WAKEFIELD

PLAGIARIST

By BOB ISAACKS. . .This high-performance FAI model is the result of "borrowing" the best parts of several successful models. The resulting aircraft is a consistent contest winner. Construction is conventional.

• As its name suggests, the Plagiarist is a Wakefield model which combines features from several successful designs. To give credit where credit is due, the wing design is borrowed directly from Frank Parmenter's Charisma; ditto for the rudder. The front-end was borrowed from Fred Pearce's 74 Wake, as is the pylon-style wing mount. The fuselage construction duplicates that of George Xenakis Tart, and the 7% thick flat-bottomed stabilizer is my contribution to the design.

The design objectives of the Plagiarist were to develop a competitive airplane with conventional construction that is warp free, easy to align and adjust, easy to repair, quick to build and rugged. Those objectives have been achieved. The Plagiarist has an excellent contest record with its most recent win being the '85 Tri-Cities Championship in Seguin, Texas where it was pitted against FAI Wakefield, Nordic, *and* Power Models, some of which were flown by current members of the USA FAI Team. The conventional construction and jig-built wing make it possible to fly this airplane, season after season, with no more than one short test hop before flying an official at any contest in which it is entered. The original Plagiarist is now over six years old and still performs consistently although it has gained some weight and a few dings from over 300 flights.

If you have never built a Wakefield model and would like to give it a try, consider the Plagiarist; it builds fast and wins trophies. It's a fun way to get acquainted with FAI competition.

FUSELAGE

Begin fuselage construction by preparing four 3/16-inch square strips and carve them to triangular cross section. Next, cut 7 pieces of 3-inch wide, 1/16-inch balsa, 6 inches long. Prepare the edges for butt gluing and glue the seven pieces together to form a single piece of 1/16-inch thick balsa 6 inches wide x 21 inches long *with the grain vertical*. Next cut one piece of 1/16-inch plywood 1/2 x 6 and butt glue it to the edge of the 6 x 21 balsa sheet. Now cut 9 pieces of 3 inch wide x 1/32-inch balsa 6 inches long; butt glue them together to form a single sheet of balsa 1/32 x 6 x 26-1/2. The next step is to glue the 1/16 sheet to the 1/32 sheet; make sure that *one* side of this assembly is flat; you now should have a single sheet, 6 x 48 consisting of plywood, 1/16 balsa and 1/32 balsa.

Secure a flat 48-inch long building board and lightly pin the sheet prepared above to it *with the flat side up* (you will have to shim up the 1/32 portion to achieve this). Using a straight edge, glue one of the 3/16 square triangles to the sheet approximately 1/8 from the top edge of the sheet with the vertical portion of the triangle at the top (see sketch on plan for the arrangement). Next, glue the second triangle on the sheet 1-1/4 inch down from the first triangle; note that this triangular strip tapers toward the top strip at the fuselage rear, so that they are 1 inch apart at the end of the sheet. Next, construct a "mirror image" fuselage side spaced approximately 3/16 down from the first side. Cut the fuselage sides apart and trim them so that approximately 1/8 of the vertical sheeting protrudes above the 3/16 triangles.

Using a 48-inch long straight edge, cut the fuselage top and bottom sheeting from the remaining portion of the edge-glued skin. Cut these to exact size utilizing dimensions taken from the fuselage top view.

The fun part of this fuselage comes in at assembly; first glue in the 1/32 plywood peg reinforcements on the *inside* of the fuselage sides. Now, utilizing two 48-inch long extruded aluminum triangles or other suitable straight edges, glue the fuselage top to the sides, *flat* side of the top sheeting to the *inside* of the fuselage. Do everything possible to insure that the sides are straight and vertical and that the taper toward the tail is even; slow curing glue will give you time to work on this step. The fuselage bottom is added after the top is thoroughly dry; again the flat side of the sheeting is positioned inside the fuselage. After sufficient drying time is allowed, use a long sanding block to "fair in" the 1/32 sheeting to the 1/16 sheeting where they are joined. Consult the section views of the fuselage and round off the corners to match the plan.

The basic pylon is constructed from two symmetrical ribs and three vertical spacers. Cut the ribs from medium 1/8 balsa and cut three *equal length* spacers per the plan. Using instant glue and a small triangle glue the spacers to the bottom rib insuring that they are perfectly vertical; now add the top rib, checking it on all sides to see that it is in perfect vertical alignment with the bottom rib. Now add the 1/16 balsa skin allowing the skin to protrude 3/16 above the top rib. Using a long sanding block, sand the balsa skin

flush with the bottom rib and curved to match the wing under camber above the top pylon rib.

WING

The first step in building the wing is to construct a wing jig. The sketch on the plan shows how I made a jig using styrofoam and thin plywood sheeting. If you do not have access to foam cutting equipment, an alternate jig can be built utilizing ribs which match the wing undercamber. Glue them to the base on approximately 2-inch centers and cover with 1/64 ply sheeting a la the styrofoam jig.

Prepare the bottom wing skins by edge gluing sufficient strips of 6 lb. "C"-grain 1/32 balsa. Cut the bottom skins to *exact* size and mark the rib and spar locations on them with a soft pencil. Pin one bottom skin to the wing jig and add the 1/8 x 3/16 balsa strip *on top* of the skin at the leading edge. Next add all ribs, checking to see that they are vertical to the skin. The 1/16 plywood ribs on the inner panels should be drilled *oversize* for the wing wire tubing before gluing them in place. Next, add the rear spars between ribs and diagonal ribs from the rear spar to the trailing edge. Use a long sanding block to sand the upper camber to shape over the rear spar and diagonal ribs and also at the front strip. Now add the aliminum wing wire tubing. I use slow-curing instant glue and micro balloons for this operation.

The top skin is now added using slow-curing glue and sufficient pins and weights to ensure even contact with every rib. Note the grain direction at the rear of the spar. The top skins are also 6 lb. "C" grain 1/32-inch balsa. C-grain was selected since it has sufficient rigidity to resist "pulling down" between ribs when the wing is covered and doped. Complete the wing structure by adding the trailing edge and leading edge pieces using epoxy. Although I have not tried it on this structure, a single vertical strip of carbon fiber between the leading edge pieces and at the spot where the wing skins transition to the trailing edge may help to prevent warps. Remove the wing from the jig after the epoxy dries and finish sanding the upper camber at the leading edge and trailing edge. Cut the bottom skin at the tip rib and fair it in to the upper skin which forms the tip outline shape.

Cut the wing apart at the dihedral break (you did add a 1/4-inch thick rib at this spot, didn't you?), sand the dihedral angle a la a hand-launched glider wing and butt glue the dihedral joint with epoxy. Add the 1/16 plywood wing cap rib, sand the aluminum tubing flush with the cap rib and the wing is ready to cover.

Build the second wing exactly like the first one *with this important note:* When you add the aluminum tubing to the second wing, install wing wires in the first wing and place it temporarily on the jig to help align the tubing. This will make it easy to install the wing and ensure exact alignment between the inner panels.

The short wing center section is now constructed on the jig using *both* wing panels for alignment. When it is complete it may be glued to the top of the pylon making sure that it is centered on the pylon and perpendicular to it.

STABILIZER

The stabilizer is constructed in the conventional manner with two important objectives. (1), Build it light. (2) Build it warp free. "Eyeball" every piece of wood for straightness and use contest grade balsa except for the 1/16 square spars, which should be medium hard. Use your favorite method for producing identical ribs; I cut two 1/32 ply ribs and sand them to identical profile, then I cut an appropriate number of 1/32 balsa rectangles which are spot glued with water soluble glue into a sandwich. After the glue dries, I sand the bottom of the sandwich flat for a reference plane and spot glue the plywood ribs aligning them fore and aft on the opposite ends of the balsa sandwich. The next step is to carve and sand the sandwich to a perfect rib profile. After notching for the spars, the sandwich is soaked in warm water until the individual ribs can be separated. Allow the ribs to dry flat on a piece of waxed paper and you are ready to assemble the stabilizer. The 1/8 balsa tip ribs are sanded to a half-round shape (when viewed from the rear) using the "eyeball" method. Cut down three ribs in the center after assembly for sheeting; add the center sheeting with instant glue, lightly sand the sheeting to fair in with the upper rib camber, and the stabilizer is ready to cover.

RUDDER

The rudder must be built "in-the-air" to achieve its double tapered shape. Construct the outer frame (including the trailing edge) over the plan; next add all conventional ribs and remove the assembly from the plan. Utilizing a long sanding block taper the rudder to achieve the symmetrical airfoil and taper as indicated on the plan. Next, add the tapered spars, geodetic ribs, gussets and sand the assembly to achieve a smooth outer profile.

NOSEBLOCK

I utilize a single piece of balsa for the main noseblock with the grain oriented fore and aft, parallel to the fuselage center line. Add the plywood facing pieces as indicated on the plan and shape to the finished profile. I drill the bushing hole from the front *and* back end, allowing for any mismatch in the center fo the noseblock where it is invisible.

PROPELLER ASSEMBLY

This component can be the difference between a good airplane and a championship calibre aircraft—take your time to get this assembly right!

Prepare two prop blocks per the plan; use 12# (medium hard to hard) balsa prefereably from the same block of wood. Note that the blade root is constructed of spruce. Epoxy the spruce to the balsa prop block with along bevel to insure strength and adequate gluing area.

Carve the *bottom* of the block, first carving across the diagonal dimension of the block. Utilize a straight edge to achieve a perfectly flat surface on the underside of the blocka at *any* point across the diagonal dimension except the root. Next, carve the top of the block to achieve the required airfoil at various points on the prop blade. Make templates from the plan to check your progress on this step.

Utilizing the tip profile drawing on the plan, carve the tip of the prop blade to match, and blend the airfoil to its final shape. I use 30# monofiliment line Hot Stuffed to the prop outline to help "feather-edge" the nose radius and trailing edge. Next drill the hub bushing hole oversize in preparation for the assembly operation.

The prop hub is not very tough if you study the plan sketch closely. Basically, the assembly consists of a "Z"-shaped wire, two brass diamonds and a brass shaft bushing. Construct these components per the plan and solder them into the sandwich as indicated on the sketch.

Next, build a prop assembly jig per the sketch and utilize it to epoxy the prop hub bushings into their oversize holes. Use slow-curing epoxy so that you can shift components as necessary to achieve proper alignment and pitch. After this assembly is dry, you should be able to lift it from the jig and the blades should fold *perfectly* tip to tip.

Finish the prop blades by giving them two coats of nitrate dope laced with talcum powder. Sand the blades with 400 grit paper between coats, then cover with Japanese tissue. After the covering is dry, add the turbulator strip of .010-inch balsa per the plan.

The prop shaft is bent from 2mm music wire and installed per the sketch *after* the noseblock has been finish doped.

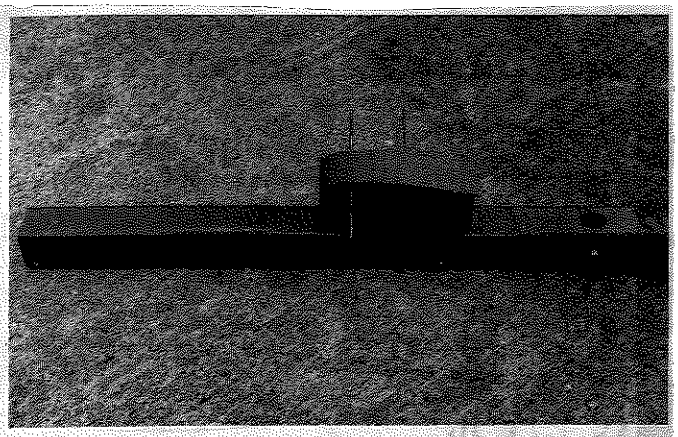
COVERING AND FINISHING

The stab and rudder are covered with superfine Japanese tissue. I use nitrate dope, full strength, and apply it to the *outer edge* of these components only. Then the tissue is applied using thinner brushed through the tissue to adhere it to the structure. After the surfaces are covered and the tissue is trimmed on all edges, spray the tissue with a light "mist coat" of alcohol and let it dry completely. Next, the tissue is doped with two coats of 50/50 nitrate dope/thinner which has a few drops of castor oil in it. Carefully done, this surface should remain warp-free forever!

The wing panels and fuselage are also covered with superfine Japanese tissue using the following method. Use nitrate dope/thinner in a 50/50 ratio and apply two coats to all surfaces sanding lightly between coats with 400 grit wet or dry paper. After the second coat is dry, position the tissue on the surface to be covered and brush nitrate thinner thru the tissue to adhere it to the structure. After the thinner dries and the tissue is trimmed on all edges, apply two additional coats of 50/50 dope/thinner to the completed surface.

The nose block can be covered with tissue using the above method or can be color doped to match your color scheme. My trim and AMA Numbers (which are required on *all* surfaces per FAI rules) were cut from tissue and doped to the primary covering using thinner, then a final light coat of dope was applied for weather

Close-up of wing, covered with superfine Japanese tissue, doped with nitrate dope and thinner in a 50/50 mixture. Note turbulators.



Fuselage with wing pylon in place shows aluminum tubing for plug-in wings. Wings and center pylon section are built in jigs.

proofing. Now is a good time to add FAI vouchers (span, chord and area) to the wing and stabilizer if you intend to fly in FAI competitions; don't forget to add your name, phone number, and address in a conspicuous spot on the airframe in case your Plagiarist gets a case of wanderlust in the middle of a contest. Strips of chrome Monokote were added to my rudder and wing leading edge to make the Plagiarist easier to see for me *and* the official timers.

Now is the time to add the turbulators to the wing upper camber at 7% and 23% of the wing chord. Note that the turbulators taper on the outer wing panels in the same ratio that the panel itself tapers.

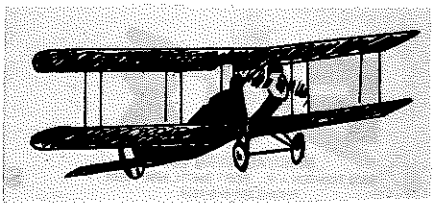
I use Sig slow-curing epoxy to add the rudder, stab shoc-mount and fuse snuffer tube at this point in the construction sequence. Note that the rudder is offset 1/8 inch for a left glide circle. Double check the fuselage front for two degrees of downthrust and three degrees of right thrust. Now add the wire stabilizer hooks and D/T band supports. Assemble the stabilizer to the fuselage and wing to the wing mount pylon which is not yet glued to the fuselage. Make up a 40 gram Wakefield motor and install it and the noseblock/prop assembly to the fuselage. Using long rubber band, temporarily attach the wing with pylon to the fuselage and slide it fore or aft until the airplane balances 1 inch forward of the trailing edge of the wing. Use a pencil to mark the spot where the pylon should be glued, dissassemble the wing and epoxy the wing pylon permanently in place.

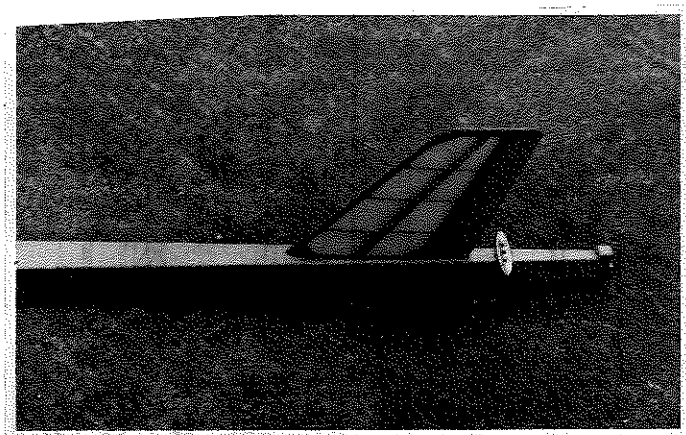
TEST FLYING

Reassemble the Plagiarist complete with rubber motor and take it to field with 12-inch high grass on a day when the wind is calm! Test glide the airplane, adjusting the stabilizer incidence until a barely perceptable stall is noted. Now remove 1/64 from the stab incidence block. Wind the motor about 100 turns and launch the Plagiarist nose high and to the right of the wind; it should climb steadily and show a tendency to turn right under power. If no turn is evident, add more right thrust. If a stall is evident in the climb add more down the thrust. Keep adding winds and shimming the nose-block as necessary to achieve a nose high, right turn in climb. My Plagiarist makes a 360-degree turn in 34 seconds which is the motor run it gets with a 14 strand, 1/4-inch FAI rubber motor. Using a 28 strand Champion 1/8-inch rubber motor I get a 37-second power run. These figures will vary according to your rubber's age, vintage, lube, and your skill as a rubber motor winer. After the prop folds, the Plagaiarist should transition into a floating left turning glide circle. Adjust the glide circle by tilting the stabilizer (left side high) for small glide circle add more tilt, for a large circle, reverse the process. Did I forget to mention that I use a winding tube of 1-1/4-inch OD thin wall aluminumb tubing? I may also have neglected to mention that I use a fuse on *every* flight including short test hops; it's better to be safe than sorry.

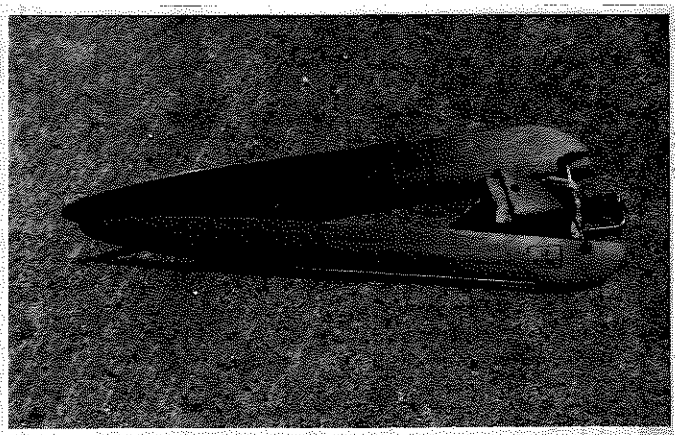
At this point, you should be ready for the next FAI qualifying trial in you area. Watch the top flyers and the thermal detectors; when a "hot" thermal comes through, launch into it!

If there are any questions or comment on the Plagiarist, write to me C/O *Model Builder*. See you at the field. •





The rudder must be built "in-the-air" in order to achieve its double-tapered shape. Stab shoc-mount is at rear of rudder.



The folding prop assembly can make the difference between winning and losing. It's important to take your time to get it right!