

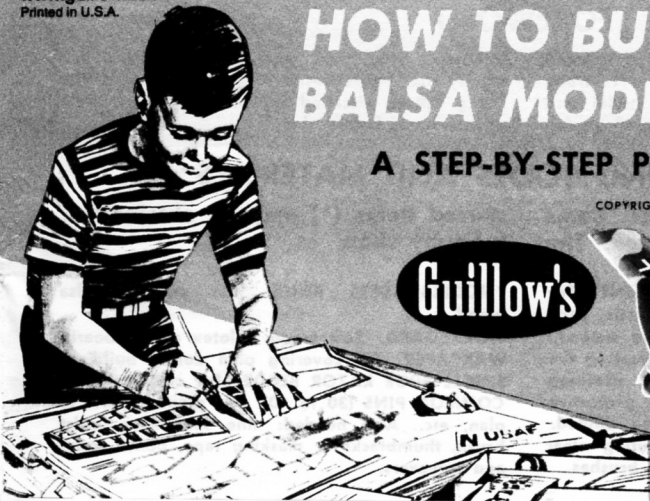
www.guillow.com
Printed in U.S.A.

HOW TO BUILD and FLY A BALSA MODEL AIRPLANE

A STEP-BY-STEP PRIMER FOR BEGINNERS

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Guillow's



FOREWORD

The instructions in this booklet were developed to show a beginner how to start and successfully complete a rubber powered flying model and are not intended to cover all phases of model-

building. The flight instructions supplied are merely the simple basics for adjustment and test flying. More detailed information is available at your local hobby shop.

MODELBUILDING TOOLS AND MATERIALS

If not readily available, the items listed below should be collected. The

starred items (*) may be obtained at a hobby shop.

*Tube of Balsa wood model cement. For joining balsa parts and attaching plastic parts to model. (White glue may be used instead.)

*Bottle of Clear dope. For "prime" coat on the wood frames — for adhesive when attaching tissue covering to model frames — for protective coating over tissue covered frames when diluted.

*Bottle of dope thinner. For diluting clear dope (not other paints) and cleaning brushes.

*Modelbuilders knife. For cutting balsa wood.

Workboard. Soft wood, celotex or cardboard.

Waxpaper. For covering plan during building.

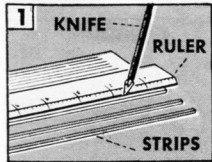
Single edge razor blade. For cutting tissue.

Common pins (30 to 40). For pinning parts to plan, etc. Also needed: fine sandpaper, artist brush, thumbtacks or masking tape, pencil, ruler and tweezers.

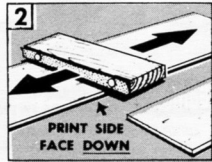
BALSA WOOD STRIP STOCK AND DIE-CUT SHEETS

3

The frames of a balsa model are made from balsa strips and flat sheet stock. 1. Before use, the strips must be cut free and lightly sanded to remove all "fuzz." When pressing parts from die-cut balsa sheets, free any that stick with the point of razor blade. If a part breaks, cement it together before use. 2. As an aid to removal of die-cut parts, first sand the **NON-PRINTED** side of die-cut sheets with fine sandpaper wrapped around a sanding block.



CUTTING STRIPS

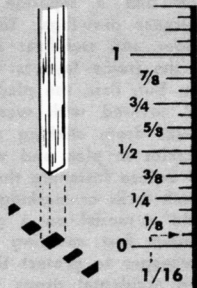


SANDING SHEETS

1" SCALE AND STRIP STOCK SIZE IDENTIFICATION CHART

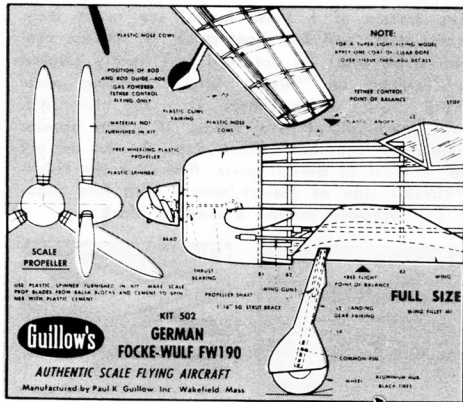
To identify strip stock size, place end of strip over a black area that matches it.

- ---- $1/16'' \times 1/16''$
- ---- $1/16'' \times 3/32''$
- ---- $1/16'' \times 1/8''$
- ---- $3/32'' \times 3/32''$
- ---- $3/32'' \times 3/16''$
- ---- $1/16'' \times 3/16''$
- ---- $1/16'' \times 1/4''$
- ---- $1/8'' \times 1/8''$



THE MODEL AIRPLANE PLAN AND ITS USE

The plan is the key to the construction and assembly of a model and should be carefully studied **BEFORE** you start building. A Guillow plan is usually divided into two areas — a work area upon which the model frames are built and a separate area containing mostly reference drawings. The fuselage (body), wing, rudder and stabilizer frames are built directly on the frame layouts in the work area of the plan but, first, the plan is laid on a workboard and covered with wax paper to prevent the frames from sticking to it. Be sure that all wrinkles in plan and wax paper are smoothed out before fastening them to workboard — use thumb tacks or masking tape. **CAUTION:** Never build a model on a good table or desk top without first covering the entire surface with newspaper to protect the finish against damage from accidental drops of cement or dope.

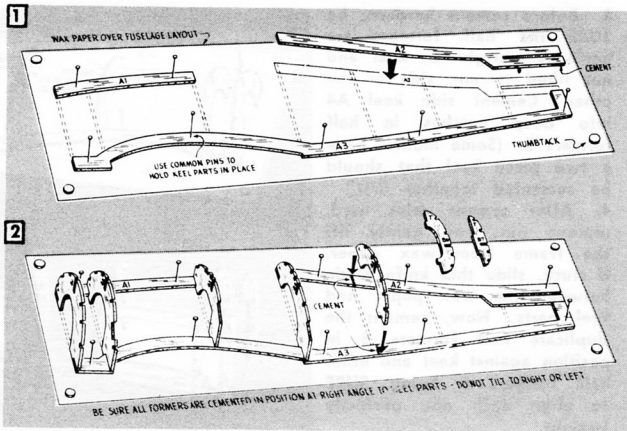


(ONLY PORTION OF A PLAN SHOWN)

THE START — BUILDING THE FUSELAGE FRAME

5

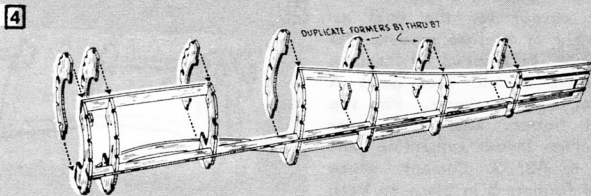
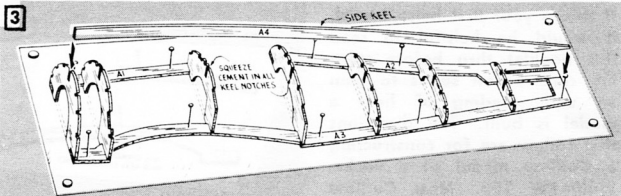
If this is your first balsa model, it would be helpful to read this booklet thru before starting construction so as to gain an understanding of how a model is built. The directions that follow are for constructing a Guillow model of a Focke-Wulf FW 190. Most Guillow kits are built in a similar manner except for the final assembly of biplane models. **TO BEGIN:** 1. Remove all fuselage formers B and keel parts A from die-cut sheets. Pin top and bottom keel parts over fuselage layout cementing part A2 to A3. 2. Cement seven half formers B in place on keel.



BUILDING THE FUSELAGE FRAME — CONTINUED

3. Before cement hardens, be **SURE** the half formers are perfectly upright on keel and not tilted to one side or the other. Cement side keel A4 into deep notches in half formers B. (Some models have a two piece keel that should be cemented together first.)

4. After cement dries hard, remove pins and gently lift the frame from wax paper. If stuck, slide thin knife blade between the wax paper and keel parts. Now, cement the duplicate half formers B in position against keel and other half formers B being **SURE** to align each one perfectly straight.

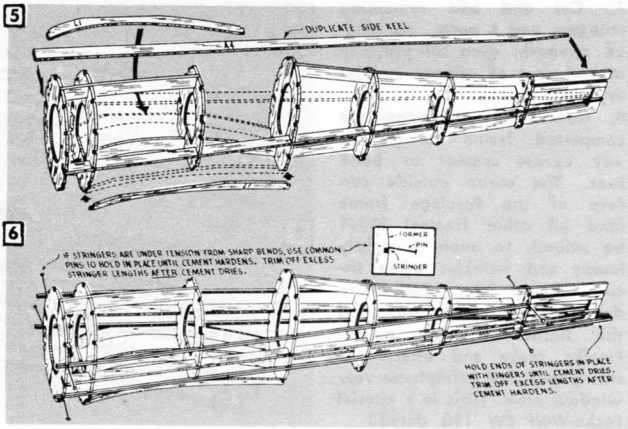


BUILDING THE FUSELAGE FRAME — CONTINUED

7

5. Now cement duplicate side keel A4 in notches of duplicate half formers B. Next cement parts L1 to formers on both sides of frame.

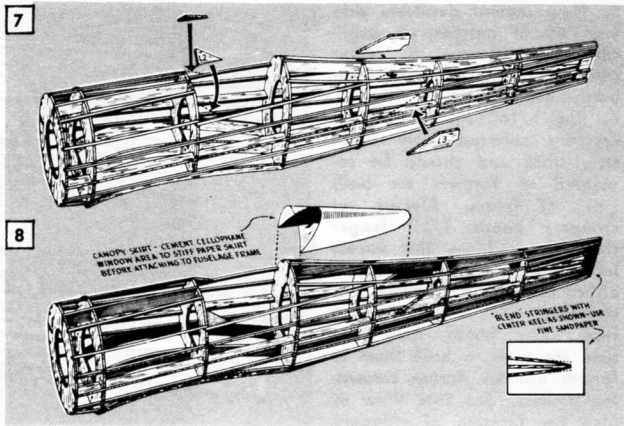
6. The 1/16" sq. side stringers are selected from balsa strip stock and should be cemented to formers on both sides of frame. Always cut stringers about 1/2" longer than required — the excess length can be trimmed off after cement has dried. If stringers are under tension from sharp bends, note how pins are used to hold them in former notches during cementing process. See Side View of plan for location of stringers.



8 BUILDING THE FUSELAGE FRAME — CONTINUED

7. Cut and add remaining stringers and L parts. For added strength, give all joints a second coat of cement and let dry.

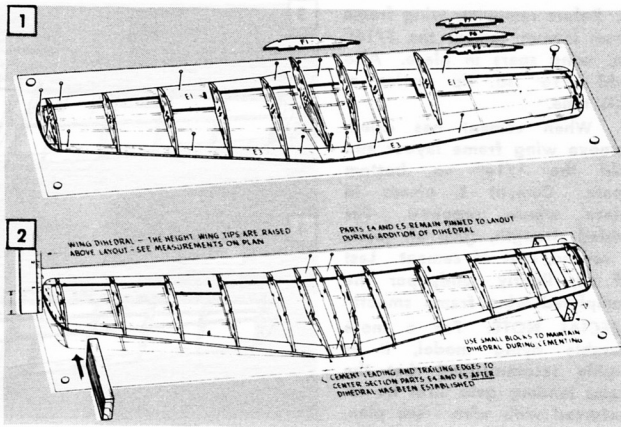
8. Now lightly sandpaper the completed frame to remove any excess cement or balsa fuzz. The entire outside surface of the fuselage frame (and all other frames) **MUST** be smooth to avoid unsightly lumps and wrinkles when tissue covered later. Failure to do this job properly will spoil the finish of your model! Finally, make and attach the stiff paper and cellophane rear window area. (This is a special Focke-Wulf FW 190 detail.)



BUILDING THE WING FRAME

1. Like the fuselage frame, the wing frame is started directly on the wing layout. Pin leading and trailing and tip parts E to layout, cementing them together EXCEPT at dihedral joints as instructed on plan. Cement ribs F between leading and trailing edges. (If fit between the leading and trailing edges is too tight, cut rib notches to permit easy placement.) Align ribs perfectly upright.

2. When cement has dried, remove pins as shown and raise tips to proper dihedral height — see measurement on plan. Cement dihedral joints — let dry.

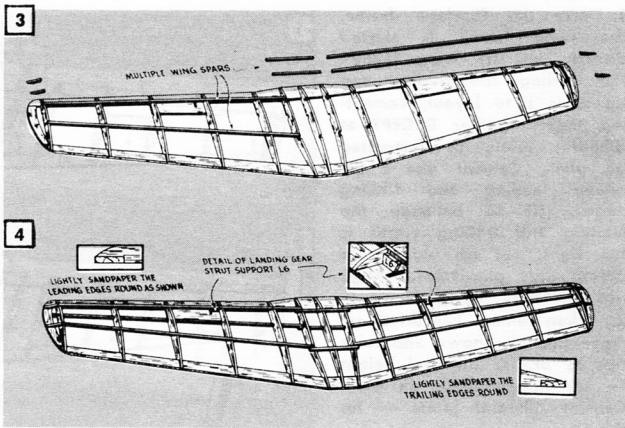


BUILDING THE WING FRAME — CONTINUED

3. Before removing wing frame from layout, cement the $1/16''$ sq. wing spars in place. Also add $1/16''$ sq. tip section at this time.

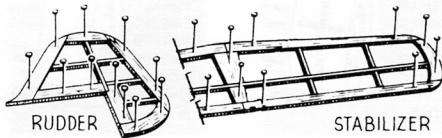
4. When cement has dried, remove wing frame layout and add the $1/16''$ sq. bottom spars. Cement L pieces in place where required. For added strength, give all joints a second coat of cement. Last of all, lightly sandpaper the completed wing frame smooth.

SPECIAL NOTE: For a more durable flying model, it is highly recommended that the balsa landing gear strut be re-enforced with wire - see plan.



BUILDING TAIL SURFACES

The stabilizer and rudder frames are built directly over their respective layouts in the same manner as the fuselage and wing frames. Pin and cement the stabilizer parts together over layout — do the same with rudder parts. When dry, sand both frames on both sides with fine sandpaper wrapped around a sanding block. Note: there are no actual separations of the stabilizer/elevator and rudder/fin sections. The dotted division lines shown on layouts indicate where black lines are added to tissue covering when completing the model — See Page 21.



DOPING MODEL FRAMES 11

Before the frames are covered, all EXTERNAL surfaces MUST be "primed" with Clear Dope to seal the balsa wood pores. Use a narrow 1/4" brush to apply dope and, when dry, lightly sandpaper all doped surfaces as a final smooth up job. The addition of a second and third coat will make an even better base for covering the frames with tissue. Lightly sandpaper between each coat.

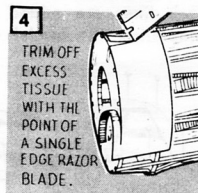
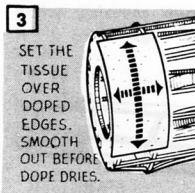
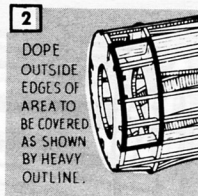
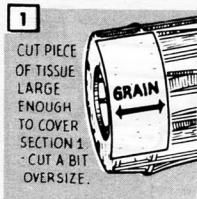


MATERIALS FOR COVERING BALSA FRAMES

Tissue paper is used to cover the frames of small balsa flying models. Certain grades have a noticeable "grain" which should always run lengthwise on any frame structure. The tissue pieces should always be cut slightly larger than the area to be covered — the excess is then trimmed off with a razor blade after application to frame.

Clear Dope is used as an adhesive for attaching tissue to frames. It is applied with a narrow

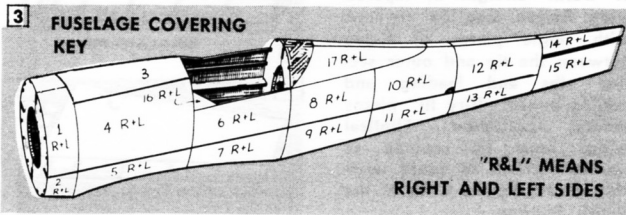
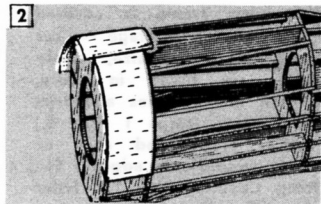
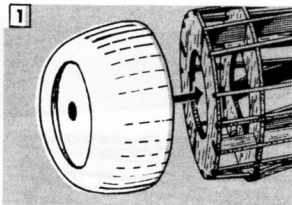
brush to the EXTERNAL edges of area being covered and the pre-cut tissue section is then IMMEDIATELY set in position and the edges smoothed out with a finger tip before it has a chance to dry. Finally, the excess tissue is trimmed off. (Steps 1 thru 4.) Apply second coat on tissue where it contacts frame and rub in with finger tip. Do not spread dope on the rest of tissue.



COVERING FUSELAGE FRAME WITH TISSUE

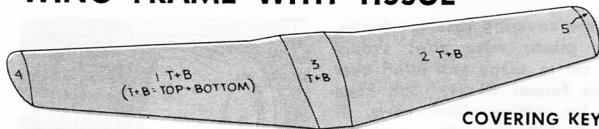
13

Before covering fuselage frame, the plastic nose cowl should be cut to shape and fitted over nose former B1 (1). See Page 17 for cutting plastic parts. If cowl will not fit over B1, sandpaper edges of former and stringers until it does making sure not to sand too much resulting in a sloppy fit. Now set cowl aside until model is assembled. Following the tissue covering procedure described on Page 12, cover fuselage frame starting at nose (2), and working towards tail. See Fuselage Covering Key on plan which shows areas to be covered as well as the order of work. (3)

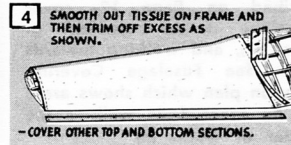
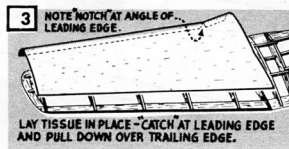
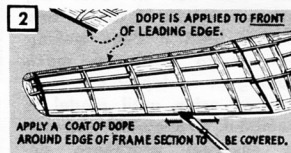
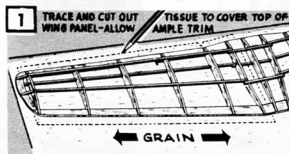


COVERING WING FRAME WITH TISSUE

The wing frame is covered much like the fuselage — cut tissue piece oversize, apply dope, set tissue in place, smooth out wrinkles and trim off excess. (Steps 1 thru 4.) Finally, apply 2nd coat of dope around all edges. See Wing Covering Key for order of work. Straight or tapered wing frames may be covered with single pieces of tissue between the tip and outer section ribs and leading and trailing edges. "Dry fit" pieces before application. Elliptical wings must be covered in smaller sections to avoid wrinkles. Example: the wing of the British Spitfire.

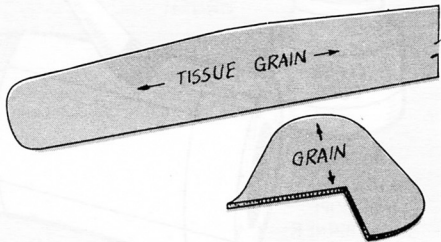


COVERING KEY



COVERING TAIL SURFACES

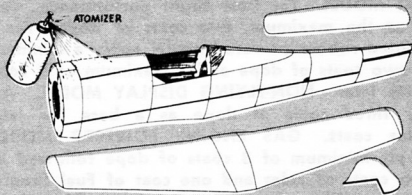
The tail surfaces are easiest of all to cover and can usually be done with single pieces of tissue on both sides of rudder and stabilizer. If the tissue has a "grain," it is most important that it should run the long way — from tip to tip on stabilizer and from top to bottom on rudder to minimize twisting or warping.



WATER SPRAYING TISSUE 15

After frames are covered, it is important that the tissue be shrunk to remove any wrinkles that develop during construction. Using clean water, spray frames with an atomizer or brush lightly with wet cotton batting or facial tissue. Caution: wet tissue is very weak so apply moisture sparingly and handle parts carefully until thoroughly dry.

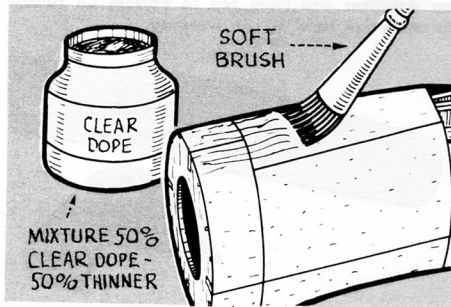
SPRAY COVERED FRAMES WITH CLEAN WATER - LET DRY.



DOPING THE TISSUE COVERED FRAMES

When dry, the tissue covered frames should be given a coat of clear dope to protect tissue from moisture and finger marks and also to act as a base for any finish coats of colored dope, enamel or lacquer you wish to add. For this purpose the Clear Dope **MUST** be diluted 50% with Dope Thinner — do not use full strength as it comes in bottle. Listed below are the recommended coats of Clear Dope for three different types of models. **RUBBER POWERED FLYING MODEL.** For best flight performance, one, or at the maximum, two coats of dope. For a painted rubber powered model apply a minimum of two coats of dope and a maximum of 2 color coats later. **NON-FLYING DISPLAY MODEL.** Apply three coats of dope as a base for later color coats. **GAS ENGINE POWERED MODEL.** Apply minimum of 3 coats of dope followed by two coats of color and one coat of Fuel Proofer — see painting instructions on Pages 19 and 20.

IMPORTANT — use fine sandpaper to lightly sand the tissue covering after first coat of Clear Dope to remove paper fuzz. Allow at least 20 to 30 minutes drying time between each coat of dope.

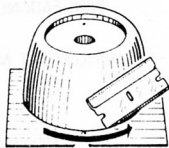


PREPARING THE PLASTIC PARTS

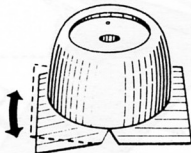
17

In addition to balsa and tissue, formed plastic parts are used to build a Guillow model. With scissors, cut individual pieces apart and then finish up each one as shown below. Use regular model cement for attaching plastic parts to model — use plastic model cement to join plastic parts together — use sparingly! **VERY IMPORTANT.** Colored dopes will soften plastic parts if too

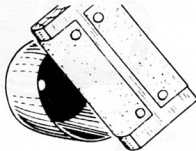
much is applied at one time. When applying, work fast and then allow at least 30 minutes drying time between coats. Colored enamel can be used and will not soften the plastic but it does add more weight than dope to a flying model. See Pages 19 and 20 for added painting instructions.



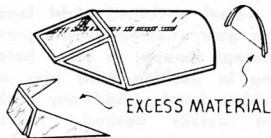
SCORE PLASTIC PART AT BASE LINE WITH POINT OF RAZOR BLADE OR KNIFE.



AFTER SCORING, FLEX EXCESS MATERIAL UNTIL IT BREAKS AWAY.



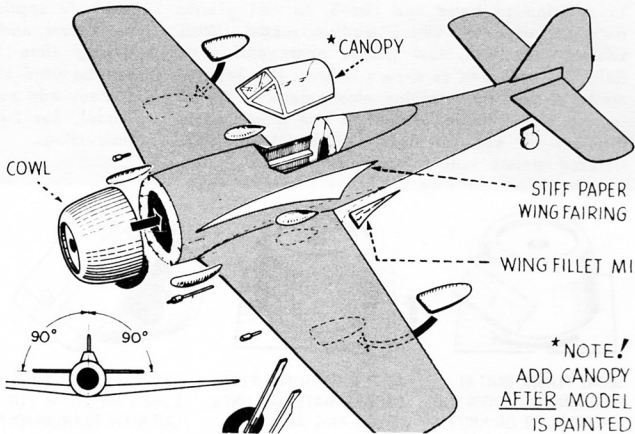
SANDPAPER ALL TRIM EDGES SMOOTH. CUT OUT NOSE BEARING HOLE.



MOST OF EXCESS CANOPY STOCK CAN BE CUT AWAY WITH SCISSORS. USE RAZOR BLADE FOR CUTTING CANOPY TO EXACT OUTLINE.

ASSEMBLING THE MODEL

Cement plastic cowl over nose of fuselage and wipe off excess cement. Next cement stabilizer and rudder in place aligning carefully as shown in sketch. Cement wing to fuselage and, when dry, add wing fillets M1 and stiff paper wing fairings. (Latter can be cut from a cereal package.) Add landing gear. Cement plastic parts (except canopy) in place holding in position with pins or rubber bands. Add any cockpit details desired. **NOTE:** For a good cement bond between the tissue covered parts, scrape tissue away in small spots at points of contact with point of a razor blade.



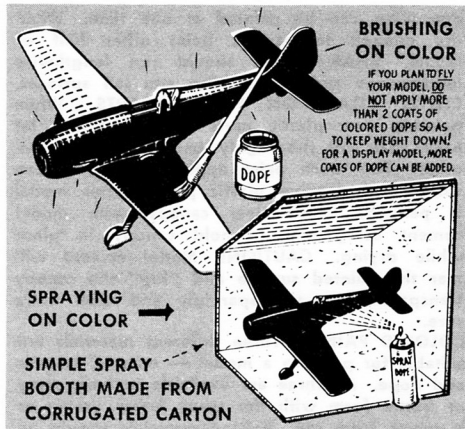
COLOR PAINTING THE MODEL

19

There are two ways to apply color — by brushing or by spraying. For beginners spraying is recommended for ease of application.

COLOR SPRAYING: For spraying indoors, a simple spray booth can be made from a corrugated carton. Spray bottom of model first and, when dry, turn over and do the top. Hold can at least 12" from model to prevent "runs." For two or more colors, apply light coat first then the darker tone using masking tape and paper the way auto body finishers do to separate different colors.

BRUSHING ON COLOR COATS. Use a good $\frac{1}{2}$ " or $\frac{3}{4}$ " wide brush and paint all **EDGES** of wing and tail surfaces first. Next paint the rudder and stabilizer on **BOTH** sides in one continuous operation — **NEVER** paint one side and let dry before doing the other — it could cause twisting or warping of these thin surfaces. One half the fuselage and the top and bottom of



COLOR PAINTING THE MODEL — CONTINUED

one wing can be painted at one time. When dry enough to handle, paint other half of model. Brush strokes should run lengthwise on fuselage and across wing and tail surfaces.

COLOR COATS ON PLASTIC PARTS. When painting over plastic parts work fast and let each coat dry thoroughly before applying another. Too much paint applied too often can soften and damage plastic parts. After model is painted, attach clear canopy with model cement using pins to hold canopy in place while drying. **CAUTION!** Model cement will mar the painted surface and "fog" the canopy transparency so use sparingly and with extra care.

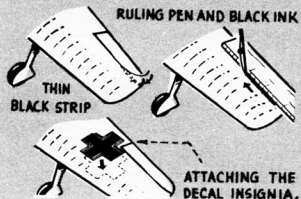
COLORED PAINTS. Three different materials are suitable for painting a model — enamel, lacquer and dope. All three are available in both spray or bottle form with the spray being usable as it comes from can. Bottled materials should be

diluted 25% with the thinner recommended by the paint manufacturer to make them smooth flowing and speed up drying time. **IMPORTANT!** Gas powered models **MUST** have a "fuel proof" finish. A coat of Clear Fuel Proofer over your final color coat (dope, lacquer or enamel) will protect the finish from gas engine fuel and fumes. (Not needed if Fuel Proof Dopes are used for color coats.) Recommended drying time between coats of paint: colored dopes and lacquers — 20 to 30 minutes; colored enamel — 1½ to 4 hours depending on temperature and humidity.

IMPORTANT FACTS TO REMEMBER. 1. **NEVER** apply color coat on a surface that has less than two coats of Clear Dope. **NEVER** apply dope over enamel — it will chip off. However, colored enamel **CAN** be applied over dope. **NEVER** combine coats of lacquer and enamel — they clash chemically.

DECORATING THE MODEL

After model has been painted, add control surface lines using a ruling pen and black ink or thin strips of black paper. Apply decal insignia following instructions on back of decals. Add final details such as radio mast, landing gear fairings L5, wheels and wing guns.

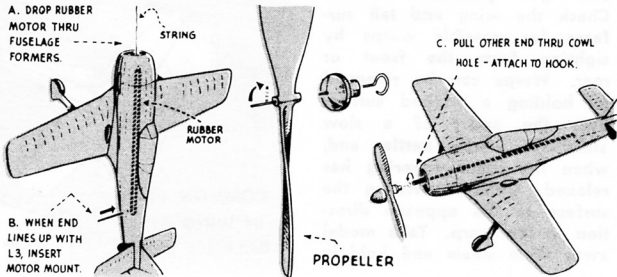


INSTALLING RUBBER MOTOR

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Assemble propeller, nose bearing and propeller shaft — see plan Side View. Tie one end of rubber motor to 12" of light string and lower rubber motor into fuselage thru hole in nose cowl until it lines

up with rear motor mount hole at part L3. Insert dowel or match stick thru parts L3 and loop in rubber motor. Pull out front end of loop and attach to prop hook.

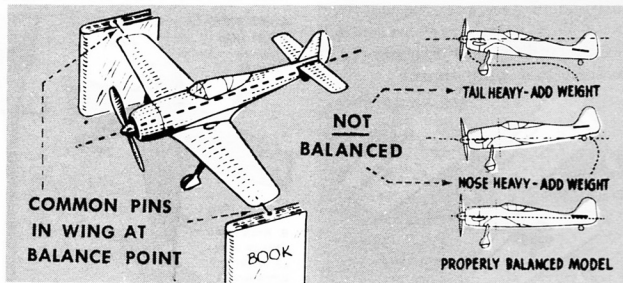


BALANCING MODEL — REMOVING WARPS

Before flying, the model **MUST** be balanced as shown in illustrations using modeling clay or a similar substance. The Side View plan shows the different balance points for rubber and gas powered models. Check the wing and tail surfaces for possible warps by sighting from the front or rear. Warps can be removed by holding a warped surface over the spout of a slow steaming water kettle and, when the tissue covering has relaxed, **GENTLY** twisting the surface in the opposite direction to the warp. Take model away from steam and hold in

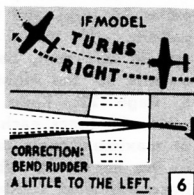
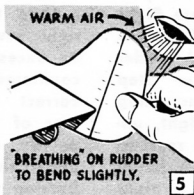
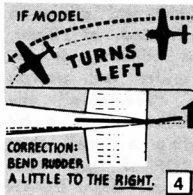
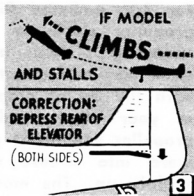
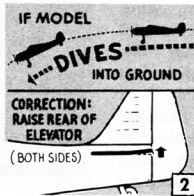
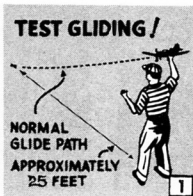
twisted position until the covering tightens up again. After releasing the surface, it should have removed warp. If more twist is needed, repeat procedure until warp is removed.

Important! Use extreme caution when steaming out warps to keep your hands away from the steam. The high temperature can easily burn your fingers.



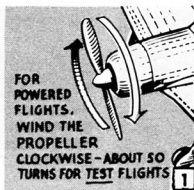
TEST GLIDING MODEL

Test glide model **BEFORE** attempting rubber powered flights. Choose a grassy area for soft landings and a day without much wind. Facing the prevailing breeze, hold model as shown and gently thrust forward with nose slightly down aiming at a spot about 50 feet away. (1) It should glide smoothly for about a distance of 25 feet without veering up or down or diving steeply to the right or left. If model climbs and stalls or dives into ground, correct by bending rear edges of stabilizer (2 & 3). For right or left turns, bend rudder as illustrated (4, 5, & 6).

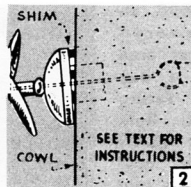


RUBBER POWERED FLIGHTS

For first powered flight, wind propeller clockwise about 50 turns. (1) Hold model the same way as for test glide but with the tip of propeller held in your other hand. Release propeller and thrust gently forward into breeze with nose slightly up. The model should fly with a gentle turn to left. For second launch, wind propeller 75 turns and note flight pattern. If model "tightens up" in left turn, bend rudder a little to the right — Step 5, Page 23. Keep increasing winds 25 times each flight, until maximum turns are reached — do not break rubber band! Keep adjusting rudder to right



until, under full power, the model either flies straight or a little to left and glides to right towards end of flight. If excessive climbing is encountered under full power, correct by "breathing" the rear of stabilizer down a bit or by adding a small shim under the TOP of the nose bearing to create slight DOWN



THRUST (2). Longer flights can be had by stretching then winding the propeller (3). For added winds and longer life, lightly lubricate rubber motor with a mixture of 2 parts GLYCERIN and 1 part GREEN SOAP — both available at your local drug store. Wipe off excess before installing in model.

