ZEPHYR 1100

IT'S JUST ANOTHER California floater, you might say. But there is more to the Zephyr 1100 than meets the eye. It is also more than just a twice-sized blow-up of the hand-launched Zephyr featured in the May 1981 Model Aviation.

This model was created to fulfill the need for an all-round competition Sailplane involving various thermalling events in a variety of conditions. I set out to design a model that would be strong and light, simple and easy to fly, have low drag for penetration in winds, and have a pleasing appearance. The result is the Zephyr 1100.

We have all seen floaters blow apart on launch or be destroyed by flutter during a high-speed descent. That's not apt to happen with this model due to its great wing strength (inherited from my 2-Meter multi-task Zephyr-Deuce). The long tail moment and general outline are inherited from the hand-launched Zephyr, except the area of the tail feathers has been reduced to the minimum size.

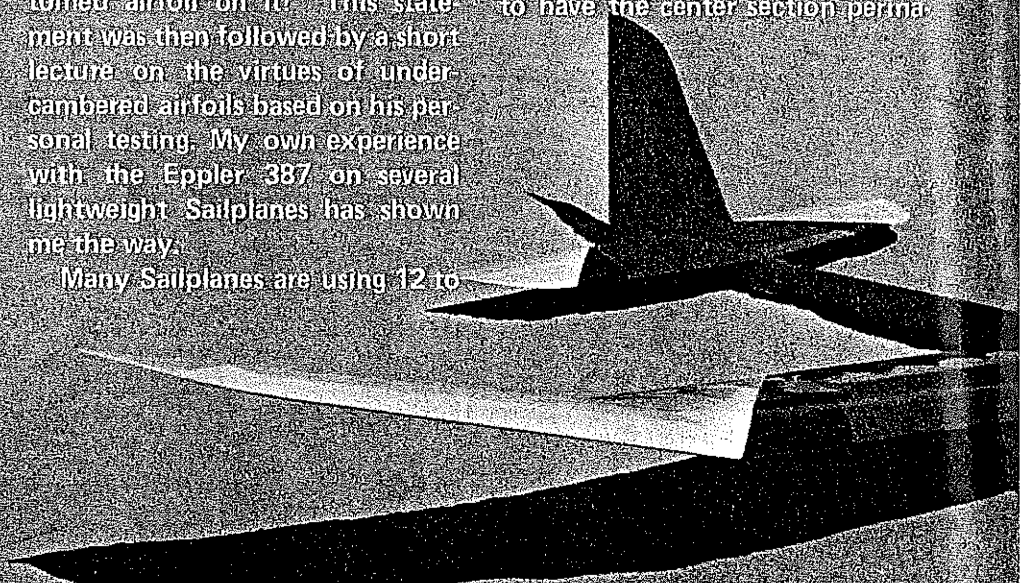
The wing is the heart of the Zephyr 1100. Yes, that's 1,100 square inches of area within the 100-inch span, yielding a relatively low aspect ratio of nine. What has been given away with the low aspect ratio is compensated for by the 12-inch chord. This nets a decent Reynolds Number of about 120,000 when floating at about 20 mph. The ever-popular Eppler 387 airfoil (which has a slight undercamber, 4% camber, and 9% thickness) is used for efficient lift.

Why an undercambered airfoil? A while ago, the late Hi Johnson and I were standing side-by-side while flying Sailplanes from a slope. As usual we chatted about airfoils. I queried him about flat-bottomed airfoils. His response was immediate: "I wouldn't insult a Sailplane by putting a flat-bottomed airfoil on it!" This statement was then followed by a short lecture on the virtues of undercambered airfoils based on his personal testing. My own experience with the Eppler 387 on several lightweight Sailplanes has shown me the way.

Many Sailplanes are using 12 to 15% thickness airfoils. Such thickness is indeed needed to produce sufficient strength to resist bending in thin, high aspect ratio wings. The 12-inch root chord of the Zephyr 1100 (affectionately called the Big-Z) produces a healthy 1-1/8-inch depth at the main spars. Wing bending strength is directly proportional to the depth at the spar, so you can readily see how this model rates.

There is more to wing strength than resistance to upward bending. Fore-and-aft and torsional strength/stiffness are factors to prevent destruction from flutter. The Big-Z has double spruce spars that are fully webbed and sheeted to provide a double torque box leading edge. That's where the real strength comes from to permit full power 12-volt winch launches with a big ZOOM off the top.

Since a 100-inch model is really too large to transport, the wing must be built in sections. I chose to have the center section perma-



nently joined (solid) with plug-in tips at the dihedral breaks. These features have been shaped into a rock-solid, easy-handling floater with pleasant appearance.

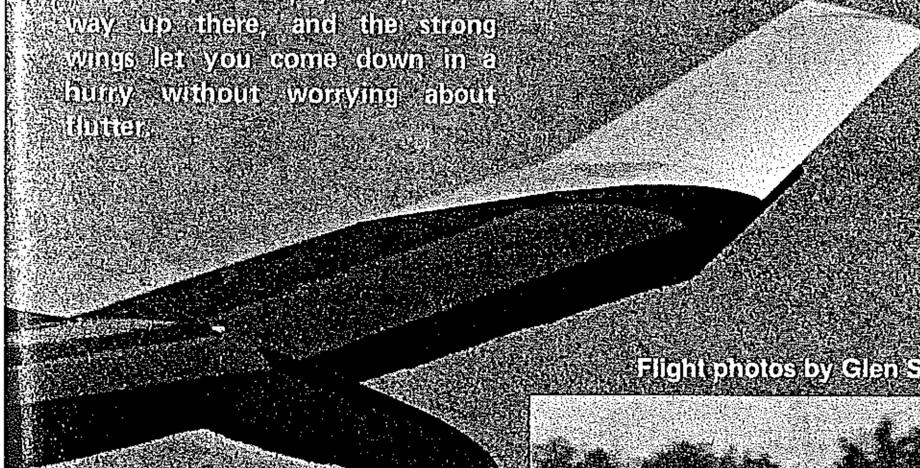
An unexpected flight characteristic of the Big-Z is its ability to slow down and core into the slightest thermal. The turn is flat and so tight that it seems to be turning almost within its own wing span.

The first time it was in competition, the prototype brought home the first-place trophy. Several Big-Zs are making the local contest circuit, and in the hands of average fliers they are more frequently than not bringing home hardware.

Results in multi-task events have shown that it is also a good

Pleasing lines, super-strong wing, high-lift Eppler 387 airfoil, and overall low drag for excellent wind penetration are all attributes of this 100-in.-span RC Sailplane. With elevator, rudder, and spoiler controls (plus releaseable tow hook if you wish), it fits into the Modified Standard class. ■ Bob Owens

goal-and-return model. The thin E-387 airfoil and pencil-thin fuselage keep drag to a minimum so that respectable speed can be achieved with the nose down, providing good penetration. Those broad wings let you keep your eye on it way up there, and the strong wings let you come down in a hurry without worrying about flutter.



TAIL SURFACES. Area of the vertical stab and horizontal stab have been reduced to the least amount consistent with good static stability. Areas are 5% and 11% of the wing area, respectively. Leading edge and trailing edge stock are purposely wider than normal to permit sanding them to nice airfoil shapes. Simple rounded edges just would not do justice to the stilleto-thin fuselage and 9% airfoil.

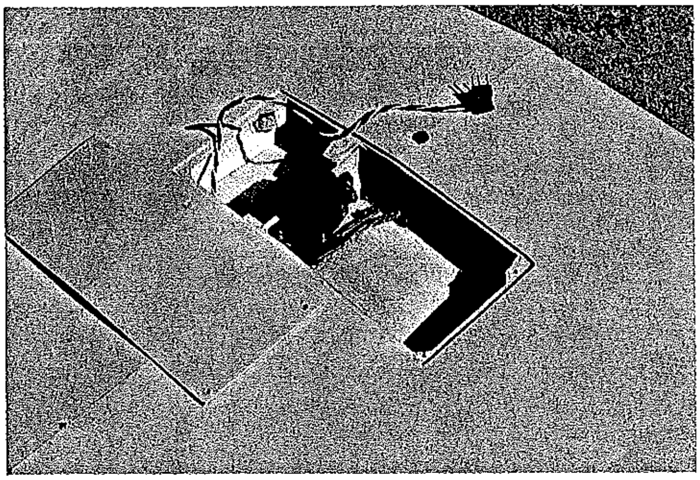
Simplest and lightest mounting for the horizontal stab is right on the top of the fuselage. This just happens to be the best aerodynamically, too, but it does take some abuse from rocks and clods on landing. The wide edges and the stub spruce spars provide the extra strength to handle normal abuse.

Pin all the pieces down directly over the plans, and use Titebond or equivalent glue. Cyanoacrylate glue (fast-setting or slow) works well, also.

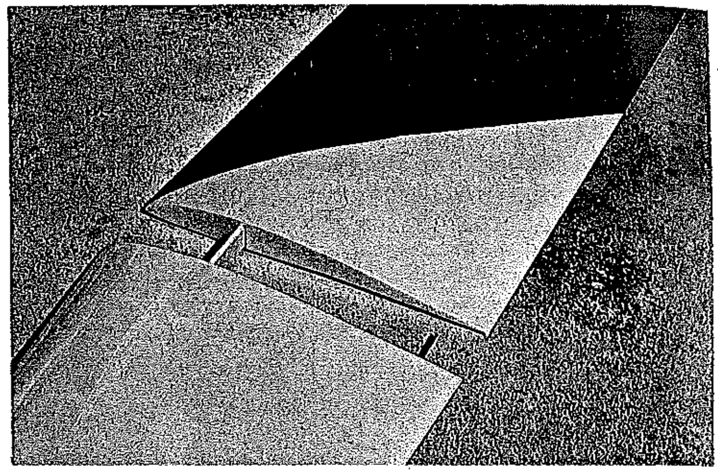
Fabricate the elevator control horn from soft wire (coat hanger) and brass tubing as shown on the plans. The horn must be slanted forward 15 degrees to clear the rudder spar with full up-elevator travel. This unit could be adapted

Flight photos by Glen Sunderland; others by the author.

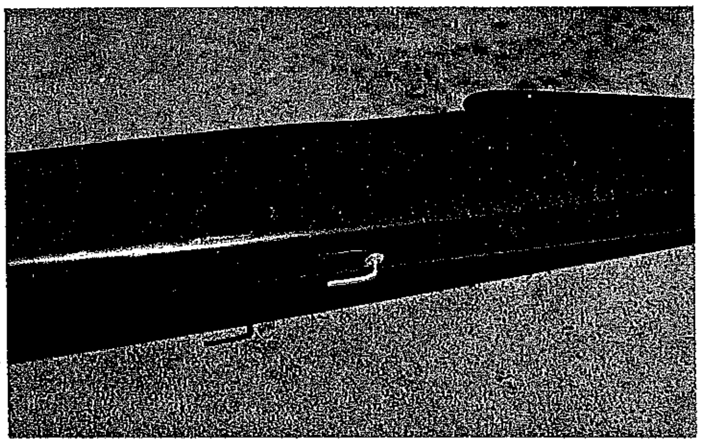
In the big picture is the finished Sailplane built from the plans in this issue and used for all construction pictures. Color scheme was selected for a nearly color-blind friend who can't distinguish greens and blues. The bottom is all red except for yellow main wing panels. The red makes the Zephyr easy to see at great distances. Right: At the controls, Bob Owens makes a slow fly-by for the photographer, also demonstrating the wide speed range of the E-387 undercambered airfoil. Thin fuselage helps keep weight and drag to a minimum.



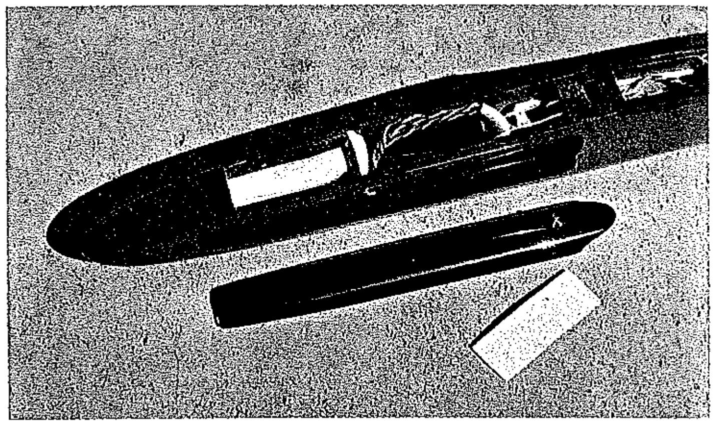
Spoiler servo area in the wing lower surface comes into view when the hatch cover is removed. Space is ample for most servos (Futaba S-20 shown). Space could be adapted easily for a ballast compartment.



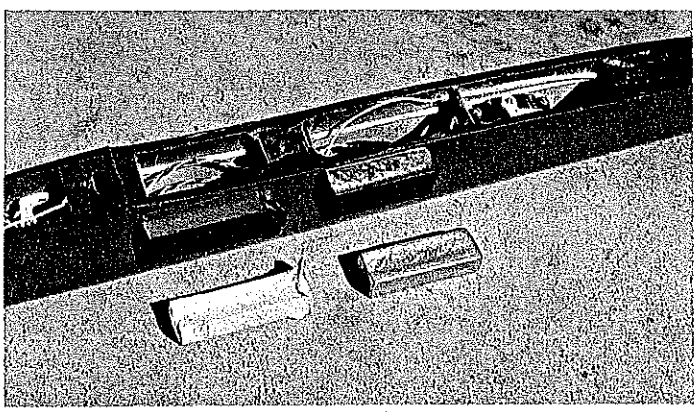
Wing tip partially plugged into the main wing panel. Blade of ¼-in. ply and wire pin in the trailing edge are visible, as is the spoiler in fully-deployed position. Formula U paint (missile red) used for touch-up in spoiler area. Vinyl electrical tape holds tips in place.



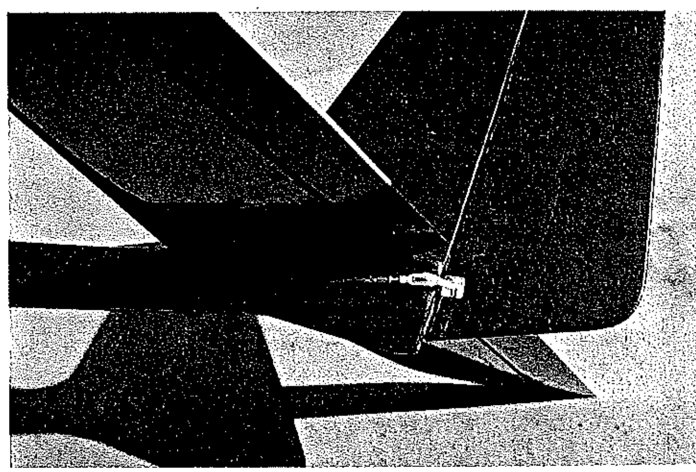
Tow hook is the ultimate in simplicity, made by reshaping a heavy-duty brass kitchen cup hook as per the plans and soldering the base washer to the threaded shank end. It's fine for sport flying.



Here's how the radio gear goes in. Battery is neatly tucked into the first compartment, wrapped in ¼-in. foam rubber. Receiver and wiring visible in second compartment (foam padding for the top is on the ground). Rudder servo partially visible just behind the receiver.



Wing saddle area shows alternate location for the elevator servo (see text) to allow adding ballast to compartments on either side of the wing mounting bolt. Cast lead ballast blocks are wrapped in masking tape to avoid skin contact. (Caution: Molten lead gives off deadly fumes. If you don't know how to handle it, don't attempt it!) The glossy red fuselage finish (reflecting the ballast blocks) is clear Ditzler Acrylic Enamel over red Super Poxy.



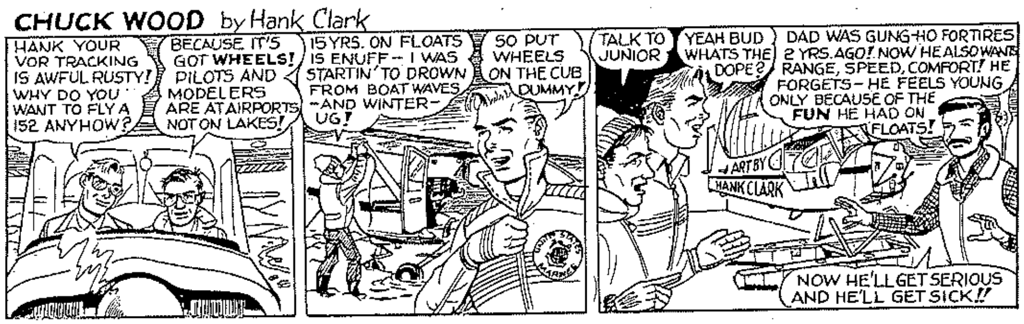
The tail end is quite simple structurally. The elevator control horn is buried inside the fuselage, with only the rudder horn on the outside. A lightweight fiberglass cloth/resin covering strengthens the tail skid against possible abuse from ground loops.

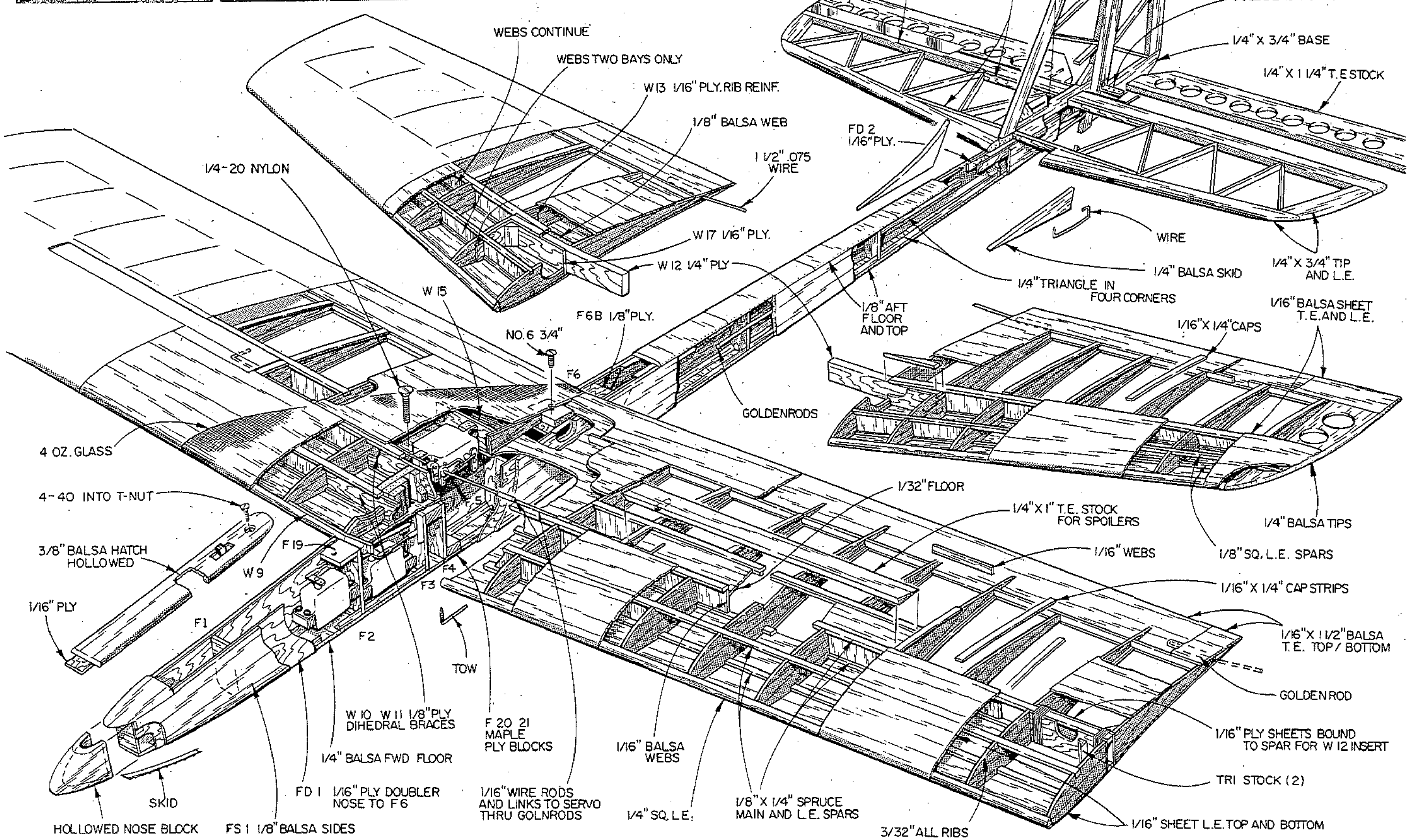
from one of several Control Line horns that are available, but they may require rebending. Fully enclosing the elevator horn is a little more work, but it is neat, clean, and well worth the trouble. (I am thinking of how the rudder horn could be fully enclosed but have not yet come up with a good scheme.)

If MonoKote hinges per the plans are to be used, be sure to leave the upper surface at the hinge line flat. In other words, all the thickness tapering should be done from the *lower* surface by sweeping the tips up.

There is nothing special about the fin and rudder except that I leave them joined at the leading edge until the final sanding has been completed. Position the rudder horn, then inlay the plastic screw-plate on the right side of the rudder.

Wings. I recommend precutting all the wing parts: ribs, tips, dihedral braces, shear webs, and trailing edges. Cut the spars and other spanwise elements to exact length


CHUCK WOOD by Hank Clark
HANK YOUR VOR TRACKING IS AWFUL RUSTY! WHY DO YOU WANT TO FLY A 152 ANYHOW?
BECAUSE IT'S GOT WHEELS! PILOTS AND MODELERS ARE AT AIRPORTS NOT ON LAKES!
15 YRS. ON FLOATS IS ENUFF -- I WAS STARTIN' TO DROWN FROM BOAT WAVES -AND WINTER- UG!
SO PUT WHEELS ON THE CUB DUMMY!
TALK TO JUNIOR
YEAH BUD WHATS THE DOPE?
DAD WAS GUNG-HO FORTIRES 2 YRS. AGO! NOW HE ALSO WANTS RANGE, SPEED, COMFORT! HE FORGETS - HE FEELS YOUNG ONLY BECAUSE OF THE FUN HE HAD ON FLOATS!
NOW HE'LL GET SERIOUS AND HE'LL GET SICK!!
ART BY HANK CLARK


R3 1/4" X 1/2" FIN BASE INTO STAB.
1/4" X 3/4" RUDDER T.E.
1/4" X 3/8" FIN AND RUDDER POSTS AND L.E.
1/8" X 1/4" BRACES
GOLDBERG HORNS
1/4" X 3/4" BASE
1/4" X 1 1/4" T.E STOCK
1/4" X 1/2" STAB. SPAR
1/8" X 1/4" SPRUCE SPARS
5/8" HOLES
MONOKOTE HINGES
FD 2 1/16" PLY.
WIRE
1/4" BALSA SKID
1/4" X 3/4" TIP AND L.E.
1/4" TRIANGLE IN FOUR CORNERS
1/8" AFT FLOOR AND TOP
1/16" BALSA SHEET T.E. AND L.E.
1/16" X 1/4" CAPS
WEBS CONTINUE
WEBS TWO BAYS ONLY
W13 1/16" PLY. RIB REINF.
1/8" BALSA WEB
1 1/2" .075 WIRE
1/4-20 NYLON
W17 1/16" PLY.
W12 1/4" PLY
W15
F6B 1/8" PLY.
NO. 6 3/4"
F6
GOLDENRODS
4 OZ. GLASS
4-40 INTO T-NUT
3/8" BALSA HATCH HOLLOWED
1/16" PLY
F19
W9
F1
F2
F3
F4
TOW
1/32" FLOOR
1/4" X 1" T.E. STOCK FOR SPOILERS
1/16" WEBS
1/4" BALSA TIPS
1/8" SQ. L.E. SPARS
1/16" X 1/4" CAP STRIPS
1/16" X 1 1/2" BALSA T.E. TOP / BOTTOM
GOLDEN ROD
1/16" PLY SHEETS BOUND TO SPAR FOR W 12 INSERT
TRI STOCK (2)
1/16" SHEET L.E. TOP AND BOTTOM
3/32" ALL RIBS
1/8" X 1/4" SPRUCE MAIN AND L.E. SPARS
1/4" SQ. L.E.
1/16" BALSA WEBS
1/16" WIRE RODS AND LINKS TO SERVO THRU GOLNRODS
F 20 21 MAPLE PLY BLOCKS
W10 W11 1/8" PLY DIHEDRAL BRACES
1/4" BALSA FWD FLOOR
FD 1 1/16" PLY DOUBLER NOSE TO F6
FS 1 1/8" BALSA SIDES
SKID
HOLLOWED NOSE BLOCK

except for the top spar caps. Extra care in precise cutting of these parts will permit a quick assembly job with a minimum of gaps at structural joints. Precutting all parts is an excellent way to become familiar with the construction details.

Outer wing panels. Probably you already have noticed that lots of spruce (or pine) is required, along with plenty of shear webs. Cap-strips are necessary on all ribs because of the exceptionally thin airfoil section near the trailing edge.

Before pinning the trailing edge (TE) down, glue a small piece of 1/32 sheet about ½-in. square to the lower surface forward edge at each rib location. This will orient the TE to the airfoil undercamber when pinned down. Do likewise for the lower main spar. That's about all the special attention you must pay in building a wing with an undercambered airfoil.

Pin down the TE, main spar, and forward spar directly over the plans using Ribs W1 and W8 for the precise location. Glue W1 in place using the forward spar shear web to set the dihedral angle. Omit the Main Spar Blade W12 at this time. Add Rib W3 and the shear webs between Ribs W3 and W4 at the forward spar, main spar and TE. Keep adding ribs and webs. If your web cutting is precise enough, the ribs will align directly over the correct spot on the plans.

Add the W13 plywood partial rib to W3. Install the ¼-in. leading edge (LE). Taper the lower TE to the shape of the top of the ribs, then glue on the upper TE. A tight fit between the shear webs and both spars is vital to the wing strength. Using a piece of ¼-in. scrap balsa, make a sanding tool by gluing 120-grit sandpaper to the edge to easily sand the edges of the webs for a good fit with the upper spar.

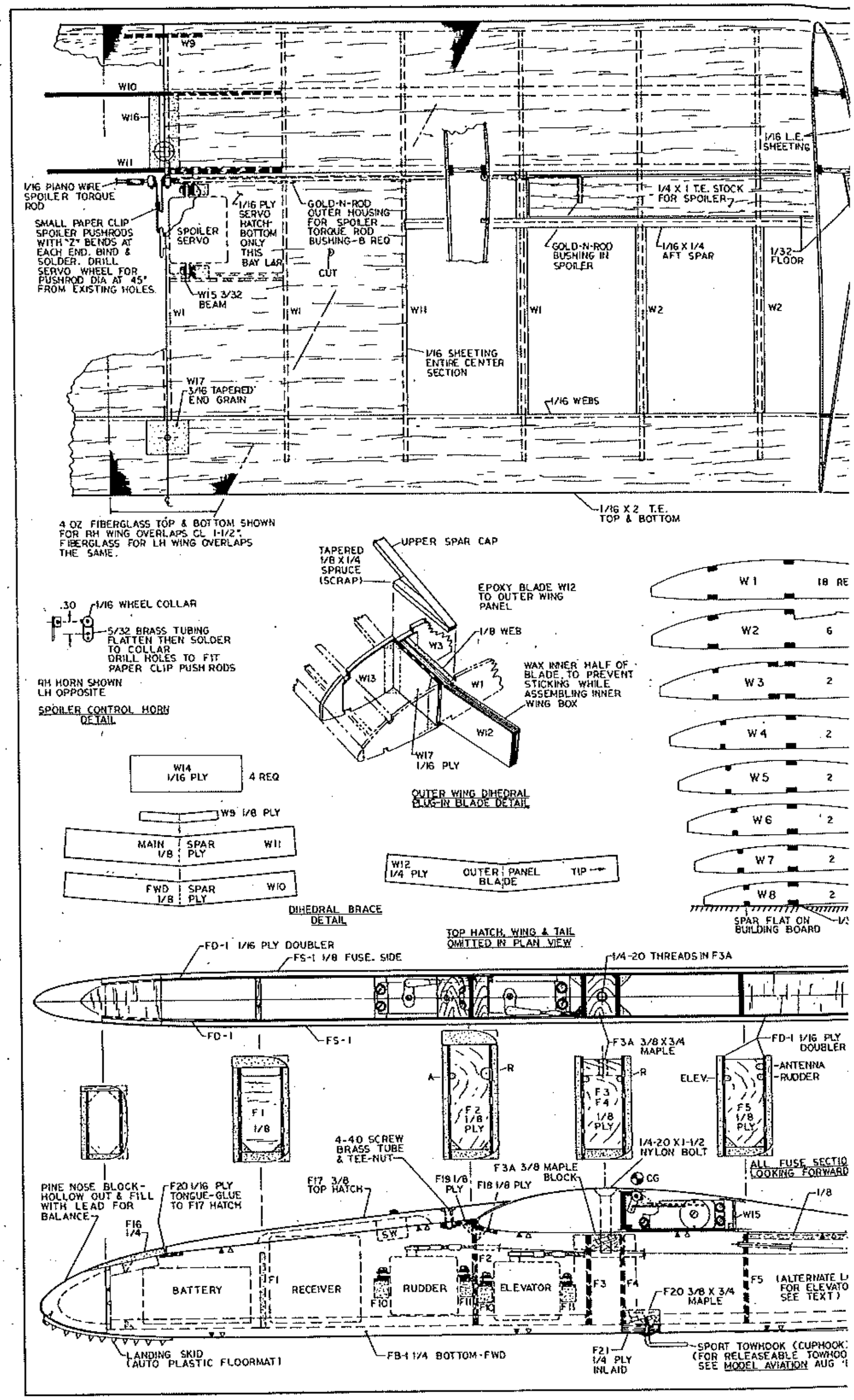
Install the upper spars. Fill the ⅛-in. notch in W1 at the forward spar with scrap balsa. Add the triangular stub spars between W1 and W13 to accommodate W12 (dihedral blade) which will be glued in after the inner (main) panel is completed and aligned. Glue the wing tip in place with the TE flat on the plans and the LE even with the TE. Add the spar extensions to the tip.

Do not install W12 (dihedral blade), TE alignment tube, or sheeting until the outer wing has been fitted to the main wing panel.

After the glue has dried, remove the wing from the plans. Flip the plans over, trace the part outlines, and build the *opposite* outer panel. When dry, re-apply glue to all joints.

Main wing panels. This assembly is built in the same manner as the outer panel using 1/32-in. shims to raise up the main spar and the lower TE. Install Rib W1 at the center line using W11 as a gauge to set the dihedral angle, but just temporarily glue it in place. Omit shear webs in the first bay, since plywood dihedral braces will be installed here later.

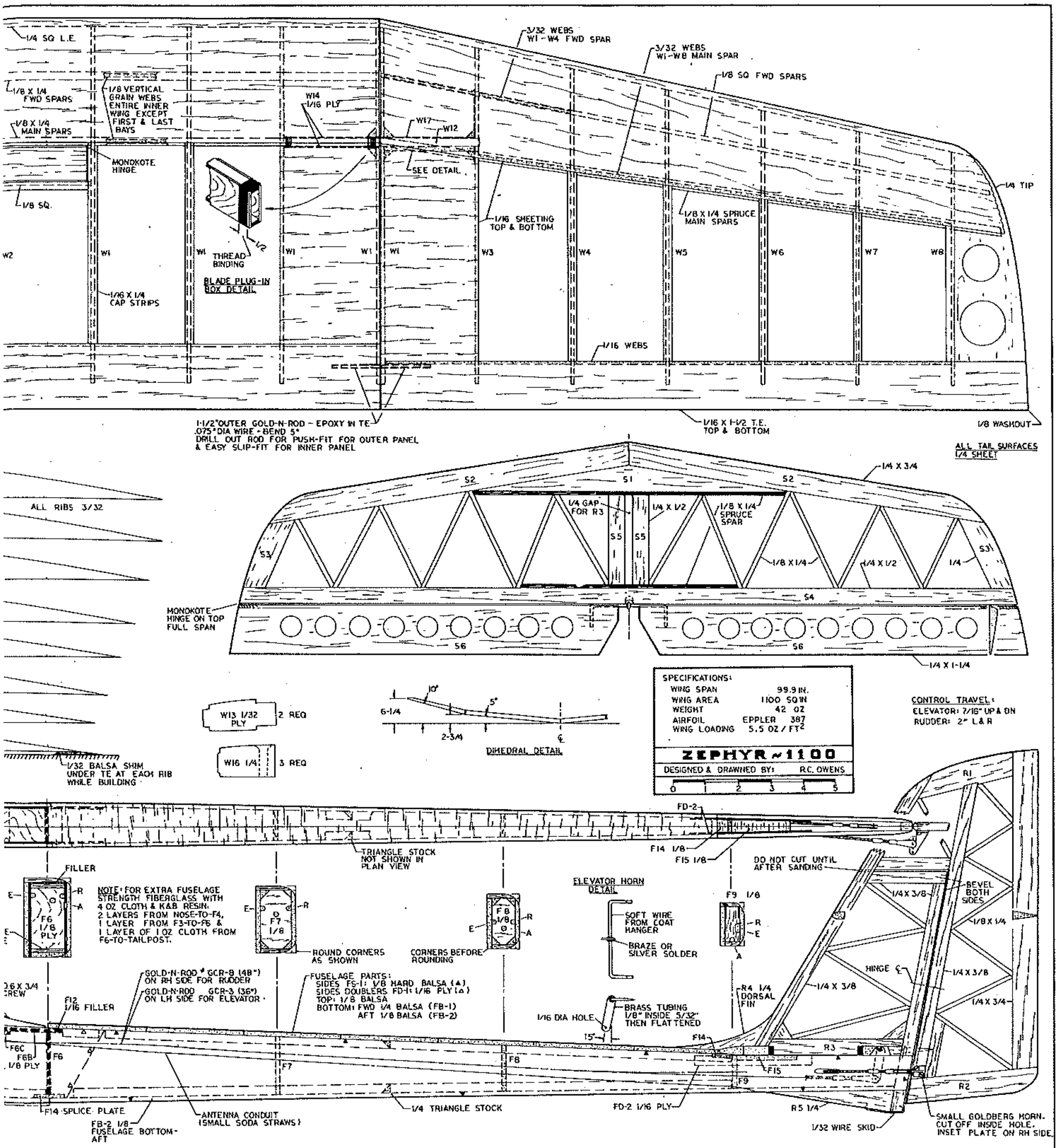
Glue in Rib W1 in the second spot, and add shear webs and ribs in succession. Install three W2 ribs with spoiler cutouts at the locations shown. Space the last two W1 ribs with W14 plywood webs, but do not glue at this time. Add the ¼ sq. LE. Sand the spar slots and webs with the sanding tool so that the spars just fit flush with the top edge of the ribs.



Install the upper spars. Add the upper TE. Add the 1/16 × ¼ spoiler box spar, and glue ⅛ sq. beneath it between the ribs. Add the 1/32 sheet spoiler box flooring. Install four pieces of ½-in.-long Gold-N-Rod to the upper main spar — after notching each rib inboard of the spoiler.

Cut out the spoiler from ¼ × 1 TE stock, and insert a piece of Gold-N-Rod to act as an internal sliding bushing for the torque rod. Temporarily tape a piece of 1/16 sheeting to the upper main spar, and fit the spoiler using masking tape as a hinge material. Notice that the bent end of the torque rod must be free to slide within the piece of Gold-N-Rod in the spoiler. When satisfied with the spoiler actuation, remove the spoiler, torque rod, and 1/16 sheeting.

Remove the wing from the building board, and add W14 plywood spar box



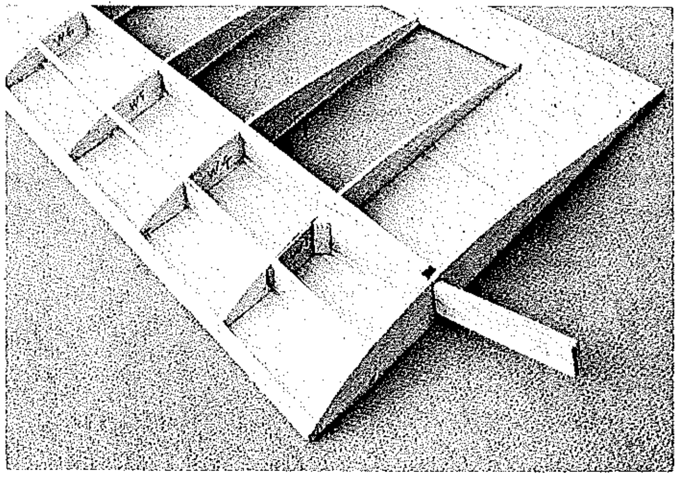
webs. Avoid excess glue, as you don't want it to get inside the box section. Bind the box with thread or non-waxed dental floss; smear glue all over it, then add the triangular gussets. Cut openings in both W1 ribs at the dihedral joint to allow the W12 brace to slip in between the spars.

Temporarily fit the W12 plywood dihedral brace into the spar box to obtain a smooth snug slip-fit without binding. If you sand or cut it too small, make a new one. Fit W12 to the outer panel, then fit the outer panel to the inner panel. Rib W1 on the outer panel may need to be readjusted slightly to get a tight fit at the joint.

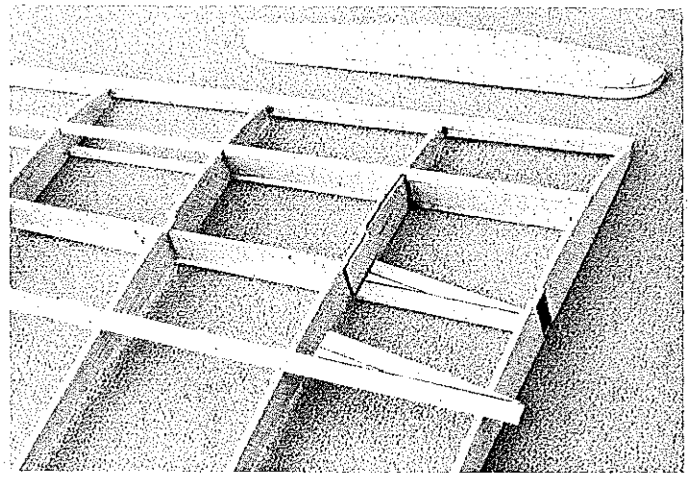
Epoxy (5-min.) W12 into the outer panel, and align with the main panel while it is curing. Add triangular gussets in four places. Mark location of the TE alignment pin. Using a No. 26 drill, hand-ream the TE between the lower and upper sheets to accept a piece of Gold-N-Rod. Bend a piece of .075 dia. piano wire 2 in. long to the correct dihedral angle. Trial-fit the wire into the Gold-N-Rod for a free slip fit. Wax the wire. Epoxy the rod into both wing panels with the wire in place and the wing panels joined.

Flip the plans over, and trace the part outlines. Build the *opposite* main wing panel in the same way. When completed, trial-fit the two main panels at the center line using W10 and W11 1/8 ply dihedral braces to set the correct dihedral angle. It is necessary to cut away the W1 rib sections at the forward and main spars.

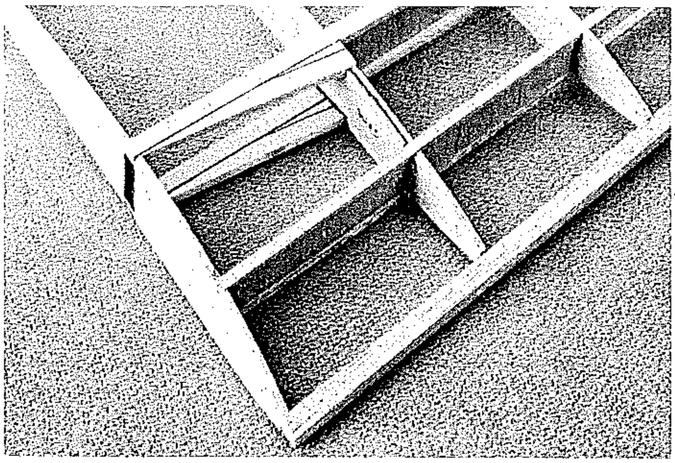
Notice that W10 is positioned in the middle of the forward spar but that W11 is positioned even with the front edge of the



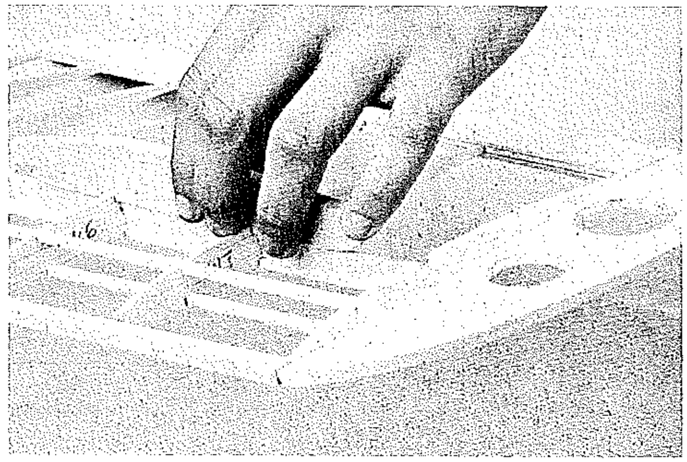
The right wing outer panel just prior to adding the leading edge top sheeting, the ply dihedral blade already installed.



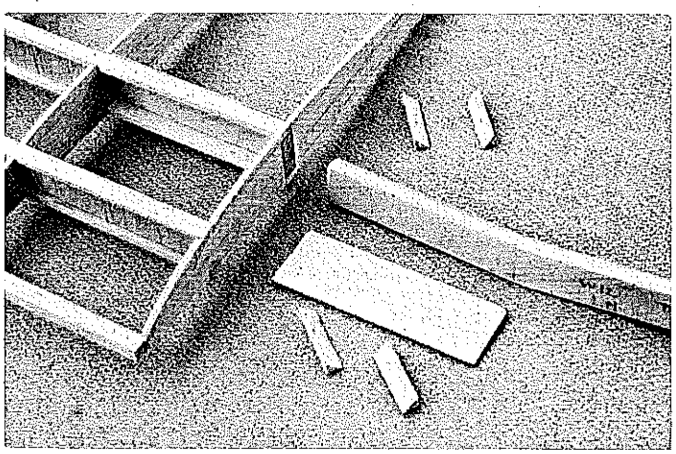
Tapered spar segments are pre-assembled and the spar webbing sanded level with the special tool prior to installing the upper spar cap.



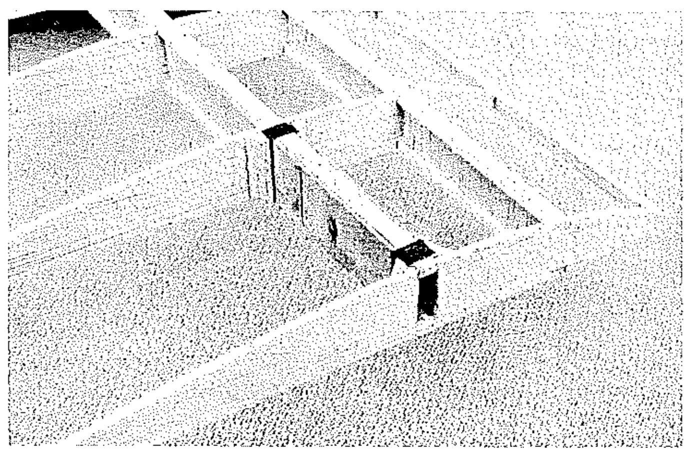
Left wing outer panel shows the main spar detail before installation of the dihedral blade. Both the forward and main spars are webbed.



Demonstrated here is the special sanding tool (see text) used for leveling the spar webs to obtain a close fit for a good glue joint.



The dihedral blade is assembled to the end of the wing inner panel spar plug-in box with precut pieces ready to be installed.



Plywood webs outside the spar caps give plenty of strength for the dihedral blade plug-in box. Note thread binding on ends of the box.

main spar. This provides more space for the spoiler control linkage.

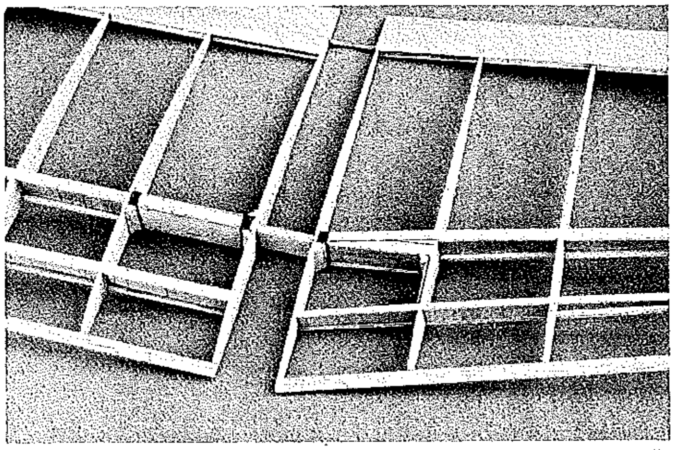
When the spars are all fitted properly at the center line, epoxy the two main panels together while installing Dihedral Braces W9, W10, and W11. After the epoxy has cured, take three W16 partial ribs of ¼ sheet with vertical grain; leave a ¼-in. gap in the center piece to accept the nylon bolt; epoxy them in place and together; sand to the same shape as the W1 rib which was cut out to make room for the assembly of the three W16s. At the TE center line, cut out for the W17 insert (made of 3/16 vertical-grain balsa to serve as reinforcement for the hold-down screw).

Install the 1/16 lower sheeting to all four panels after sanding the LE to contour of the ribs. Cut away the sheeting slightly to clear the binding thread at the spar box.

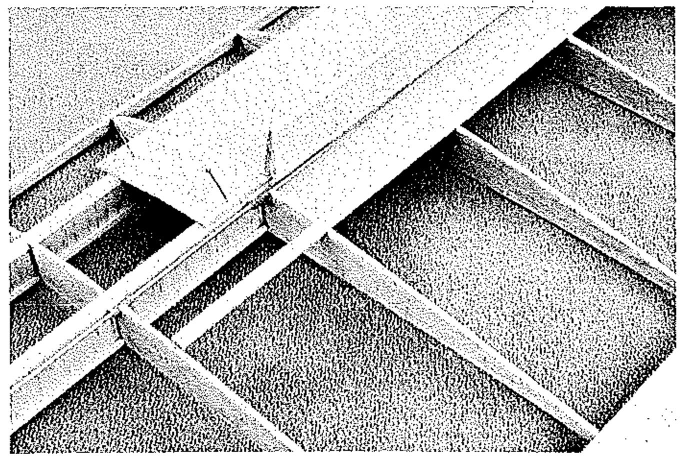
After the glue is dry, remove all pins, and place the outer panel flat on the building board, then place a ⅛-in. shim under the tip TE to build in the washout. Add weights or pins to hold down the rest of the panel. Now add the upper LE sheeting, and leave it to dry overnight. Be sure that glue is put on the full length of each spar and on every rib to achieve all the strength that is possible.

Repeat this procedure for the opposite outer panel. The main panels are sheeted in the same manner, except that they have no washout.

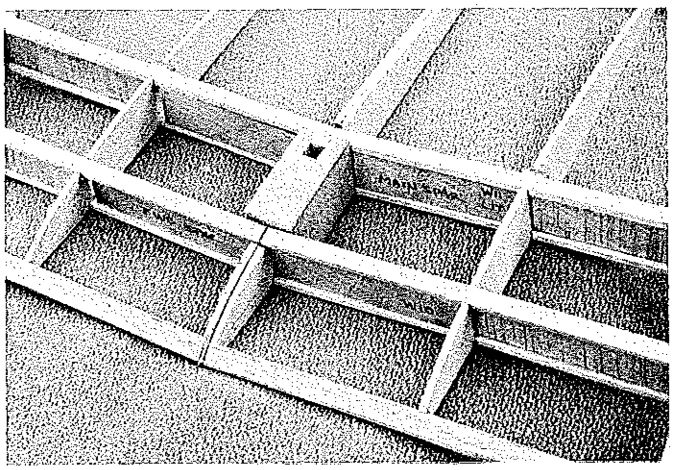
Add the W15 beam to the servo box to suit your servo size and mounting method. Add the remaining upper and lower sheeting, then the cap-strips to the ribs (upper and lower), except leave the lower sheeting off the servo box. Sand the wing to a smooth surface, and match all the cap-strips to the sheeting, etc. Make the servo hatch



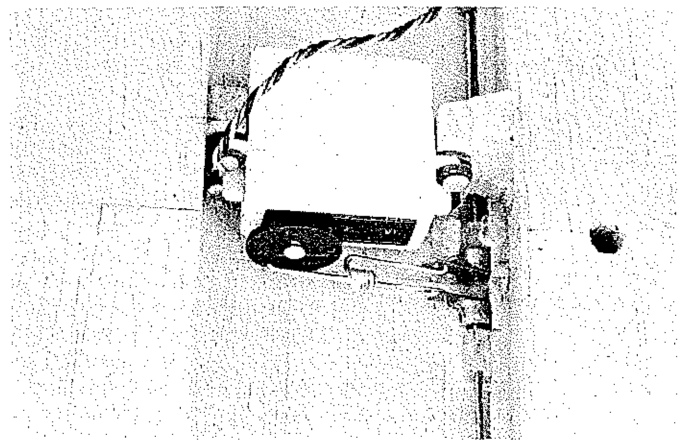
The wing panels need to be carefully fitted together to assure a slip-fit for the dihedral blade and trailing edge wire. Applying a paste wax to the blade and wire helps to moisture-proof them.



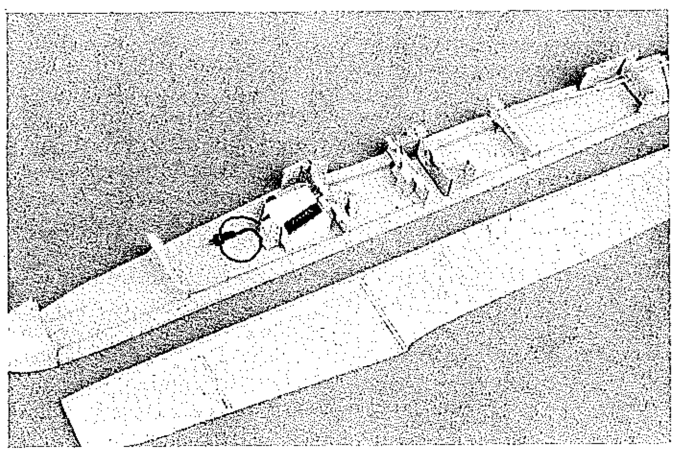
Spoilers up! Simple wire torque rods provide positive control—here shown during test operation using scrap sheeting, masking tape hinges.



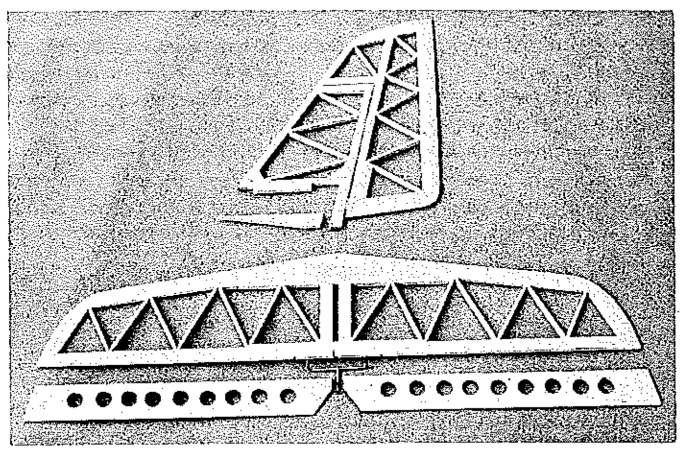
Wing center section detail includes the double spar construction, wing bolt blocks, dihedral braces, and webbing.



Spoiler servo control linkage is made from paper clips—easy to bend (and the price is right). Also visible are the torque rods with Gold-N-Rod bushing material. Spoilers would be up with servo as shown.



The fuselage right side is built "on the half-shell," completing as much of it as possible prior to gluing on the fuselage left side.

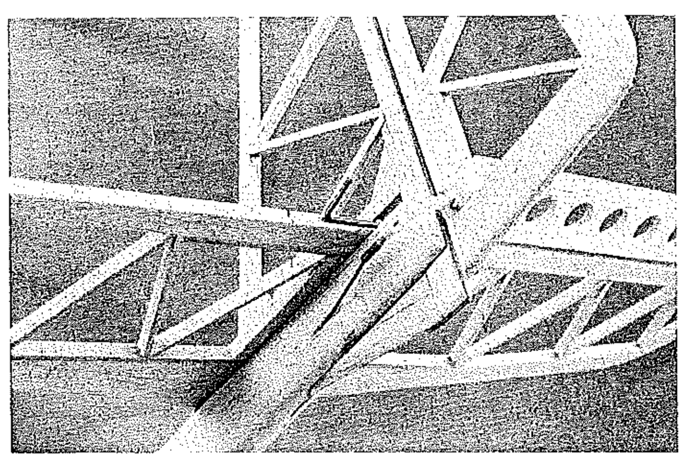


Tail surfaces are simple to build. To keep the tail weight down, author was trying for the minimum area giving adequate stability.

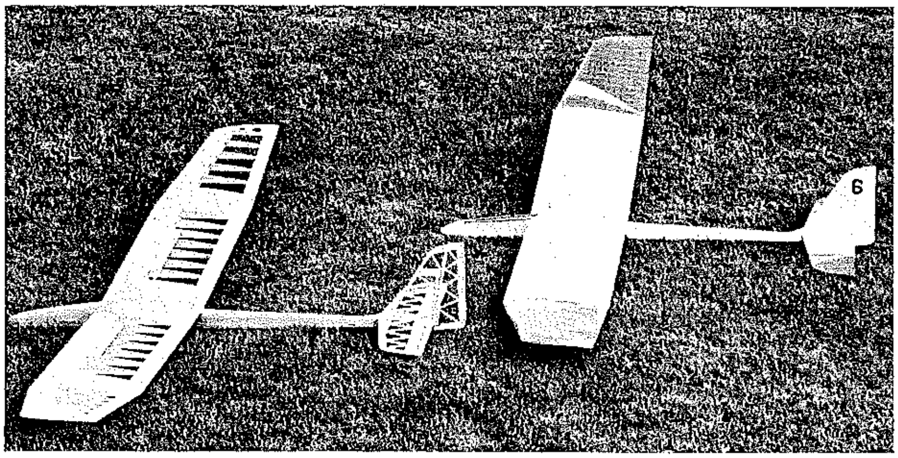
from 1/16 ply, and add blocks similar to F10/F11 in each corner to support the hatch screws. Sand the leading edge to the shape on the plans. The TE should be about 1/16-in. thick at the aft edge.

Fiberglass the wing center section upper and lower surfaces (except for the spoiler servo box) with 4-oz. glass cloth. Overlap each side to produce two layers at the center section. Coat with polyester coating resin. Sand the resin slightly when it has cured, and add a second thin coat of resin. Final sanding is done with #180 grit—just enough to break the glaze and feather the edges.

Install the spoiler servo using the wood mounting



Horizontal stab is positioned in front of the fin spar to permit the elevator horn to be buried within the fuselage. Notice elevator connector wire and rudder horn, as well as thin elevator/rudder trailing edges.



The uncovered model (built per this article) has the horizontal stab positioned more forward than the prototype in order to allow the fin spar to extend down to the tail skid for strength.

blocks as shown on the plan. Make the torque rods from 1/16-in. piano wire, leaving a ¼-in. gap between the ends at the center line. Make the control horns from Du-Bro #137 wheel collars and 5/32-in. flattened brass tubing as shown. Solder the tubing to the end of the collar. Drill through the collar and arm with a #51 bit. Drill through the tubing for the push-rod with a #56 bit. Install the torque rods, fit both control horns onto the pushrods, then fit and tighten the collar setscrews securely onto the torque rods.

Fit the spoilers with masking tape as a hinge, temporarily. Operate the servo to check spoiler operation using just the one rod until the full 75-degree travel is obtained. Then align the other rod, bind with fine copper wire, align the two spoiler blades, and solder the wires. This particular linkage does not permit the spoilers to float up on launch.

Fuselage. Cut out all the fuselage parts. Be sure to check the size of your radio and battery pack to be sure they will fit. (There are so many different radios available that it is impossible to anticipate all of the sizes.) The battery pack is probably the most critical, because the four-pencell-size that comes with most sets just will not fit. I recommend that a 225 or 450 mAh long, skinny battery pack be used. With the Futaba 225 mAh pack, you can thin the nose block width even more than shown on the plans.

While you have the radio out, check the direction of servo rotation against the plans just to be sure the control rods are on the proper side of the fuselage to obtain the correct rudder and elevator throw. Once that is established, you can proceed with construction.

Glue FD-1 and FD-2 plywood doublers to FS-1 sides with Super Tape, contact cement, or a gap-filling type of cyanoacrylate. Add ¼-in. triangular stock to the upper and lower edges of both fuselage sides. Caution... be sure to make one *left* side and one *right* side! Note that the upper aft ¼-in. triangles are flush with the FS-1 side. The lower forward sections are ¼-in. above the lower edge. The lower section aft of the F6 doubler is ⅛-in. above the lower edge of FS-1.

Position the right side directly over the side view of the plans. Glue the following parts to the right-hand (RH) side: nose-block, F1, F2, F3, F3A, F4, F4A, F5, F6, F10, and F11. Keep all of these perpendicular to the side with the lower edge of the "F" bulkheads located ¼-in. up from the lower edge, except that F6 is 3/16-in. down from the top. Note that F3, F4, and F5 are 1/16-in. down from the top edge of the sides to account for the wing dihedral angle. Add F7, F8, and F9 in the same manner, except that each should be flush with the top edge.

Once the RH side is anchored (pinned or weighted) directly over the plans, glue the left-hand (LH) side directly over it. Be sure plenty of glue is coating all of the contact surfaces of the "F" bulkheads and the ¼-in. triangles (except F7, F8, F9, and the tail post). Use a right angle (square) to assure that the wing bolt area at F3/F4 is perpendicular to the sides. Do the same for the F15 area at the tail. This will assure correct wing and tail alignment.

To obtain the proper fuselage curvature, place shim blocks under the RH side to bring it up to the correct center line. The correct shim block thicknesses are 3/16-in. at F7, 5/16-in. at F8, 7/16-in. at F9, and 9/16-in. at the tail post. By now you should have the idea that your building board has become a fuselage jig since the sides are parallel forward of F6 and straight-tapered aft of F6. Tack-glue a scrap of ¼ balsa to the tail post in lieu of the fin spar. Apply glue to the ¼-in. triangle, F7, F8, and F9. Weight down the LH side at the above bulkheads, and clamp the sides at the tail post. Let it dry.

Install FB-1, FB-2 fuselage bottoms, and F14 splice—preferrably while the fuselage is still weighted down to the board. Install the Gold-N-Rod controls and antenna conduit (small soda straws joined with CA and micro-balloons). Attach the straw with CA and micro-balloons at each bulkhead and every four inches where it contacts the fuselage sides. Install F14 and F15 stab saddle. Add F16 nose block and ¼-in. triangles. Trial-fit the wing and tail. If the wing lower leading edge doesn't fit exactly, use micro-balloons and resin on the fuselage to fill the gaps.

Locally MonoKote the wing, apply vaso-line to the MonoKote, and screw the wing down to squeeze out the excess resin while it is still wet. When cured, sand it smooth, and remove the MonoKote from the wing.

Align the wing with the fuselage as viewed from the top. Measure the distance to the outer end of the inner wing panel to the tail post. Both sides should be within 1/16 inch of the same. Drill a 1/16-in. hole for the rear wing screw through the wing TE, F6B, and F6C. Remove the wing, then re-drill the TE with a .140 bit for the No. 6 screw.

Install F18 at F2 flush with the fuselage top edge. Add triangular stock. Install a 4-40 T-nut from the underside of F19, then glue in place, and add ¼-in. triangular stock. Make the F17 top hatch from ⅜ balsa. Drill for 5/32-in. brass tubing ¼-in. long. Glue the tube into F17 with CA. Fit F17 to

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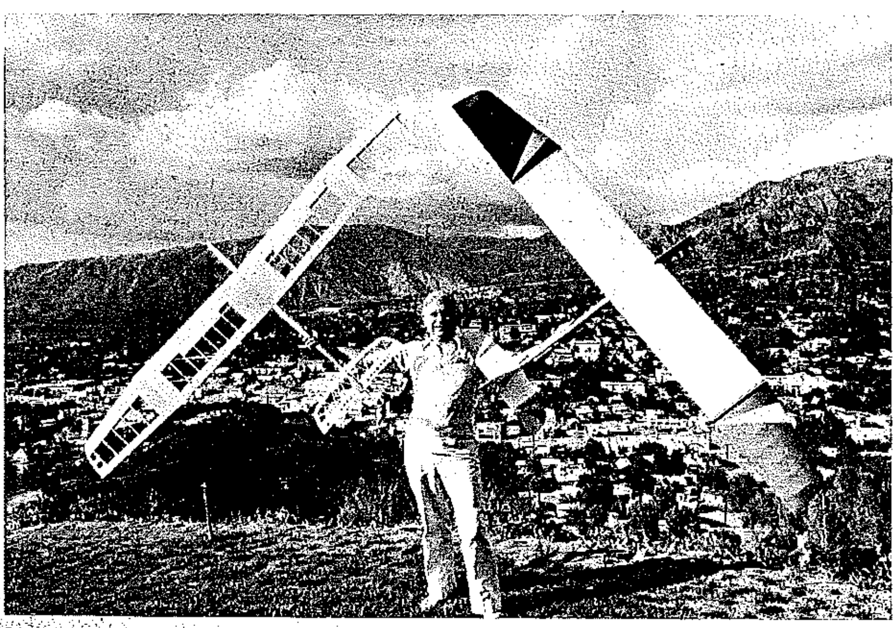

Our author holds aloft the prototype Zephyr 1100 along with the uncovered latest version built to the plans presented here. At 5 oz./sq. ft. it is a true floater, yet strong enough for 12V launches.

seven, sub-C cells. A new generation of motors is being developed by both manufacturers.

There's lots more. For this month, I'd like to show you some tips by Bob Kopski which appeared in an info sheet he gave out at the Annual Electric Fly in Hatfield, PA. And a wiring diagram from the *SEAM Newsletter*—a remarkable publication. Do join SEAM if you want to keep up ($10.00). Society of Electric Aircraft Modelers, 11632 Flamingo Dr., Garden Grove, CA 92644. You'll be shocked!

Bill Winter, 4426 Altura Ct., Fairfax, VA 22030.

Zephyr 1100/Owens

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the nose fairing, then add the F20 1/16 ply tongue (which is to be a slip-fit between the fuselage sides). Remove F17, and install the wing; now carve F17 to match the wing upper surface. Install the F17 hatch using a 4-40 × ½-in. screw. Finish carving F16 and F17 to obtain a rounded, smooth contour which blends with the fuselage.

Install the reinforcement blocks for the tow hook. For sport flying I prefer the simple bent screw hook, which can be made from cup hangers. If you prefer to compete, use the capture/releaseable hook shown in the August 1982 *Model Aviation*, which uses the Fourmost hook in an easy-adjust method.

Install the fuselage F12 filler at F6, then the top sheeting. Trial-fit the tail to permit alignment of the tail skid and dorsal fin. Carve and sand the fuselage corners to a rounded section as shown—just enough to expose the FD-1 and triangular stock. Leave the wing and tail saddles flat.

For extra strength and competition, fiberglass the entire fuselage. Starting at the tail, apply one layer of 1-oz. cloth up to F6, one layer of 4-oz. cloth from F6 to F3, and two layers of 4-oz. cloth from F4 to the nose block. Use toilet paper to soak up the excess resin before it cures—to minimize the weight gain. Sand the resin/glass coating with #120 grit wet-or-dry paper. If the resin tends to clog the paper, add a little dishwashing detergent to the water, and wet-sand. Apply one thin final coat of resin if you plan to paint the fuselage (which I recommend). Sand the final coating with #180 wet-or-dry. Spray-paint with your favorite color and material. Install the servo, and solder the threaded end-fittings to the control wire. Trial-fit the tail surfaces with control horns while cutting the wires to length.

Covering. You are encouraged to use a little imagination in selecting a color scheme. Use several colors, but have large areas of contrasting (dark and light) tones on the underside. I prefer to have the fuselage, inner wing panels, and vertical tail in a light shade, with the wing tips and horizontal tail dark. When you get in a big boomer, those three dark areas spaced wide apart and separated by light tones will help maintain visual contact.

MonoKote is my preferred covering material. However, the new Coverite Micafilm will save a couple of ounces, and it is considerably tougher. With Micafilm, seal down all the edges with a CA glue *before* shrinking with a not-so-hot iron temperature. Omit covering, at this time, on the lower extension of the fin spar and also on the stab center line where it attaches to the fuselage. Separately cover the rudder, elevator, and spoilers, but do not attach yet. After shrinking the covering, go over all ribs and other framework to seal it down. This is truly necessary for the wing undercamber.

Tail assembly. Temporarily bolt the wing to the fuselage to serve as a reference for correct alignment of the horizontal and vertical stabilizers. Place the horiontal stab in position on the aft fuselage, and view from the rear from a fair distance. If not aligned, sand the high side of the fuselage. Apply 5-min. epoxy to the stab saddle, then clamp it in place while viewing it from all angles and adjusting as necessary for a perfect alignment, including the fin slot (which should be straight ahead).

Connect the elevator control clevis to the elevator horn. Apply a heavy coat of Vasoline to the mid-portion of the elevator joiner wire, then apply 5-min. epoxy to the stab around the slot for the joiner—in the area of the Vasoline only. When cured, the epoxy serves as a zero-slop bushing, and the

Vasoline is a permanent lubricant and rustproofer.

Before installing the elevators, glue the vertical stab into the horizontal stab slot and the tail post slot with 5-min. epoxy. Use a right angle to assure that it is square with the horizontal stab. Add the R5 skid. Epoxy the wire skid in place. Add fiberglass to the skid and aft fuselage to strengthen the skid against side loads during possible ground loops. Paint or MonoKote the skid area.

Install the elevators using epoxy on the joiner wire, and hold the elevators to the stab with masking tape on the lower surface. Leave a 1/16-in. gap. Iron on a MonoKote hinge full-span on the top surface only. Check for free travel, 7/16-in. up and down. Add ¼-in. patches of MonoKote to the underneath ends of each elevator. Install the rudder using plastic hinges at the locations shown. Install the rudder control horn after cutting away the innermost hole to provide clearance from the fuselage side while permitting at least 2 in. of left and right travel.

Spoilers are installed with MonoKote hinges after the application of a small amount of Vasoline to the torque rod bent ends (no glue). The spoiler should lay flat in the box, flush with the upper surface of the wing. Hold the spoiler in place with masking tape at the aft edge to assure a 1/16-in. gap all around, then seal down the MonoKote hinge on the forward edge. Check the spoilers for free travel.

Balance. The location of the balance (CG) shown on the plans is at 32% mean aerodynamic chord. That is fine for all general flying. Penetration is good in moderate winds. In strong winds, ballast can be added in the fuselage while allowing the CG to move forward about one inch—just about on the main spar.

Flying. There are no special tricks to flying the Zephyr 1100. The flight characteristics can be described in one short phrase: *an excellent floater with good penetration that grooves up the winch line and is strong enough for zoom launches.* All examples built to date have performed similarly, and almost no experimentation has been made in attempted improvement. Climb angle on launch is exceptional, and great strength eliminates worry about folding wings. High-speed dive capability permits rapid descent without flutter from altitude when time runs out in the duration event.

Add plastic electrical tape around the wing at the outer dihedral break to seal the air gap and to keep the outer panel in place.

If ballasting is your thing, locate the elevator servo a couple of bays back between Bulkheads F5 and F6. This leaves the fuselage bays fore and aft of F3/F4 open for ballast. Sixteen ounces of lead will fit in each. This will raise the wing loading up by 4 oz./sq. ft. Additional ballast can be added to the wing spoiler servo box if some additional strength is added to the hatch.

Pop-offs have not been a problem even with nearly vertical launches. Just be sure a strong tow hook is used, because it regularly breaks a 120-pound-test winch line.

Happy thermalling.

Radio Technique/Myers

Continued from page 33

designed the case I used a shallower box (2 in.) than most folks use. Then I put in provisions for two special cards, which left no room for additional battery packs. Along came Larry with his 900 mAh cells, and look what happened: Ace 450 mAh cells in plastic boxes (.74 × 2.22 × 4.85 in. and 8 oz.); SR 900 mAh cells in sleeve (.70 × 2.06 × 5.25 in and 9.3 oz.). For a weight increase of 1.3 oz., I *doubled* my transmitting time! There was enough room in the box to accept the extra .4 in. of width, and I actually ended with more room in the other two directions!

How does he do it? I cut open an SR900 cell to find out. Well, the laws of physics haven't changed! You want more capacity, you use more plate area. My micrometer says that the plates in the SR900 cell are only 2/3 as thick as those in the 450 mAh cell. Add to that the fact that the 450 mAh cell is wound on a plastic rod while the SR900 is just wound on a mandrel that is (apparently) later removed, then throw in the consideration that the SR900's can measures .645 O.D., while the 450's can measures .535 O.D., and you begin to understand how the SR cell winds a few more turns into the package.

As regular readers know, I've been using SR900 packs in my Helicopters (Baron 20 and Heliboy), and now I can say that after more than 50 hours of flying I haven't had any problem traceable to those batteries. I use the SR900 packs to deal with the added current drain of some gyros, rather than add a second pack for the purpose, which would add a lot of weight. When it comes to charging, I plug in the M.E.N. C/50 charger and walk away for lunch. A completely discharged pack will stay on High Rate for about 90 minutes, but most often they're back on Low Rate in less than an hour.

Let's end this discussion of batteries with yet another Fast Field Charger, this one the FFC from Ace RC. It recharges both your Transmitter and your Receiver at the same time. The circuit is