

How to Build a Gas Type Pursuit Model

HERE IS A SMALL GAS JOB THAT LOOKS EXACTLY LIKE A MINITURE U.S. ARMY PLANE AND WHICH PERFORMS WELL

by Peter Westburg

THE WS-3 gas model was designed primarily for appearance, although its flying qualities are remarkable in view of the fact that it is quite small and comparatively heavy



Here is the little ship ready to fly. Looks like a real full size plane, doesn't it?



A view from the rear. Note the detail of the cockpit and the insignia which creates a realistic effect.

for its size. The original model weighed almost 4 ½ pounds, with a wing area of 600 square inches. The wing loading was well over one lb. per square foot. However, by careful work, the weight could be brought down to under four lbs.

This model is copied somewhat from the Douglas O-43 and makes a really beautiful model when finished in regulation army colors.

An inverted Baby Cyclone engine equipped with an adjustable timer is used. Other engines could be used with minor changes in construction. It is believed a 1/5 hp. engine would greatly improve the performance of this plane and if any of you readers build this plane and use a 1/5 hp. engine, the author will appreciate hearing from you regarding its performance.

You should have very little trouble in making this plane because nothing on it is very complicated. A careful study of the plans will tell you everything you want to know.

Since the tail surfaces are easiest to make, suppose we start with them. They are made in two halves for adjustability and ease in transporting. By simply loosening the turnbuckles, the angle of incidence can be varied within a range of five degrees. The tail wires are No. 24 soft tinned wire.

Lay out the bottom ribs which are 3/16" x 1/8", and over these lay the two 1/4" square hardwood spars. The 3/8" wide outlines are glued on and then the top ribs. Put in the triangular braces. Bind the pieces of 3/32" rod and wire the fittings. The butt rib must be filled in so it is solid. When thoroughly dry, trim off the outlines to make a neat, streamline appearance.

The wings should come next. The airfoil section used is the old standby, the Clark Y. Lack of space prohibits drawing all the ribs and so we have presented only three ribs to show you how they are made. Rib No. 14 is 1/4" thick, rib No. 9 is 1/8" thick, all others are 1/16".

Do not make the spars until after you have cut all the ribs. The spars vary in height and the top surface of the rear one is beveled. They are solid and half-inch wide. After binding on the tubing, assemble the ribs on the spars and then glue on the half-inch outlines. You should have no trouble with the trimming tab. Only one is necessary and that is on the left wing panel. Either tin, copper or brass strip hinges can be used. The bottom of the wing between the leading edge and the front spar, and the rear spar and the trailing edge is covered with 1/32" balsa. The rear surface is covered diagonally and 1/64" x 1/4" strips are glued on to cover the tracks and make a better appearance. This strengthens the wing and no internal bracing is necessary. It also makes the wing virtually warp-proof. The tin wing fittings have a " piece of either brass or aluminum " O.D. tubing soldered to them and bolted and glued to the spars just

outside of rib No. 9. Trim the edges of the wing and you have finished it.

Now for the fuselage. Don't be dismayed. It looks a bit complicated but as you progress you will discover how simple it really is.

The longerons, crosspieces, diagonals and uprights are all 3/16" square. After you have laid out the sides, make the bulkheads. Be sure all the holes are cut or drilled in. No. 1 is 1/4" thick veneer, 2, 3 and 4 are 1/4" thick hard balsa and 7 is 1/8" thick. Formers No. 5, 9, 11, 13, and dashboard 14 are all 1/8" thick. The intermediate formers No. 6, 8, 10, and 12 are all 1/16" thick. Assemble the sides on bulkheads No. 3 and 4. No. 1 and 2 are next put in, then 7. Put in the cross-pieces and formers. At this stage the hickory engine mounts, which are 3/8" x 1/2", can be installed.

The landing gear legs, which are also hickory, must be notched and fitted together carefully before putting in. The 1/4" thick sides of the box are glued in first and the holes for the upper ends of the landing gear legs cut in. Glue the legs in very well at all points and finish by putting in the top and bottom of the box.

The tail blocks are made out of soft or medium balsa. Hollow them out as much as possible and fit the top one on carefully. The bottom one is not put on until the rudder is done. Pieces (x) are glued on next. Square them up accurately and use plastic wood to make a fillet. Drill in 1/8" front hole for the tubing that acts as socket for the stabilizer pins. The tubing in the rear groove moves freely up and down.

Assemble the ribs and outlines of the rudder on the 1/4" square rudder post and insert it carefully in the tail block. Glue well on the inside. The trimmings tab is solid and the same kind of tin, or other metal, hinges are used. The top and bottom tail wire fittings are put on and wired securely.

The battery box can be made of 1/8" flat hard balsa or cigar box wood. Use small brads and plenty of glue. Only one tab is necessary and a 3/8" wood screw is used. Piece (Y) is a 1/4" x 1" x 10" piece of hard balsa and serves only as a runner for the battery box. Mount the switch in its proper place in the cockpit.

You should have no trouble in the construction of the gull. Its construction is quite clearly shown. Take great pains in putting on the butt ribs. Note that the angle of dihedral, which

is four degrees, is built into the gull, not the wing. The angle of incidence is two degrees and must be carefully built in. Line up the tubing accurately and bind well. The dashboard, the flat piece between it and the rear spar come next; and then the trailing and leading edges. At this point you can put in the ignition system. The condenser is fastened to an engine mount with a clip; the booster plugs can be put almost anywhere where they are easily accessible.

All of the cowling that is not detachable is made by gluing planks of balsa 1/8" x 3/8" side by side. The entire bottom of the gull is covered in this way, as well as the upper surface of the wing between the leading edge and the front spar, the rear spar and the trailing edge. The rest of the gull is covered with silk. The cowling on the left side between stations 1 and 3 is made of one piece of medium balsa and should be made to fit carefully. It screws onto eight hardwood gussets which must be glued well to the longerons. 3/8" flat head wood screws are used. Plastic wood is used to make a fillet around the gull. By studying the pictures you can see how this is done.

Carve out the landing gear fillets roughly; notch them and glue on well. The brass axle holders are bolted on next. Note that the tips are filled with solder and drilled to receive a 6/32" bolt. The landing gear is streamlined with 1/4" thick inner pieces and 1/8" thick outer pieces of medium balsa. The lower streamlining finishes the landing gear except for shaping and sanding.

The stringers are all hard balsa 1/8" x 1/16". There are thirty-two in all. The tail wheel streamline is made of medium balsa and will have to be made according to the size wheel you use.

The windshield is made of one piece of celluloid with a piece of stiff manila paper cut out to simulate the various panels.

You will probably have to make a gas tank because the regular Baby Cyclone tank is a trifle large. It is bolted to the firewall. The gas-line is either brass or copper 1/8" O.D. tubing with a rubber elbow for a connection.

You may have trouble making the top and bottom engine cowlings. The top one can be hollowed out of one piece of balsa, in which case no formers are necessary. The writer carved the front half out of two blocks, and made the rear half of 1/8" x 3/8" strips. Note that former No. 15 is cut to fit over the gas tank. The bottom cowling has several curves

but if you use rather soft balsa and run the grain in the right way, you can make it easily enough and you will be amply repaid when you have finished it. The cowling holes are entirely optional and can be put in almost any place. Don't forget the holes for the exhaust and the needle valve stem. When you mount your Cyclone see that you don't leave too large a gap between the spinner and the cowling. The plans should tell you all you need to know about how to fasten the spinner to the prop. To make it, glue four blocks together. After shaping the outside, split them apart and hollow out. All the engine cowling screws to gussets.

The struts will vary a little. They are made of basswood and are a half-inch wide by one-quarter inch. The wings' ends are simply a hinge affair with hard balsa shear pins serving as the pins. To streamline the ends make a former as shown and glue it to the strut. When dry, fill in all around with plastic wood. Cut an opening for the shear pins. The fuselage end is a brass tubing socket that slips over a bent piece of 3/32" welding rod, one end of which is threaded 2/56. It goes through the landing gear just ahead of the hickory leg, not through it. Through each butt rib and tubing a small hole is drilled, into which common pins or wire staples are pushed. This is amply strong enough to hold the wings on but they will break off quite easily when the occasion arises.

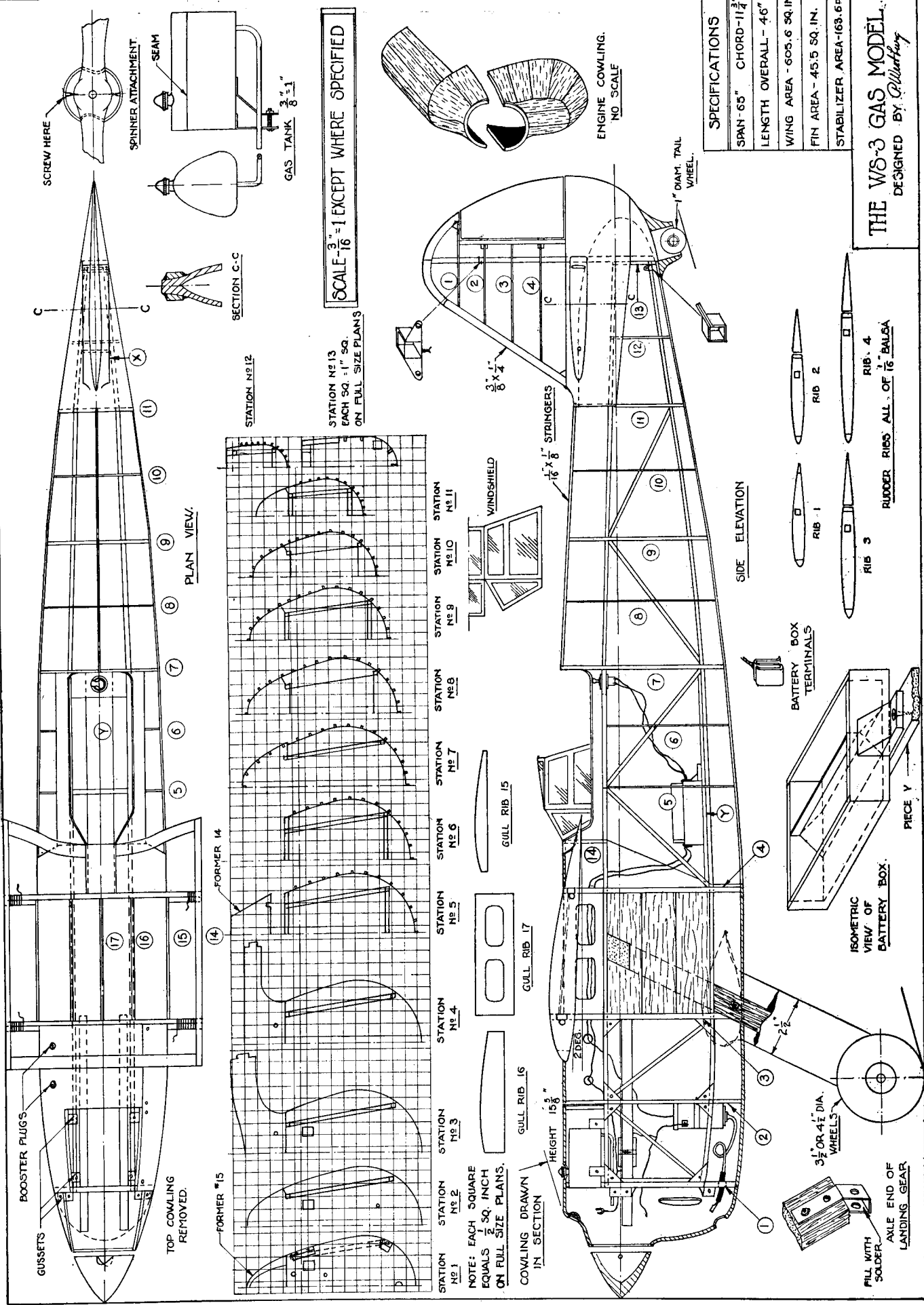
Covering the airplane is quite easy; two coats of good dope will practically eliminate all wrinkles. The original model was painted the conventional army colors but it could be painted to represent a commercial plane or racer. Two coats of good brushing lacquer will give it a fine finish. You can polish the whole plane with wax or liquid polish to get a shiny surface.

A word or two about flying. Balance the plane by moving the batteries and set the stabilizer at 1 1/2 degrees negative incidence. The engine is offset to the right 1 1/2 degrees, but otherwise leave the thrust line alone. Unless you put a timer on your plane don't fill the tank more than a quarter full, and raise the tail of the plane when you start the engine. This brings the gas level well above the needle valve. It is not advisable to fly the plane with the spinner or bottom cowling on because even a minor crack-up will probably break it completely.

Take it easy, work carefully and you will have a gas model you can be really proud to own.

SCALE $\frac{3}{8}$ " = 1" EXCEPT WHERE SPECIFIED

STATION N° 13
EACH SQ. = 1" SQ.
ON FULL SIZE PLANS



SPECIFICATIONS	
SPAN - 65"	CHORD - 11 3/4"
LENGTH OVERALL - 46"	
WING AREA - 605.6 SQ. IN.	
FIN AREA - 45.5 SQ. IN.	
STABILIZER AREA - 163.6 sq. in.	

THE WS-3 GAS MODEL
DESIGNED BY *Walter*

RIBBER RIBS ALL OF 1/8" BALSAL
RIB 4
RIB 2
RIB 1
RIB 3

NOTE: EACH SQUARE
EQUALS 1/2" SQ. INCH
ON FULL SIZE PLANS.

COWLING DRAWN
IN SECTION

HEIGHT 15 5/8"

2 DEG

2 1/2"

PIECE Y

BATTERY BOX
TERMINALS

ISOMETRIC
VIEW OF
BATTERY BOX.

3 1/2" OR 4 1/2" DIA.
WHEELS

AXLE END OF
LANDING GEAR

FILL WITH
SOLDER

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

Y

X

C

WINDSHIELD

GULL RIB 15

GULL RIB 17

GULL RIB 16

STATION N° 1

STATION N° 2

STATION N° 3

STATION N° 4

STATION N° 5

STATION N° 6

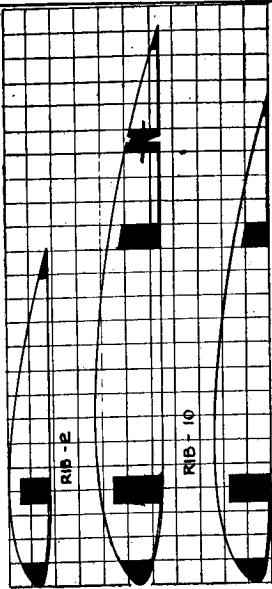
STATION N° 7

STATION N° 8

STATION N° 9

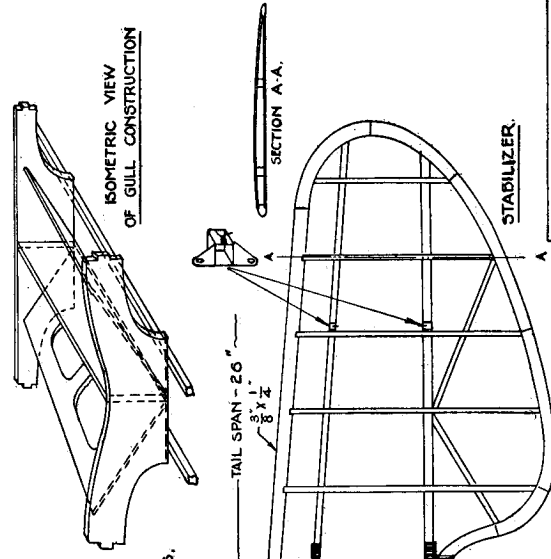
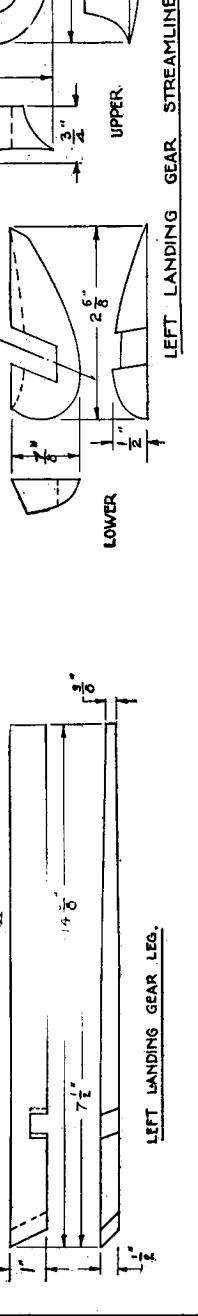
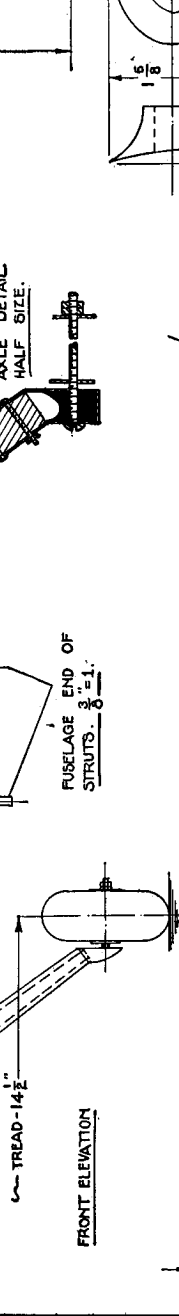
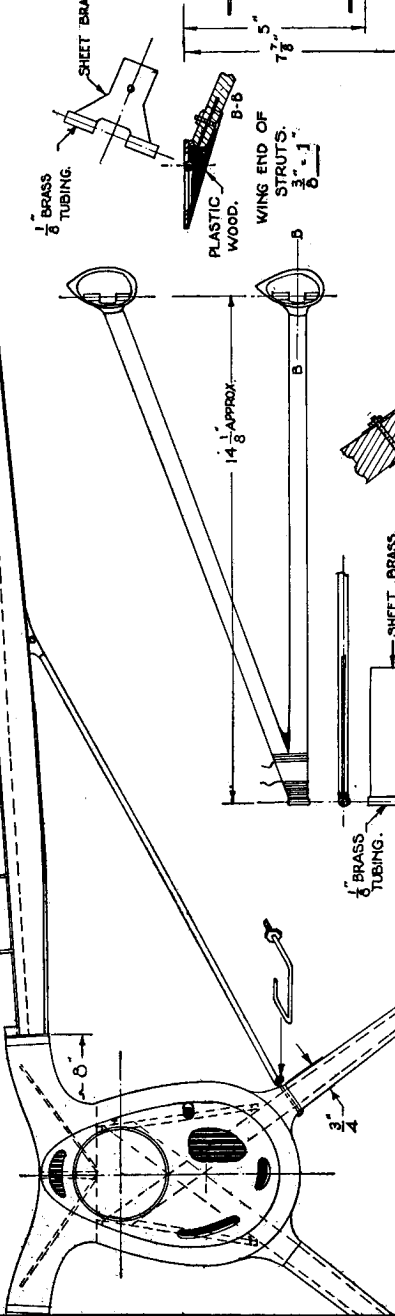
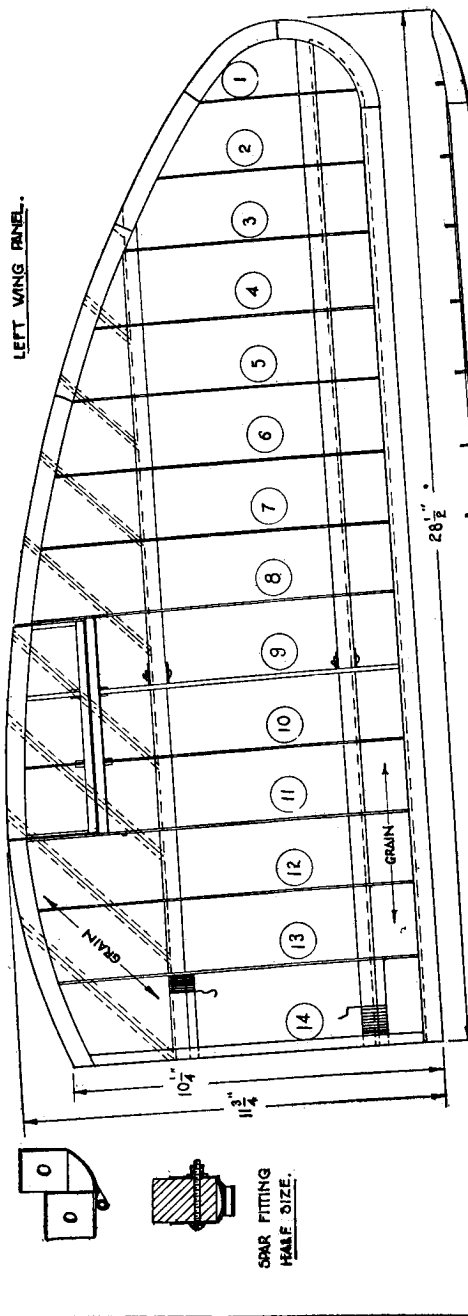
STATION N° 10

STATION N° 11

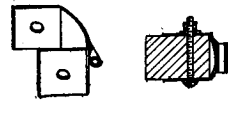


RIB - 14
EACH SQ. = $\frac{1}{2}$ " SQ. ON FULL SIZE PLANS.

SCALE - $\frac{3}{16}$ " = 1" EXCEPT WHERE SPECIFIED.



PRE. CURVE	CLARK 'Y' ORDINATES	
	UPPER CURVE	LOWER CURVE
0.00	3.50	3.50
1.25	5.45	1.93
2.50	6.50	1.47
5.00	7.90	.95
7.50	8.85	.63
10.00	9.60	.42
15.00	10.69	.15
20.00	11.36	.03
30.00	11.40	
40.00	10.52	
50.00	9.15	
60.00	7.35	
70.00	5.22	
80.00	2.80	
100.00	.12	



SPAR FITTING
HALF SIZE.

LEFT LANDING GEAR LEG.

LEFT LANDING GEAR STREAMLINES - $\frac{3}{8}$ " = 1"