

GUN
2 REQUIRED



WING DIHEDRAL



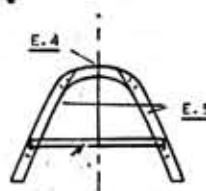
WHEEL AXLE
2 REQUIRED



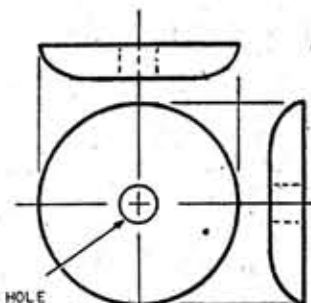
EXHAUST
2 NEEDED



RADIO MAST



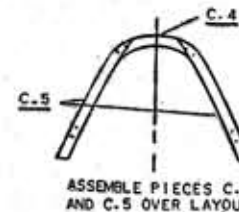
ASSEMBLE PIECES E.4
AND E.5 OVER LAYOUT



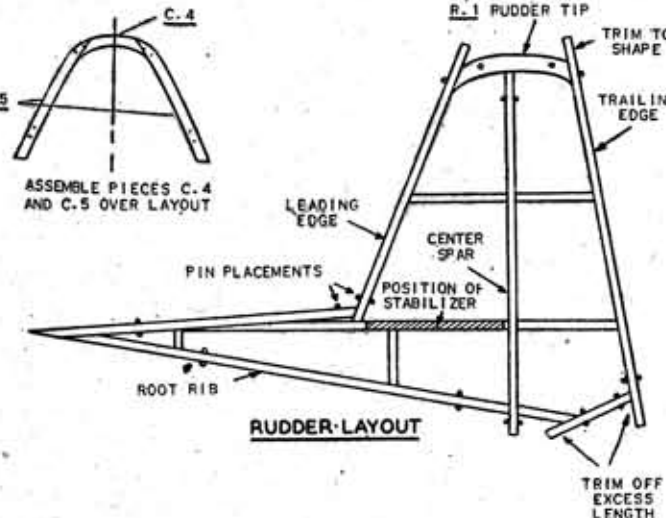
NOSE BLOCK



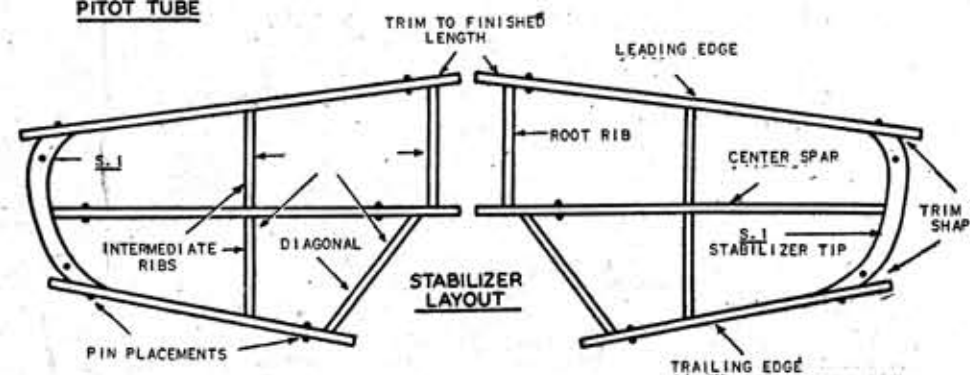
PITOT TUBE



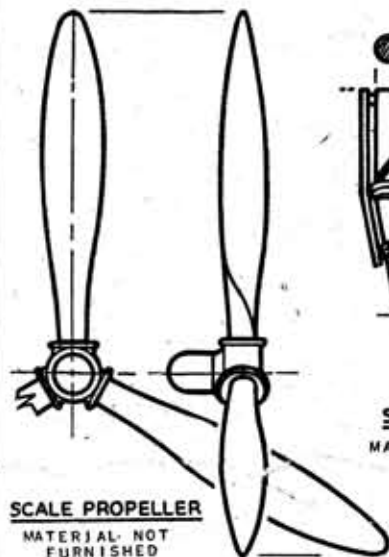
ASSEMBLE PIECES C.4
AND C.5 OVER LAYOUT



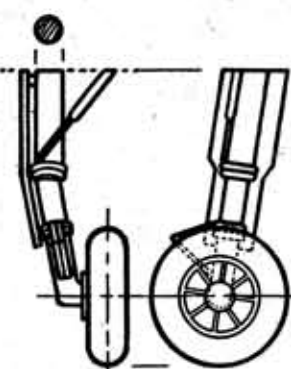
RUDDER LAYOUT



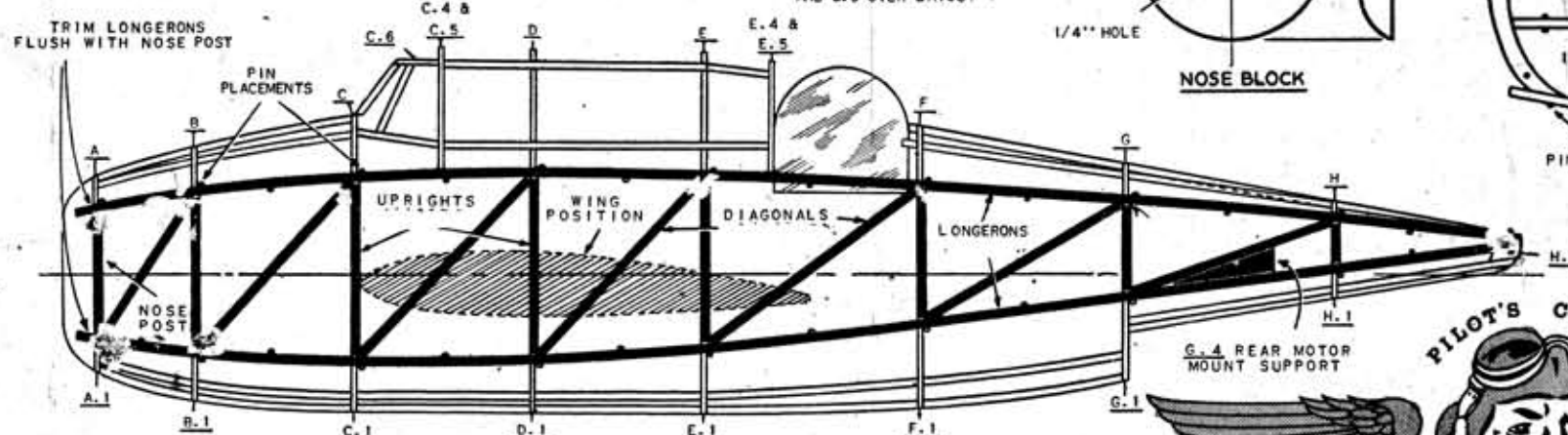
STABILIZER LAYOUT



SCALE PROPELLER
MATERIAL NOT
FURNISHED
-OPTIONAL



SCALE LANDING GEAR
MATERIAL NOT FURNISHED
-OPTIONAL



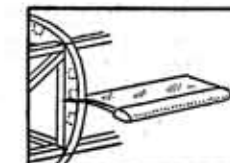
FUSELAGE SIDE FRAME LAYOUT

NOTE:

BUILD ALL FRAMES ON THIS WORK SHEET. PLACE WORK SHEET ON WORK BOARD AND TACK A SHEET OF WAX PAPER OVER IT. THE FRAMES ARE BUILT ON

THE WAX PAPER. OTHER FULL SIZE TEMPLATES SUCH AS NOSE BLOCK, SCALE PROPELLER AND LANDING GEAR ARE GIVEN ON THIS SHEET. A COMPLETE

REDUCED SCALE PLAN OF THIS MODEL IS FURNISHED ON THE INSTRUCTION SHEET. STUDY PLAN AND DIRECTIONS BEFORE STARTING WORK ON THE MODEL



IMPORTANT NOTE!

DO NOT CUT NOTCHES IN FORMERS G2, G3, H, H1, H2 & H3 UNTIL THEY HAVE BEEN CEMENTED TO FUSELAGE SIDE FRAME. CUT NOTCHES AS SHOWN IN SKETCH AT LEFT. USE POINT OF RAZOR BLADE OR MODELERS' KNIFE.

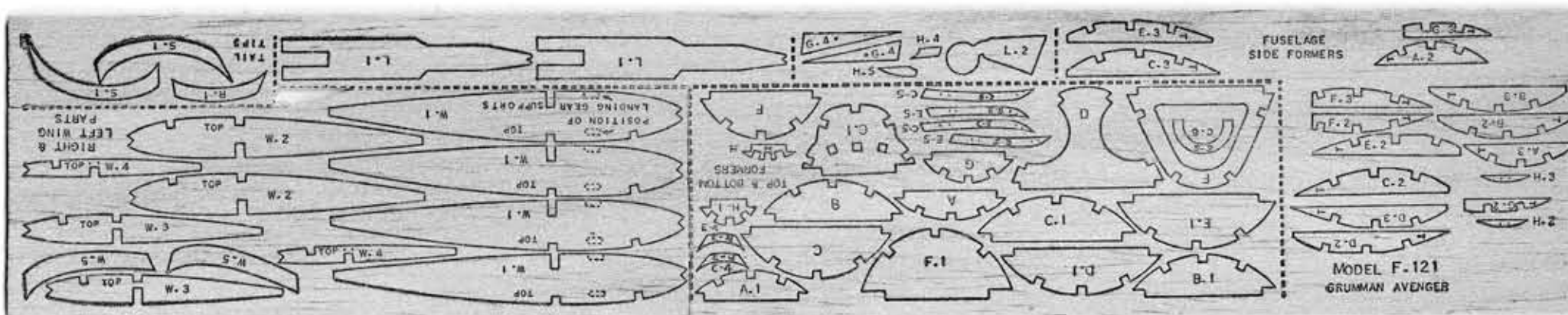
PILOT'S CHOICE



NO. F 121 GRUMMAN TBF AVENGER

WORK SHEET

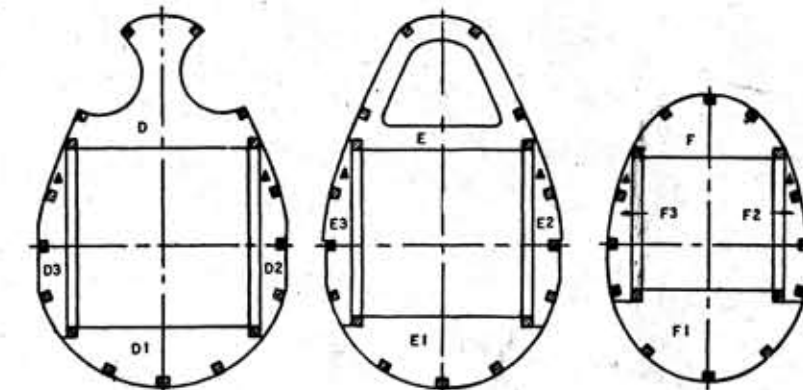
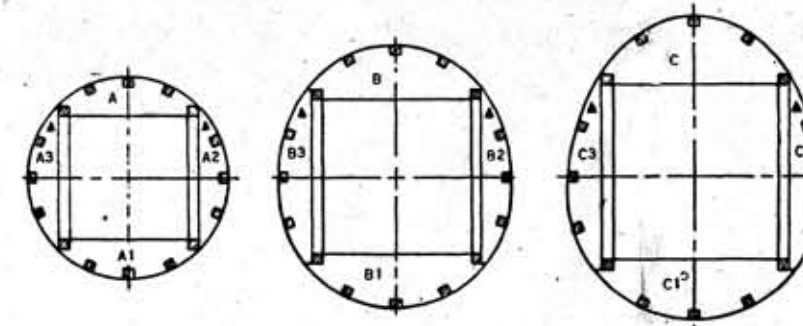
12" WING SPAN FULL SIZE TEMPLATES



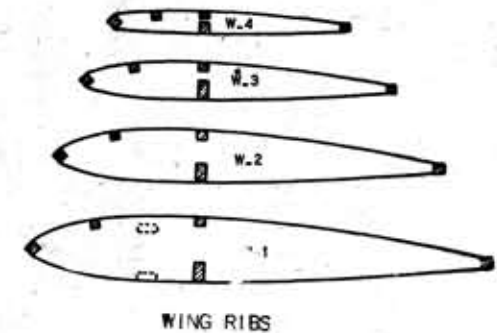
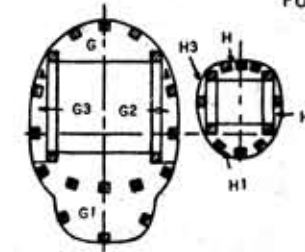
MODEL F.121
GRUMMAN AVENGER

GRUMMAN TBF AVENGER NO. F 121

THE TEMPLATES FURNISHED BELOW ARE FOR CHECKING AND BUILDING ADDITIONAL MODELS. ALL ARE DUPLICATED ON THE PRINT STOCK.



FUSELAGE CROSS SECTIONS



WING RIBS

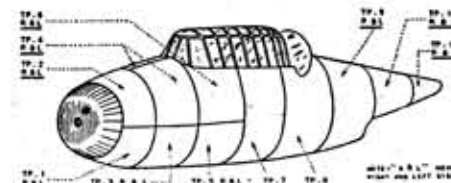
READ DIRECTIONS CAREFULLY!

FIRST: TACK SHEET OF TISSUE OVER FUSELAGE PATTERNS (GLOSSY SIDE DOWN - GRAIN RUNNING IN DIRECTION OF ARROWHEADS). TRACE THE PATTERNS LIGHTLY WITH A SOFT LEAD PENCIL.

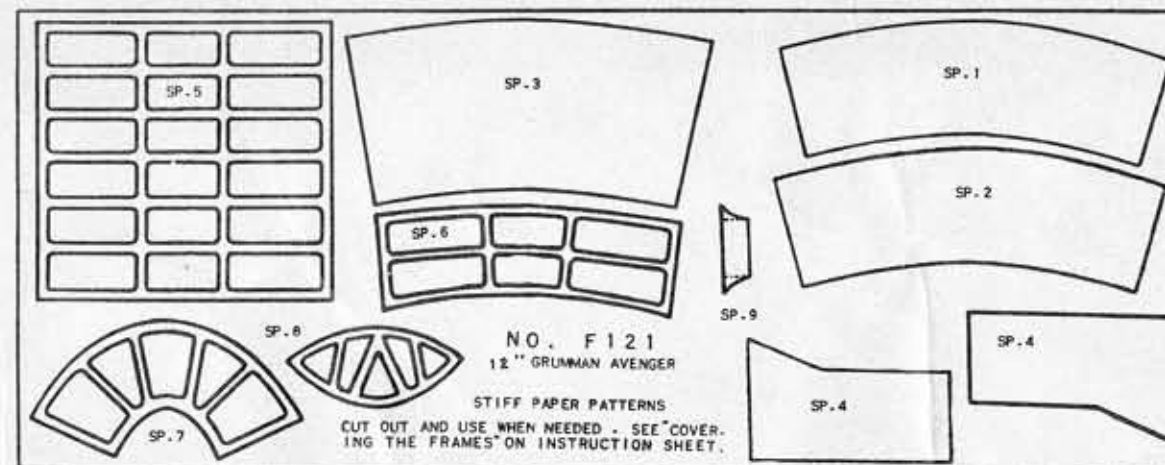
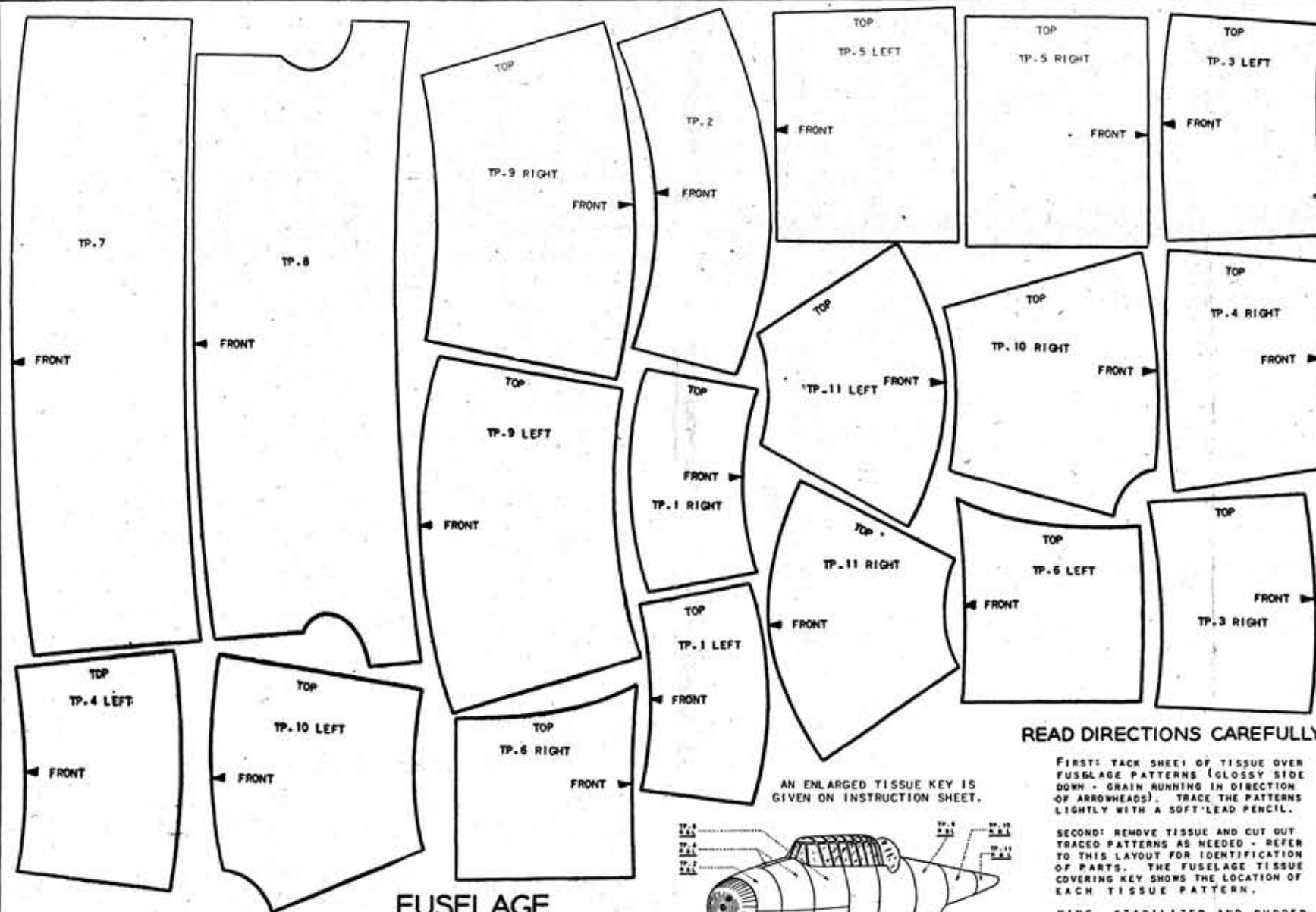
SECOND: REMOVE TISSUE AND CUT OUT TRACED PATTERNS AS NEEDED - REFER TO THIS LAYOUT FOR IDENTIFICATION OF PARTS. THE FUSELAGE TISSUE COVERING KEY SHOWS THE LOCATION OF EACH TISSUE PATTERN.

WING, STABILIZER AND RUDDER PATTERNS ARE MADE BY LAYING REMAINING TISSUE OVER FRAME LAYOUTS AND TRACING OUTLINE OF DESIRED PARTS. MAKE ALL PATTERNS 1/8" OVERSIZE ON ALL EDGES.

AN ENLARGED TISSUE KEY IS GIVEN ON INSTRUCTION SHEET.



FUSELAGE
TISSUE PATTERNS
FOR TRACING ONLY - DO NOT CUT OUT

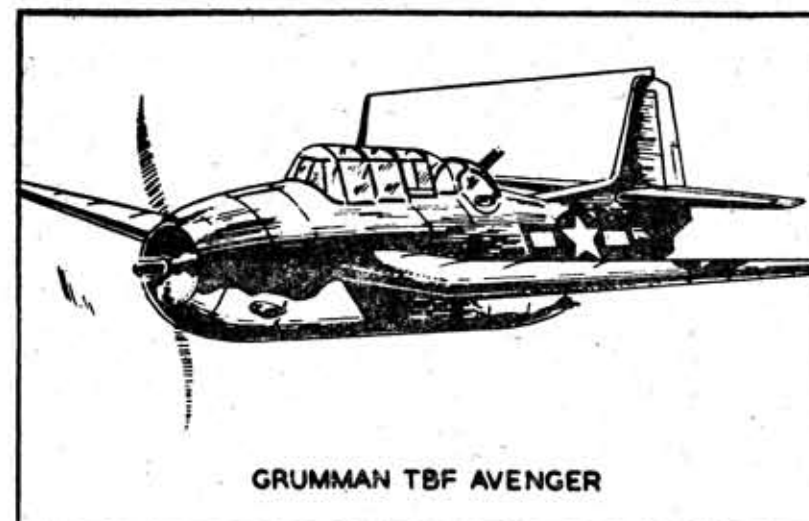


USE ON 12" GRUMMAN AVENGER (F121)

SPECIFICATIONS

WINGSPAN 54 FEET
 LENGTH 41 FEET
 WEIGHT ABOUT 6 TONS
 RANGE 1400 MILES
 CREW

PILOT, RADIO-NAVIGATOR, 2 GUNNERS
 ARMAMENT
 MACHINE GUNS. 2000 LB. TORPEDO



GRUMMAN TBF AVENGER

OUTLINE OF WORK

Build the fuselage frame first, then the wings, and finally the stabilizer and rudder. Build the frames on the full size scale drawings given on the Work Sheet. Step-by-step instructions are given on Page 3 of this folder. Balsa strips are used for making the fuselage frame members such as longerons, upright and diagonal braces, and stringers; wing, stabilizer and rudder frame members such as leading and trailing edges and spars. The dimensions of the cross section of each frame member cut from strip balsa is given on the Work Sheet. Frame members such as fuselage formers; wing ribs and tips; stabilizer and rudder tips are cut from printed sheet balsa. Balsa members are lettered the same as on the Work Sheet. The nose block is made from the printed balsa block. Model airplane cement is used to fasten the balsa frame members together.

Each frame must then be covered with tissue. Turn to Page 4 for step-by-step instructions. The fuselage frame is covered first. Cut the outlines from sheet of Stiff Paper Patterns. Apply as directed. Add the cellophane pieces and finally the tissue. Model Airplane Dope (Tissue Cement) is used to fasten the covering materials to the balsa frames. The patterns for cutting the tissue are given on the back of the Work Sheet along with the Tissue Key (A perspective of the fuselage showing the location of each piece of tissue). The wings are covered next, and then the stabilizer and rudder.

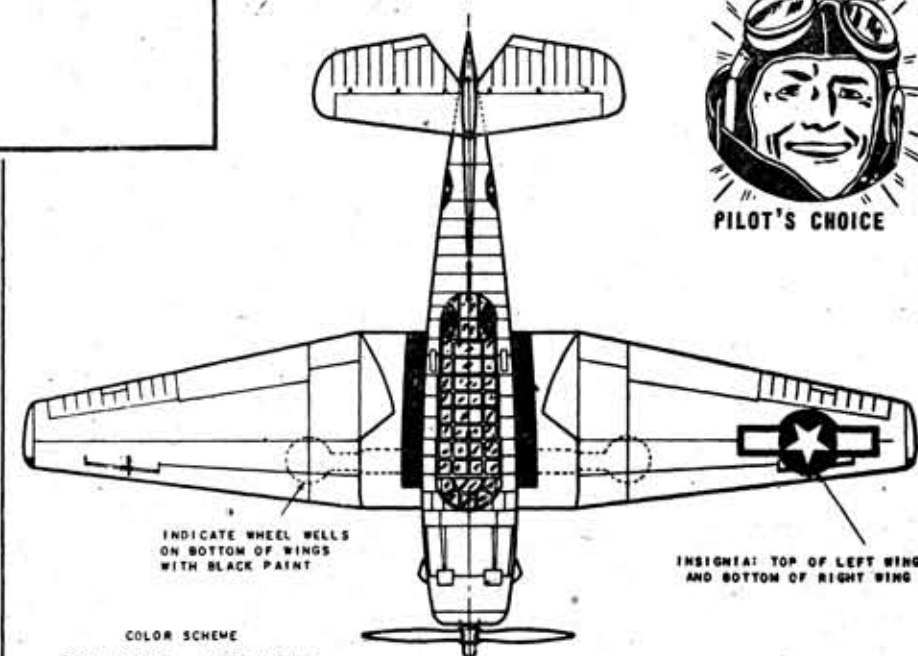
The model is then ready for assembly. The first task is to cement the rudder, stabilizer and wing frames to the fuselage. Model airplane cement is used to fasten the frames together after tissue has been removed from the points of contact. See 3-View Plan on Page 2 for locations needed, also the Work Sheet for correct amount of dihedral. Assemble landing gear and cement in place. See Work Sheet for full size drawing of axle, strut and wheel; and the 3-View Plan on Page 2 for location of the landing gear.

The model is next doped in order to shrink the tissue covering taut. This is done by (1) spraying the model with water or (2) by painting it with clear or colored lacquer. See Plan on Page 1 for the color scheme.

The propeller unit is then assembled and installed. See Work Sheet for full size drawings of scale propeller. Control lines showing the location of ailerons, flaps, elevators and rudder are added next. See Plan on Page 1. Small parts such as air scoops, pitot tube, lights and armament are made and added to the model. See Work Sheet for full size drawings, also Plan on Page 2 for locations. Then paint the details black and add the insignia.



PILOT'S CHOICE



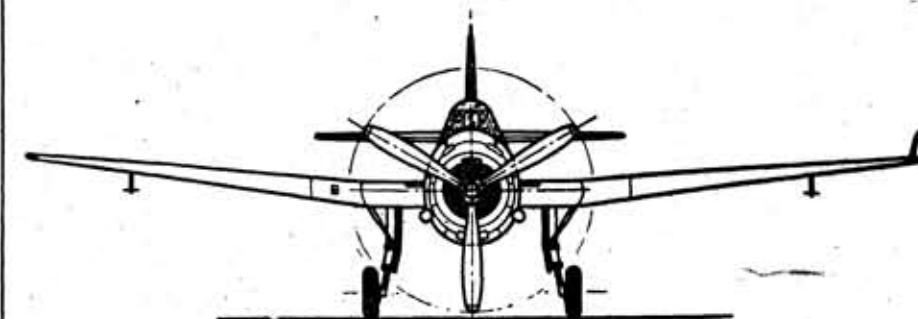
INDICATE WHEEL WELLS
 ON BOTTOM OF WINGS
 WITH BLACK PAINT

INSIGNIA: TOP OF LEFT WING
 AND BOTTOM OF RIGHT WING

COLOR SCHEME

TOP SURFACES... MEDIUM BLUE
 LOWER SURFACES... PALE BLUE
 DETAILS... BLACK
 INSIGNIA... WHITE AND BLUE

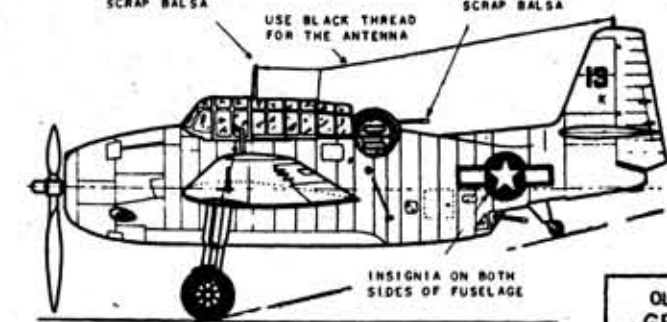
DRAW ALL CONTROL AND TRIM
 LINES WITH RULING PEN AND
 BLACK INK



MAKE MAST FROM
 SCRAP Balsa

USE BLACK THREAD
 FOR THE ANTENNA

MAKE GUN FROM
 SCRAP Balsa



INSIGNIA ON BOTH
 SIDES OF FUSELAGE

OUTLINE DRAWING
 GRUMMAN TBF
 AVENGER

The general scheme of covering the fuselage is to cement the stiff paper reinforcement in place first, then the cellophane and finally the tissue. All patterns except stiff paper are made oversize and after being applied the excess is trimmed off. Tissue patterns are always cut so that the grain runs lengthwise with the fuselage, wings, stabilizer and rudder. They should always be cut larger than the area to be covered. A safe rule is to allow 1/4" on all edges. After tissue is cemented to frame, the overhang can be cut off with razor blade. When attaching tissue covering, always spread the cement on top the outside edges of frame area being covered. Never smear cement on the tissue. Be careful to set tissue in place so that it will not have to be moved except for smoothing out wrinkles.

Sand all frames lightly to remove fuzz or excess cement. Cut out stiff paper patterns SP-1, SP-2, SP-3 and SP-4. Apply to fuselage frame as in Figure 1. Add cellophane cockpit enclosure - apply pieces in numerical sequence as in Figure 2. (A pattern for the cellophane windshield may be made by tracing outline of stiff paper pattern SP-7.) Also add cellophane cover to bottom gun position. Cut out stiff paper patterns SP-5, SP-6, SP-7 & SP-8. Add to frame.

Add tissue covering in order given: TP-1 first, TP-2 second, TP-3 third, etc. - see Figure 3. (Tissue patterns are furnished on back of worksheet.) Cover top of wing frame from root rib W-1 to 2nd rib W-1 with single piece of tissue. Cover the rest of top from 2nd rib W-1 to W-5, with a single piece of tissue. The bottom of wing is done the same way. Cover top and bottom of stabilizer frames and both sides of rudder frame.

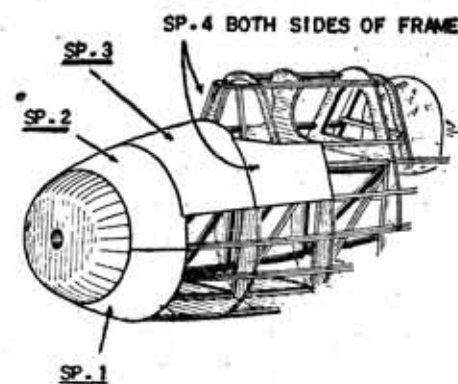


FIG.1 STIFF PAPER REINFORCEMENT

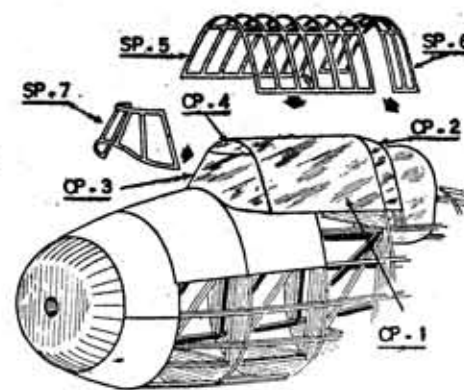
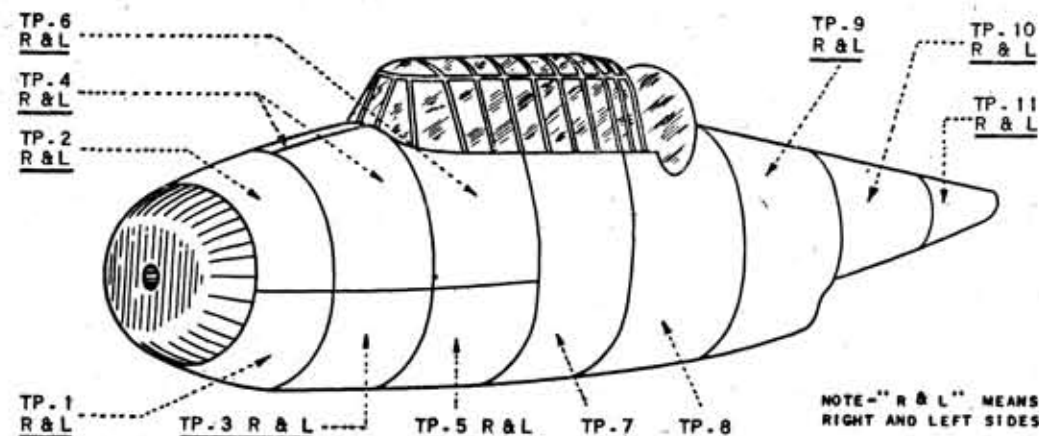
FIG.2 CELLOPHANE COCKPIT ENCLOSURE
(NO CELLOPHANE PATTERNS FURNISHED)

FIG.3 FUSELAGE TISSUE COVERING KEY

NOTE-"R & L" MEANS
 RIGHT AND LEFT SIDES

ASSEMBLING THE MODEL

The model is assembled by joining the frames together. Extra strong joints are required. The tissue covering must be scraped from the balsa frame members of the fuselage at the points where the rudder, wings and tailwheel are cemented to the fuselage. (See Side View Plan.) In addition, it is good practice to give the frame members an extra coat of cement at the points they are to be joined before cementing the frames together.

Cement the rudder to the tail of fuselage - then cement the stabilizers to the sides of rudder. Finally, cement the wings to sides of fuselage. The alignment must be checked carefully. Attach the spar connector to right and left wing bottom spars inside fuselage frame - see Top View of Plan. It will be necessary to cut a small hole in tissue at bottom of fuselage to attach the spar connector, then replace tissue.

Cut out landing gear struts L-1 and attach axles and wheels. Cut small holes in bottom of both wings and cement struts to landing gear supports.

Add tailwheel L-2. Cut out stiff paper pattern SP-9 and cement in place

on nose block - cover with tissue.

Spray model with water to shrink the tissue covering taut. Use insect sprayer and be sure to spray all surfaces before any one section dries. This helps prevent the frames from warping.

Assemble propeller, propeller shaft and nose plug (removable wood bearing). Hook up the rubber motor: fasten one end of rubber motor to rear motor mount, pull the other end thru body with long wire hook and attach to propeller shaft.

ADDING THE DETAILS

The model may be painted with colored dope if desired. Use black ink and ruling pen to draw the control lines (ailerons, elevator, flaps and rudder). Carve radio masts, exhausts and guns

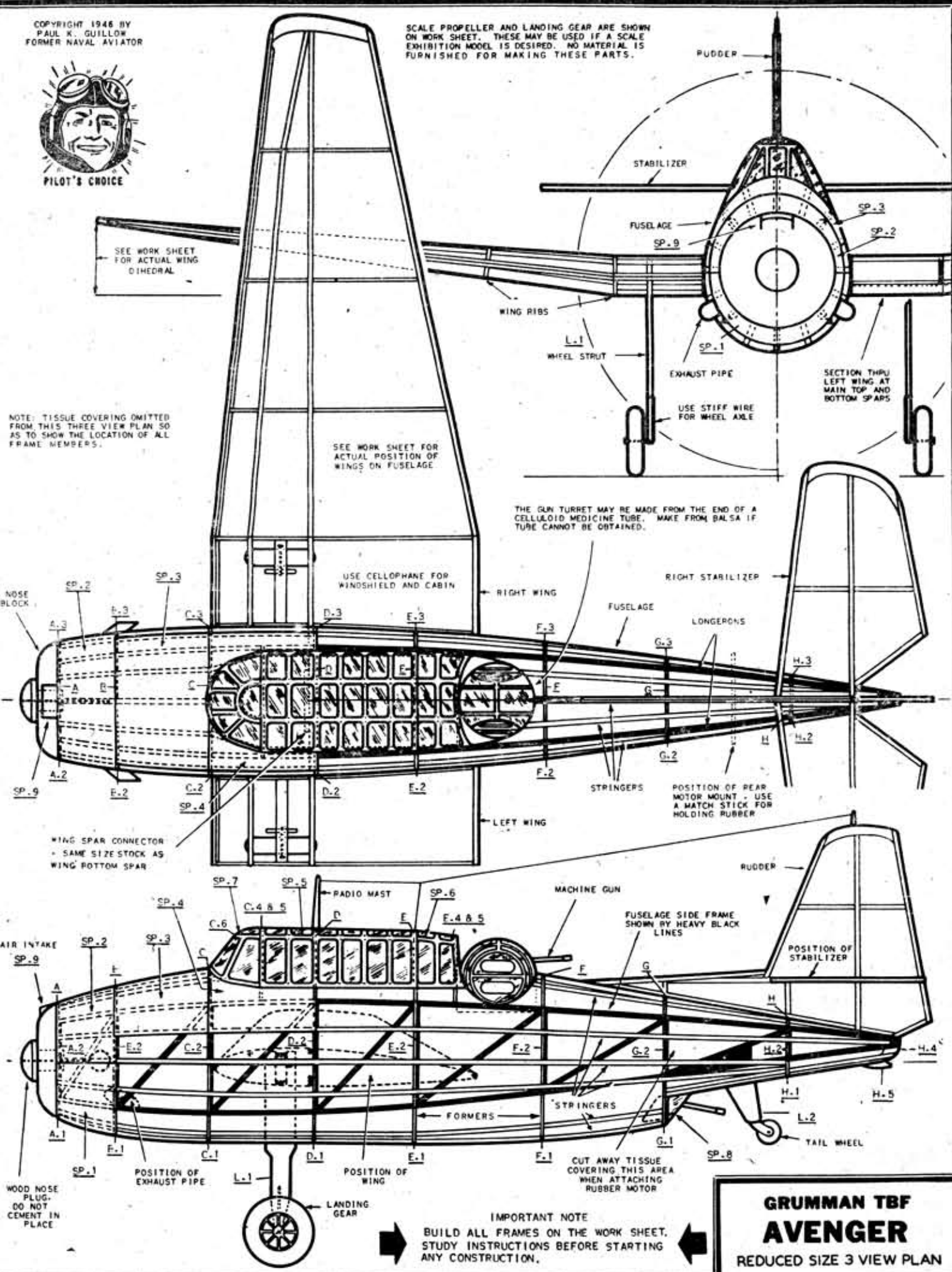
to shape. Cement to fuselage as shown on outline drawing. Add antenna and insignia. Indicate wheel wells on bottom of wings with black paint or black tissue. Lastly make and attach the

pitot tube to top of left wing tip. Scale drawings of propeller and landing gear are given on the Work Sheet so that the model builder can make a scale exhibition model if he wishes. Material for scale parts not furnished.

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PAUL K. GUILLOW
FORMER NAVAL AVIATOR



NOTE: TISSUE COVERING OMITTED FROM THIS THREE VIEW PLAN SO AS TO SHOW THE LOCATION OF ALL FRAME MEMBERS.



**GRUMMAN TBF
AVENGER**
REDUCED SIZE 3 VIEW PLAN

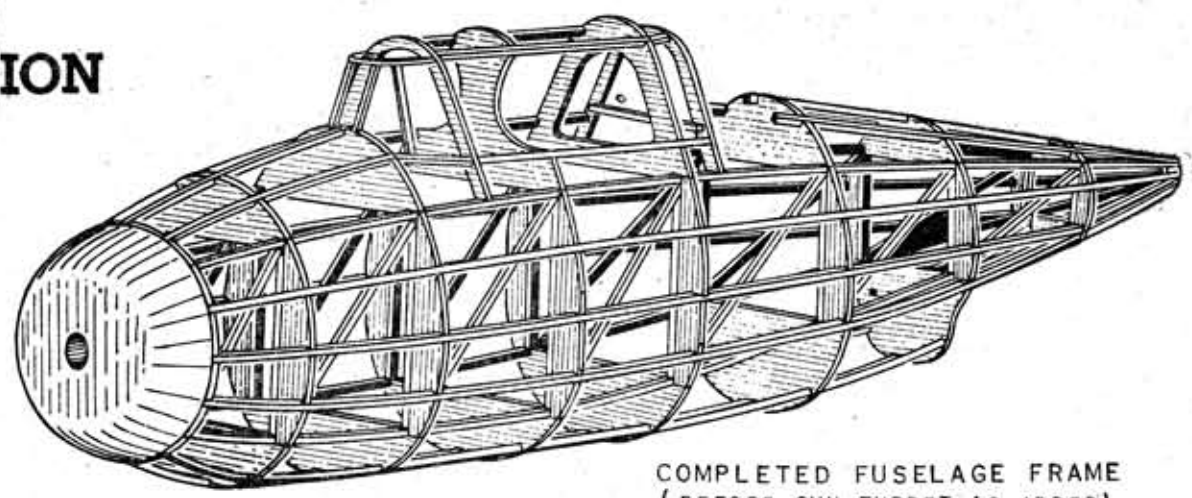
FUSELAGE CONSTRUCTION

FUSELAGE CONSTRUCTION.

Pin longerons over side frame layout. Cut and fit uprights between longerons beginning with nose post and work towards tail. Cement uprights in place. Cut and fit diagonals, and cement in place. Add piece G-4 (cut from print stock).
Build a 2nd side frame directly over the first side frame. Slide longerons between pins until directly over longerons of first side frame. Add uprights, diagonals and G-4.
Trim ends of longerons to actual length. Smear a coat of cement on the ends of longerons at tail. When dry remove frames from Work Sheet.
Cut fuselage formers (A, A1, A2, A3 and so on) from printed balsa sheet. Pin former A to work board. Split side frames apart except where cemented to-

gether at tail. (Run a razor blade between the longerons to separate them.) Stand side frames on nose posts and press ends of top longerons against side notches of former A. Cement and pin in place. Add former A1 between bottom longerons - cement and pin in place. Set formers B & B1 in position between side frames but do not cement in place at this time. Check alignment carefully to see that side frames are perfectly straight and not tipped to one side or the other.
When dry, remove side frames from workboard and cement B & B1 in place. Add the rest of top and bottom formers (C, C1, D, D1, etc.). Assemble formers C4 & 5 and E4 & 5 over the layouts on work sheet. Attach to fuselage frame.

Cement H-4 to tail of fuselage.
Next add the side formers to the side frames starting with A2 and A3 and working towards the tail.
Stringers are added next to the fuselage frame. Attach top stringers first; then the bottom stringers and finally the side stringers. Refer to the plan and fuselage perspective for stringer construction.
Cement C-6 to front of C-4, then add the short balsa braces between C-6 and former C.
The gun turret may be made from the end of a celluloid tube (medicine) or from balsa. Cement the completed turret in position between fuselage sides.
Lastly carve nose block to shape, bore hole for removable wood nose plug. Cement block to nose of fuselage.



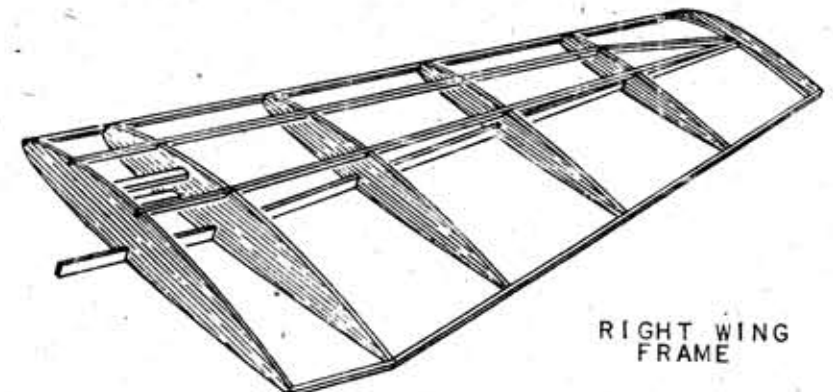
COMPLETED FUSELAGE FRAME
(BEFORE GUN TURRET IS ADDED)

WING CONSTRUCTION

Cut out all wing parts from printed balsa sheet. Divide the parts into two groups, one set for the right wing frame and the other for the left.
Build the right wing frame first. Pin bottom spar to plan. Taper top of bottom spar from W-3 to W-5. See Work Sheet.
Cement and pin root rib W-1 over the bottom spar. Cement and pin the rest of the ribs over the bottom spar. Check alignment.
Add the section of leading edge between the W-1 ribs. Add the section of trailing edge between the same ribs. Next attach the top spars between these ribs. When the cement has dried, remove pins holding ribs W-2, W-3 and W-4 in place - also pins holding section of bottom spar from the 2nd W-1 rib and raise the free end to the height given for the dihedral on the Work Sheet - set small block under spar to hold it in place during construction. Cement

cracked joint generously and let dry.
Remove pins holding rest of frame to workboard. Pin section of bottom spar from 2nd W-1 rib to tip back over the the layout - also pin W-2, W-3 and W-4 in place. Add remaining sections of leading edge - then trailing edge. Pin and cement wing tip W-5 between leading

and trailing edges. Add the sections of top spars from 2nd W-1 rib to tip. Trim all spars to actual length and shape.
When dry remove all pins, lift frame from workboard. Add the two landing gear supports between the W-1 ribs.
Build the left wing frame over left wing layout in a similar manner.

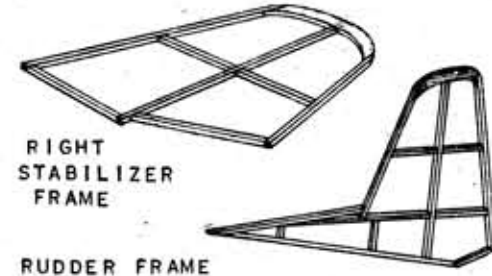


RIGHT WING
FRAME

STABILIZER AND RUDDER CONSTRUCTION

STABILIZER CONSTRUCTION

Cut stabilizer parts from balsa print. The right stabilizer is built first: Pin S-1 to workboard. Cement end of center spar to S-1 and pin in place. Add leading edge and then the trailing edge. Add intermediate ribs, root ribs and diagonal brace. When dry trim off excess spar lengths and remove frame from workboard. Build left stabilizer next.



RIGHT
STABILIZER
FRAME

RUDDER CONSTRUCTION.

Cut rudder part from print stock. Pin R-1 to workboard. Cement end of center spar to R-1 and pin in place. Add leading edge - then trailing edge. Cement and pin rest of the balsa strips in place. When dry, trim off excess spar lengths and remove frame from workboard.



RUDDER FRAME