

Dirty Birdy

BY JOE BRIDI

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

Text By Ben Strasser

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 17 1/4" 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 17 1/4" 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 the bottom of the stab to the rear of the fuse. ☆

Cut the *servo compartment doublers* 1 3/4" 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 1 1/16" 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. ☆

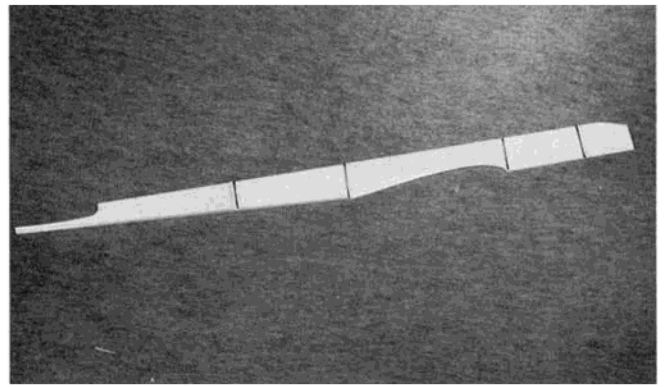
The *fuel compartment bottom block* is 3/8" x 3 1/2" x 7" and is cut from 3/8" x 4" x 36" balsa sheet. ☆ The *fuel compartment top block* is cut from the same balsa sheet. ☆ Cut the two *top block stringers* to width from the 3/8" x 2" x 36" balsa. ☆ The hardwood *motor mount rails* are cut to shape from 1/2" x 1 1/4" 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 3 1/2" x 4" and is cut from 3/4" x 4" x 36" balsa. The 1 1/4" x 1 1/2" x 2 3/8" *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 2 3/8" long. ☆

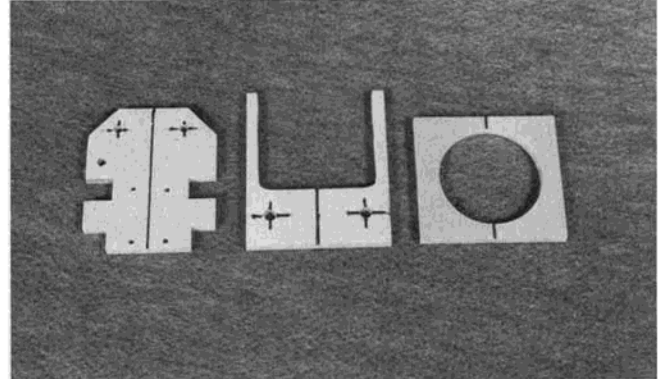
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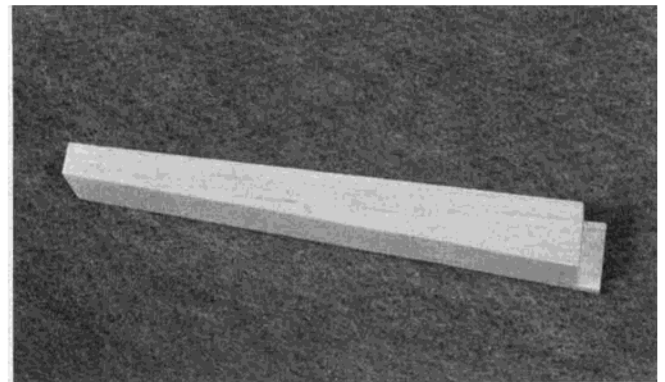
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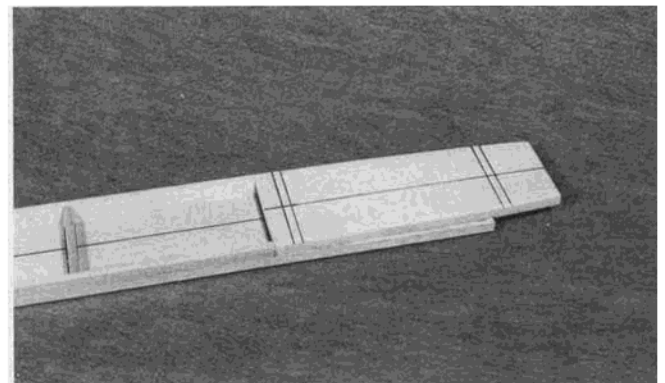
Fuselage side showing wing and stab cut-outs.



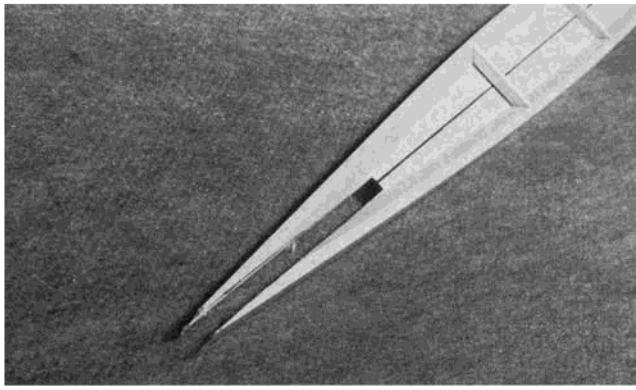
Bulkheads 1, 2, and 3.



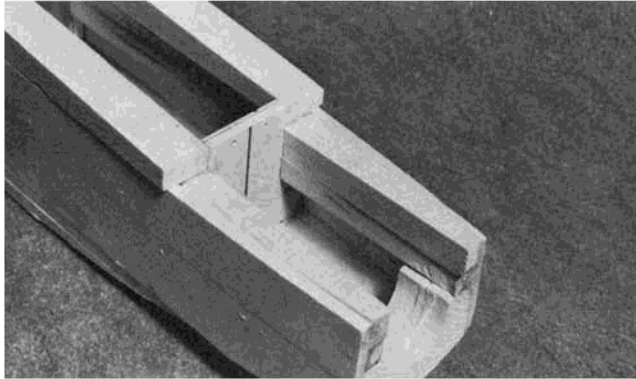
Balsa side block showing cut-out for bulkhead 2.



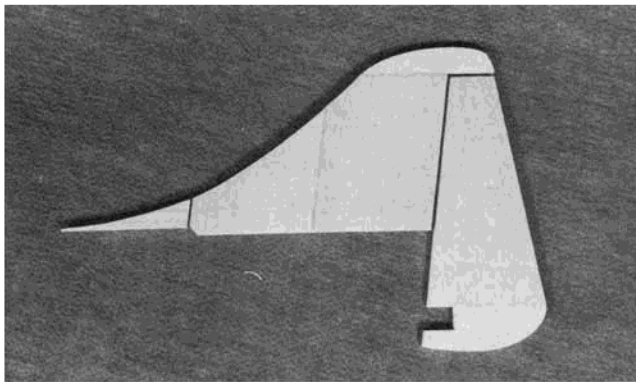
Fuselage top block with engine compartment top block in place.



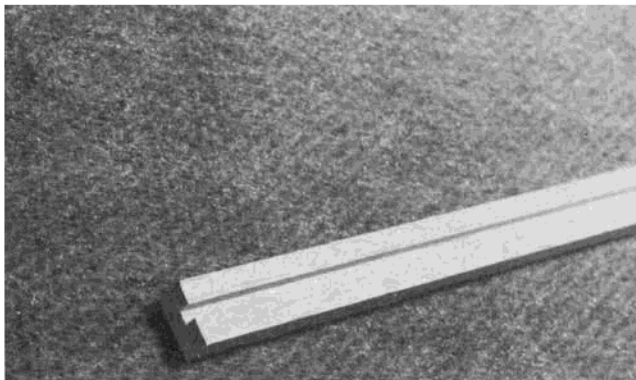
Top block showing slot for fin.



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 $3/8'' \times 3/4'' \times 12\frac{1}{2}''$ stab *leading edge blocks* are cut from $3/8'' \times 4'' \times 36''$ balsa sheet. ☆ The $1/4'' \times 3/4'' \times 24''$ *trailing edge block* is cut from $3/4'' \times 4'' \times 36''$ 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 $1/16'' \times 2''$ 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 $3/8'' \times 2'' \times 6-7/16''$ and is cut from the $3/8'' \times 4'' \times 36''$ 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 $3/8'' \times 3''$ balsa. ☆ Then, cut the *stab center rib filler block* from the $2'' \times 4'' \times 36''$ balsa plank. ☆ Cut the $3/4'' \times 2'' \times 7''$ *stab tip blocks* to shape from the $3/4'' \times 4'' \times 36''$ balsa sheet. ☆ The *fin* and *rudder* parts are cut from $3/8'' \times 4'' \times 36''$ 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 $3/32'' \times 3''$ 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 $3/16'' \times 2''$ balsa. ☆ The $1/2'' \times 3/4''$ *leading edge* is cut from $1/2'' \times 2'' \times 36''$ 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 $1/2'' \times 1/2''$ 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 $1\frac{1}{2}'' \times 2\frac{3}{4}''$ 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 $1\frac{1}{4}'' \times 2'' \times 9''$ balsa *wing tip blocks* to shape from the $2'' \times 4'' \times 36''$ 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 $1/4'' \times 4'' \times 36''$ balsa. The bottom is $3\frac{1}{2}'' \times 3\frac{1}{2}''$. The front is $3/4'' \times 3\frac{1}{2}''$, making sure the grain goes from side to side. The sides are $3/4'' \times 1\frac{1}{4}''$. 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.

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 1/4" 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 1/4" 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. homs
- 1 ea. Sullivan 14 oz. slant face fuel tank
- 1 ea. 2 1/4" hard rubber wheel, nose gear
- 2 ea. 2 1/4" soft rubber wheel, main gear
- 2 ea. pushrods
- 3 ea. clevis and rod assembly, nose gear steering and throttle linkage

DIRTY BIRDY Designed By: Joe Bridi

TYPE AIRCRAFT

Competition & Sport

WINGSPAN

64 1/4 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

55 3/4 Inches

RADIO COMPARTMENT AREA

(L) 13" X (W) 3" X (H) 2 1/4"

STABILIZER SPAN

27 1/2 Inches

STABILIZER CHORD (incl. elev.)

7 3/4" 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)

**From
RCModeler
June 1975**

Dirty Birdy

BY JOE BRIDI

Text By Ben Strasser

CONCLUSION

● In Part I of this construction article we included a list of materials you will need and went through the process of building a custom kit. Now it's time to get out the pins, clamps, and glue to make something worthwhile out of those pieces.

The building sequence begins with the fuselage. Because of the flat top block, the fuselage is built in typical Bridi fashion, upside down. Next, the stab, elevator, fin, and rudder are built. To add strength to the symmetrical airfoil stab, angle braces are used between the ribs. Then the wing panels are assembled and the wing halves are joined. Follow the construction sequence outline and you'll get the wing dowels in so your wing is properly located. Then finish the plane, put in the equipment, and you're ready to fly.

Since the way the plane flies is affected by the way the wing, stab, fin, and sub fin are installed, please follow the alignment procedure carefully. In addition, the hinge gaps should be kept as narrow as possible — or seal the hinge gap with a strip of Solarfilm. To make sure you get parts like the wing leading and trailing edge, the stab, the elevator, and such sanded straight, we recommend preparing a 12 to 18 inch sanding block. A piece of 1/2 x 2 aluminum channel stock with sand paper glued to the flat face works very well because it's straight, light, and easy to handle. So the building sequence will be easy to follow, the first time a part is used the name is given in italics. The marker ☆ is used to indicate that we've said all we're going to say about

installing a particular piece and it's time to get out the glue.

THE FUSELAGE

To get started, draw a center line down the length of the top block, from top to bottom on bulkheads 1, 2, and 3, and down the fuel compartment top block. ☆ Draw a line across the top block at the location of the back of the back of the fuel compartment top block, at the location of the cross brace in the center of the servo compartment, at the location of bulkhead 3, and behind bulkhead 3 at the location of the cross brace. ☆ Draw a line across the fuel compartment top block at the location of bulkheads 1 and 2. ☆ Working on the inside of the right and left fuselage sides, draw lines to mark the location of bulkheads 1, 2, and 3, and the vertical support braces. ☆ Draw a straight line on the outside of the fuselage sides just above the wing saddle. Each line should run from about 1" in front of the wing saddle to 1" behind it and located about 1½" from the straight edge of the top block. This line will be used to check the wing incidence angle. ☆

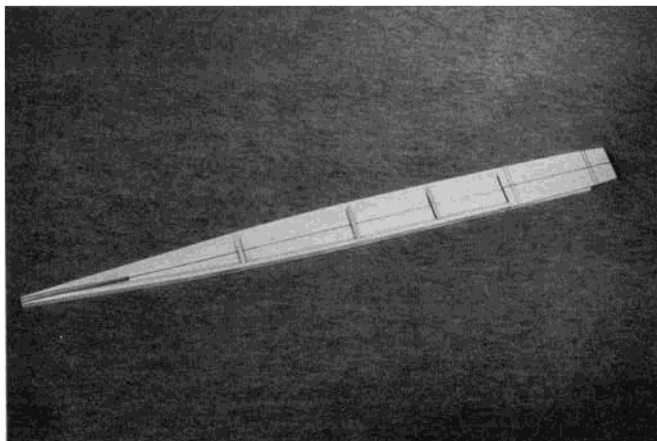
With the top edge of bulkhead 1 "up", mark and drill the holes for the nose gear bearing or retract gear, and for the throttle linkage and fuel lines. ☆ Pin the 3/8" top block down on a flat building board with the center line side up. ☆ Next, the *fuel compartment top block* is to be glued in place. If you are to use retracts, the fuel compartment top block should be cut out to make room for the fuel tank. Use the top view of the motor mount rails in the fuel compartment as a guide to mark the cut-out.

You'll note that bulkhead 2 is already cut out for this purpose. The side view of the plans indicates the forward limit of the cut-out. Be certain not to make the fuel tank cut-out too far forward or else you may sand through the top block as the nose of the fuselage is shaped later. ☆

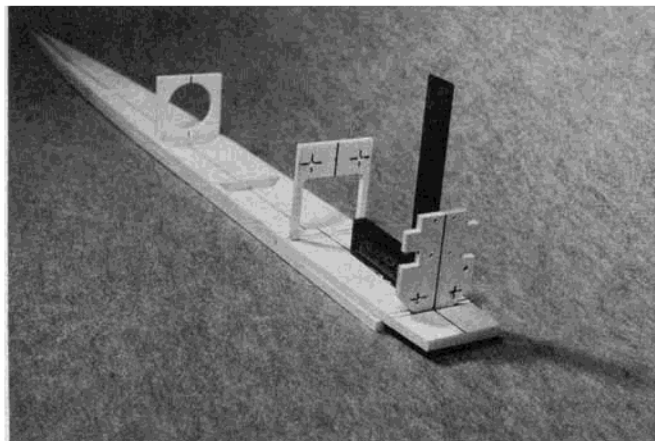
After the fuel compartment top block is glued in place, a piece of 3/8" scrap may be used under the front end to support it while you're working. ☆ Add the *top stringers* to the top block. Note that the stringers shown on the plans are triangular stock with one edge of the stock cut down to make a flat edge to mate with the fuselage side. Because of the difficulty in preparing this type of stringer, we have used 3/5" x 5/8" stock for the stringers. They should be installed with the 5/8" side onto the top block, butted up to the back of the fuel compartment top block, even with the edges of the top block, and run to the trailing edge. The width of each top stringer will have to be shaved in the area of the fin slot. ☆ Relieve the inboard corners of the stringers in the area of the servo compartment to make room for the servos. ☆ Before the glue has set-up, add the 1/4" x 3/8" *cross brace* in the center of the servo compartment, at the location of bulkhead 3, and behind bulkhead 3. The cross braces should be glued in place with the 1/4" side down. The top block stringers may be moved in or out slightly to insure a good glue bond to the cross braces. ☆ Glue *bulkheads 1, 2, and 3* in place, upside down. ☆

Glue the 1/32" ply *servo compartment doubler* in place on each fuselage side. ☆





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 9/2" 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 2 3/8" across, from side to side.

Prepare a 5/8" x 3 1/8" 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. ☆

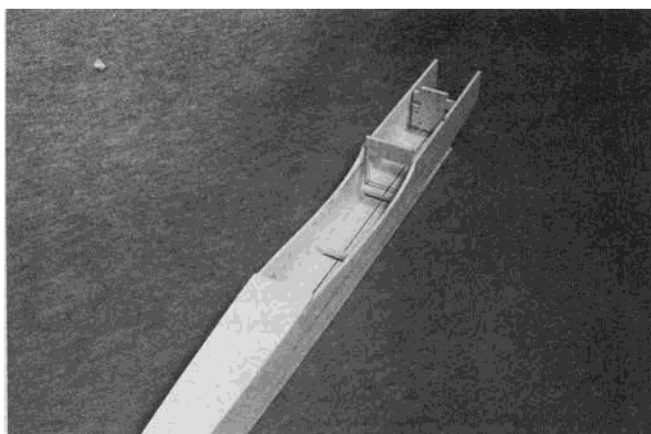
Add 1/4" *triangle stock* along the top and bottom of the motor mount rails in the area of the fuel tank compartment. ☆ Shape the sides of the *upper spinner ring filler block* to fit the angle of the fuselage sides. ☆ Glue the block in place. Cut both the top forward end of the fuel compartment top 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. ☆

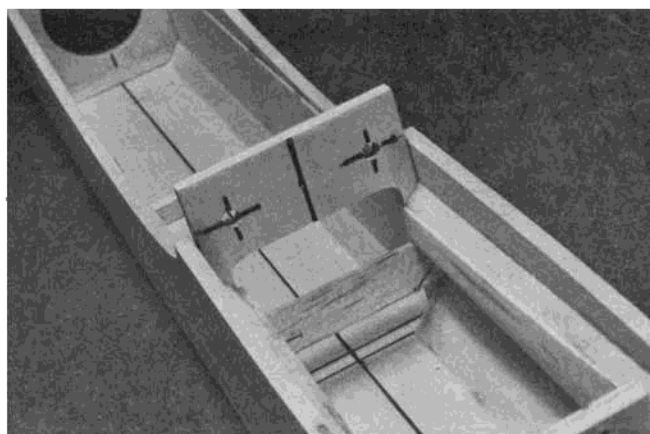
Fit the *fuel compartment side blocks* by cutting the bottom of each one to make a straight line from bulkhead 1 to bulkhead 2. Relieve the inside corner of each side block as necessary for clearance for the wing hold-down dowels. ☆ Glue the side blocks in place so they fit in the notch in bulkhead 1 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. ☆

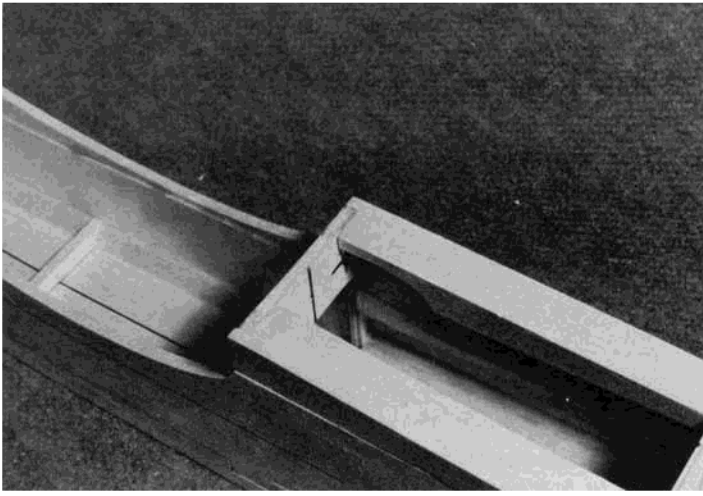
Mark and drill the engine mounting screw clearance holes in the balsa *motor mount supports*. Put a small piece of masking tape on the bottom of the blind nuts in the motor

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.

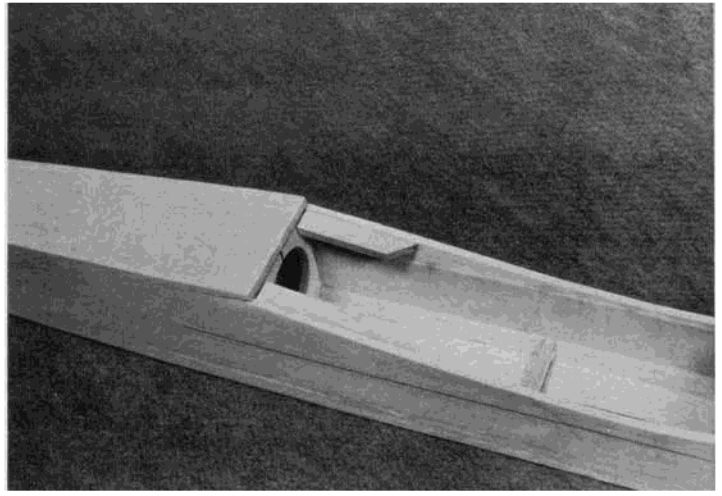


Using the scrap balsa motor mount locator template pinned in place across the front of bulkhead #2 to align the rear of the motor mount rails.

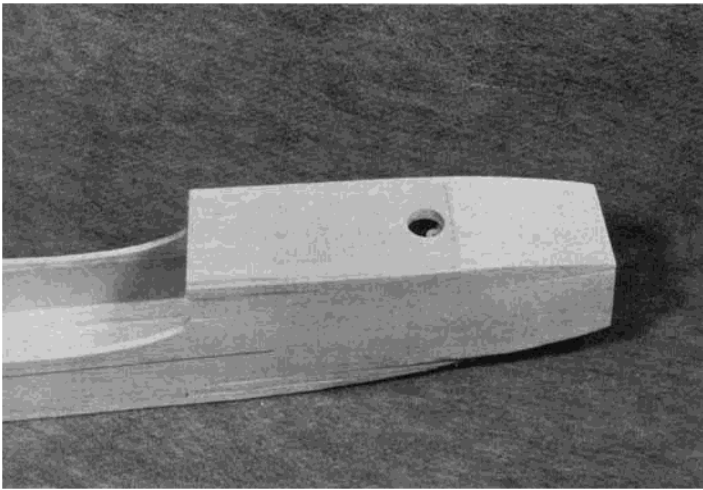




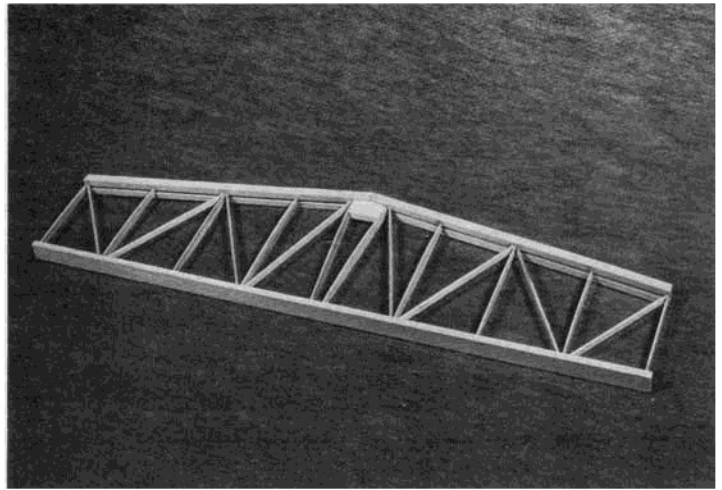
The fuel compartment side blocks glued in place so they overlap the sides of bulkhead #2 and fit in the notches cut out of bulkhead #1. The rear corners of the side blocks have been relieved for clearance of the wing hold-down dowels.



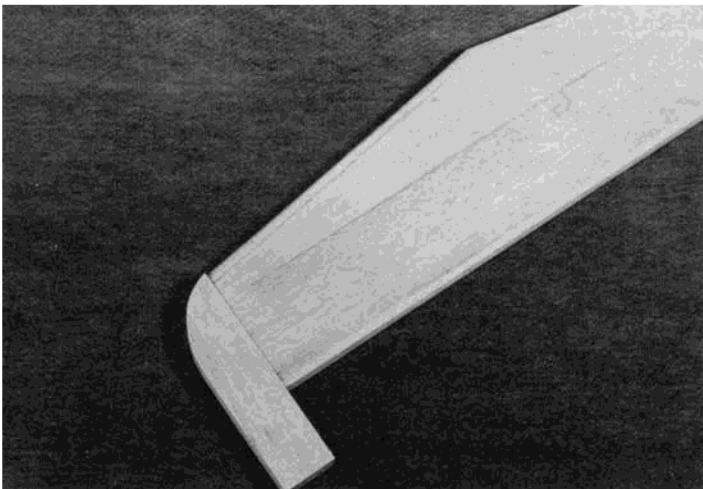
The 1/4 ply fuselage wing hold-down plates glued in place. Pieces of 1/4 triangle stock have not yet been installed.



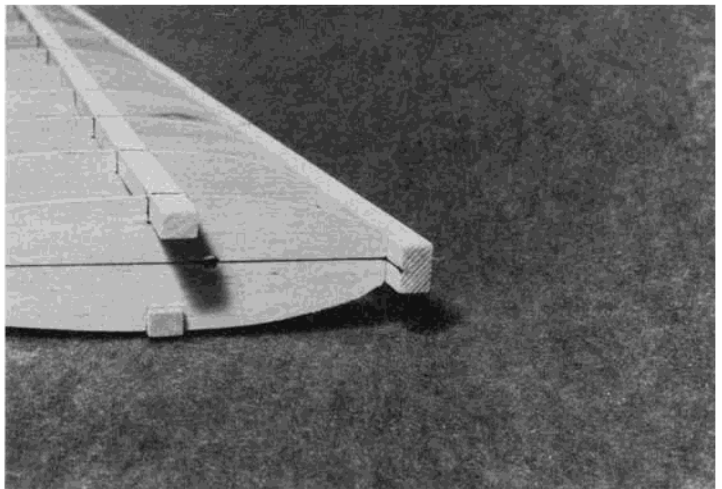
The bottom of the fuselage showing the chin block and fuel tank compartment bottom block.



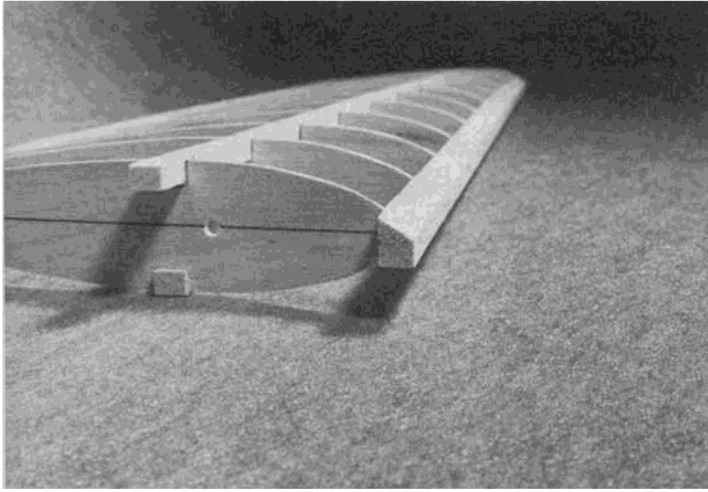
The stab ribs and cross braces glued in place to the leading and trailing edge blocks.



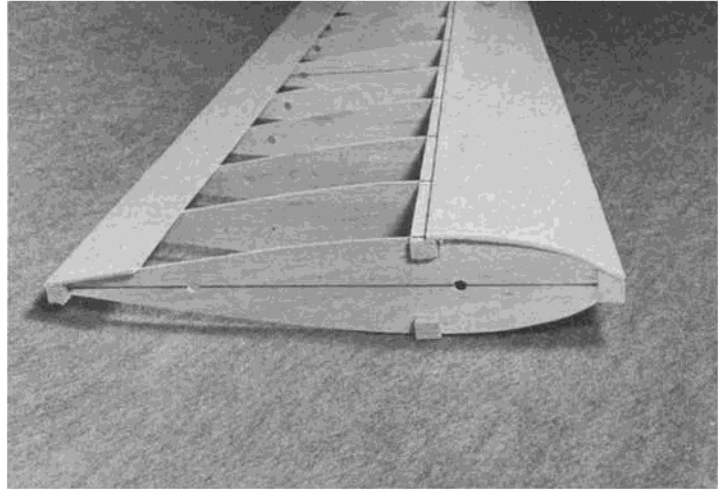
The stab is sheeted, the leading edge partially shaped, and, the tip blocks are installed.



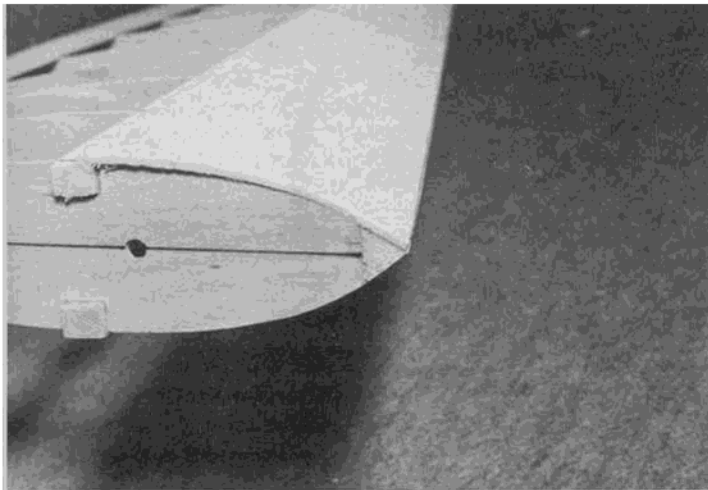
The wing leading edge installed. Note the center line on rib #1 and the back of the leading edge.



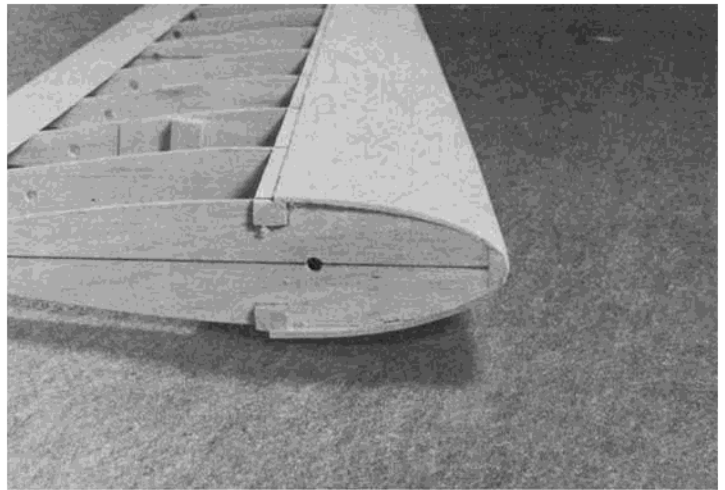
The top of the leading edge shaped to the rib contour.



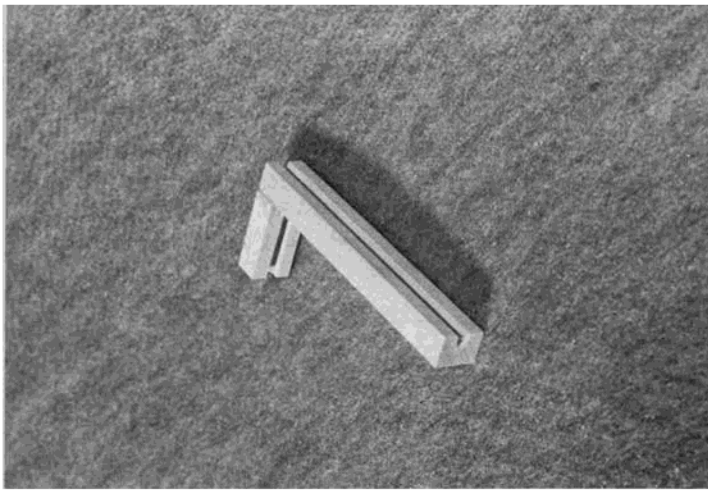
The T.E. and top L.E. sheeting installed.



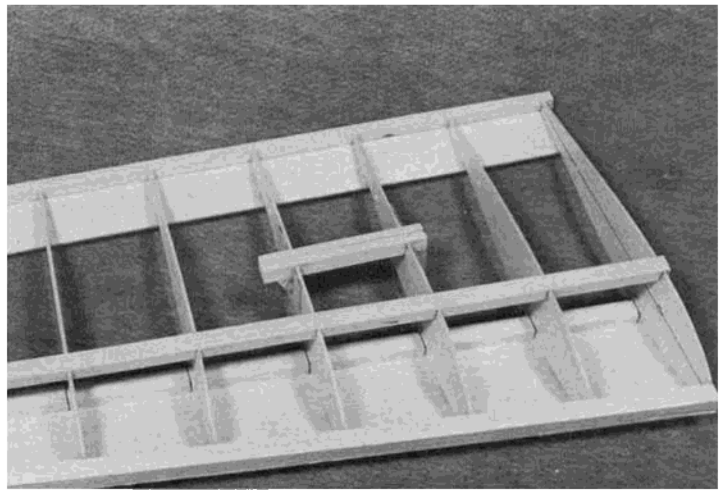
The bottom L.E. shaped to the rib contour.



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.

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 nose gear 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 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 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

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 6 1/2" 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'. □

**From
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June 1975**