Dirty Birdy

BY JOE BRIDI

Text By Ben Strasser

The Dirty Birdy is a new pattern ship by Joe Bridi whose Sun Fly series and Kaos pattern aircraft have become almost legendary in competition circles. All-up weight, including retracts, ranges from 7¾ to 8½ lbs. and, with a wing area of 688 sq. in., this new ship has been expressly designed for the current AMA and FAI Patterns.

Since the first flights of the prototype, the Dirty Birdy has proven itself to be a superb pattern ship. The design makes it a gentle and rock steady flier with absolutely no snap roll tendencies. Even though the clean design makes a ship that moves out well in the air (from 80 to 100 mph), the landings are as slow as you'll want them to be. 2° of down thrust is used on the engine with no right or left thrust required. Response to the use of the control surfaces is extremely smooth. A minimum of surface deflection is all that is necessary for it to perform to absolute perfection. As a result, the plane is a very predictable and reliable ship that you will really enjoy on those Sunday morning flying sessions or at contest time.

Since most construction articles presented in model aviation magazines are necessarily short due to space limitation in each publication, we have asked RCM's Contributing Editor, Ben Strasser, to present a complete step-by-step construction article with full material list in order that you may build the Dirty Birdy in the shortest possible time and with as complete a set of instructions as is possible to present. For this reason, this article is divided into two parts. The conclusion will appear in the July 1975 issue of R/C Modeler Magazine. In this first segment, you can assemble the materials while waiting for your set of plans to arrive from the RCM plans department. The canopy is available from the RCM Products Division and, when your plans arrive, you can proceed with Ben's instructions to cut out a complete "kit" for yourself with the full construction of the aircraft appearing in the conclusion of this two part series. - - - Don Dewey

PART I

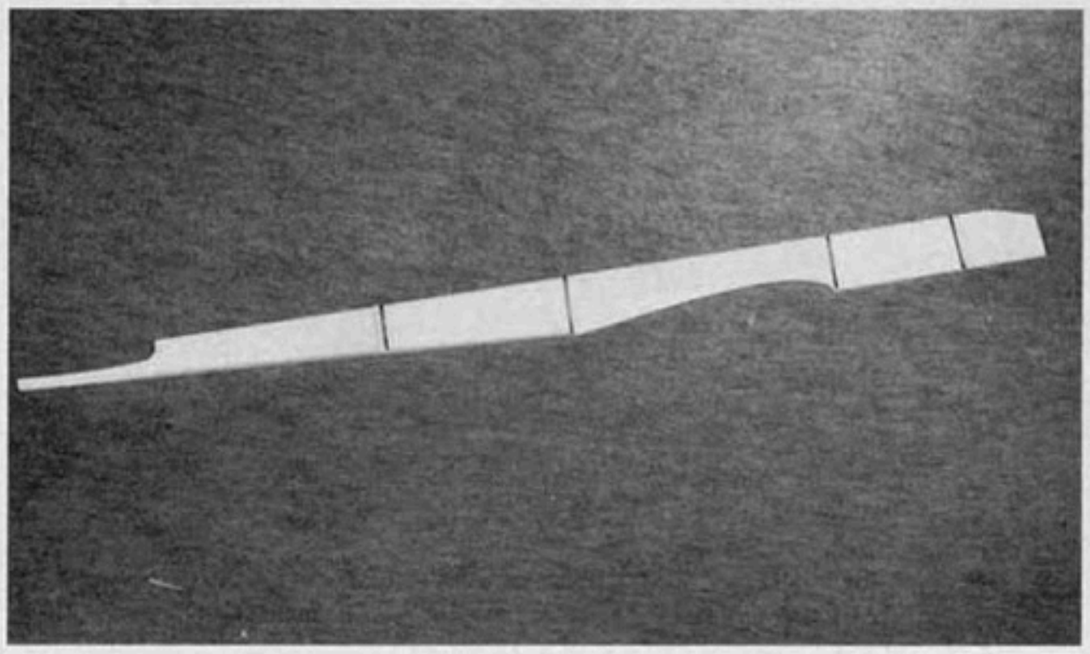
If you want to get your own DB going, your first step is to put a kit together. To save you time, we've prepared a list of the wood and hardware you'll need to get the job done. It's at the end of this article so you can cut it out without messing up our glorious building notes. Before you begin cutting the parts though, there are some other comments we want to make. First and foremost, the hotter the engine the better. If you fly one of the real "go-ers" like the new Webra, put in a 14 oz. tank if you want to fly the whole pattern without running out of fuel. A Sullivan SS-14 fits well. The size and shape of the canopy is critical for the superb flight characteristics of the plane. If you care about that sort of thing, the canopies are available from RCM Products Division, P.O. Box 487, Sierra Madre, California 91024. You can, of course, make your canopy from a hollowed-out balsa block or make a plug and shape your own. If you've done a lot of scratch-building you probably have your own techniques for marking the wood to cut out the pieces. If this is one of your first attempts, one way is to work with a double set of plans. Cut up one set. Put household rubber glue onto the back of the



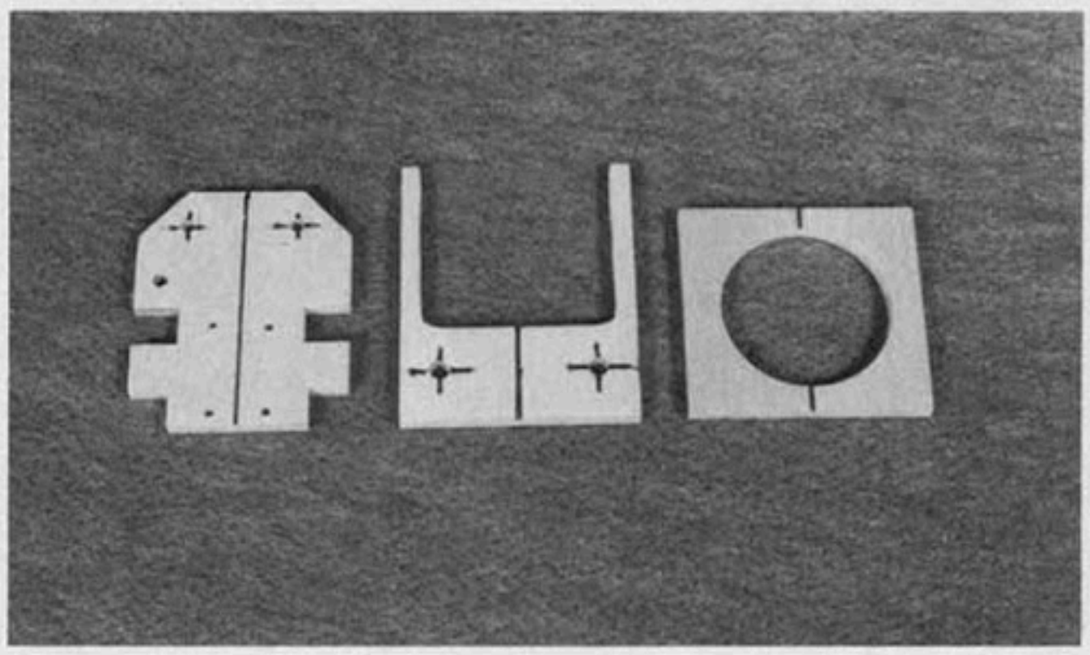
paper pieces and glue them to the wood. Or do it the easy way and buy a set of RCM's adhesive backed templates for the plane with the plans. As you read through the cutting notes that follow, watch for the marker (☆). Each one means you've read everything about that part and you're ready to get your knife or jigsaw going. Now, to quote a friend of ours by the name of Marvin Barnsworthy, ''It's time to get a'whittlin.''

The Fuselage Parts

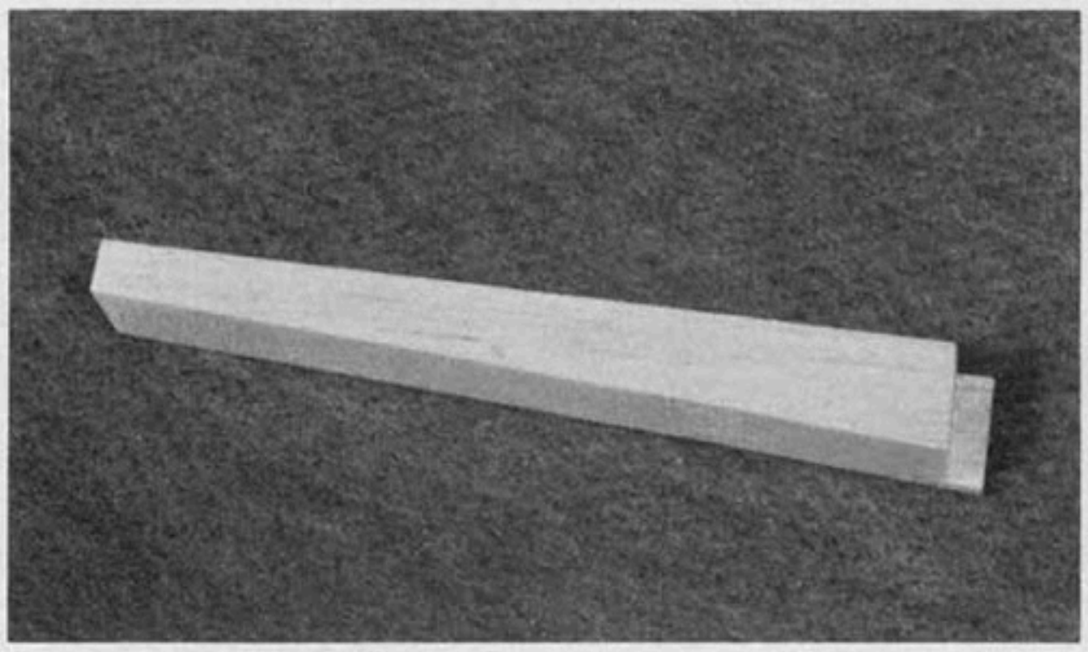
The *top block* is cut from 3/8'' x 4'' balsa. Cut a 3/8'' x 8'' slot in the back end of the top block for the two rear fin sections. See plans.☆ Cut the *bottom block* from 1/4'' x 4'' x 36'' balsa. Because of the thickness of the balsa, the bottom sheeting is cut in one piece.☆ The *fuse sides* are to be cut from 3/16'' x 3'' balsa. However, since the fuse is 50'' long, a 17¼'' length of 3/16'' x 3'' balsa sheet will first have to be joined to each of 2 pieces of 3/16'' x 3'' x 36'' balsa. For maximum strength, the glue joint should be cut at 45° to the grain of the wood. See plans.☆ With the 17¼'' piece joined to the 36'' piece, the prepared sheet of 3/16'' balsa for the fuse sides will be 50'' long. Cut the fuse sides from the two 3/16'' x 3'' x 50'' balsa sheets. The glue joint should be located about one-third back of the front of wing saddle. A ply doubler is added to this area later. Note that the cut-out for the stab begins with a straight cut down to the middle of the leading edge of the stab. The cut-out then follows the contour of of the bottom of the stab to the rear of the fuse.☆ Cut the *servo compartment doublers* 1¾'' x 13'' from 1/32'' ply.☆ *Bulkheads* 1 & 2 and the two *fuselage wing hold-down plates* are cut from 1/4'' ply.☆ Cut the notches for the motor mount rails into bulkhead 1. Use the 3/4'' triangular stock as a guide when cutting the top angled corners of bulkhead 1.☆ Drill two holes in bulkhead 2 for the wing dowels.☆ Cut *bulkhead 3* from 1/4'' x 4'' balsa so grain runs from top to bottom.☆ The *sub fin* is cut from 3/8'' x 4'' balsa. The *fuel compartment side blocks* are 3/4'' x 7/8'' x 7'' and are cut from 3/4'' x 4'' x 36'' balsa plank. The back end of both side blocks is notched out 11/16'' deep by 1/4'' long to allow the side block to overlap bulkhead 2. When properly cut out, the fuel compartment side block will overlap bulkhead 2 to be flush with the 3/16'' fuse sides. Sand the end of the block that glues to the front of bulkhead 2 to a slight angle so the block will conform to the angle of the sides.☆ The *fuel compartment bottom block* is 3/8'' x 3½'' x 7'' and is cut from 3/8'' x 4'' x 36'' balsa sheet.☆ The *fuel compartment top block* is cut from the same balsa sheet.☆ Cut the two *top block stringers* to width from the 3/8'' x 2'' x 36'' balsa.☆ The hardwood *motor mount rails* are cut to shape from 1/2'' x 1¼'' x 12'' beech. Note that they are cut out in the area of the fuel tank compartment for the fuel tank.☆ The two *motor mount supports* are 5/8'' x 3/4'' x 4'' and are cut to shape from 3/4'' x 4'' x 36'' balsa. From the top view they are the same shape as the front of the motor mount rails.☆ The *chin block* is 3/4'' x 3½'' x 4'' and is cut from 3/4'' x 4'' x 36'' balsa. The 1¼'' x 1½'' x 2⅜'' *upper spinner ring filler block* is cut from the piece of 2'' x 4'' x 6'' balsa plank.☆ Cut the *spinner ring* from 1/16'' plywood.☆ The two *wing fillet base pieces* are cut from 1/32'' plywood using the template provided on the plans.☆ Finish up the fuselage portion of the kit by cutting the various *cross braces* from 1/4'' x 3/8'' balsa. One cross brace is located in the center of the servo compartment, another at the location of the fuselage. Note that the cross braces are cut to fit between the top block stringers.☆ Cut the *vertical support braces* for the fuse sides from the 1/4'' x 1/4'' balsa. They are located on each fuse side behind bulkhead 3. The bottom of each brace should be angled to mate with the 1/4'' triangular stock on the bottom of the fuse side.☆ Also cut the *bottom block cross brace* from 1/4'' x 1/4'' balsa. It should be 2⅛'' long.☆



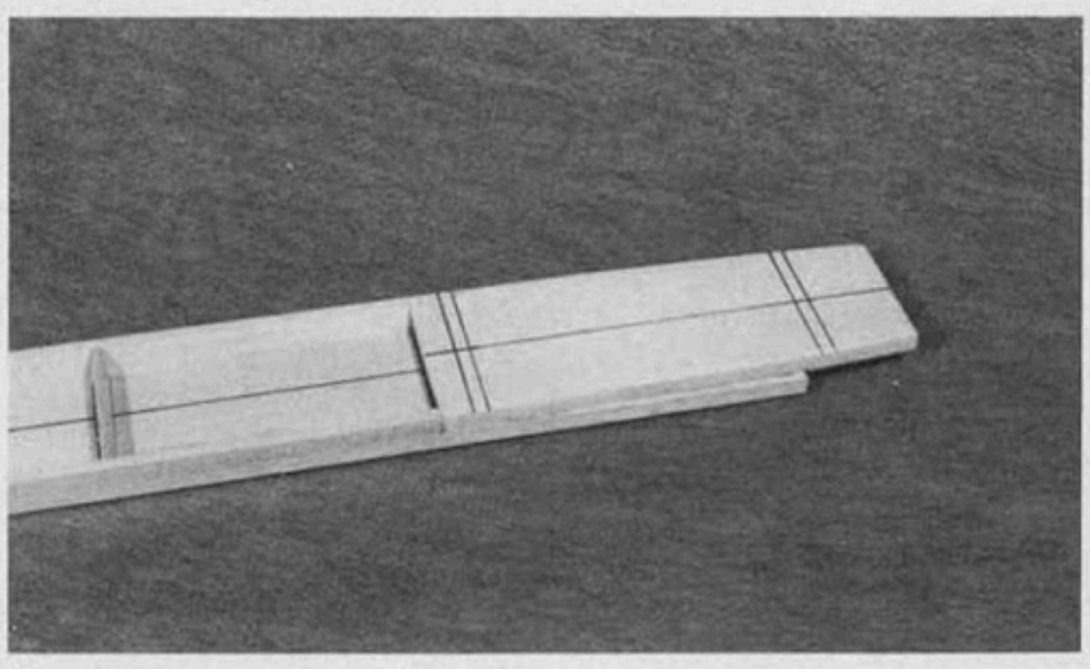
Fuselage side showing wing and stab cut-outs.



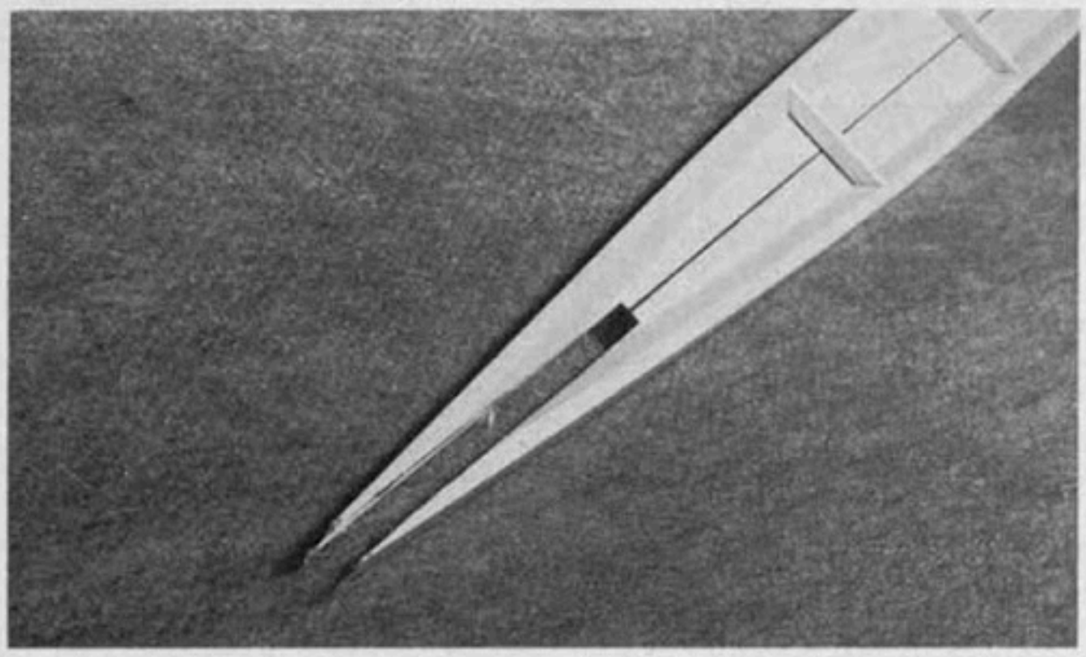
Bulkheads 1, 2, and 3.



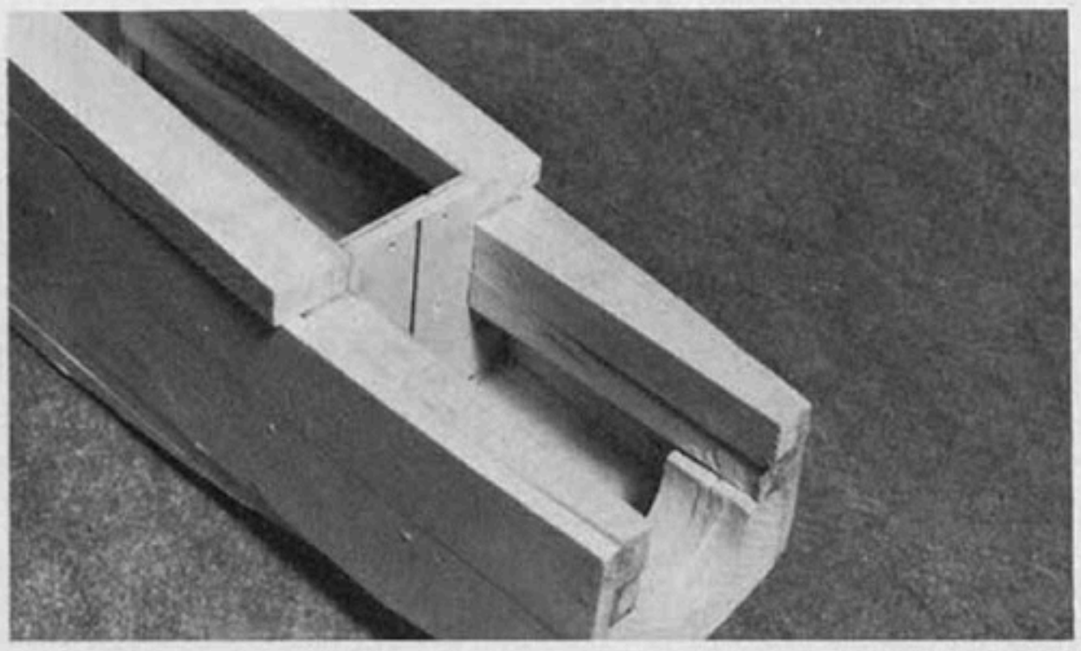
Balsa side block showing cut-out for bulkhead 2.



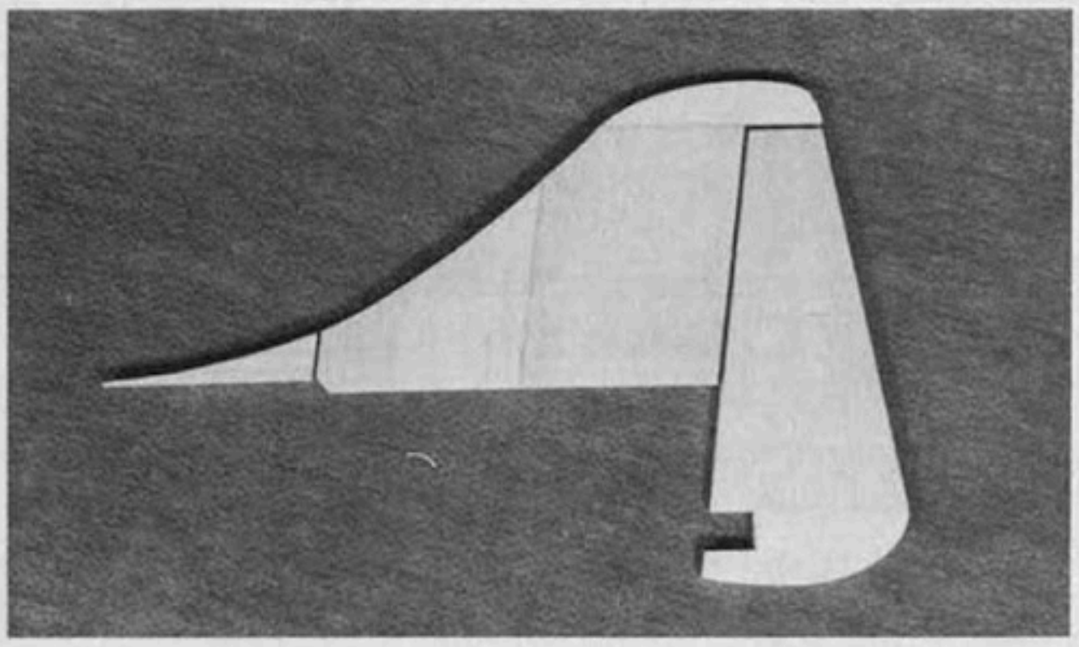
Fuselage top block with engine compartment top block in place.



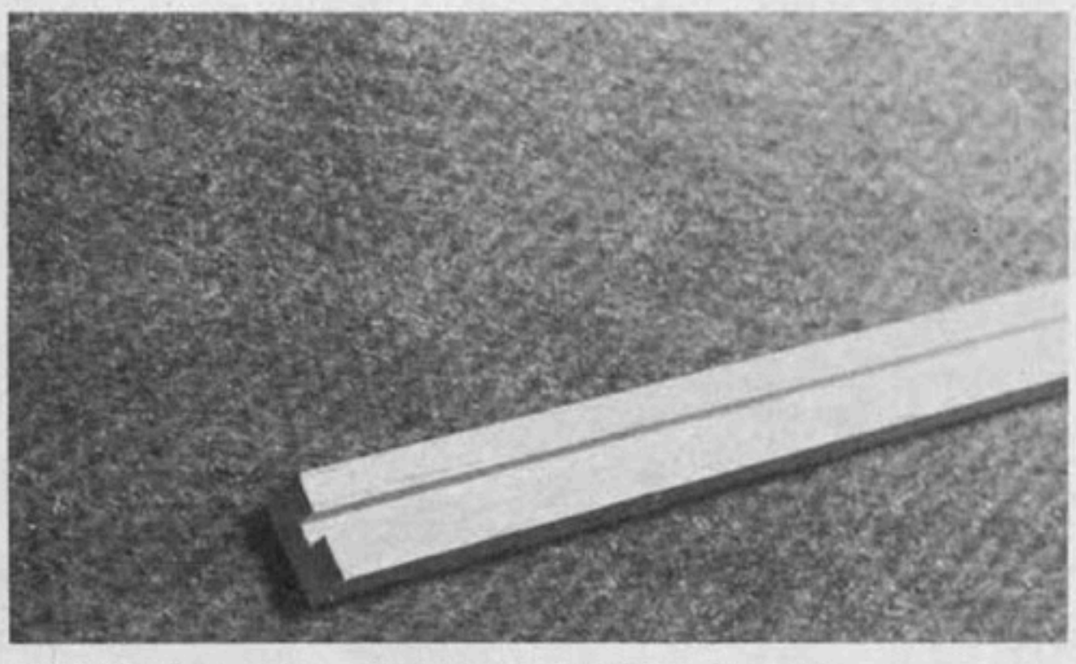
Top block showing slot for fin.



Fuselage bottom view. Motor mount supports and spinner ring filler block shown.



Fin and rudder pieces.



Stab leading edge showing notch for stab ribs.

The Fin, Rudder, Stab, And Elevator Parts

The two 3/8'' x 3/4'' x 12½'' stab *leading edge blocks* are cut from 3/8'' x 4'' x 36'' balsa sheet.☆ The 1/4'' x 3/4'' x 24'' *trailing edge block* is cut from 3/4'' x 4'' x 36'' balsa.☆ Cut a 3/16'' notch down the length of leading and trailing edge blocks to accept the squared ends of the ribs. See the plans.☆ Cut the stab *ribs* from 1/16'' x 2'' balsa sheet. The front end of the ribs are oriented toward the front of the plane on the plans. Mark the front end of the ribs on each rib as you cut them, otherwise you may have trouble deciding which end is the front when it comes to gluing them in place.☆

The *stab top filler block* dimensions are 3/8'' x 2'' x 6-7/16'' and is cut from the 3/8'' x 4'' x 36'' balsa sheet. The stab top filler block is installed into the fuselage on top of the stab after the stab is installed. To cut it to shape, the trailing edge of the fuselage top block may be used as a top view template.☆

The *elevator halves* are cut from 3/8'' x 3'' balsa.☆ Then, cut the *stab center rib filler block* from the 2'' x 4'' x 36'' balsa plank.☆ Cut the 3/4'' x 2'' x 7'' *stab tip blocks* to shape from the 3/4'' x 4'' x 36'' balsa sheet.☆ The *fin* and *rudder* parts are cut from 3/8'' x 4'' x 36'' balsa sheet.☆ Cut out the notch for the rudder horn insert in the proper rudder piece.☆ Prepare the *rudder horn insert* by laminating some pieces of 1/16'' ply together.☆

The Wing Parts

Cut the *ribs* from the 3/32'' x 3'' balsa.☆ If you're going to build the wing on the RCM Wing Jig, the jig rod holes should be drilled as indicated on the plans. Otherwise they aren't necessary.☆ Cut the four *false ribs* from the 3/16'' x 2'' balsa.☆ The 1/2'' x 3/4'' *leading edge* is cut from 1/2'' x 2'' x 36'' balsa sheet.

Cut the notched hardwood *main gear supports* and *main gear torsion blocks* to size.☆ Drill a 5/32'' hole through the main gear support so the hole will line up with the slot in the torsion block. See the plans.☆ The four *main gear brace pieces* are to be cut from 1/16'' ply; two for each gear support. Notch out the braces for the main gear support. When installed, the braces align with the edge of the rib, while the main gear support aligns with the surface of the balsa center section sheeting.☆ Cut the *triangular gusset* for the outboard end of each main gear support from the 1/2'' x 1/2'' hardwood.☆ If you are going to use retract gear, cut the *retract gear mounting plate* from 1/4'' ply.☆ Cut the four 1/16'' ply *retract gear mounting plate braces*, two for each mounting plate.☆ Relieve the wing ribs for the retract gas tubes, wires, or linkage.☆

Cut the 1/4'' hardwood *wing hold-down dowels* to length and round the front ends.☆ The *dowel support pieces* are cut to 1½'' x 2¾'' from 1/16'' ply.☆ Drill a hole in the center of each one for the 1/4'' dowel.☆ The wing *hold-down plate* is also cut from 1/16'' ply.☆ Cut the two 1¼'' x 2'' x 9'' balsa *wing tip blocks* to shape from the 2'' x 4'' x 36'' balsa plank.☆ The two *center section trailing edge pieces* are 7-9/16'' long and are cut from scrap aileron stock.☆ Notch the center section pieces for the aileron torque rods.☆ Cut the *wing fairing bottom, sides,* and *front piece* from 1/4'' x 4'' x 36'' balsa. The bottom is 3½'' x 3½''. The front is 3/4'' x 3½'', making sure the grain goes from side to side. The sides are 3/4'' x 1¼''. These dimensions are a bit oversize to allow adequate wood so you can sand the parts to the wing contour.☆ Cut the *main landing gear* from a piece of 5/32'' piano wire and bend it to shape as shown on the plans.☆ At this point you should have a box full of parts and a floor full of balsa scraps and sawdust. In reality this mess is a special, customized, deluxe Dirty Birdy kit, all ready to build. And by now the next issue of the R/C Modeler Magazine should be waiting for you in your mail box with the Dirty Birdy, Part II, to get you from the pieces to a plane.

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NEW ERA III

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COMPLETING THE FUSELAGE:

Before carving the top block, tack glue a 3/16'' x 1/2'' spacer in the aft end of the stabilizer and fin slots. These spacers will support the aft end of the top block during shaping and prevent the ends from breaking during handling.

2) Draw a centerline on the top as a guide while shaping. Use a razor plane or knife to slab off the corners of the top block and sides, then start shaping the contour. Follow the cross section on the plan for the proper contour. Block sand until the edge of the 3/8'' triangle stock is just visible. Taper the aft top surface starting at the forward end of the dorsal fin following the side view of the plans. Round these corners smoothly. Shape the aft bottom sheet corners with a coarse sanding block since a knife will tend to gouge out the cross-grained sheet. Carve and sand the nose and chin area rounding the corners to fair smoothly with the nose ring and Former F-2B. Cover the engine intake and exhaust parts and wrap the spinner with a couple of layers of masking tape. Temporarily install the engine and use the spinner as a guide for final shaping.

3) Mount the wing on the fuselage temporarily and remove the spacers from the slots. Insert the stabilizer into its slot and sight from the front to check alignment with the wing. When satisfied, epoxy stabilizer in place, checking alignment in all planes very carefully. Slip the fin into the fuselage slot and seat firmly on top of stabilizer. Trim the lower surface of the dorsal fin to fit tightly against the top and glue to the fin. Remove from fuselage and shape dorsal top outline and sand contours into fin. Cut hinge slot in aft end of fuselage and glue fin and dorsal to fuselage and stab. Check alignment and be sure the fin is seated on the stab. Temporarily mount rudder and elevator horns and attach surfaces.

4) Check the direction of movement of your servos and lay out and install all pushrods. We used .062 diameter music wire for the throttle and nosegear running in 1/8'' O.D. nylon tubing. The rudder and elevator pushrods used were Su-Pr-Line NyRods. Cut holes through the sides and F-3 to suit your installation. Be sure that the rudder pushrod exits through the left side.

5) Trim canopy base to roughly fit the fuselage. Wrap 120 sandpaper around fuselage and sand canopy for final contour. If you plan to add cockpit detail, make up the parts now and fit to the fuselage contour. A Williams Brothers 1½'' scale pilot is the right size for this aircraft.

This completes the construction of your RCM New Era III. Go over the airframe again with fine sandpaper filling any dings or cracks with Dap or Hobbypoxy Stuff and you are ready to cover.

COVERING AND FINISHING:

We suggest that you assemble the whole aircraft and give all surfaces a final alignment check before starting covering. It's a lot easier to correct any problems before finishing the model. Check the landing gear alignment, saddle fit, wing and tail alignment once again and you will be confident of success on the first flight.

The secret of performance of this size model is light weight. Resist the urge to pile on a super finish with many coats of primer and paint. In our opinion the only way to finish your New Era III is with one of the plastic film coverings. Properly done, this will provide a beautiful finish with minor weight increase. The structure is very rigid and strong so any of the film coverings may be used.

Cover the bottom of the wing first then add the aileron horn links. Check aileron operation and cover the top of the wing. If using MonoKote, covering the tips with a separate piece will make the job easier. The bottom rear fuselage is covered first then a piece of material is applied to each side and wrapped around the top and seamed at the center. Complete the fuselage covering, then cover the tail surfaces and ailerons. Trim to suit.

FINAL ASSEMBLY:

Now permanently install all control surfaces and control horns. Make up pushrod ends and attach to control surfaces. Install tank and engine mount, all gear and wheels and connect the nosegear pushrod. Mount engine permanently and hook up pushrod to throttle arm. Position the radio equipment so that the completed model balances as shown on the plans. Install servo rails to suit, and mount the servos. Make up the inboard pushrod ends, check control movement and you are ready to go flying.

Insofar as the flying characteristics of the New Era III are concerned, these were covered in the introduction to the article. Use your normal check-out procedures for trimming out a new pattern ship and have at it! If you've built the New Era III according to the preceeding instructions, and without deviating from the plans, you'll find that it will far exceed your expectations for this size ship. In fact, we're willing to bet that its performance, coupled with its overall economy and ease of construction and transportation, will have you hanging that .60 powered pattern ship on the wall for a while.

Good flying. □

FLIGHT TRAINING SEMINAR

from page 38

that as you do, the tail will whip to one side and you will have to correct for it. Now, move the cyclic forward and the ''dolly'' will take-off across the parking lot at a surprising rate of speed. You may find that you will be going forward and to the right or left, while the tail is flipping to one side or the other as you advance or retard the throttle. At first, you'll find that it will be difficult to accurately and precisely control the movement of the helicopter across the parking lot since it will want to go in several different directions at once. Keep running tank after tank of gas through your helicopter until you can move it around the asphalt training area and make it go exactly where you want it to go! You will find that as you utilize this helicopter ''dolly'', you will soon be able to ''drive'' it around the parking lot in any direction that you want to — smoothly and precisely, whether it be backwards or forward or to the side, and that you can actually do Figure Eights, 360° tail rotor turn, and the like. In other words, you will be doing virtually all of the things that you will be doing in the air, except that you are safely on the ground where you will not cause any damage to your expensive helicopter. In fact, in the first few tanks of fuel, you can mentally note how many times you would have crashed your helicopter had you been in the air instead of on the helicopter ''dolly''. It is at this point that you will realize the potential and ultimate value of this training aid.

Keep working with the ''dolly'' until you can do exactly what you want to do at all times, one tank of gas after another. When you have a gallon or more through your helicopter, your rate of progress will be so rapid that it will surprise you. You, and you alone, will be able to determine when you are ready to actually stop using the helicopter ''dolly'' and be ready for your first test hops into the air. The only difference between ''driving'' the ''dolly'' on the ground and flying in the air is that you will be using a vertical ascent mode that was not possible with the ''dolly''. Beyond that, all movements will be the same except that it will take less control action to move the helicopter in the air than it did on the ground due to the weight of the training gear and the friction of the wheels against the asphalt or concrete.

So that's it for this month — try this remarkable training aid and stick with it until you are able to make your helicopter do exactly what you want it to do all of the time. At this point you will be ready for Part IV of the training course and your first initial flight with your chopper. □

DIRTY BIRDY

from page 35/32

The Dirty Birdy Materials List

Whenever we've ever done any scratch building in the past, we've wished the building instructions would have included a list of the wood and such we'd need. After having spent several hours of listing wood sizes, checking sizes normally available at hobby shops and so on, we now know why they haven't done so. However, we've spent the time for the Dirty Birdy so you won't have to. Isn't that wonderful?

Following is a list of the materials you'll need. Because of the special sizes of some of the parts like the wing leading edge, and the stab leading and trailing edge for

example, you'll have to cut them from sheet or plank balsa. In checking the plans you'll also find that we've switched wood sizes in some cases because the wood size Joe has cut for himself just may not be available in most hobby shops. For example, the fuselage top block stringers are triangular stock with one point cut off to mate with the fuse side. We've used rectangular stock for the stringers. The plans call for 5/8'' triangular stock up in the nose of the fuse. Try to find that stuff! 3/4'' triangular stock works just as well and is available. The same is true of the 1/4'' x 5/16'' wing trailing edge stock. We used 1/4'' x 1/4''. To find the 1/2'' x 1¼'' x 12'' beech hardwood you'll need for the motor mount rails, stop by a local lumber supply. Happy shopping.

Balsa Planks

1 ea. 2'' x 4'' x 10'' — stab center rib filler block, spinner ring filler block, wing tip blocks.
1 ea. 3/4'' x 4'' x 36'' — stab T.E., stab tip blocks, chin block, fuel compartment side blocks, motor mount supports.
1 ea. 1/2'' x 2'' x 36'' — wing L.E.

Balsa Strips

4 ea. 3/8'' x 1/2'' x 36'' — wing spar.
1 ea. 3/8'' x 1/4'' x 36'' — top block cross braces.
2 ea. 1/4'' x 1/4'' x 36'' — fuse vertical support braces, wing T.E.
1 ea. 3/32'' x 1/4'' x 36'' — stab angle braces.
4 ea. 3/32'' x 3/8'' x 36'' — wing capstrips.

Triangular Stock

1 ea. 3/4'' x 36'' — fuel tank compartment, motor mount supports.
3 ea. 1/4'' x 36'' — motor mount rails, rear fuse bottom, fuse wing hold-down plates, plywood wing fillet pieces, pieces behind bulkhead #2.

Aileron Stock

2 ea. 3/8'' x 1/4'' x 36'' — ailerons, center section trailing edge pieces.

Balsa Sheet

1 ea. 3/8'' x 4'' x 48'' — fuselage top block.
2 ea. 3/8'' x 4'' x 36'' — fuel compartment top block, stab L.E., stab top filler block, sub fin, fuel compartment bottom, fin & rudder pieces.
1 ea. 3/8'' x 3'' x 36'' — elevator.
1 ea. 3/8'' x 2'' x 36'' — fuselage top block stringers.
1 ea. 1/4'' x 4'' x 36'' — bottom block, bulkhead #3, wing fairing pieces.
3 ea. 3/16'' x 3'' x 36'' — fuse sides.
1 ea. 3/16'' x 2'' x 36'' — wing false ribs
1 ea. 1/16'' x 2'' x 36'' — stab ribs.
6 ea. 3/32'' x 4'' x 36'' — wing L.E. and center section sheeting.
6 ea. 3/32'' x 3'' x 36'' — wing ribs.
4 ea. 3/32'' x 2'' x 36'' — wing T.E. sheeting.

Plywood Sheet

1 ea. 1/4'' x 6'' x 12'' — bulkhead #1 & #2, fuselage wing hold-downs.
1 ea. 1/16'' x 6'' x 12'' — wing hold-down plate, spinner ring, main gear brace pieces, dowel support pieces, rudder horn insert.
1 ea. 1/32'' x 12'' x 24'' — servo compartment doubler, wing fillet base pieces.

Hardwood

2 ea. 1/2'' x 1¼'' x 12'' — (beech hardwood) motor mount rails.
1 ea. 1/2'' x 1/2'' x 12'' — (hardwood) servo mount rails, main landing gear support gusset.
2 ea. 5/8'' x 1/2'' x 12'' — (notched hardwood) landing gear support, landing gear support torsion block.
1 ea. 1/4'' x 12'' — (hardwood dowel) wing front hold-down.

Miscellaneous

1 ea. nose gear steering arm
1 ea. nose gear bearing
1 ea. nose gear
1 ea. 5/32'' piano wire
1 ea. Dirty Birdy canopy
6 ea. landing gear straps
1 set aileron torque rods
3 ea. horns
1 ea. Sullivan 14 oz. slant face fuel tank
1 ea. 2¼'' hard rubber wheel, nose gear
2 ea. 2¼'' soft rubber wheel, main gear
2 ea. pushrods
3 ea. clevis and rod assembly, nosegear steering and throttle linkage

DIRTY BIRDY

Designed By: Joe Bridi

TYPE AIRCRAFT
Competition & Sport
WINGSPAN
64¼ Inches
WING CHORD
11'' (Average)
TOTAL WING AREA
688 Square Inches
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Swept L.E.
DIHEDRAL
3/8''-center with wing inverted
O.A. FUSELAGE LENGTH
55¾ Inches
RADIO COMPARTMENT AREA
(L) 13'' X (W) 3'' X (H) 2¼''
STABILIZER SPAN
27½ Inches
STABILIZER CHORD (incl. elev.)
7¾'' Average
STABILIZER AREA
212 Square Inches
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
10'' incl. sub fin
VERTICAL FIN WIDTH (incl. rudder)
9 Inches Average
REC. ENGINE SIZE
.61 cu. in. (10 c.c.)
FUEL TANK SIZE
12-14 Ounces
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4 (5 with retracts)
CONTROL FUNCTIONS
Rudder, Elevator, Throttle, Ailerons
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa and Ply
Wing ..... Balsa and Ply
Empennage ..... Balsa
Weight Ready-To-Fly ..... 128 oz. (dry)
Wing Loading
20.5 Ounces
(includes wing and stab area)

SUNDAY FLIER

from page 22

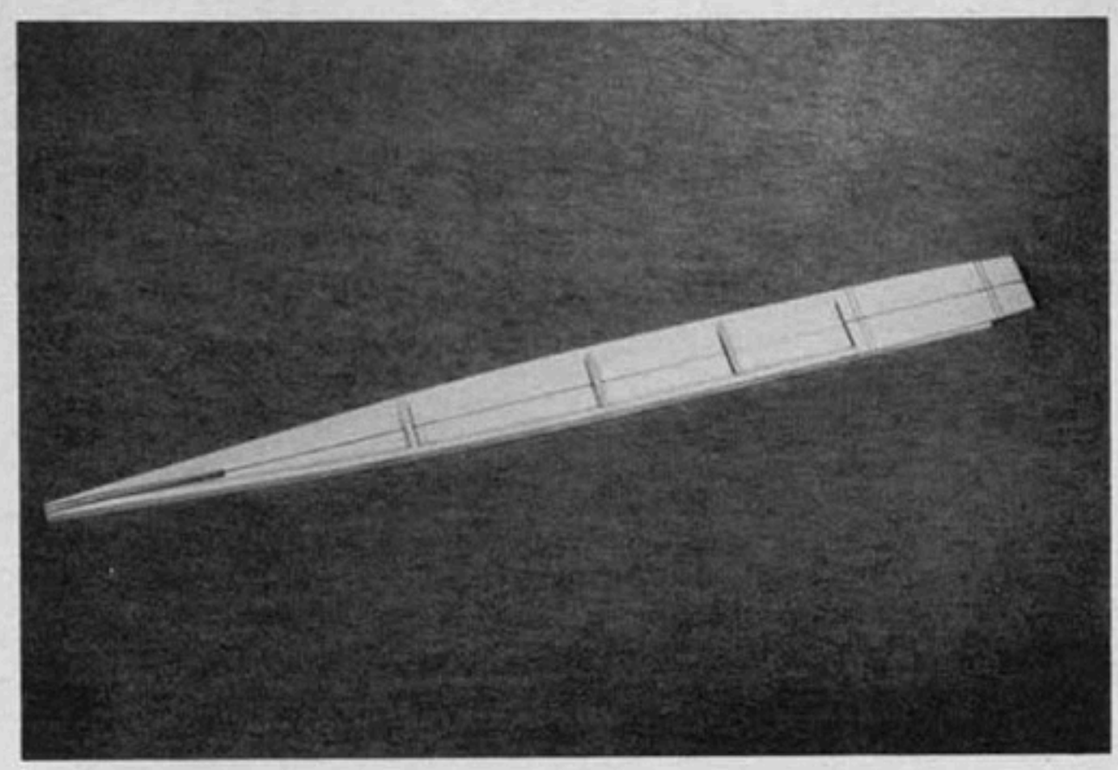
There's a lot of other things you really should have checklists for — like charging batteries, for instance — but I just haven't gotten around to it after all these years. And that's why I still qualify as a Sunday flier, I guess.

These last two incidents led me into recalling some of the other dumb things I've done through the years. The list is almost awesome, although I haven't as yet done the one thing that nearly everybody has heard about. I'm referring to that old story about the guy who was about to hand launch his plane after making sure eveything was working okay then proceeds to run into the wind, with the transmitter in one hand and the plane in the other, then throws the transmitter into the wind and tries to control it with the plane. Some guys swear that really happened.

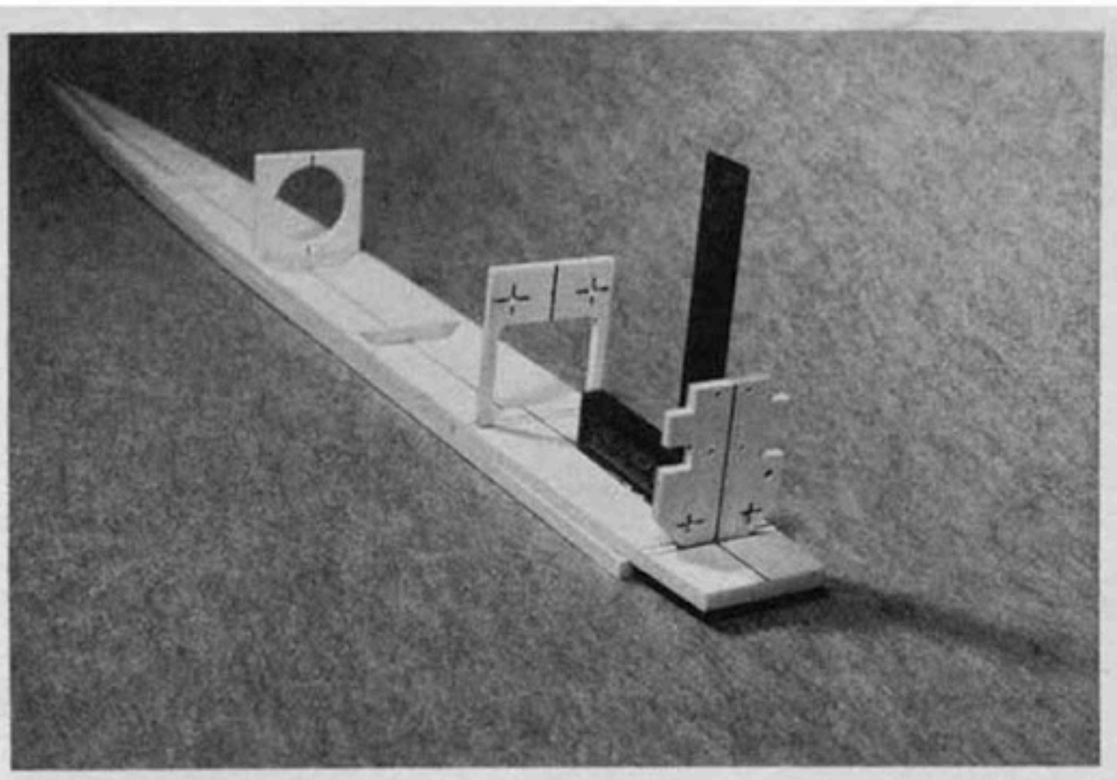
Maybe. The closest I've ever come to that is to launch the plane with the receiver turned off. That's embarrassing enough, but even more embarrassing is to launch the plane with the receiver on, but the transmitter off, yell ''I ain't got it!'' and then have some guy standing near you say ''Turn on your transmitter, dummy!'' Believe it or not, both those things have happened to me.

I wonder how many of you have also done what I did once — rush to get out to the field in the evening before it got too dark — only to arrive and find that you left the wing at home. And the reverse; fly a couple of flights, pack up your gear and go home, only to find that you left your plane at the field — or your toolbox. I've done both; a couple of years ago, at the Pioneers' WW I Jamboree, I even left my SE-5 at the field. Considerate members held it for me — but I did take quite a ribbing. Deserved it, too.

One of the wildest flights I ever had was when I was flight testing the prototype Wavemaster. We made a lot of flights with different height steps, to get the best possible lift-off. To keep from having to make a lot of hulls, we made one with a relatively small step, then we had molded plastic pieces which faired into the bottom of the hull and gradually increased the height of the step. They were held on with waterproof tape. The idea worked great;



The fuselage top block showing the stringers, cross braces, and fuel compartment top block glued in place. Note the top block centerline.



The bulkheads glued in place on the top block. Note that the end of bulkhead #1 with the angle cuts is oriented toward the fuel compartment top block.

Add a piece of 1/4'' *triangular stock* along the bottom of each fuse side from the back of bulkhead 3 to the fuse trailing edge. Shape the 1/4'' triangular stock as necessary at the back of the fuselage sides so they can be glued together at the trailing edge.☆ Glue the 1/4'' x 1/4'' *vertical support brace* in place on the fuse side so the angled end mates with the 1/4 tri stock.☆

When the glue has dried, glue the fuse sides in place from bulkhead 2 to the trailing edge. Clamp the sides to bulkhead 2, making sure they are at 90° to the top block.☆ Add a piece of 1/4'' *tri stock* along the back of both sides of bulkhead 2.☆ Glue the *bottom block cross brace* in place between the fuse sides. Remove any pins from the inside of the back of the fuselage and add the 1/4'' rear fuse *bottom block*.☆

Glue a 9½'' long piece of 3/4'' *triangular stock* onto each side of the fuel compartment top block so it runs from the front of bulkhead 2 into the engine compartment. If you've cut out the fuel compartment top block for the fuel tank, the inside edges of the tri stock will also have to be relieved.☆

Put glue on the side of each of the pieces of 3/4'' tri stock that is to mate with the fuse sides. Before you clamp the fuse sides in place though, apply glue to the hardwood *motor mounts* and slide the motor mount rails in place. Next, pin and clamp the fuse sides in place along the tri stock and to bulkhead 1. Clamp the fuse sides together in the front so they are 2⅜'' across, from side to side.

Prepare a 5/8'' x 3⅛'' motor mount locator template out of some scrap balsa. This template is used to align the rear of the motor mount rails when they are glued in place to make sure they are level and to build in the correct amount of down thrust into them.☆ Pin the template in place to the fuse sides so it is across the front of bulkhead 2 and rests on top of the tri stock on each fuse side.☆ Clamp the motor mount rails in place to the fuse sides so the rear of each rail rests on top of the template. Remove the template and let the glue dry. At this point the fuselage should be removed from the building board.☆

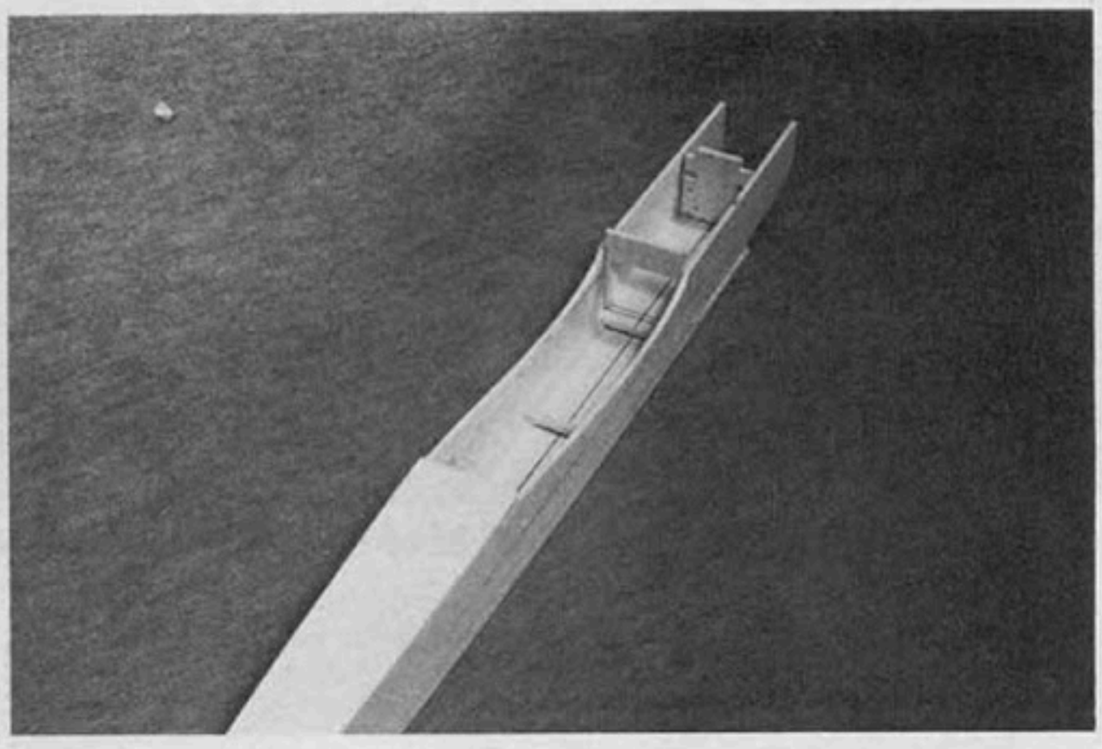
Add 1/4'' *triangle stock* along the top and bottom of the motor mount rails in the area of the fuel tank compartment.☆ Shape the sides of the *upper spinner ring filler block* to fit the angle of the fuselage sides.☆ Glue the block in place. Cut both the top forward end of the fuel compartment top block and upper spinner ring filler block as necessary for your engine.☆ Mark and drill the motor mount screw holes in the rails and install the blind nuts. When mounted, the engine thrust washer should extend 1/8'' in front of the fuse sides.☆

Fit the *fuel compartment side blocks* by cutting the bottom of each one to make a straight line from bulkhead 1 to bulkhead 2. Relieve the inside corner of each side block as necessary for clearance for the wing hold-down dowels.☆ Glue the side blocks in place so they fit in the notch in bulkhead 1 and overlap the side of bulkhead 2. If you're using fixed gear, you may want to install the tubing for your nosegear linkage at this time because it will be more difficult to get to after the bottom block is in place.☆ Install the *nosegear bearing*.☆ Cut out a hole in the front of the *fuel compartment bottom block* for the nosegear strut and spring — or relieve the center of the block as necessary for your retract gear. Glue the bottom block in place.☆

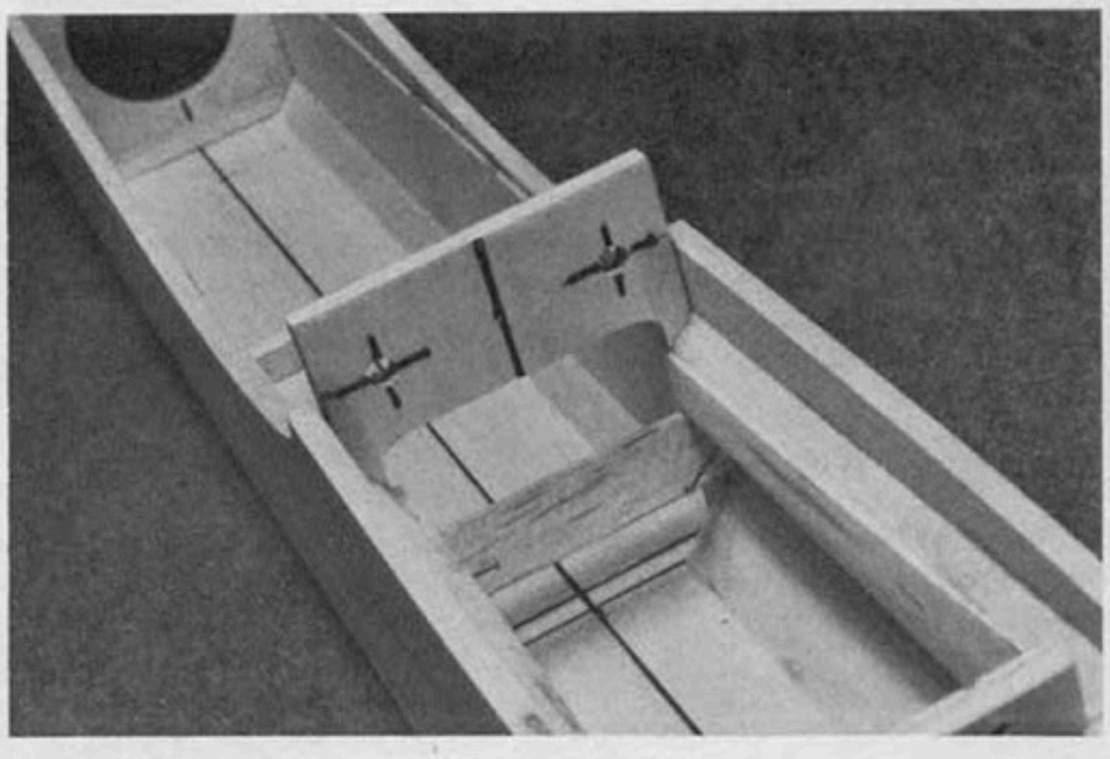
Mark and drill the engine mounting screw clearance holes in the balsa *motor mount supports*. Put a small piece of masking tape on the bottom of the blind nuts in the motor

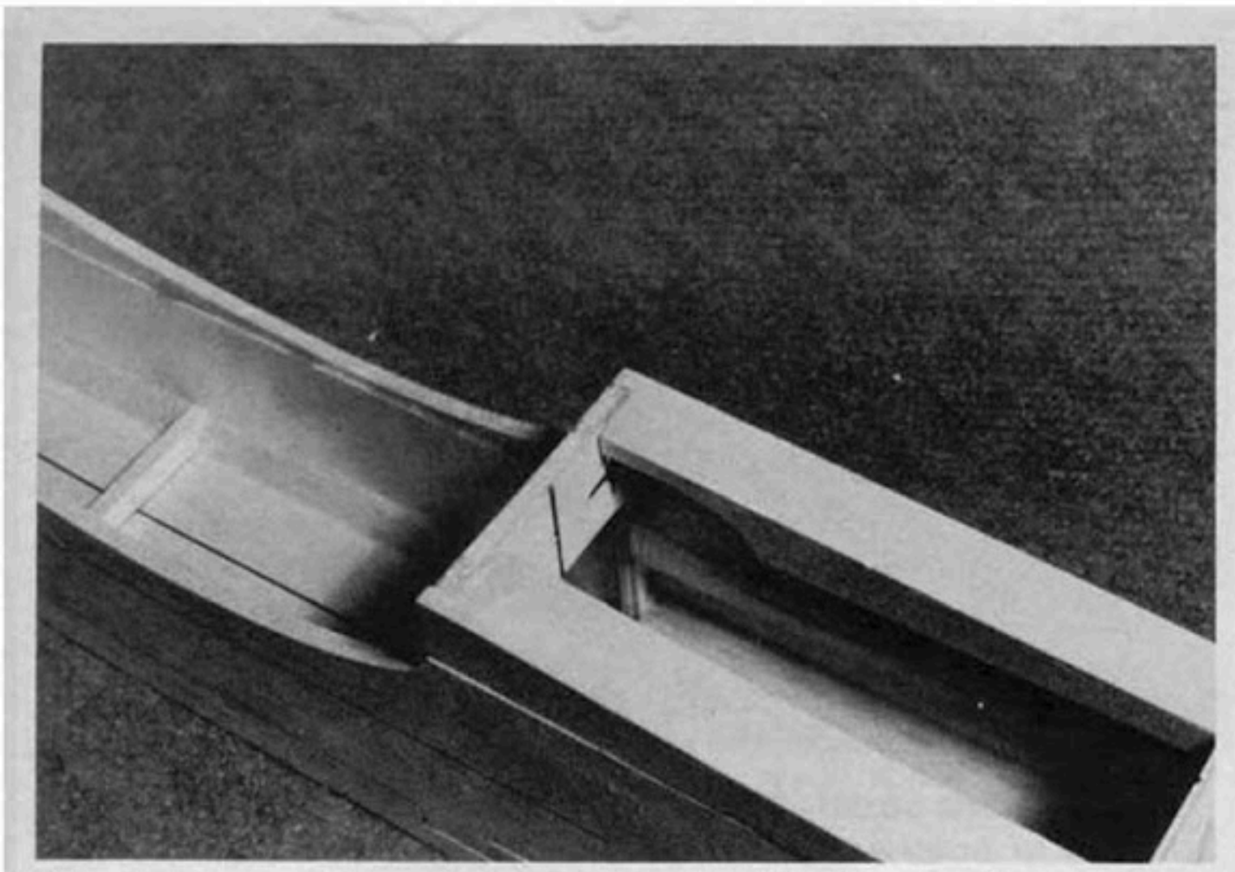
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The fuselage sides glued in place from bulkhead #2 to the tail, with the fuse rear bottom block added. The sides are not yet glued in place forward of bulkhead #2.

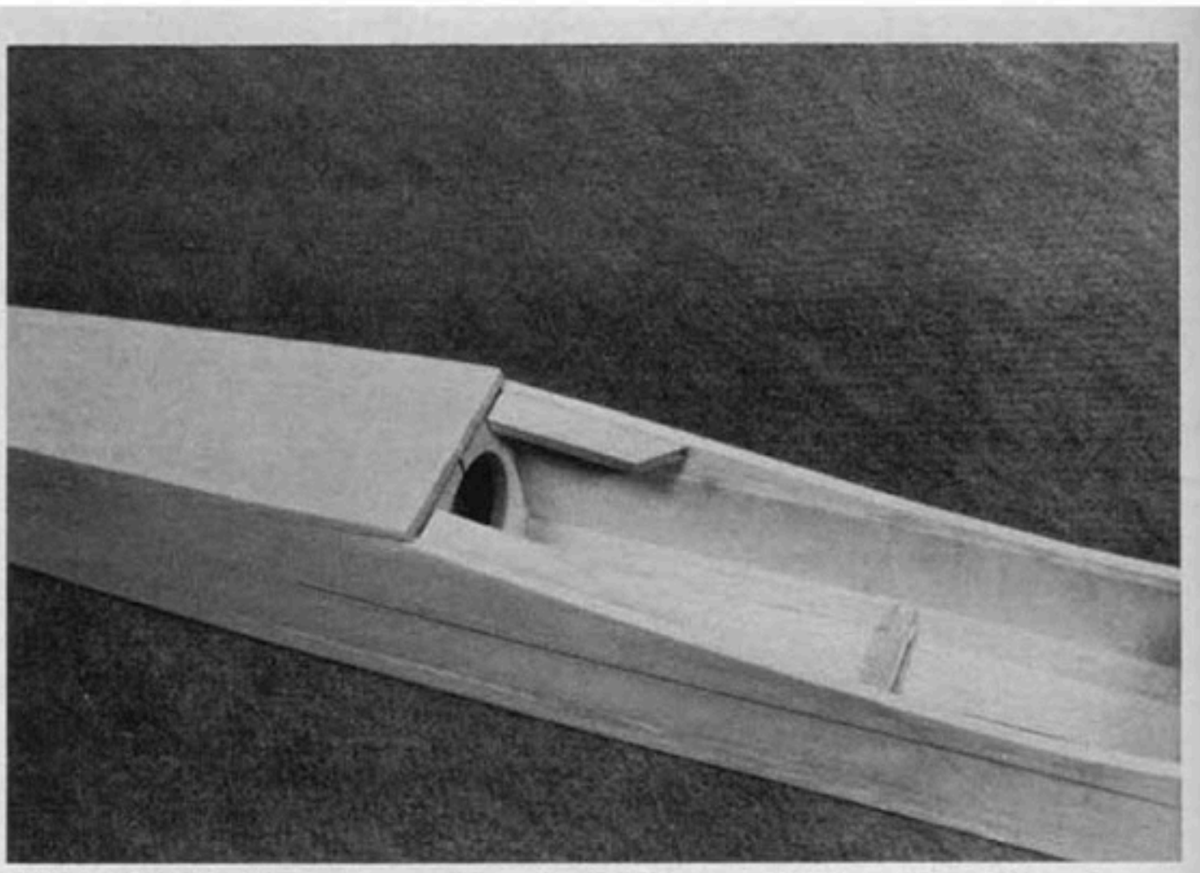


Using the scrap balsa motor mount locator template pinned in place across the front of bulkhead #2 to align the rear of the motor mount rails.

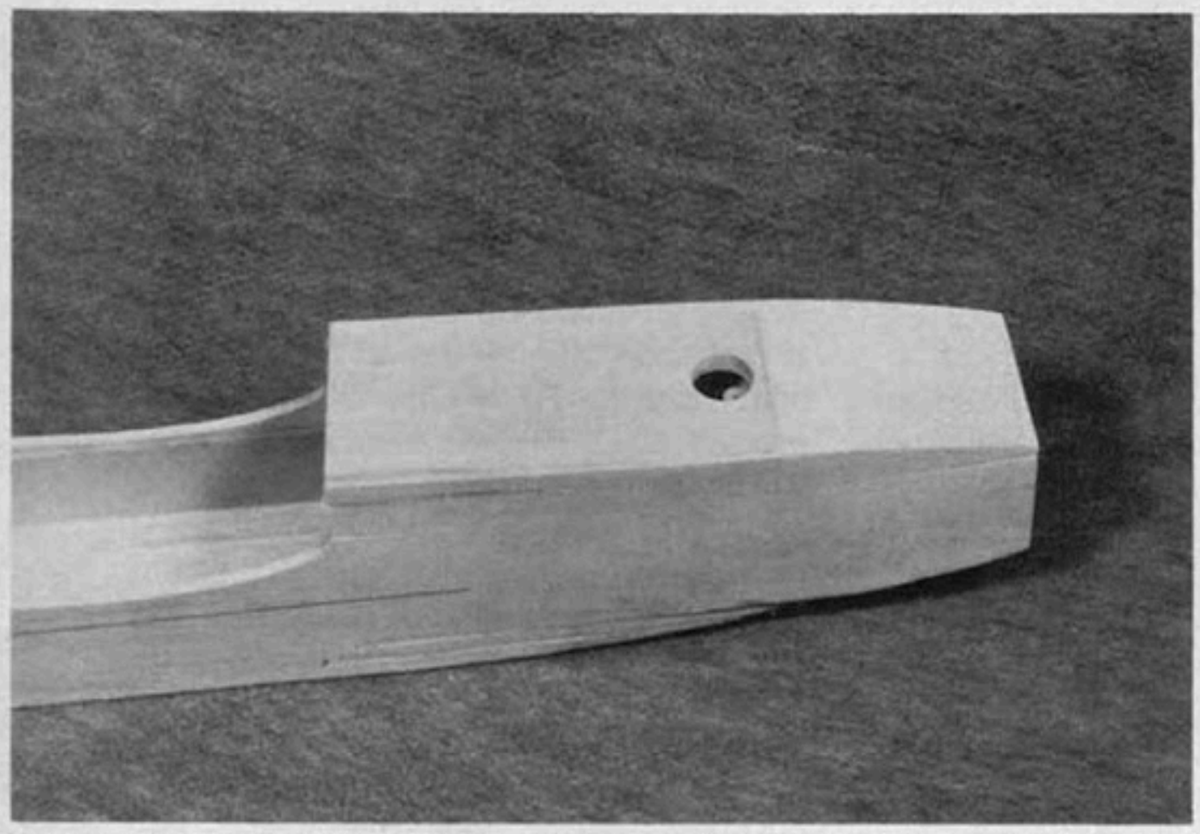




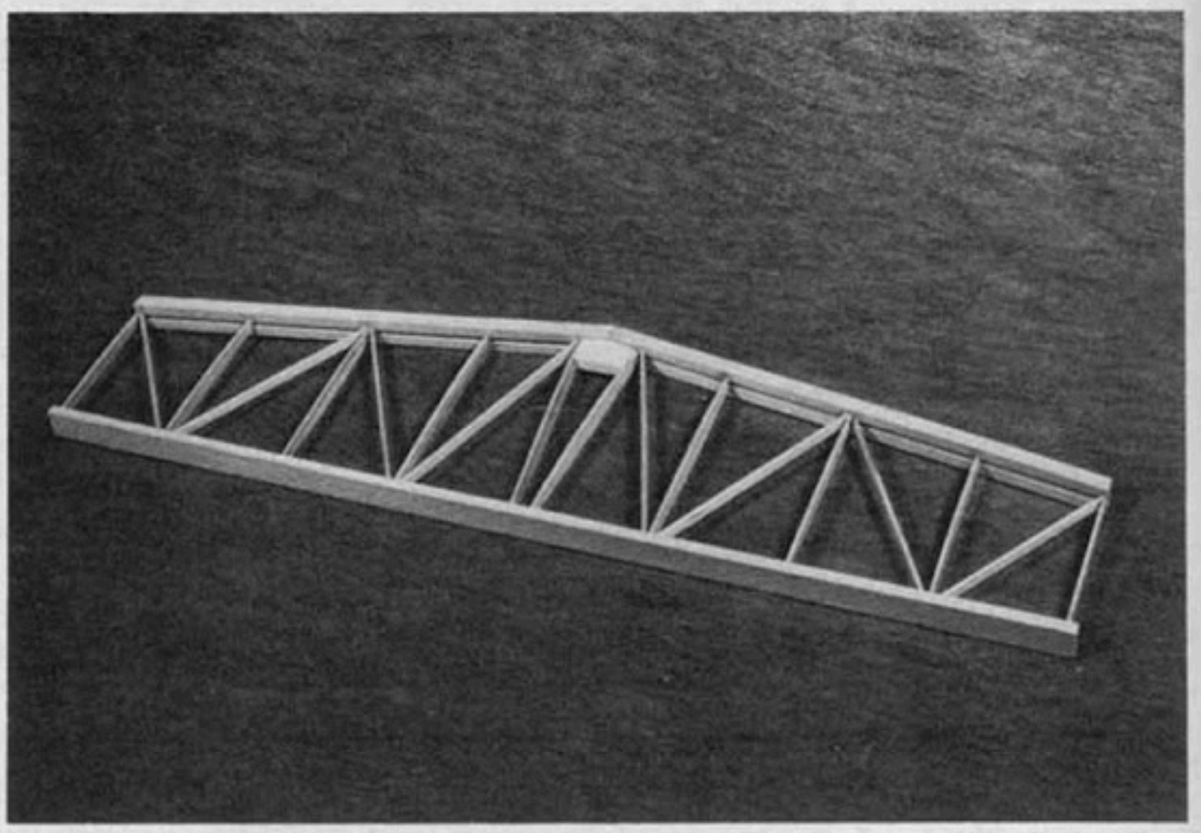
The fuel compartment side blocks glued in place so they overlap the sides of bulkhead #2 and fit in the notches cut out of bulkhead #1. The rear corners of the side blocks have been relieved for clearance of the wing hold-down dowels.



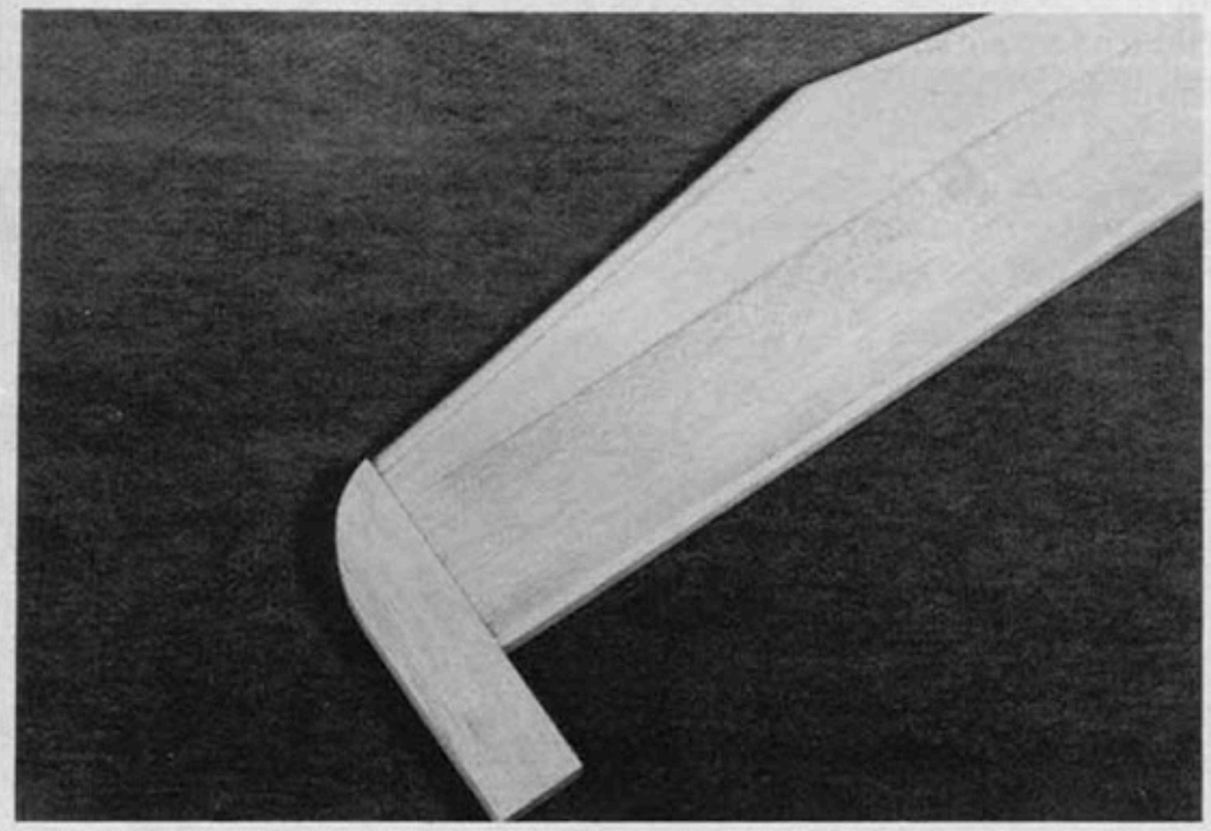
The 1/4 ply fuselage wing hold-down plates glued in place. Pieces of 1/4 triangle stock have not yet been installed.



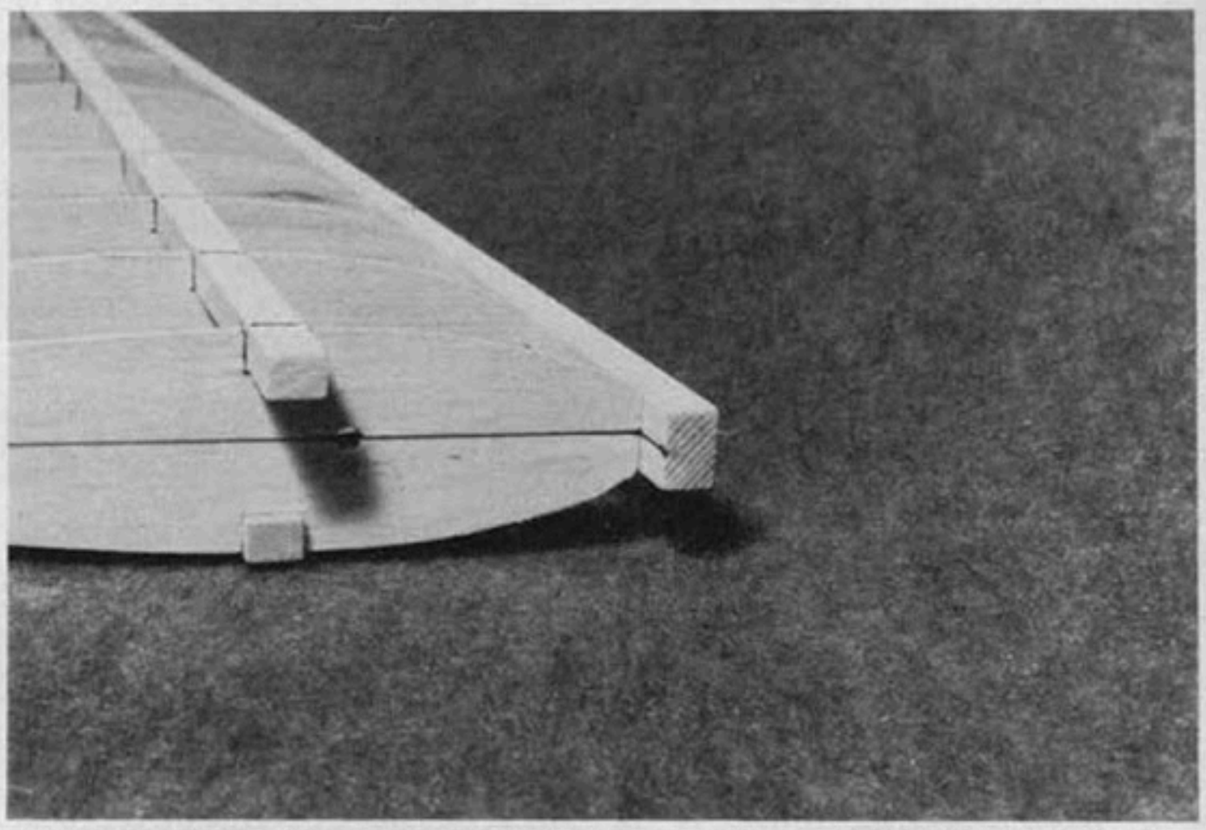
The bottom of the fuselage showing the chin block and fuel tank compartment bottom block.



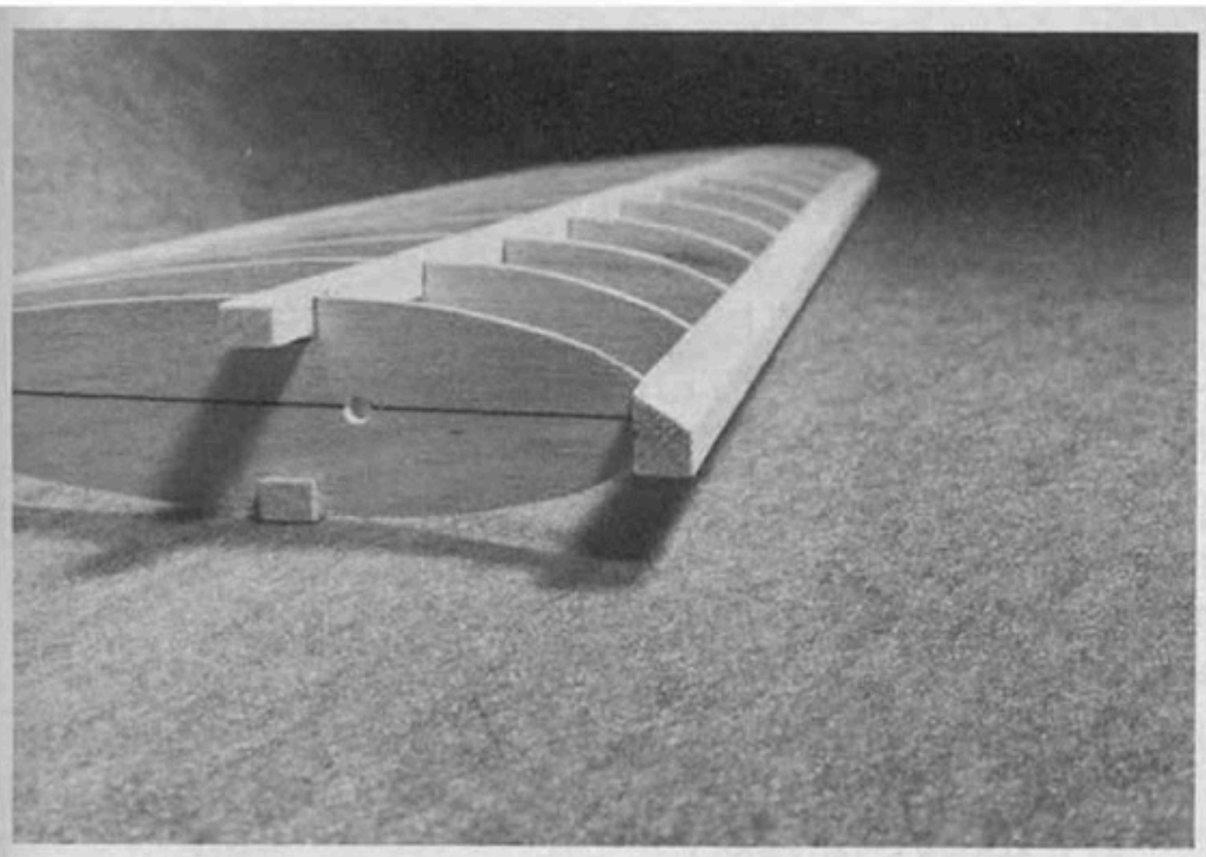
The stab ribs and cross braces glued in place to the leading and trailing edge blocks.



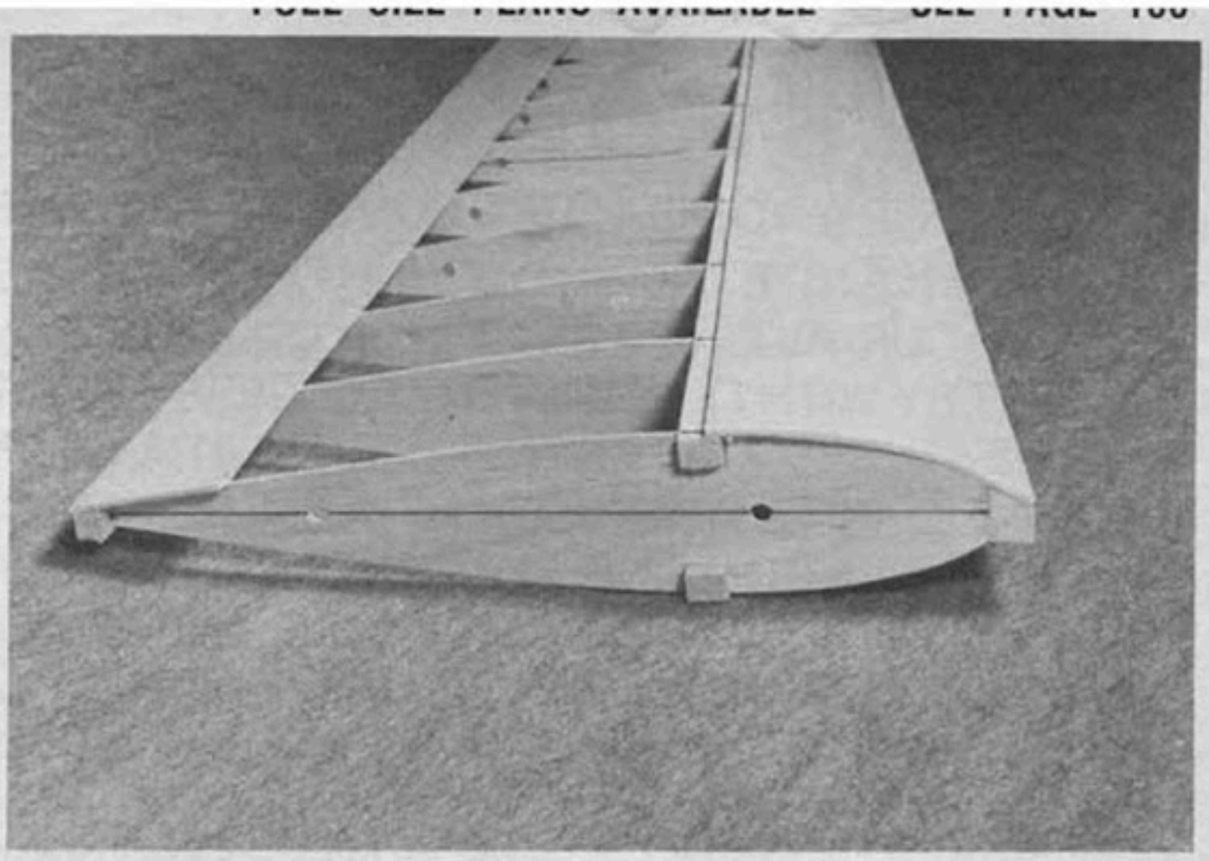
The stab is sheeted, the leading edge partially shaped, and, the tip blocks are installed.



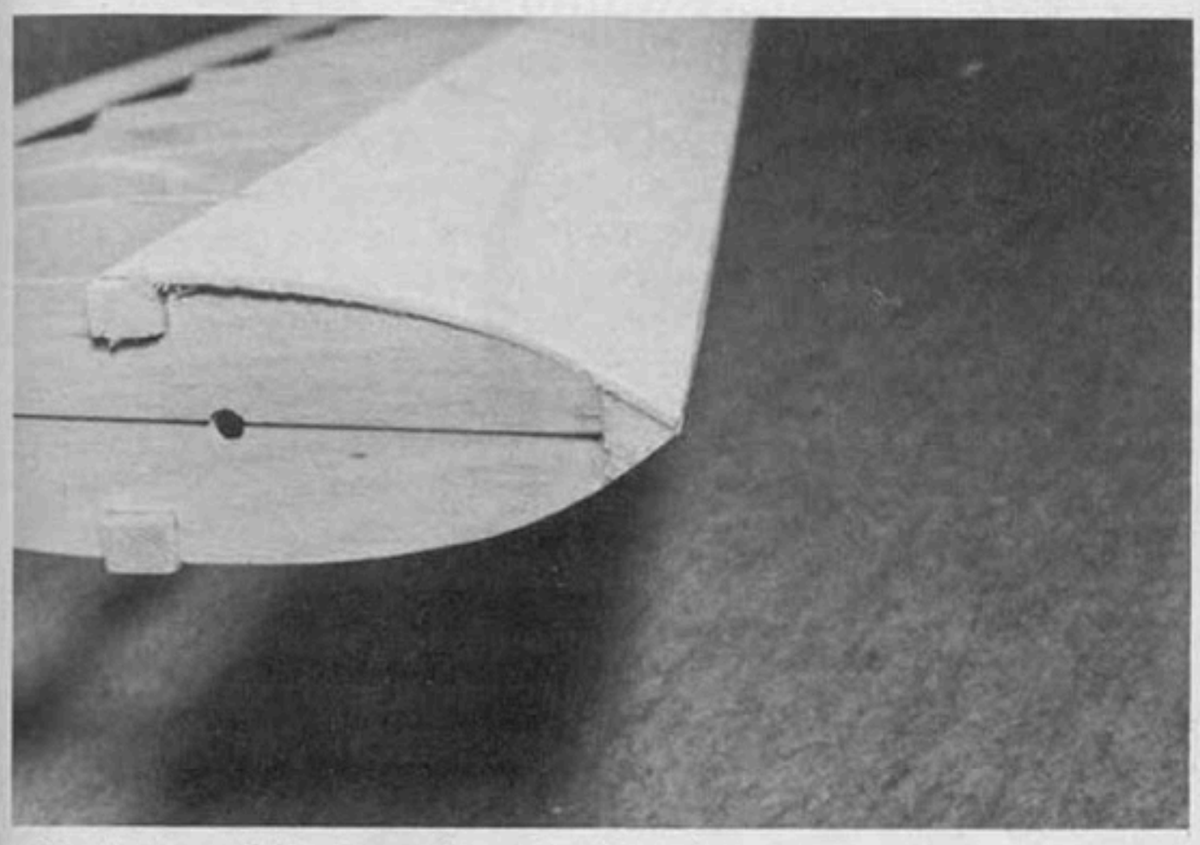
The wing leading edge installed. Note the center line on rib #1 and the back of the leading edge.



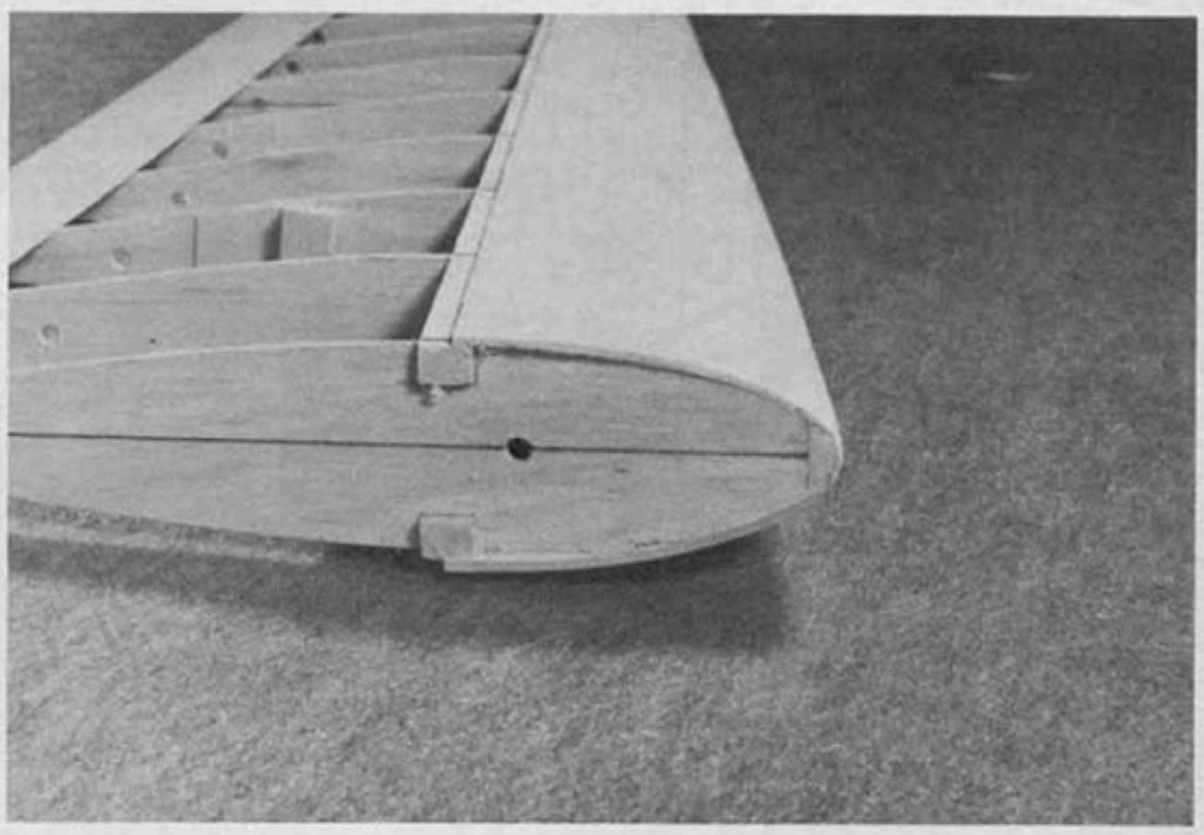
The top of the leading edge shaped to the rib contour.



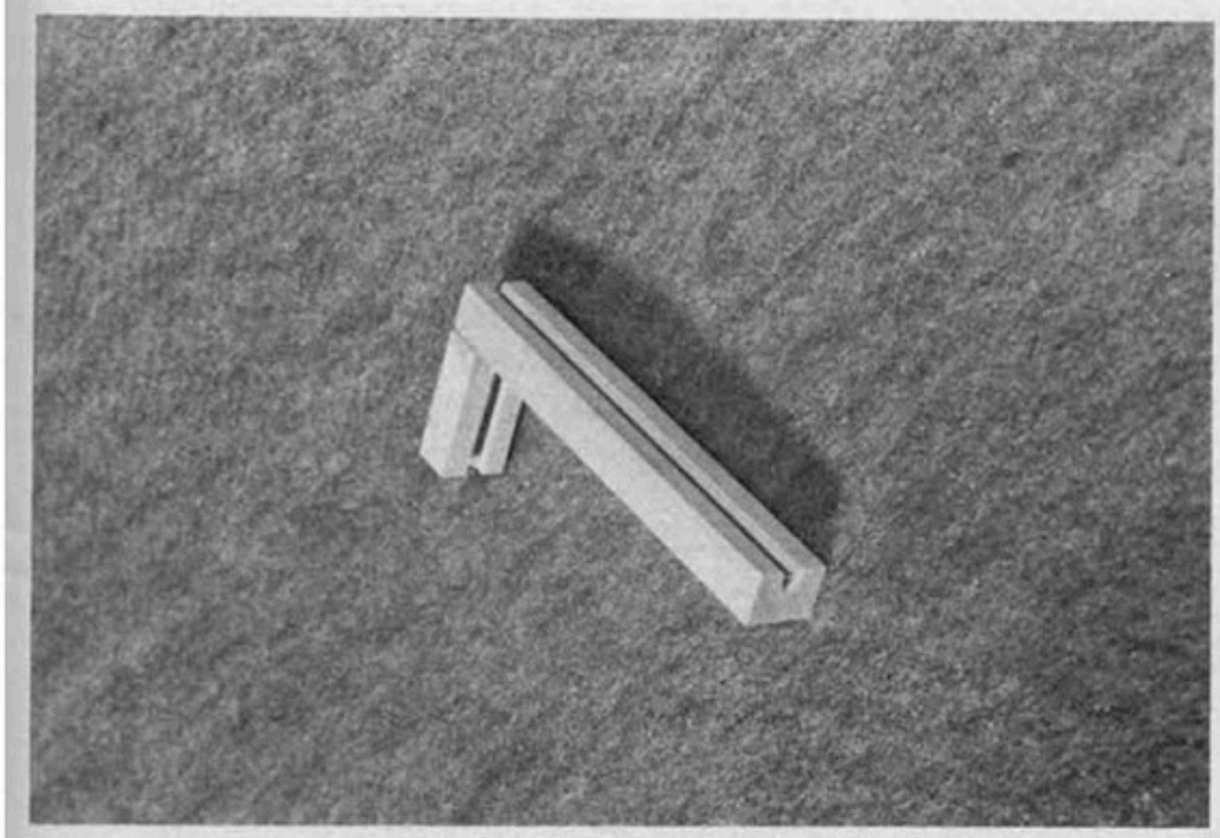
The T.E. and top L.E. sheeting installed.



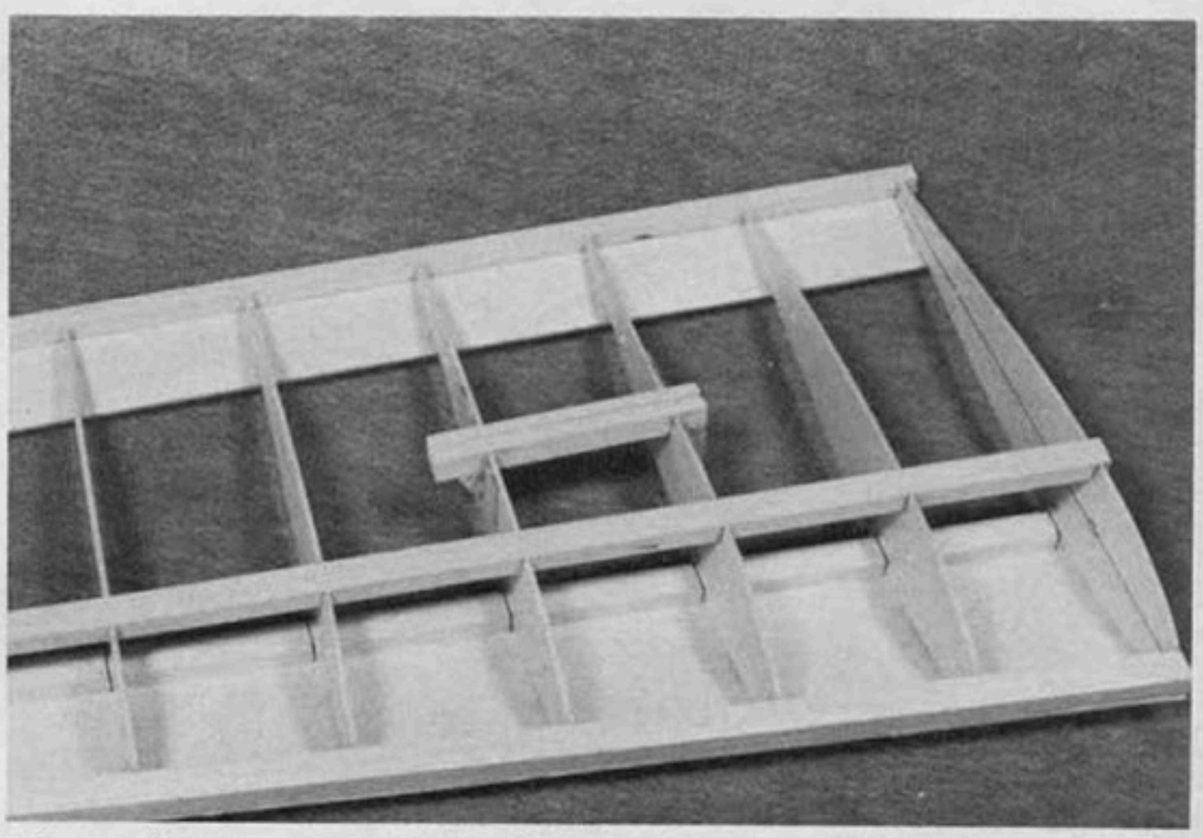
The bottom L.E. shaped to the rib contour.



The bottom L.E. sheeting installed and L.E. sanded to shape.



The main gear support with the torsion block installed.



The main gear support/torsion block assembly installed on the bottom side of the wing. Note both the gusset at the outboard end of the main gear support and the ply brace glued to the rib.

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mount rails to keep out unwanted glue, and glue the motor mount supports in place.☆ Add a piece of 3/4'' *tri stock* down the sides of the motor mount supports. The tri stock should be installed so one flat side will mate with the chin block to be glued in place next.☆

Relieve the top back edge of the *chin block* so it will clear the bottom nosegear mounting screws and nuts, and glue the chin block in place.☆ Add the two 1/4'' ply *fuselage wing hold-down plates* inside the fuselage.☆ Glue 1/4'' *tri stock* to the bottom of the sides and back of the fuselage wing hold-down plates☆

To mount the ply spinner ring in place for a perfect fit, use your ply spinner ring as a template and prepare a shim out of a piece of scrap 1/16'' balsa. Tack glue the balsa shim to the back of the aluminum spinner plate.☆

Mount the engine temporarily in place. Put the ply spinner ring onto the engine thrust washer so it rests against the fuse. Then put the spinner plate — with shim — in place. If the spinner plate won't seat, sand the appropriate area of the front of the fuse as necessary.☆ With the prop bolted in place, hold the ply spinner ring forward to the balsa shim on the back of the spinner plate. Don't worry about small gaps between the spinner ring and the fuse. Large gaps can be shimmed. Get some epoxy between the ply spinner ring and the front of the fuselage and hold the ply spinner ring up to the balsa shim while the epoxy sets up.☆

Remove the prop and engine from the fuse. Remove the 1/16'' balsa shim from the spinner plate.☆ Use epoxy and micro balloons to fill any gaps between the ply spinner ring and the front of the fuselage☆

At this point the fuselage should be complete except that it has not been shaped and the ply wing fillet base pieces, fin, sub fin, and stab are not yet installed.

THE STAB, ELEVATOR, FIN AND RUDDER

Sand the inboard end of each of the *leading edge blocks* as necessary so they will fit together at the proper angle. The groove serves to center the stab ribs and to assure a strong rib to leading and trailing edge glue joint.☆ Glue the two leading edge blocks together and pin them in place on your building board.☆

Use the root and center ribs to space the *trailing edge block* and pin it in place.☆ Sand the *center rib filler block* to the rib contour. Glue it and the *center* and *root ribs* in place.☆ Glue in the remaining ribs.☆ Cut and install the *angle braces* using the 3/32'' x 1/4'' balsa stock.☆

When the glue has dried and while the stab is still pinned down on your building board, apply the 1/16'' *top sheeting* so it butts up to the leading and trailing edge. Be certain that when installed, the sheeting is seated on each rib and butts up to the leading and trailing edge.☆ Remove the stab from the building board after the glue has set-up and install the *bottom sheeting*.☆ Cut the leading edge to shape and finish sand it with your 12-18 inch sanding block. See the plans.☆ To shape the trailing edge, tack glue the elevators to the stab T.E., then sand the stab T.E. down to size.☆ Add

the stab *tip blocks* and sand them to a sharp edge as shown on the plans.☆

Break the tack-glued *elevator halves* free from the stab and sand them to shape. The T.E. of the elevators should be left 1/8" thick rather than sanded to a sharp edge. Do not install the elevators onto the stab yet. They are to be hinged after the stab is installed on the fuselage.☆

Glue the two rear *fin pieces* together. The forward fin piece should not be glued in place until after the other fin pieces are glued to the fuselage.☆ Glue the *rudder pieces* together and add the plywood *rudder horn insert*. If you want to make the rudder horn insert flush with the surface of the rudder, you can either laminate several pieces of ply together or add a piece of scrap balsa to one side.☆ Sand the sides of the fin and rudder smooth.☆ Round the fin tip and taper the rudder T.E. down to 1/8". Do not hinge the rudder until the fin has been installed onto the fuse.☆

At this point you should have the stab, elevators, a forward fin piece, the fin, and the rudder ready to install.

THE WING PANELS

Lay both pieces of leading edge stock on your workbench with the 3/4" side down. Draw a center line down the length of the top side.☆ Also draw a center line down ribs 1, 6, and 11, from the leading to the trailing edge.☆ Finally, relieve the appropriate ribs for your landing gear. If you're using fixed gear, the bottom of ribs 3 and 4 should be notched for the hardwood main gear support. The support should be mounted so it will be just flush with the balsa center section sheeting. If you're using retract gear, the ribs should be relieved for the 1/4" plywood retract gear mounting plate just deep enough so the mounting flange on the retract gear is flush with the balsa center section sheeting. Also relieve the ribs for the retract gas tubes, wires, or linkage.☆

When you build the wing panels, rib 1 is to be glued only to the leading and trailing edge pieces. It should not be glued to the spars and leading and trailing edge sheeting. That will allow you to adjust the angle of the root rib on each panel so they will mate squarely when the wing panels are joined. With the angle of the root rib properly adjusted, each one is glued to the spars and sheeting. Then the wing panels are joined.

Building The Wing Panels On A RCM Wing Jig

To build the wing panels on a wing jig, use the sequence outlined for building one wing on a building board which follows. However, to make sure the ribs are properly spaced, mark the location of the ribs on the spars and trailing edge stock. Begin by putting the ribs onto the jig, then pin and glue the bottom spar in place.

Building The Wing Panels On A Building Board

Before you get started, save yourself some grief by checking out your building board with a straight edge or carpenter's level to make sure you have a flat surface. To make the work easier, set up your wing so the leading edge is toward the front of your workbench.

Since the wing is built top side up, begin by pinning the 3/8" x 1/2" *bottom spar* down.☆ Pin rib 1 in place on the spar but do not glue it.☆ Pin and glue the other *ribs* in place on the bottom spar. The ribs relieved for the landing gear should have the notched side down.☆ Add the *trailing edge*, making sure that the ribs are at 90° to the trailing edge stock. Note that 5/16" x 1/4" stock is called for on the plans, but 1/4" x 1/4" is more readily available and works just as well.☆ Sand the trailing edge to the rib contour with the king sized sanding block.☆ Add the 3/32" x 2" top *trailing edge sheeting*, but don't glue it to rib 1.☆ Block up the trailing edge of the wing as necessary so the center lines on ribs 1, 6, and 11 are parallel to your building board.☆ Glue the *top spar* in place to ribs 2-11 and pin it to rib 1.☆ Add the *leading edge* so the center line aligns with the center line on ribs 1, 6, and 11. Center the other ribs on the leading edge.☆

Use your X-Acto knife to roughly shape the top of the leading edge stock to the rib contour. Then sand it smooth to the rib contour with the big

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sanding block. The front of the leading edge should not be rounded until the top and bottom sheeting have been installed.☆ Add the 3/32'' x 4'' *leading edge sheeting* so it goes to the center of the spar and overlaps the leading edge. Do not glue the leading edge sheeting to rib 1. The outside of the sheeting may be dampened with a sponge so it will bend to the rib contour easily.☆ Trim the leading edge sheet flush with the front of the leading edge.☆ Add the 3/32'' x 4'' *center section sheeting pieces*, but don't glue them to rib 1.☆ Glue the 3/32'' x 3/8'' *capstrips* in place.☆

Remove the wing from the building board. Shape the bottom of the leading and trailing edge to the rib contour.☆ Add the bottom *trailing edge sheeting*.☆

Build the second wing panel in the same way. Be sure to set up the other wing panel carefully so you won't end up with two right or left wings.

FINISHING THE WING

Now it's time to glue rib 1 of both wing panels in place. To find the proper angle, turn the wing panels upside down and move them together. With the spar at the tip rib down on the building board, block the center of each wing panel up 3/8 of an inch. Adjust the angle of rib 1 on each wing panel so these ribs will mate squarely when the wing panels are joined. Glue rib 1 on each wing panel in place to the spars and the sheeting.☆ Trim the leading edge, spars, trailing edge, etc., flush with rib 1.☆ Glue the wing panels together using 5 minute epoxy. As you do so the center section should be blocked up 3/8''.☆

Glue the *aileron torque rods* in place into the groove in the *center section trailing edge pieces*.☆ Put some Vaseline around both ends of each torque rod sleeve to make certain epoxy glue

won't get inside, and glue the center section trailing edge pieces in place. Add the 1/16" ply *hold-down plate* on the bottom of the wing with 5 minute epoxy. See the plans.☆

As preparation for the installation of the wing hold down dowels, draw a line on the bottom back of bulkhead 2 to indicate the location of the center of the wing dowel holes.

Time to align the wing to the fuselage. Lay the fuse upside down on your workbench and tape the back end down so it won't move. Put the wing in place in the wing saddle. Center the wing on the fuselage by measuring the distance from each tip rib to the fuselage side.☆ To assure the wing is straight, measure the distance from each wing tip to a point on the center of the trailing edge of the fuselage. Obviously, both distances must be the same. Mark the location of the fuselage on the leading and trailing edge of the wing. Also draw a line down the wing cord on the fuselage side of the wing along both sides of the fuselage — to mark the location of the outside of the fuselage sides. This line will be used to locate the ply wing fillet base pieces. Also mark the location of the holes to be drilled in the wing for the rear hold-down bolts. Drill a pilot hole through the wing hold-down plate into the 1/4" ply plates in the fuselage to mark the location of the holes.☆ Remove the wing from the fuse. If the holes are properly located on the fuselage hold-down plates, drill out the clearance holes in the wing for the 6/32 hold-down screws. Also drill the holes in the plates for the blind nuts and install the blind nuts on the bottom side of the fuselage wing hold-down plates.☆

Next the alignment of the wing saddle is to be checked. First the wing fillet base pieces should be taped in place on the wing. Working on the wing, draw a line down the wing cord 3/16" inboard of each of the lines you drew earlier. Tape each *1/32" wing fillet base piece* to the wing so it butts up to this inboard line. Be certain that the tape will be clear of the wing saddle. Put the wing in place on the fuselage to check the alignment of the fillet base pieces.☆ If they are okay, run a strip of masking tape down the wing so it butts up to the straight-edge of the ply fillet base pieces to prevent glue from seeping out from the saddle and gluing the wing in place. Now you're ready to get to the final alignment of the saddle.☆

With the fuselage still taped down on your workbench, bolt the wing in place. To assure the wing is level, measure the distance from each wing tip to the workbench. To check the wing incidence, work on one side of the wing at the fuselage. Measure the distance from the center of the leading edge to the line you drew earlier on the fuse side. Also measure the distance from the center of the trailing edge to the other end of the same line. Because the wing incidence is slightly positive, the distance should be 1/32" more at the trailing edge.☆ Double check yourself by repeating this process on the other side of the fuse.☆ Remove the wing and sand or shim the saddle as necessary to assure that the wing is level

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and is at the proper incidence. Put the wing back in place and check it again. Don't worry about trying to get an exact wing-to-saddle fit since the ply fillet base will give you a perfect fit when you're done.☆

When the saddle is okay, put a thin coat of 5 minute epoxy on it. Bolt the wing in place and push down firmly on the front center of the wing to assure the forward end of the fillet base pieces will seat properly to the wing saddle.☆ While the wing is still in place on the fuselage, use the marks on the back of bulkhead 2 to mark the location of the holes for the wing hold-down dowels on the wing leading edge.☆ After the epoxy on the fillet base pieces has set-up, remove the tape from them and remove the wing from the fuse. The fuselage may be removed from the workbench.☆

Any gaps between the wing fillet base pieces and the saddle may be filled with epoxy.☆ Add pieces of *1/4'' triangular stock* to the fillet base pieces along the fuselage sides.☆ Use 5 minute epoxy to glue the back ends of the fillet base pieces to the fuse sides.☆ Add *1/4'' triangle stock* to this area as well.☆

Drill the two 1/4'' holes through the leading edge for the hold-down dowels.☆ Now you're ready to glue the dowels in place. Bolt the wing in place onto the fuse. Put the ply *dowel support pieces* onto the *wing hold-down dowels*. Slide one end of the dowels through the holes in the wing leading edge and into the holes in bulkhead 2. Add some 5 minute epoxy to the back of the ply dowel support pieces and, while holding the wing firmly in the wing saddle, slide the dowel support pieces to the rear so they'll glue to the front of the top and bottom spar.☆ Glue the dowels to the ply support pieces and to the wing leading edge.☆ Add a *false rib* to both sides of each dowel.☆ Remove the wing from the fuselage.☆

Glue the *bottom leading edge sheeting* in place as you did the top leading edge, and trim it flush with the leading edge.☆ If you are using fixed gear, glue the *torsion block* to the bottom side of the *main gear support*. The grooved side of the torsion block should be oriented toward the outboard end of the main gear support.☆ Glue one 1/16'' ply *main gear brace* on the inboard side of rib 3 and the other on the outboard side of rib 4.☆ Glue the main gear support/torsion block assembly in place so the torsion block is glued to the main gear brace on rib 3.☆ Add the *triangular hardwood gusset* at the outboard end of each main gear support. (If you're using retract gear, glue the *retract gear mounting plate* in place.☆ Add the 1/16'' ply *retract gear mounting plate braces.)*☆

Add the *bottom center section sheeting* and *capstrips*.☆ Use your king sized sanding block to round the leading edge. For the desired flight characteristics the leading edge should be blunt rather than sharp. See the plans.☆ Trim the leading edge, top and bottom sheeting and the trailing edge sheeting flush with the tip rib.☆ Add the *tip blocks* and sand them to a sharp edge along the tip as shown.☆

Use 4 to 6 oz. glass cloth at least 5 inches wide with resin to reinforce the wing center section.☆ Sand the *ailerons* to shape. A slightly rounded T.E. about 1/8'' is recommended.☆ Install the ailerons using at least 4 hinges for each one. The outboard hinge should be within 1/2'' of the end of each aileron.☆

Put the wing in place on the fuse and glue the *wing fairing front, sides,* and *bottom* in place using 5 minute epoxy.☆ Holding the wing upside down at the center section, do a tip to tip balance. Add weight to either wing tip as necessary.☆

The aileron servo well may now be cut into the top side of the wing.☆ Add the 1/2'' x 1/2'' hardwood servo mounting rails into the servo cavity.☆

FINISHING THE FUSE

Time to check the stab saddle and mark the stab for installation. With the fuse upside down on

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your workbench, mount the wing in place. Put the *stab* in place to check the alignment. The L.E. of the stab cut-out in the fuse may have to be enlarged a little to get the stab in place.☆ Make sure that (1) the distance from the stab tip to the fuse is the same for both stab sides, (2) the distance from the center of the stab L.E. and T.E. to the workbench is the same for each stab panel (0° incidence) and for both panels, and, (3) the distance from the L.E. of one stab tip to the T.E. of the wing tip rib on the same side of the fuse is the same as for the other stab panel. Mark the location of the fuselage on the leading and trailing edge of the stab so you will be able to locate it properly when you are ready to glue it in place. Sand or shim the stab saddle as necessary.☆

Turn the fuse right-side-up and glue the *fin rear sections piece* in place. The fin T.E. should be aligned with the fuse T.E. and it should be at 90° to the fuse top. Eyeball the fin from the front in relation to the wing to make sure it's okay before the glue sets up.☆ Add the *forward fin piece*.☆ To glue the *sub fin* in place, first pin the rudder to the fin. Then use the rudder to align the T.E. of the sub fin. The L.E. of the sub fin should be centered on the fuse bottom.☆

Remove the wing from the fuse. File and sand the fuselage and wing fairing to shape.☆ Use 3/4 oz. glass cloth and resin on the fuselage, stab, fin, sub fin, rudder, wing fairing, and elevator.☆ Shape the bottom of the balsa *stab top filler block* so it fits to the top half of the stab.☆ Glue the stab in place in the fuselage using 5 minute epoxy, making sure it's properly aligned. Epoxy must be used for this joint because the stab has already been covered with resin and glass.☆ Add the stab filler block by sliding it in place on top of the stab. It should be glued to the top of the stab and the fuselage.☆ Hinge the rudder using at least three hinges. By making a slight "V" notch in the T.E. of the fin and cutting the L.E. of the rudder to a slight "V" shape, the hinge gap may be minimized. The bottom hinge should be into the sub fin.☆

Install the elevator horns onto each elevator half. Each one should be cocked forward at 15°. This will assure that both inside and outside loops take the same amount of control on the elevator stick. Using a horn on each elevator half means that the elevators are independently adjustable; a feature important for fine trimming of the airplane. For additional strength, a piece of 1/16" ply may be countersunk into the elevator halves at the 15° angle in the location of the elevator horns.☆ Prepare the stab T.E. and elevator L.E. as you did the fin and rudder.☆ Install at least three hinges on each elevator half.☆

Finish the area under the canopy as it will be for the finished airplane and install the canopy using Hot Stuff.☆ Use resin and micro balloons to build a fillet around the canopy, along the sides of the bottom wing fairing, along the stab/fuse joints and along the fin and sub fin/fuse joints.☆ Complete the wing fillet by adding resin and micro balloons to the plywood plate to get the desired shape. See the plans.☆

Cut the pushrod exit holes for the elevator and rudder. See the plans. Note that the rudder pushrod exit hole is actually on the bottom of the fuselage, near the sub fin.☆

The rudder and elevator pushrods may be prepared at this time. Since the split elevator will need two rods and clevises at the rear, double clevis rods will have to be attached to the rear of the elevator pushrod.☆

Install the nosegear steering linkage. The steering arm should be at an angle to bulkhead 1 so it will be free to move back and forth.☆ Install the main landing gear. If retracts are used, the main gear struts should be cut so the plane rests on the ground with a slightly positive incidence. The wheel wells may be cut out. Add hardwood rails above the retracted nose gear to support the fuel tank.☆

LOCATING THE CG

To set up the CG, the plane should be finished. The landing gear, engine, muffler, fuel tank, battery, and receiver should be installed. The pushrods should be in place inside the fuse. Lay the servos on top of the fuselage and move them fore and aft until the desired balance point is found. Then the servos are mounted inside the fuselage at this location.

While the specific location of the CG in a pattern ship is a matter of personal preference, we recommend locating it at a point approximately 6½" in front of the T.E. at the wing tips for your first flights. Above all, the plane must not be tail heavy. The CG may then be checked in flight by putting the plane into a tightly banked turn. If the nose drops, the plane is nose heavy. If the tail drops during the bank, the plane is tail heavy. Shift the battery pack or add weight to the nose as necessary. The CG may also be checked by putting the plane into a spin. If it wants to go into a spiral dive instead, it's nose heavy. The landing is another thing to check. If elevator must be added to keep the plane flared out for the touch down, it may be nose heavy.

FINAL CHECK-OUT

With the plane standing on the ground, measure the distance of each wing tip to the ground. Bend the main gear as necessary so the wing tips are level. Eyeball the plane from the side.☆ It should rest in a slightly nose-up attitude.☆

Check the roll of the plane to make sure it rolls straight.☆ Check the operation of the control surfaces to make sure they operate freely and in the direction they should.☆ With someone holding the plane, check the operation of the surfaces with the engine running wide open — to check for the effects of vibration.☆ And do a distance check with your radio.

Time to go a'flyin'. □

NOTE: CENTER SECTION BUTTS TOGETHER ONLY. NO CENTER DIHEDRAL BRACES ARE NEEDED. CLOTH, GLASS CLOTH, CELASTIC OR OTHER MATERIALS ARE REQUIRED TO SUPPORT THE CENTER SECTION. EXTEND MATERIAL 2"-3" ON EACH SIDE OF CENTER RIB.

1/4" HARDWOOD DOWEL

3/16" BALSA FALSE RIB (TOP & BOTTOM)

1/16" PLY PLATE

1/2"X 3/4" BALSA LEADING EDGE

3/32"X 4" BALSA LEADING EDGE SHEETING

3/8"X 1/2" BALSA SPARS

3/32"X 3/8" BALSA CAP STRIPS (TYPICAL)

AILERON SERVO CUTOUT (TOP OF WING)

WHEEL IN RETRACT POSITION

1/16" PLY PLATES

TOP CENTER SHEETING TO HERE

BOTTOM CENTER SHEETING TO HERE

LANDING GEAR BLOCKS

PINE BLOCK

1/16" PLY PLATES

L/G BLOCKS

PINE BLOCK

SECTION A-A

ALL RIBS 3/32" BALSA

BALSA TIP

3/32"X 2" BALSA TRAILING EDGE SHEETING

5/16"X 1/4" BALSA TRAILING EDGE

HINGE LOCATION

AILERON TORQUE ROD 1/8" WIRE WITH METAL BEARING

3/8"X 1-1/4" BALSA AILERONS

1/16" PLY BOTTOM PLATE

C.G.

NOTE:
KEEP TIP SHARP- INLAY EDGE OF TIP WITH PLY OR WIRE FOR PROTECTION. THIS APPLIES TO STAB ALSO.

ALL WING RIBS 3/32" BALSA (2 EACH REQ'D)

ALL ELEVATOR RIBS 1/16" BALSA (2 EACH REQ'D)

3/16" BALSA FALSE RIB (2 EACH REQ'D)

TIP SECTION B-B

BALSA TIP BLOCK

SHEET ENTIRE STAB WITH 1/16" BALSA (TOP & BOTTOM)

1/16" BALSA RIBS

3/32"X 1/4" BALSA ANGLE BRACES

3/8"X 1/2" BALSA LEADING EDGE (FINISHED)

1/4"X 1/2" BALSA TRAILING EDGE (FINISHED)

HINGE LOCATION

3/8" BALSA ELEVATORS

1/32" PLY (2 REQ'D)

WING FILLET TEMPLATE

MICRO-BALLOONS FILLET

3/16" BALSA FUSELAGE SIDES

1/4" BALSA TRIANGLE STOCK

1/32" PLY FILLET BASE

WING FILLET DETAIL

1/4" HOLE

1/16" PLY WING DOWEL PLATE (2 REQ'D)

BOTTOM OF WING

TOP OF WING FACING TABLE

3/8" AT CENTER

DIHEDRAL DETAIL

1/32" PLY DOUBLER

3/16" BALSA SIDES

L.E. OF FUEL COMPARTMENT BLOCK

1/16" PLY SPINNER RING

1/2" HARDWOOD MOTOR MOUNTS WITH 1/4" TRIANGLE STOCK ON TOP & BOTTOM

1/4" TRIANGLE STOCK

BATTERY PACK

RCVR

TOP CROSS BRACE LOCATION

SERVOS

1/4" PLY WING HOLD DOWN PLATES

BULKHEAD #3

1/4" TRIANGLE STOCK

TOP BLOCK & 3/8" TRIANGLE STRINGERS NOT SHOW IN THIS VIEW

1/4"X 3/8" BALSA CROSS BRACE (TOP)

1/2" BALSA FILLER

PLACE HORN ON BOTH ELEVATORS

2-1/4" SPINNER

5/8" TRIANGLE STOCK

GOLDBERG STEERING ARM & BRACKET

END OF FUEL COMPARTMENT BLOCK

1/32" PLY FILLET LINE- FITS INSIDE WING SADDLE CUT OUT

1-1/4" BALSA BLOCK (CROSS GRAIN)

3/16" BALSA SIDES

1/2" HARDWOOD MOTOR MOUNTS

BALSA MOTOR MOUNT SUPPORT

5/8" BALSA TRIANGLE STOCK

BALSA CHIN BLOCK

SECTION D-D

CROSS SECTION VIEW OF CANOPY

FINISHED OUTLINE

BALSA OUTLINE BEFORE CARVING

SECTION C-C

TYPICAL CROSS SECTION OF FUSELAGE TOP

3/8" BALSA STOCK

1/16" BALSA SHEETING

1/4" BALSA STOCK

CONSTRUCT ELEVATOR ON FLAT TABLE SURFACE

TABLE TOP

ELEVATOR CONSTRUCTION DETAIL

FIN INSET INTO TOP BLOCK FOR STRENGTH

3/8" BALSA FIN & RUDDER

3/8" BALSA BOTTOM DORSAL FIN

PINE INSERT FOR RUDDER HORN

SLANT ELEVATOR HORNS 15° FORWARD

RUDDER PUSHROD EXIT (LEFT)

ENGINE USED- VECO .61 WITH PUMP- INSTALL UPRIGHT

CUTOUT FOR ENGINE

FOR RETRACTS, CUTOUT BLOCK TO CLEAR FUEL TANK

3/8" BALSA BLOCK

TRIANGLE STRINGERS ENDS HERE

SPLIT FUSELAGE SIDES AT THIS POINT

1/4"X 3/8" BALSA CROSS BRACES (TYPICAL)

3/8" BALSA TOP BLOCK

DENOTES OUTLINE OF FUSELAGE SIDES

3/8" TRIANGLE STRINGERS

5/8" BALSA TRIANGLE STOCK

USE 12 TO 14 OZ. TANK

#1

#2

#3

BATTERY PACK

C.G.

RECEIVER

THROTTLE LINKAGE

SERVO AREA

DENOTES OUTLINE OF 1/32" PLY FUSELAGE DOUBLER

1-1/4" BALSA BLOCK-CROSS GRAIN

STEERING LINKAGE

AILERON LINKAGE

6-32 BLIND NUTS

1/4" BALSA TRIANGLE STOCK

1/4" PLY WING HOLD DOWN PLATE

RUDDER PUSHROD

ELEVATOR PUSHROD

ELEVATOR PUSHROD EXITS (BOTH SIDES)

1/4" SQ BALSA VERTICAL BRACE

3/8" BALSA STAB TOP FILLER BLOCK-CARVE TO FIT

0°

5/8" TRI. STOCK

1/2" HARDWOOD MOTOR MOUNTS

BALSA M.M. SUPPORT

1/4" WING DOWELS

1/32" POSITIVE INCIDENCE

1/4" SQ BALSA BRACE ACROSS BOTTOM

1/4" BALSA BOTTOM

2° DOWN THRUST
NO RIGHT THRUST

PROP USED 11-7-3/4 OR 11-8 REV-UP

BALSA CHIN BLOCK TO HERE

1" CLEARANCE HOLE FOR NOSE GEAR

3/8" BALSA BOTTOM BLOCK

BALSA SIDE BLOCK

1/4" BALSA WING FAIRING

AILERON SERVO

1/16" PLY PLATES

1/32" PLY FILLET

1/16" PLY PLATE

HARDWOOD L/G MOUNTS FOR FIXED GEAR

6-32 X 1" MACH. SCREWS FOR WING HOLD DOWNS

CANOPY OUTLINE

90°

90°

93°

LANDING GEAR PATTERN 5/32" MUSIC WIRE (2)

NOSE GEAR 5/32" MUSIC WIRE

BEVEL EDGE

SPINNER RING 1/16" PLY

2-1/4" HARD NOSE WHEEL

#1 1/4" PLY

#2 1/4" PLY

#3 1/4" BALSA

2-1/4" SOFT WHEELS

5/8" BALSA TRIANGLE STOCK

THROTTLE PUSHROD

5/8" BALSA TRIANGLE

BALSA MOTOR MOUNT SUPPORTS

BALSA SIDE BLOCK

BALSA CHIN BLOCK

3/8" BALSA BLOCK

FUEL LINE HOLES

3/16" BALSA SIDES

1/2" HARDW'D MOTOR MOUNTS

3/8" BALSA BOTTOM BLOCK

BULKHEAD #1

1/4" BALSA TRIANGLE STOCK

WING DOWEL HOLES

BULKHEAD #2

3/8" BALSA TOP BLOCK

3/8" BALSA BLOCK

1/4" PLY WING HOLD DOWN PLATES

BALSA SIDE BLOCK- CUT AWAY TO CLEAR DOWELS

1/4"X 3/8" BALSA CROSS BRACES

3/8" TRIANGLE STRINGERS

1/32" PLY DOUBLERS

3/16" BALSA SIDES

1/4" BALSA TRIANGLE STOCK

MICRO-BALLOON FILLETS

1/32" PLY WING FILLETS

1/4" BALSA BOTTOM

BULKHEAD #3 1/4" BALSA

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DIRTY BIRDY

DESIGNED & DRAWN BY	JOSEPH BRIDI	INKED BY	DICK KIDD

0 1 2 3 4 5 6