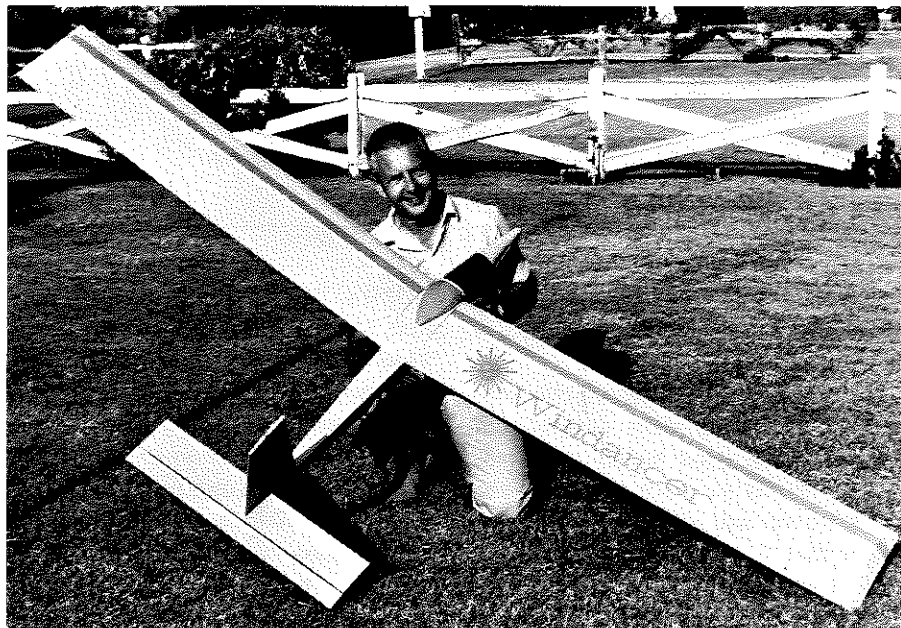


3721

"Yankee Gull"

The ultimate machine? No. But a different approach to the common problem . . . soaring performance . . . Finesse be hanged . . . here's a direct assault on the world's thermal population . . . an affront by brute force, wrapped in a three-for-one variety package.



How's that for a first time model building job? Bill Whitney is rightfully proud. "Windancer" is the name Le has given all of his series of glider designs. All employ his pet turbulator wing spars

TAIL SURFACES: These are just a bunch of sticks glued together . . . basically a 3/16 "core" with 1/16 stock on either side around the edges. The 1/16 edges lock it all together, providing a gusset over every joint and holding the covering material up away from the core. Makes for a smooth surface. The covering only touches the structure around the perimeter.

Start building by laying 1/16 x 3/8 strips and other 1/16 sheet pieces directly over plans, gluing joints as indicated. Next, fit and glue all 3/16 thick "core" pieces over the 1/16 base. Note that trailing edge of elevator and rudder do not have the 1/16 sheet overlay, and thus must be shimmed 1/16 above building surface for proper alignment. Add the top layer of 1/16 sheet, similar to that which went down first. That's it.

When dry, sand leading and trailing edges round. Final cross section should be like that shown for the horizontal tail surfaces on fuselage side view drawing. Hinge the elevator four places and the rudder two places. Prepare mounting holes for control horns. Note that elevator horn is on center line as the elevator push rod comes straight out the

tail end of fuselage.

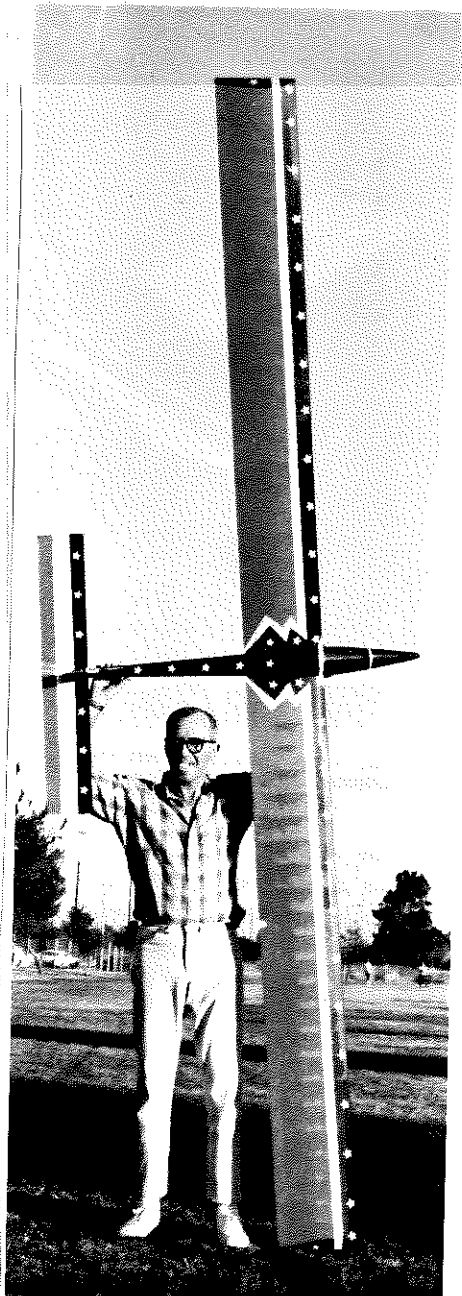
WING: Cut, splice and laminate all spars as noted. Take care to make good scarf . . . angled . . . joints, and orient splices as shown. Use straight edge for alignment and pin down to building board while glue dries completely.

Cut ribs as necessary for the version you're building. Where ribs are laminated . . . such as A-1 to A-2 and C-1 to C-2 . . . the easiest way is to cut the plywood rib, laminate balsa stock to it, and then trim to the ply outline. Rib B goes on after panels are otherwise complete and final sanded. Plan your work so as to stack cut and stack drill whenever possible. This can be accomplished by progressively modifying Template I to match rib cutting order specified on drawings. Same with Template II.

Make appropriate splices . . . taking care for good fit . . . and pin to building board the 1/4 x 1/2 leading edge backup strip, the 1/16 x 1-1/2 bottom trailing edge sheet, the main spar and, if used, the secondary spar. Be sure to make bevel at aft edge of trailing edge sheet, per drawing, before pinning down. Position and glue Ribs D thru F in place.

By Le Gray

PHOTOS BY BILL WHITNEY



"How ya going to get it home, Mister?" Believe it or not, the whole shebang fits in Le's VW convertible. Of course the wings unplug, dummy!!

Cut 1/4 OD wing wire tubes to length. These MUST extend 1/4 inch beyond root Rib B after wing is completed, so don't cut too short. Check fit of tubes in holes of Ribs C-1. Should be an easy, slip fit. If too tight, use a round file, twisting carefully to enlarge holes for proper clearance. Do it now . . . not after ribs are glued in place.

Position per drawing and glue Ribs C-1 and C-3 in place. Note that 1/16 shim is required under Ribs C at this stage in lieu of bottom root sheeting that will be added later. Use dihedral template and carefully position the root rib, Rib C-1/C-2 laminate, and glue. Check and re-check angle until glue sets firm. This step fixes the wing dihedral and is quite important.

When construction to this point is dry, remove all pins in structure from wing tip Rib F inward towards root for 24 inches. Prepare 1/8 sheet wing tip washout shims. Locate one shim at the extreme aft edge of the bottom trailing edge sheet so that the trailing edge at tip Rib F is elevated 1/2 inch above the building surface. Pin shim to building board and bottom trailing edge sheet to shim. Re-pin leading edge backup strip flat to board. Use the second shim under the forward edge of the bottom trailing edge sheet to help support the structure during subsequent work. Do not force too lightly . . . just barely touch the bottom of the bottom trailing edge sheet . . . and remember it should not go in quite as far as the shim at the aft edge. Pin this second shim to the board but NOT to the structure. The balance of wing construction will be accomplished with the structure "jigged" this way so that washout "warp" will be built-in.

Splice and glue 1/4 x 1/2 leading edge in place. Fit wing wire tubes in place . . . flush with outboard surface of outboard Rib C-1 . . . and epoxy. Add wing wire stop plates.

Position 1/8 x 1/4 spruce turbulator spars and glue in place. Orient splices as noted on drawing. These spars should be flush with top of ribs. Recut any rib notches if necessary . . . or "suspend" spar in slot. But get 'em and keep 'em flush.

Cut and glue 1/16 x 1/4 trailing edge webbing. Top must be flush with top of ribs before top trailing edge sheet can be added. So trim now or later as ne-

cessary.

Add 1/8 square diagonal bracing, over full panel span, as noted. These braces are important for torsional rigidity. Don't omit.

Glue 1/8 x 1/2 and 1/8 x 3/8 x 3/8 plywood backup plates to Rib C-1/C-2 laminate. These are required to anchor wing hooks securely in root rib.

Add top trailing edge sheet. Next, add 1/16 sheet at root over top of Ribs C-1 to C-3. Glue 1/16 x 1/8 x 3 balsa cap strips to top of each turbulator spar, running from top root sheeting at Rib C-3 to Rib D. Trim and sand cap strips to straight taper down flush with top of spars at Rib D. Since root sheeting goes over the top of turbulator spars, these cap strips are needed to make a smooth transition for covering material from sheeting to the Rib D contour.

Remove wing panel from building board. Re-glue all joints. Cut and glue 1/16 lower root sheeting to bottom of Ribs C-1 to C-3. Note that bottom sheeting is flush with and butts to either side of main spar and, if used, secondary spar.

Prepare wing tip block by laminating 1/8 sheet to 1 inch triangular stock per drawing. Glue this sub-assembly to Rib F. Trim to match Rib F contours.

Carve and sand panel to final finish. Add Rib B and Tip Plate.

Screw main wing hook in place. The forward auxiliary wing hook is usually only required on the longer span versions to hold wings snug to fuselage during launch acceleration. It may be added later, if experience proves it necessary. Pilot hole was drilled during rib fabrication.

FUSELAGE: Cut side panels from good medium stock. If 4-foot lengths are not available, splice as shown on drawing. Be sure sides are identical or you're liable to have a funny flying sailplane. Mark position of bulkheads. Glue 1/8 x 1/4 spruce stringers in place. Glue the two horizontal grain doublers in place on side panels . . . use contact cement or epoxy. One doubler goes from Bulkhead 1 to Bulkhead 3, and the other from Bulkhead 4 to 5.

Cut out fin base plate and 1/16 plywood stabilizer anchor plate and glue together. Add 4-40 T-Nut to anchor plate . . . or epoxy a 4-40 Hex-Nut in place. Cut out skid base plate. Cut out all balsa and plywood bulkheads.

The fuselage is assembled upside down directly over drawings.

Secure fin base plate assembly in position over drawing . . . inverted, with nut side up. Position one side panel assembly inverted over drawing so that alignment point for wing leading edge . . . forward face of Bulkhead 4 . . . is exactly positioned per drawing. Pin solid to keep this index point, and glue aft end of panel to fin base plate. Repeat with opposite panel, again taking care to get wing leading edge index point right on . . . so to speak. Any error or misalignment in this step can cause major offset in the wings and poor flying qualities. Glue second panel to fin base plate. Now, if the tail end of the panels don't come out quite even, fix it later with a saw . . . but don't mess around with the index points for the wing.

Starting at tail, glue Bulkhead 9 working forward thru 6. Masking tape is handy to hold sides snug into bulkheads, and fast drying epoxy works great here. Let set to hard cure. Add tail skid base plate.

Pin Bulkhead 4 in place, temporarily, and glue in Bulkhead 5. Let cure.

Very carefully, glue in Bulkhead 4. Before it sets up hard, pull forward end of fuselage together to Bulkhead 1. Tape, pin or whatever to hold together and to hold alignment over drawings while Bulkhead 4 sets up. Add balance of bulkheads using a small carpenter's square or draftsman's triangle to check squareness and alignment. Keep it as true as possible. Leave it pinned down while working on the bottom.

Cut bottom center 3/4 x 2 balsa block to side contour. If you plan to use a wheel, cut a 1 x 2-1/4 slot at the aft end. Epoxy block in place on the fuselage. Add 1 inch triangular stock to either side of bottom center block, between plates. When all is ready, drop wheel assembly into slots and lock in with a drop of epoxy or glue down each slot to axle. Glue is adequate to hold weight of wheel assembly in slot . . . and that's all it takes. Build a box around the wheel . . . of course before the fuselage is completed and sealed up . . . out of 1/8 sheet to keep dirt and moisture out of interior. Paint inside of box with epoxy.

Add 1/16 sheet to bottom of fuselage from aft of bottom blocks to Bulkhead 6. Use scrap underneath as nec-

essary to support butt joint at end of blocks.

Trim and sand top of side panels preparatory for center section assembly and the 1/16 sheet decking.

Refer to construction notes on drawings which describe center section detail. This step is really quite simple, but it's worth repeating that time and care should be taken to obtain a perfect fit of parts . . . particularly to get a square end fit on the main cross brace and the Rib A laminates. Don't hurry . . . let fast drying epoxy do your rushing in this stage.

Do not cover top of center section yet . . . not until push rod casings are installed. And we're not quite ready for them yet.

Next comes the fin. Make the necessary marks to get it true on center line of fuselage. The thing mounts directly onto the fin base plate. It's a butt joint with no bracing. Works fine. In case of a "rough" . . . goes inverted . . . landing, the fin may get knocked off, but that's a quick fix . . . and it won't take half of the aft end of the fuselage with it. Brace it if you want. But not on my sailplane.

To get the fin perpendicular to the fuselage . . . and wings . . . a small bubble level, a short hunk of string, a straight pin and a small fishing weight are needed. Here's how it works. Set the bubble level across the ribs of the just-finished center section. Get the fuselage level, then brace and block to secure it in this level position. Tie one end of the string around the pin and the other end to the weight. Push the pin into the center of the fin trailing edge, up near the top. Attach the fin to the fuselage with epoxy . . . keeping the bubble level centered. Pin to hold true alignment on fuselage. Now, pin, hold or whatever so that weighted string falls directly down center of fin trailing edge. Let set until dry. It'll be true.

Might as well put stabilizer mounting saddles on now . . . while the fuselage is still tied down and level. The saddles are the 1/16 x 1/2 x 2 plywood pieces that the stabilizer sits on. Use the 4-40 stabilizer mounting screw and pull the stabilizer down snug against the saddle pieces . . . don't glue yet. Check stabilizer with bubble level. Trim fuselage as necessary until saddle pieces set level and support the stabilizer is a level position relative to the fuselage/wing and

perpendicular to the fin. Make sure these saddles are square with the fuselage center line, too. When all is satisfactory, epoxy in place.

Add 1/16 aft top deck sheet from Bulkhead 6 to 9. Use one piece, grain fore and aft . . . naturally . . . with a cutout to go around fin. Cut elliptical exit hole for rudder push rod casing. Mount and secure elevator and rudder push rod casings.

Cover top of center section with 1/16 sheet, grain spanwise. Carve canopy fairing block and mount as shown on drawings to top of center section. Secure canopy fairing face plate to forward surface of block and Bulkhead 4 as shown.

Carefully cut hatch base plate away from fuselage. Add canopy molding string. Attach with glue or cement. Make glue fillet forward of string.

The next logical step in the construction sequence is to apply a layer of resin impregnated fiberglass over the bottom forward section of the fuselage . . . from the nose tip to a coupla inches aft of the wing leading edge. This layup completely encases the fuselage structure, adds only about an ounce of weight . . . which you'll need as ballast anyhow . . . and makes the whole mess highly resistant to damage. It's about the cheapest insurance for field servicability you can get. Suggest a review of the discussion and "how to" talk in the February issue. Nuff said.

After the "nose job" is finished, epoxy the 1/8 plywood nose skid in place. Drill holes at angle indicated for tow hook tubes. Scar tube exterior, and epoxy in place. Note: Squeeze tube ends closed before inserting in drilled holes so that epoxy won't flow into end block tubes. Let cure then file smooth to skid.

CANOPY: The canopy can be made by bending a flat piece of acetate sheet around and attaching it to the hatch base sides and the hatch block. However, it's a much easier task if the plastic has a pre-set "curl" in it. That way it has a natural urge to stay next to the hatch assembly rather than trying to spring away. You can either use a cylindrical object . . . such as a tall tomato juice can . . . as a form, or just roll the plastic sheet up into a tube that's about 2 to 3 inches in diameter. Use masking tape to hold plastic to can . . . or to itself if you decide to roll your own.

Now, stand the whole works up on a piece of aluminum foil in a 200 degree oven for 5 minutes. Take it out and let it cool . . . and it's curled. Cut and trim as necessary for a good, professional fit and attach with contact cement. Masking tape is your best tool while fitting canopy. Can be used to hold in place . . . but maybe more important . . . to mark exactly where you want to cut. Try it.

An internal hook on the under side of the hatch base . . . and one on the floor of the fuselage equipment compartment . . . with a coupla small rubber bands, makes a neat and easy way to attach the hatch to the fuselage. Locate hooks after you know exactly where radio gear will sit.

COVERING AND FINISH: Your choice. Super MonoKote recommended.

ASSEMBLY: How to put the thing together is pretty obvious, but there might be a question or two about the wings. The first thing you may wonder about is, yes, the wing wires DO NOT attach to the fuselage. They "float" free in the wing tubes, and the fuselage just sorta hangs on 'em. That's the reason the wing tubes must extend beyond the root ribs . . . because they plug into Rib A in the fuselage center section. The holes in Ribs A may need to be slightly enlarged for a slip fit. If so, do so . . . but take it easy. Material is quick to take away, but very slow to put back.

To mount the wing, locate wing wires through fuselage, and slip on one panel. Make three loops in a No. 62 rubber band, fit it over main wing hook, and pull through fuselage. You'll need a special wire tool for this . . . and a small screwdriver is handy when transferring the rubber band from the wire tool to the second wing hook. Slip the other panel on wires, bring up to near fuselage, and fit rubber band over its hook. Tension should be quite tight between the two panels. On the long-winged versions, a 1/4 diameter x 1-1/4 long tension spring is similarly stretched between the forward auxiliary wing hooks. No, this operation doesn't really require 13 hands and 4 knees, but they might help until you get the knack. Have patience.

Incidentally, you'll notice that in rough air you can hear the wing wires rattling on occasion as the wings "load" and "unload". But that's okay . . . it

causes no problems . . . and those wires ain't gonna break. That's for sure.

The stabilizer goes on with a single machine screw. Be sure it's not so long as to cause interference with the elevator push rod. A coat of dried rubber cement on the aft stabilizer saddle will resist movement and still let the horizontal tail rotate if it hits something.

FLIGHT TRIM: The first step here should occur before covering . . . so hope you're reading the complete article before starting to build. Assemble all components. Ballast nose to get a reasonable balance. Push a heavy pin into fuselage, on top center line, at trailing edge of center section. Push another one in at leading edge. Tie heavy twine around pins, so as to make a "sling" or "bridle". Now, lifting the whole works by the twine "bridle", check for balance about the fore and aft center line. Chances are that one wing will be heavier than the other. On a 12-foot span, a full ounce of weight may be needed to get the wings to balance properly. Maybe more. Whatever is needed, do it. Those big thick tip blocks will hide lots of ballast. Bury it in the block. You don't want it flying off loose in a "hard landing".

Now, cover and finish . . . like a coupla paragraphs back. If you use other than plastic film covering, re-check balance after final finish. Correct as necessary. Shouldn't be much now.

With all gear, push rods, canopy, wheel and everything else installed and assembled, check CG position. Again, make a "bridle" of heavy twine, but this time tie ends to 2 small brads . . . little nails about 1/2 inch or so long. Pull the wings away from the fuselage far enough to push brads into the 1/16 hole on either side of center section that represent the 30 per cent point of wing chord. It's noted on plans . . . should be the second in a series of four holes . . . 3 inches back from leading edge.

Add ballast in nose . . . undoubtedly . . . until balance is achieved and craft hangs level when suspended by twine bridle. Use various sized fishing weights so that you can adjust by 1/2 ounce increments. When you're satisfied by balance, remove ballast, weigh and record the amount required for a 30 percent CG.

Repeat this balancing act, but this time set pins in the 35 percent holes. Again, record ballast required. Put these

notes in your field kit for future reference. Re-balance at 30 percent in first flights.

Check total assembly for alignment. Get it right. Check for warps. Correct as necessary. Check washout at wing tips by measuring from a flat surface . . . such as a dining room table. Washout in both wings MUST be the same . . . about 1/2 inch, or maybe a little less. If washout is not correct . . . and similar . . . warp wings as necessary to get it right.

Check control surface movement . . . and centers. Go for maximum rudder throw . . . at least 1-1/2 inches either side of center. About 1/2 inch up and down on elevator should be okay. Is up, up? Right, right?

Note that to this point, all pre-flight checks are made before loading the car for the field. Don't hurry. Look at it this way; you've spent numerous hours and several bucks on your Yankee Gull, so why take a chance on blowing it now? . . . by hurrying . . . or even skipping the last, and perhaps most important steps. There'll be thermals next week, too. And, it's always better to be as relaxed as possible . . . certainly not all in a dither . . . when you're out for first test flight. Besides you'll enjoy it more. Take your time in pre-flight, and the first flights will probably be a breeze.

And so . . . to the field.

FLIGHT TESTING: If there happens to be a crowd around . . . and, at times, that can mean one particular guy . . . and it bothers you, shut the whole operation down. It ain't worth it. Wait till you can have most of the world on your side.

If you know how to test glide . . . and I'm not being funny . . . fine. I've seen dozens of brand new and beautiful sailplanes literally worn out . . . and sometimes actually destroyed . . . by improper hand glides. They never had a chance. A real shame. Some guys just don't know how . . . or are not physically capable of performing a safe and meaningful glide test. There's no honor involved . . . just one of those things. So if you can, fine . . . and want to, great. Otherwise, let's hook up and go on the winch or Hi-Start. Chances are very good that you'll have an easy first flight IF you really did it right in the pre-flight stage.

For first flight, CG should be at 30

percent . . . tow hook should be in forward position. We want to avoid anything that would cause an extreme nose up or stally flight. With this set up, climb out on tow will probably be rather shallow . . . and don't fight to get the nose up for a steeper climb cause it might stall and snap. That we don't need. As long as it's safe, don't push it. Take a moderate tow . . . tomorrow we set records.

With the 30 percent CG, flight speed will be a bit on the fast side. That's fine . . . a little back pressure on the stick will flair out the landing, and you'll have good airflow over the surfaces for control.

If the first flight wasn't too rough, try another with the same trim. If it was a bit too hairy, don't repeat without changing trim to help the problem. If your Gull is like the ones around here, your next flight should be with a 1/16 shim slipped in between the aft stabilizer saddle and the stabilizer. Better? If so, fly again with this new trim. Probably still requires back pressure on the stick, so replace the 1/16 shim with a 1/8 shim. Incidentally, these shims should be of plywood, 1/2 inch wide and 2 inches long.

A few flights with this setting and you should be starting to sweat less . . . and enjoying it more. So now, let's start monkeying around with the CG . . . 1/2 ounce out at a time . . . working back towards the 35 percent CG balance. Check your notes . . . that you made at home . . . and keep track of what you have removed. Make several flights with each change. Don't go beyond the 35 percent point . . . until you're completely familiar with the bird, in different flying conditions. Then go easy if you must go at all. The further aft the CG, the squirrelier it'll get. And you may like it, but you're on your own.

And that's about the size of it. If you build the "1440", notice how the wings spot lift for you. The one that's in the bumpy, lifting air sorta flaps up and down as if pointing and trying to say, "Hey, Dummy, over this way a little." And you know, it's usually right.

If you decide to build a Yankee Gull, hope you enjoy it. Let me hear from you . . . as long as it's your nickel. And you keep in mind the time zones. Try 213/340-8620. ●

#3721