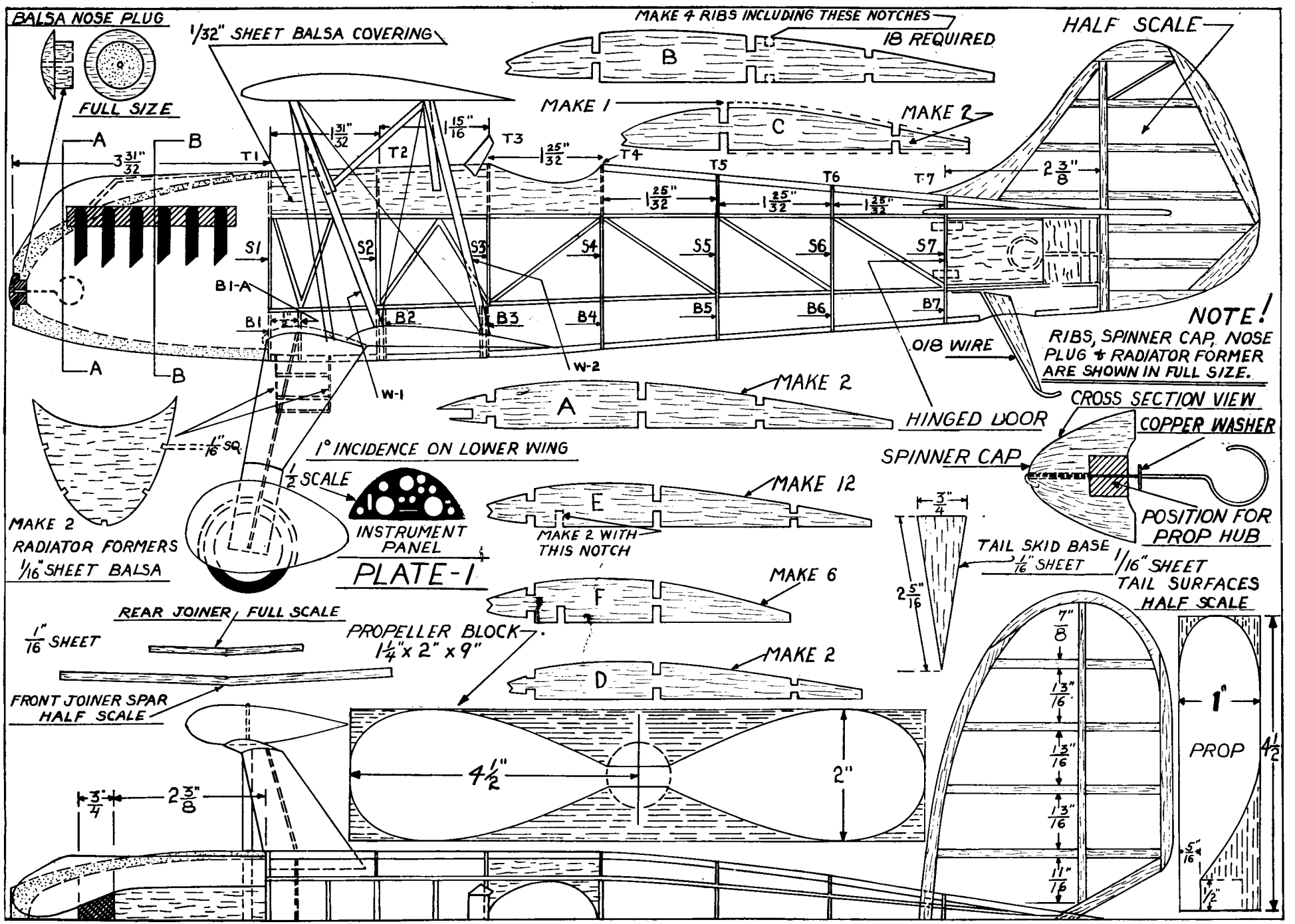
Assembly

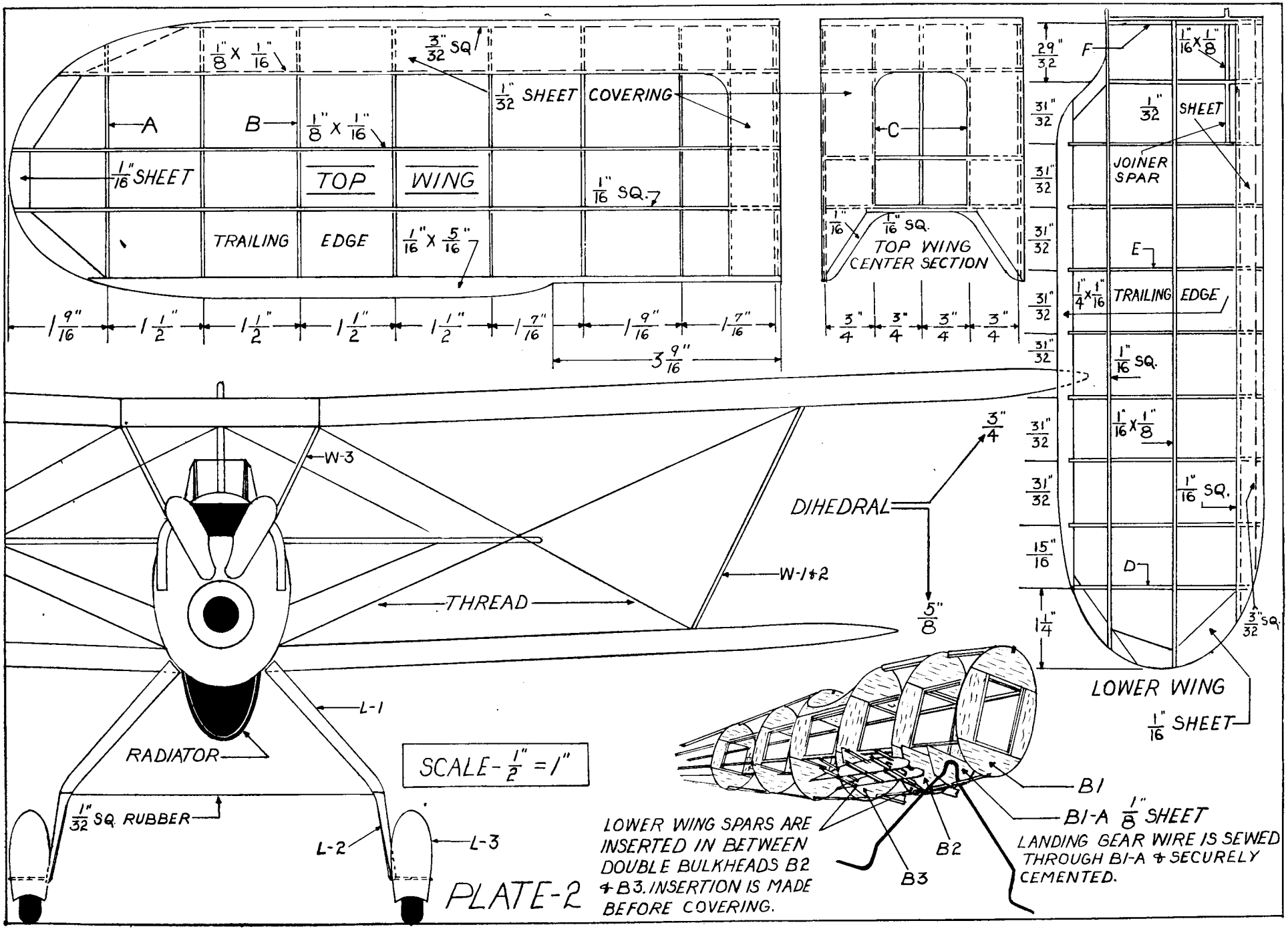
The center section struts W-3 are cemented to the sheet balsa covering over the fuselage cowl, as shown on plate 1. Inserting small model-making pins through these struts will aid in maintaining greater rigidity. Be sure they are
slanted at the proper angles before attaching the top wing. Insert more model-making pins at the top ends of these struts
and push part way into the wing itself. Apply cement generously at all joinings. The outer bay struts are next to be cemented into position. They rest directly on and below a wing rib. The rigging wires consist of strong white threads. Both landing and flying wires are rigged double. The rudder is lastly cemented in position and perfectly aligned. The power plant consists of six strands of 1/8" flat rubber. Better and longer flights may be
obtained by using a gear winder.

Bill of Materials

5	sheets of balsa, 1/16" x 3" x 36" for wing ribs, formers, bulkheads, tail surfaces, etc.
7	strips of medium balsa, 1/16" x 1/16" x 18" for longerons, cross braces.
1	piece sheet balsa 1/32" x 3" x 36" for fuselage cowl, cockpit and wing panel covering.
1	piece of soft balsa, 1/2" x 1/2" x 1-1/8" for the nose plug.

1 block of hard balsa, 1-1/4" x 2" x 9" for the propeller.
4 pieces of soft balsa, 5/16" x 1-1/2" x 2-1/2" for the wheel housings.
2 pieces of soft balsa, 3/8" x 1-5/8" x 3" for the landing gear struts L-1.
2 pieces of soft balsa, 1/4" x 5/8" x 1-3/8" landing gear legs L-2.
1 piece of hard balsa, 1/8" x 1/16" x 26" long for wing and center section struts.
1 piece of soft balsa, 1/4" x 3" x 6" for the exhaust ports.
1 piece of soft balsa, 1/2" x 3" x 10" for the cylinder banks.
1 block of soft balsa, 1-1/16" x 1-1/16" x 7/8" for the spinner cap.
1 strip of hard balsa, 3/32" sq. x 36" for the leading edges of both wings.
1 strip of hard balsa, 1/16" sq. x 36" for wing spars of both wings.
2 strips of hard balsa, 1/16" x 1/8" x 36" for wing spars of both wings.
1 strip of soft balsa, 1/16" x 5/16" x 36" for trailing edges, top wing.
1 strip of soft balsa, 1/16" x 1/4" x 18" for trailing edges, lowed wing.
Jap tissue, cement, dope, sandpaper, white thread, model-making pins, and one foot of No. .018 wire for the landing gear. Six inches of .038 wire for propeller shaft and tail hook.


BALSA NOSE PLUG
FULL SIZE
1/32" SHEET BALSA COVERING
MAKE 4 RIBS INCLUDING THESE NOTCHES
18 REQUIRED
B
HALF SCALE
MAKE 1
C
MAKE 2
A
B
3 31/32"
T1
1 31/32"
T2
1 15/16"
T3
1 25/32"
T4
T5
T6
T7
2 3/8"
1 25/32"
1 25/32"
1 25/32"
S1
S2
S3
S4
S5
S6
S7
B1-A
B1
1"/2
B2
B3
B4
B5
B6
B7
W-1
W-2
.018 WIRE
NOTE!
RIBS, SPINNER CAP, NOSE PLUG & RADIATOR FORMER ARE SHOWN IN FULL SIZE.
MAKE 2
A
HINGED DOOR
CROSS SECTION VIEW
COPPER WASHER
SPINNER CAP
1/16" SQ.
1° INCIDENCE ON LOWER WING
1/2 SCALE
INSTRUMENT PANEL
MAKE 12
E
MAKE 2 WITH THIS NOTCH
POSITION FOR PROP HUB
MAKE 2
RADIATOR FORMERS
1/16" SHEET BALSA
PLATE-1
3"/4
TAIL SKID BASE
1/16" SHEET
2 5/16"
1/16" SHEET
TAIL SURFACES
HALF SCALE
MAKE 6
F
REAR JOINER FULL SCALE
1"/16 SHEET
PROPELLER BLOCK
1 1/4" x 2" x 9"
MAKE 2
D
FRONT JOINER SPAR
HALF SCALE
4 1/2"
2"
3"/4
2 3/8"
7"/8
1 3/16"
1 3/16"
1 3/16"
11"/16
1"
PROP
4 1/2
5"/16
1/2"


1/8" X 1/16"
3/32" SQ.
1/32" SHEET COVERING
A
B
1/8" X 1/16"
1/16" SHEET
TOP WING
1/16" SQ.
TRAILING EDGE
1/16" X 5/16"
9/16" 1 1/2" 1 1/2" 1 1/2" 1 1/2" 7/16" 9/16" 7/16"
3 9/16"
C
1/16" 1/16" SQ.
TOP WING CENTER SECTION
3/4" 3/4" 3/4" 3/4"
29/32"
31/32"
F
1/16" X 1/8"
1/32" SHEET
JOINER SPAR
E
1/4" X 1/16" TRAILING EDGE
1/16" SQ.
1/16" X 1/8"
1/16" SQ.
15/16"
D
1 1/4"
3/32" SQ.
LOWER WING
1/16" SHEET
W-3
W-1+2
THREAD
DIHEDRAL
3/4"
5/8"
L-1
RADIATOR
1/32" SQ. RUBBER
L-2
L-3
SCALE - 1/2" = 1"
B1
B1-A 1/8" SHEET
B2
B3
LOWER WING SPARS ARE INSERTED IN BETWEEN DOUBLE BULKHEADS B2 & B3. INSERTION IS MADE BEFORE COVERING.
LANDING GEAR WIRE IS SEWED THROUGH B1-A & SECURELY CEMENTED.
PLATE-2

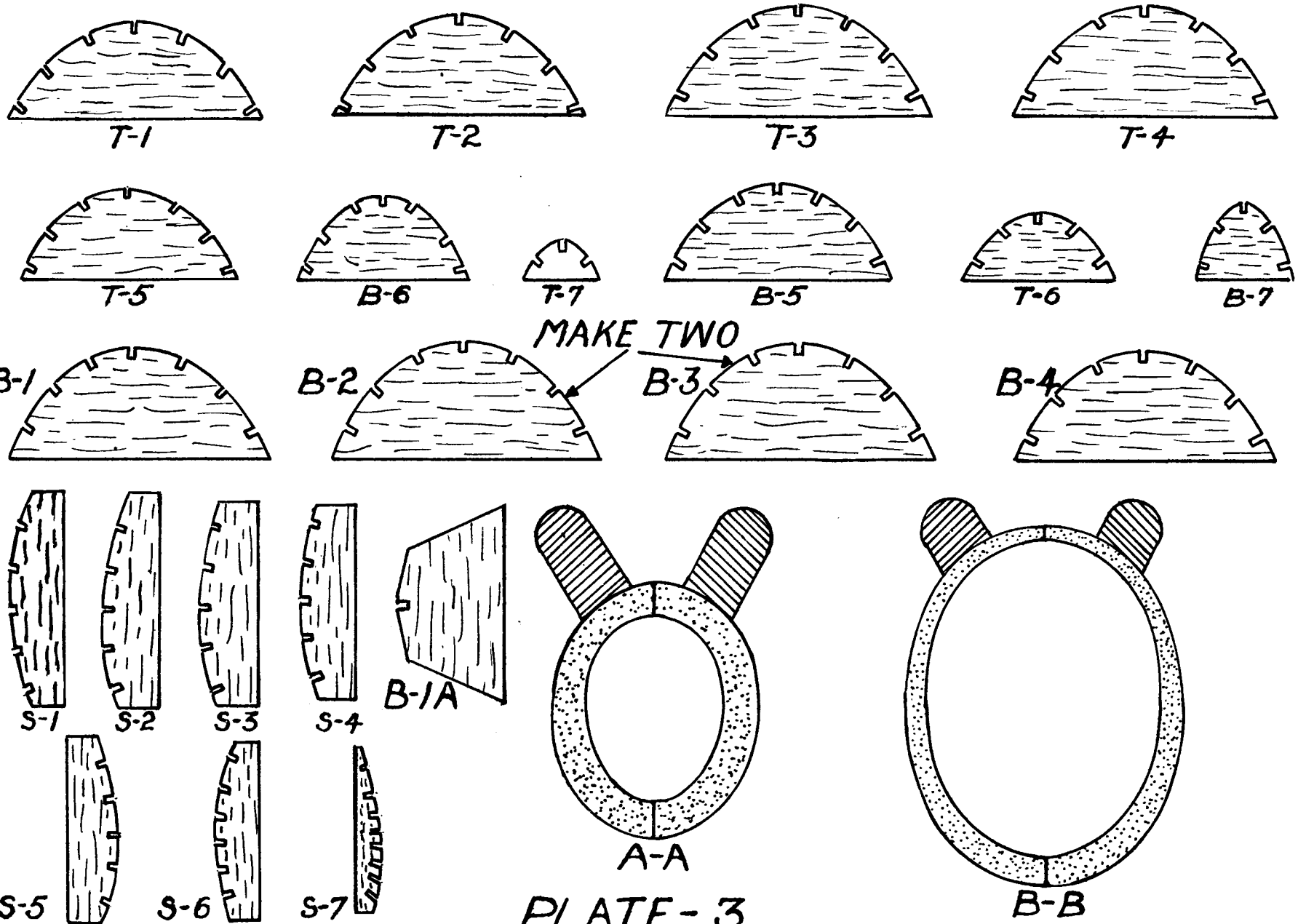
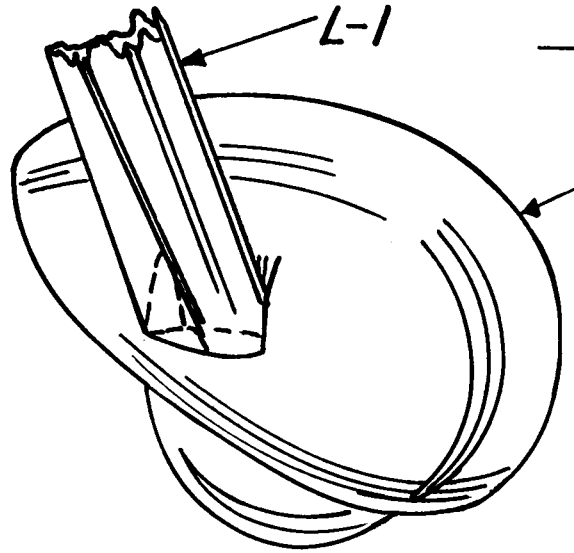
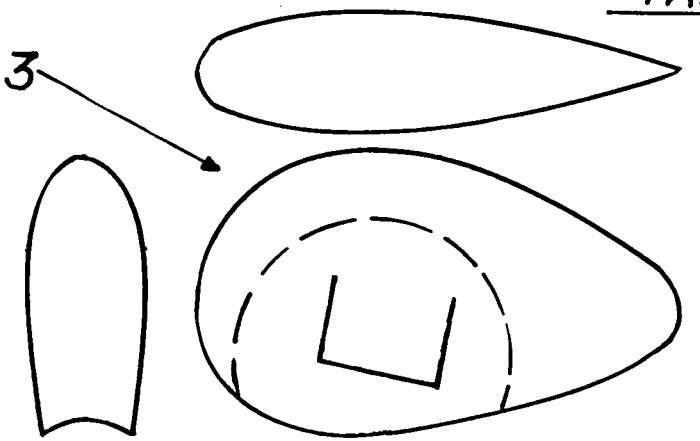

T-1
T-2
T-3
T-4
T-5
B-6
T-7
B-5
T-6
B-7
MAKE TWO
B-1
B-2
B-3
B-4
S-1
S-2
S-3
S-4
B-1A
A-A
B-B
S-5
S-6
S-7

PLATE - 3

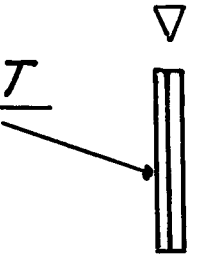
PLATE-4

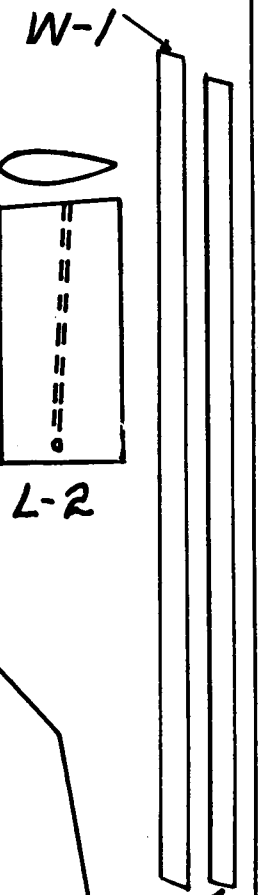
FULL SCALE

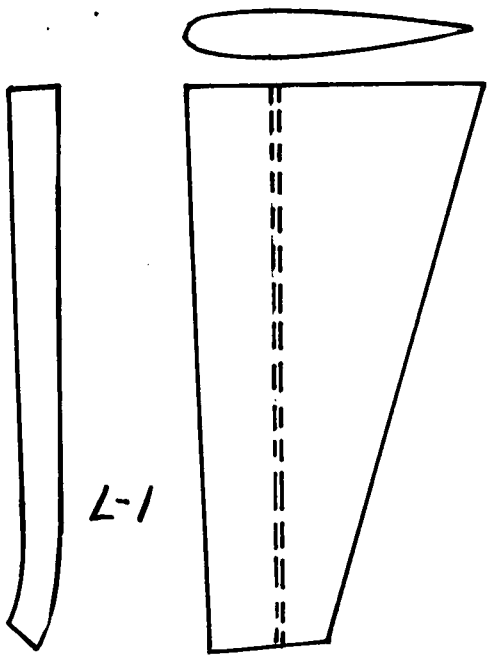




TAIL POST







LANDING GEAR
WIRE .018