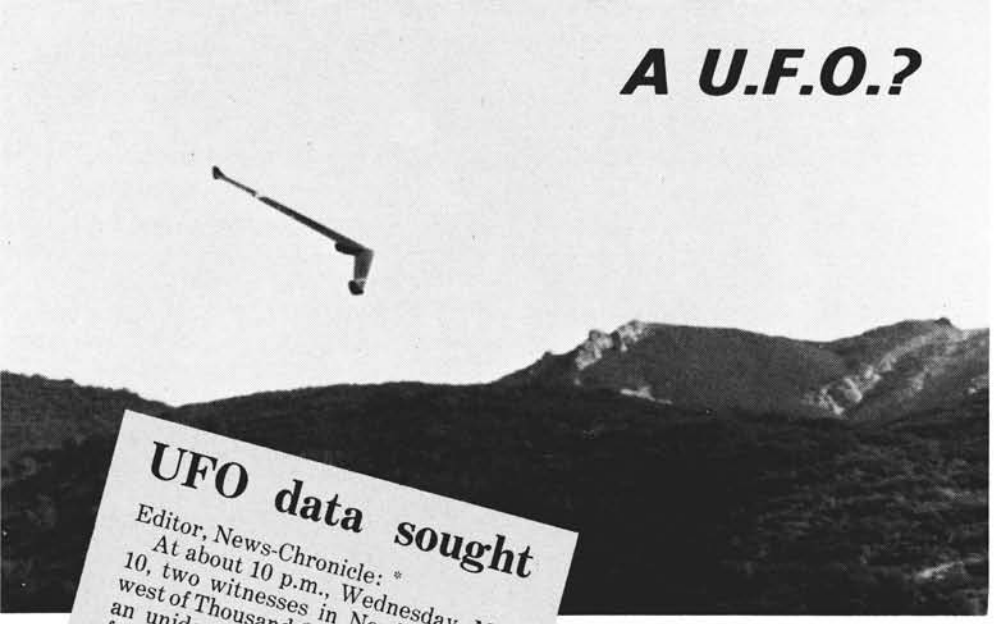
A U.F.O.? No, it's an "Illusion"



UFO data sought

Editor, News-Chronicle: *
At about 10 p.m., Wednesday, May 10, two witnesses in Newbury Park, west of Thousand Oaks, both observed an unidentified flying object moving from east to west and directly overhead. One of the witnesses, himself a licensed private pilot, described the object as roughly in the shape of a boomerang flying quite rapidly, without any sound, no running lights, a shimmering near the surface, and roughly the size of a DC-9 wing at an altitude of about 1,000 feet. As the director of the UFO Research Institute I would be most grateful if any of your readers who might have observed this object or any other non-light-in-the-sky UFO would send in a report; the address is UFO Research Institute, POB 941, Lawndale, Ca. 90260. (All witness identities will be protected.)
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10 feet of Flying Wing, a weird, graceful Soarer that triggered a U.F.O. report.

by Hal Cover

Photos by Don McGovern

How would you like to build a ten foot span radio controlled Flying Wing which flies easier than a conventional glider and rivals it in glide? Here it is and would you believe a finished weight of 18 ounces? Many stories can be told about this Wing, even a U.F.O. sighting which made the local paper, but build one and you will find out it doesn't need tall tales to sell it.

The evolution of this design was a result of several untried construction ideas, plus an interest in finding out just how well a Wing could soar. The basic planform borrows from previously published plans (Flying Models Dec. 1958, D. Gurnett). The size, aspect ratio and light weight of the design required many unconventional construction techniques. It is not easy to build and if expected to fly properly it must be accurately and painstakingly built.

Wing Construction

Due to the span of the wing it is necessary to splice all spars. Care should be exercised in performing this construction step.

The front spar is laminated using the following procedure: Start with 1/16" thick medium hard balsa. Make a 1½"x61" sheet, splicing 36" or 48" stock. Trim the tapered spars out of the sheet, reversing ends for the wide dimension after each spar is cut. Next file the back edge of an Xacto blade half round. This is to be used to groove the spar to accept the .012 dia. piano wire. Lay one spar on a flat surface and retain in a straight position by placing a 1" long x1/16" thick block on each side at 12" intervals. The blocks may be held using double sided tape and should not project above the spar. Carefully groove the spar using the rounded end of the Xacto blade. The groove should be about .012 deep. This operation is best done using a metal 36" or 48" straight edge. Form a small loop in each end of a 6 foot length of .012 dia. single strand piano wire. Put a nail in the working surface about 4" away from the end of the spar and in line with the groove. Hook one end of the wire over the nail and stretch the wire over the spar. Position the wire over the spar groove, pull tight and hold in tension with the aid of another nail. Using a pencil as a roller, push the wire into the groove.

Mix approximately 5cc of epoxy (do not use the 5 minute epoxy, you won't have enough time) and spread a thin, even film on the surface of the spar. Place the second half of the spar on top and using moderate pressure, squeeze out all excess epoxy. Check the position of the upper spar for alignment with the lower spar. Now carefully place weights on the spar making sure the two halves stay aligned. Do not remove weights until the epoxy is cured. Laminate a total of four spars using this procedure.

The back spars and the top portion of the leading edge are formed out of hard 1/8" sheet. Splice 36" or 48" sheet into a 2"x 61" sheet and trim out the tapered spars as previously described.

The trailing edge is created in a similar manner using medium straight grained ¼" sheet (36" long stock). The bottom half of the leading edge is made from ¼" triangle stock 61" long. Glue the triangular stock on the tapered 1/8" sheet leading edge, this now can be used for reference for matching ribs when trimming the leading edge notch.

All wing ribs are cut from medium straight grained 1/16" sheet. The front of the rib will have to be carefully trimmed and chamfered at 30° to match the leading edge. One basic template may be used for cutting out all the undercambered ribs (ribs 1-18). Mark the proper rib length and leading and trailing edge height on the 1/16" sheet rib stock, then place the upper edge of the template over the marks and trim. Next repeat the operation for the bottom surface. Always position the template leading edge the same for all ribs. A similar technique can be used for the reflexed ribs.

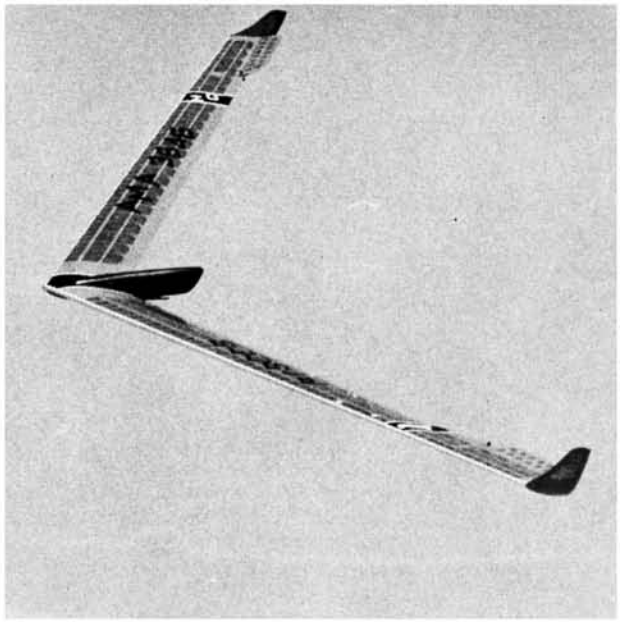
The reflexed portion of the trailing edge is formed by water soaking the area between 40" and 48" out from the center. This may be accomplished by wrapping this area in wet paper towels. Soak for four to six hours. Pin the trailing edge down to the 40" point, then twist the next 8" and block only the trailing edge portion up 3/8".

The Assembly

Pin the trailing edge in place over the plans. Block up the leading edge 1/8" out to the tip. Starting at the reflex section of the tip block the trailing edge up ½", then pin the leading edge in place and proceed by gluing all ribs in place.

The ribs are notched to accept the spars by laying a metal straight edge on the wing. Notch each rib for one side of the spar, then position the spar with one edge in line with the notches and carefully notch the other side of that spar slot. Cut the notches 1/8" deep. Note the first three ribs are notched 1/16" deep.Glue the upper spars in place and use a straight edge on the top of the spar to make sure that they are flat. After the wing has thoroughly dried, remove from the building board. Turn over and install the bottom spars in the same manner. The 3/32" square diagonals are positioned by punching a 3/32" dia. hole at the correct angle through each rib. Angle the front to match the leading edge, slide between the back spars and through the hole, then trim off the back. Glue in place with the trailing edge ends centered so the 1/16" gussets will fit on top and bottom.

*Excerpted from letter printed in **Thousand Oaks News-Chronicle**, Thousand Oaks, Cal., from Stanton P. Friedman of U.F.O. Research Institute in Lawndale, Cal.



Swish and it's gone! The rubber shock cord hauls it up upward, not much pull is needed. Right: Buried piano wire reinforces the wing spar. A homesick angel in the glide.

Next the webs can be added. Take your time and make all webs fit tightly and position directly in the center of the spar. After this you can add the false ribs.

Install the cable attachment arm using 3/32" plywood and a 1/8" dia. dowel for the pivot point. Make the elevons from light quarter grained 1/4" sheet and the rudders from 1/16" plywood.

Installation of Controls

Cut out the trailing edge for the elevons. Glue the 1/32" plywood to the wing trailing edge and the elevons, then temporarily attach the rudders and make the hinge of steel pins. Epoxy the inner hinge pin into elevon and make outer pin removable.

Cut out the control horns from 1/16" plywood or epoxy board. Notch carefully for a tight fit with .012 dia. braided cable. Using 1/16" I.D. sharpened brass tubing, punch a hole in each rib along the leading edge for cable clearance. Install teflon or nylon tubing as shown on the plans for cable guides. Note they do not run the full length of the wing, just until the wires are straight down the leading edge. Make an approximately 1/8" dia. loop in one end of four cables and feed each one through the tubing and ribs. Using a 2/56 nut and bolt attach the cable hook to the control arm and hook the upper and lower cables to the hooks. Now cut a notch in the elevon for the control horn. Do not glue the horn on to the elevon permanently, just tack glue in position and with the elevon held in line with the reflex portion of the trailing edge, make loops in the other ends of each control cable. Slight tension is needed for proper control response. When correctly installed the arm should be able to be moved with only one ounce pull at the servo attachment point. If both elevons respond freely, epoxy the cable guide tubing in several spots to make sure they don't move.

The 1/16" gussets can now be added to the trailing edge. Note that the gusset goes on the top on the outer side of the rib and on the bottom on the inner side.

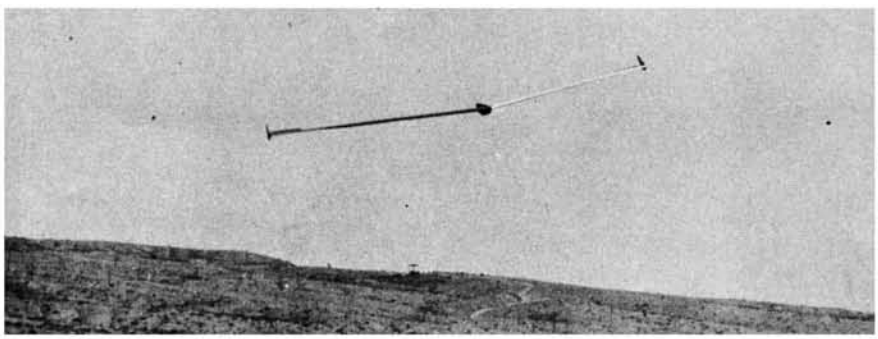
The 1/16"x1/8" spruce trailing edge strip is added. It is glued to the bottom of the trailing edge out to the beginning of the reflex where it transitions to the top of the trailing edge at the reflex section.

Assembly of Two Halves

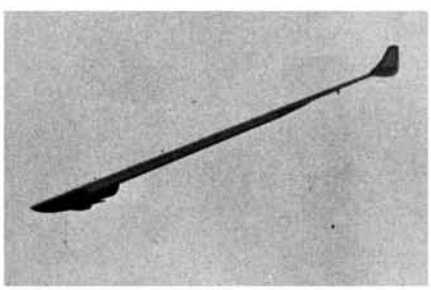
Prior to assembling it is best to shape the leading and trailing edges.

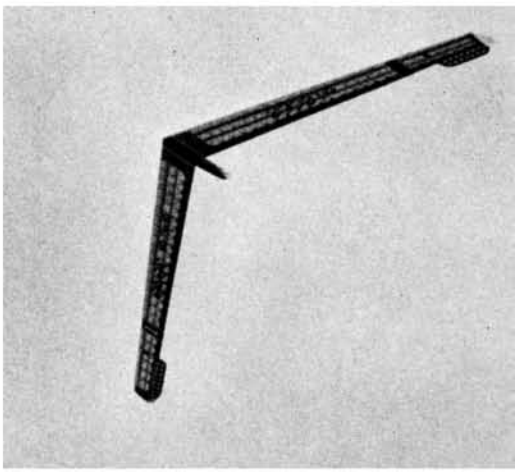
The wing is blocked up with 10" dihedral total. Fit the leading edge, second spar and trailing edge, then very carefully trim off excess wood on the front spar so there is a 1/4" gap between spars to fit the plywood rib. Don't nick or kink the wire! After obtaining a proper fit remove the wing from the table and proceed by solder tinning each .012 dia. wire. Form a semicircle out of .032 I.D. copper tubing. The diameter should be the same as the space between the upper and lower wire. Now push the two wires into the tubing so the top wire comes out the bottom and the bottom wire comes out the top. Position the tubing so it is slightly over 1/4" away from the end of the spar, then solder the wires into the tubing.

When actually assembling the two halves, the plywood center rib is placed through both wire loops and with the leading and trailing edge properly positioned, a tapered half dowel is pushed tightly into each loop which forces the loop out from the plywood rib and places the wire under tension. A convenient tapered dowel for this application is the end of a 1/2" or 3/4" paint brush handle split in half. Prior to gluing together make sure all possible operations are done to each wing half because it's difficult to work on a 10 foot long boomerang in the average workshop. With the wing assembled but not glued, form the leading edge plywood brace and second spar plywood brace. The leading edge, second spar and trailing edge are glued using Titebond and the wire braced spar is epoxied. Make sure all portions of the wire are coated with epoxy and the taper-



Watch your orientation until you get familiar. At right: Elevons move to control your glider. Below: Easy to lose head-on. Keep it in close.





ed dowels are very tightly pushed in place, because the strength of the wing is in the proper fit and assembly of the wire and spar.

Plank the bottom of the wing with 1/16" sheet and install the two clevices on the control arms and plank the top. When dry, cut out the planking and trailing edge to match the fuselage width. Cover the top and bottom with two layers of glass cloth approximately 3" wide.

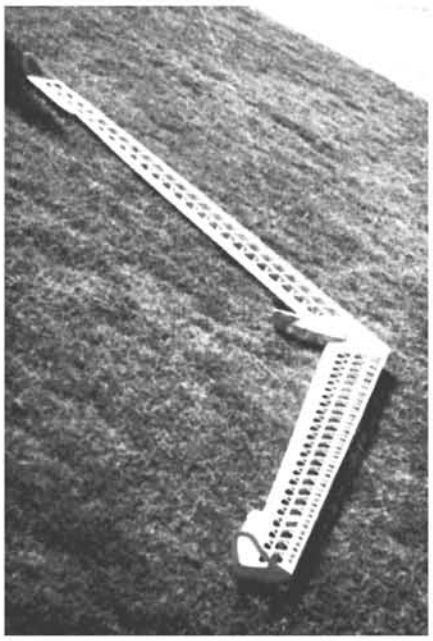
The Fuselage

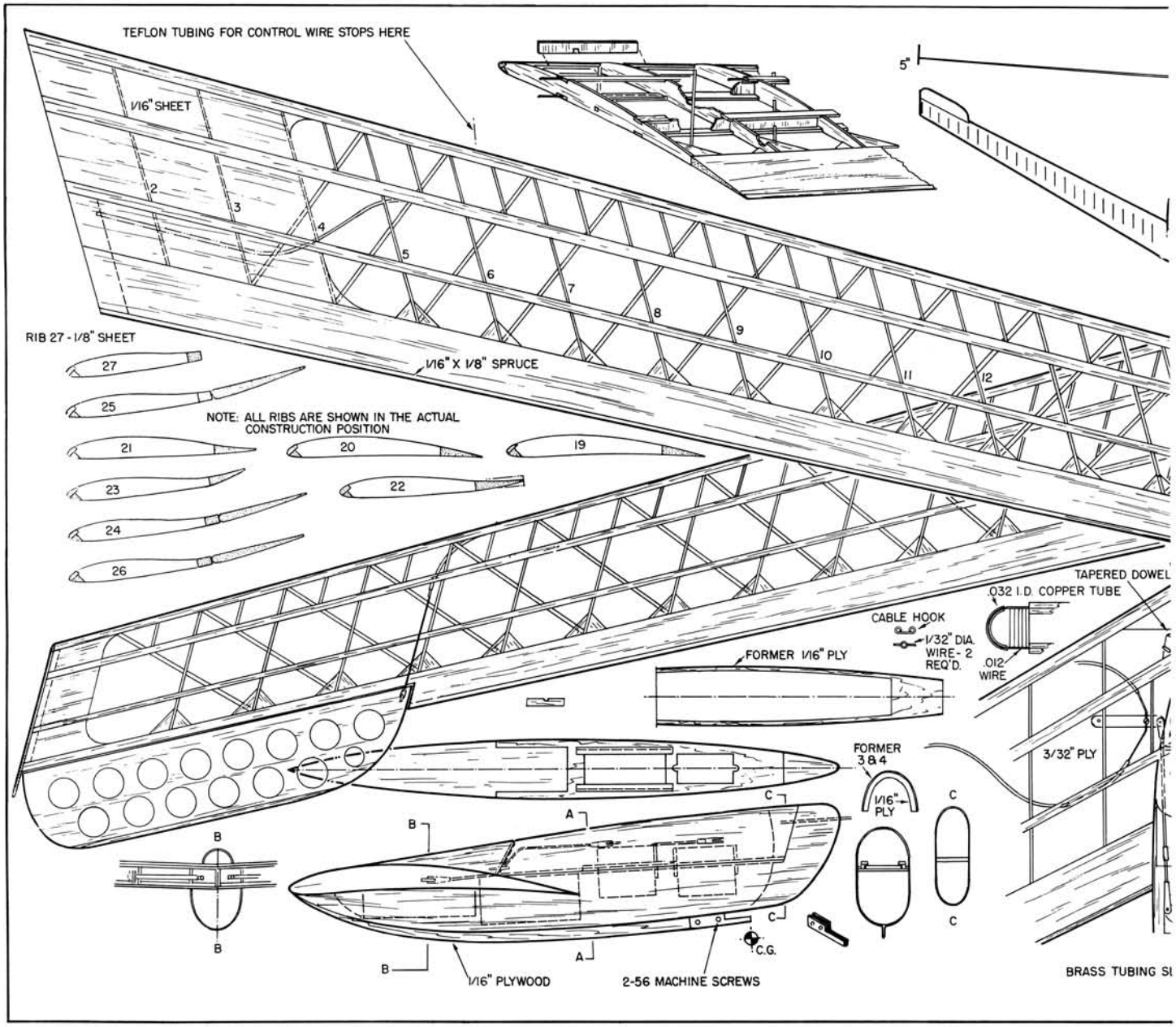
The fuselage is carved to shape out of a block, carefully fitted to the wing airfoil. Laminate two layers of glass cloth and resin onto the block. When cured, epoxy the plywood skid in place and using thin strips of glass cloth, reinforce the skid. Sand and finish the fuselage outer surface. Trim off excess glass cloth and fit to the wing, then carefully cut the top half of the fuselage off. Next, hollow out the necessary areas for the radio gear. Epoxy the lower half of the fuselage onto the wing. Cut out the two plywood fuselage crutches, #1 and #2 and former #3 and #4. Epoxy #1 in the lower half and the #2 one in the upper (removable) half, then add formers #3 and #4. You will notice the removable cover is held in place with two 1/8" dia. dowel pins in front and one removable 1/8" dowel in the rear.

Radio Installation

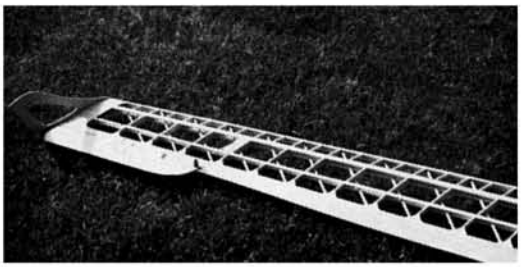
The radio used in the wing was a Cannon Super Flite with a 225ma battery pack and PS4D type servos. The front servo is set up as the sliding servo as shown on the plans. The servo slides are made from 3/32" plywood and should freely move into the channels, but with a minimum of slop. The receiver fits in front of the two servos as low as possible in the fuselage for control linkage clearance. The 225ma battery pack used was taken apart and the two batteries placed end to end in shrink tubing. A small size switch was mounted sideways in the bottom with a 1/16" dia. wire rod out the side for switching. The antenna was inserted into a 3/32" I.D. teflon tubing which ran out through the wing as visible on the plans.

The clevis rods can be fed through the





Question not the backward body, it balances. A hand-hold for launching. At left and below: the delicate framework, spars tapering toward tips.



center of the rear spar and threaded into the clevis. Be sure the clevises thread freely prior to their installation or this operation could be difficult. Bend the rod for proper servo alignment and cut off about 1½" in front of the servo. Attach using 1/16 I.D. brass tubing to another short section of threaded rod. Thread a clevis in place and adjust for proper elevon before covering the wing.

Miscellaneous

Epoxy a ½" wide strip of glass cloth along the wing/fuselage interface for additional strength.

Covering

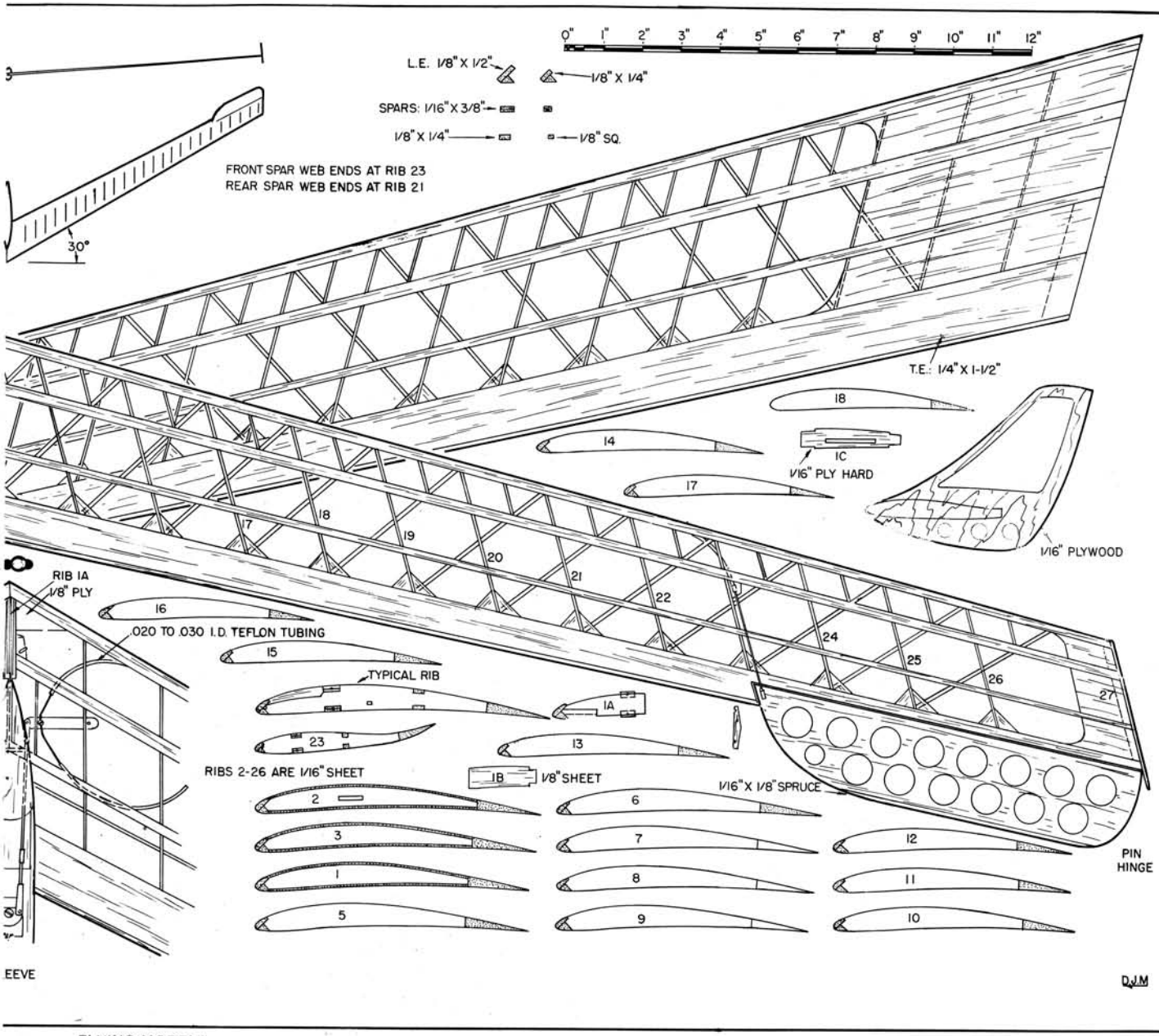
MonoKote was used on the original model for covering. Remove the elevons and carefully check all surfaces for a smooth finish and inspect all glue joints. Cover with MonoKote in the conventional manner. Be sure to attach the MonoKote to all ribs and spars. Shrink small sections at a time (both top and bottom). Maintain the inner portion flat. Measure the wash out in the tips and make sure both sides are the same. Paint the fuselage and decoration trim as desired. Use a strip of chrome MonoKote trim on the leading edge. This is very effective for visibility as there is not much to see when the wing is flying below 45° in the sky.

Flying Technique

The center of gravity should be located as shown on the plans. Towing may be accomplished using ⅛" dia. bungee cord, but only stretch about 75% of its maximum stretch. Two strands of ¼" Pirelli will also work. The wing will tow straight with no tendency to wander, but be careful, you will find it doesn't take much power to tow.

Once released from the line, the wing is flown in the same manner as a conventional glider and in many respects you will find it much easier to fly.

Good luck with your wing. You will find the first flight will more than pay for all the work necessary building it. I would like to thank Frank Zaic for refreshing my memory on drafting plans and also for many interesting discussions on the theory of flight.



FULL SIZE PLAN AVAILABLE THROUGH CARSTENS FLYING PLANS ORDER PLAN CF-280