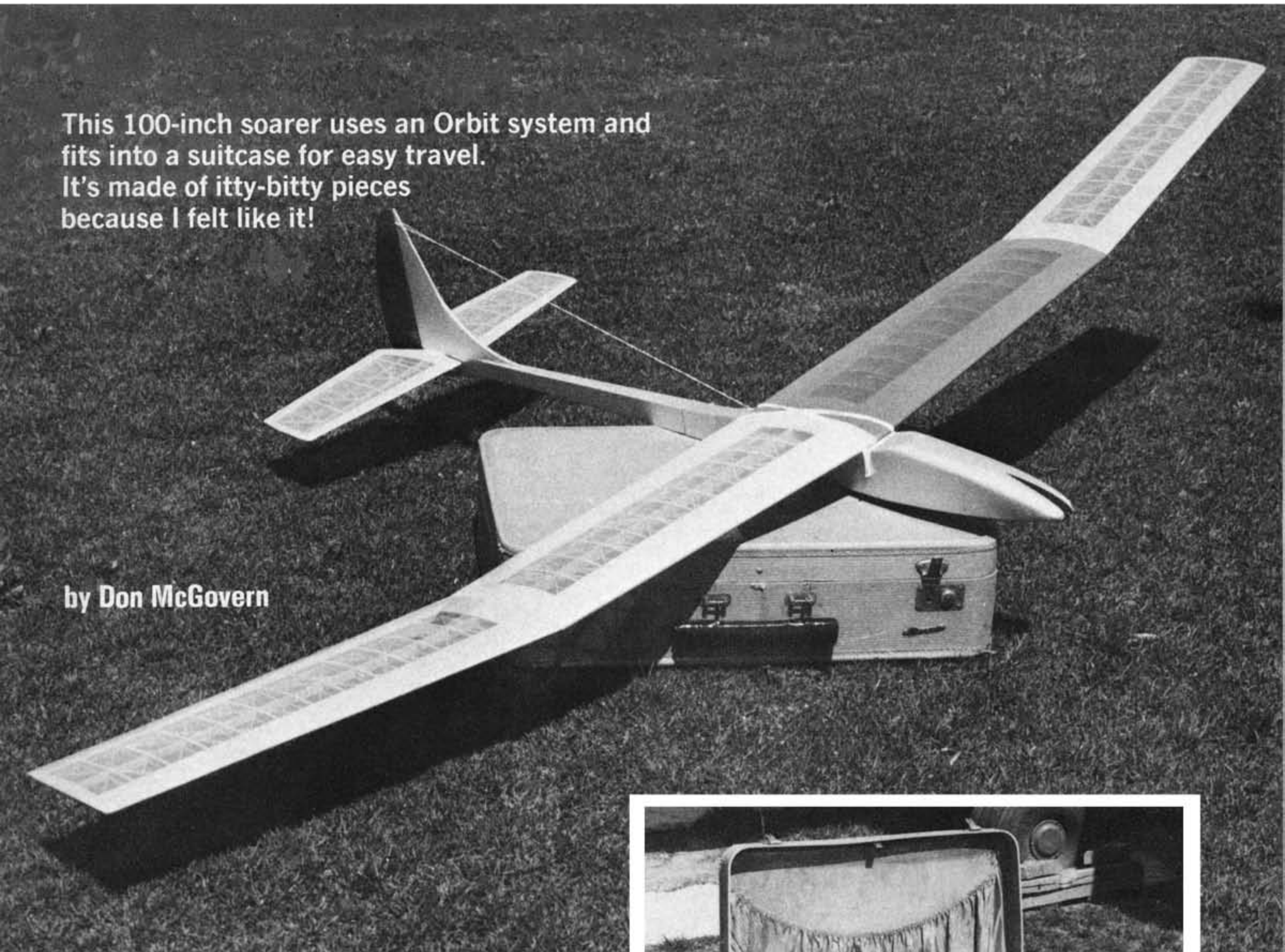
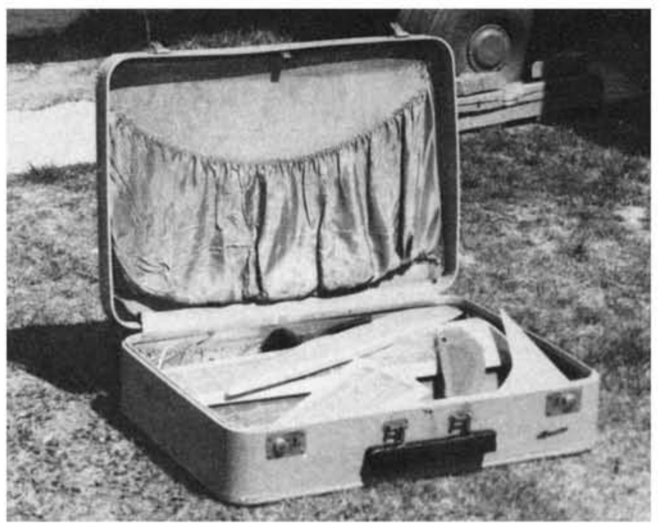
This 100-inch soarer uses an Orbit system and fits into a suitcase for easy travel. It's made of itty-bitty pieces because I felt like it!

by Don McGovern



Freshly hatched from a rectangular egg. "Wild Blue" collapses to travel. At right: It's all inside, ready to fly. A few soft duds to cushion it.

A Case of Wild Blue



FM photos: Don McGovern

I was aghast! A *UPF-7 Waco* is a bulky bird and Tom Wenzel was charging up the boarding stairs of the Caravelle at Toledo. Now a *Waco* is a big fat thing, a *Caravelle*, a little skinny thing as feeder line jets go. The stewardess was a medium sized thing, spread-eagled across the door. "You cannot bring that thing in here," she was resolute! But Tom buried her in cold logic, inching past in her confusion. "But it's United's first airliner, Captain Eddie Rickenbacher's very own, your Presidents!" Fortunately this exotic young and tender thing did not know who her own airline ruler was, and was soon captivated by the very details of how the ten passengers sat in the open cockpit in togetherness.

One cannot count however on the gullability factor when traveling about in the big kerosene-eaters. I found this out taking a soarer to Europe. 9,000 miles of arguing with lovely airborne ladies who kept explaining to me in French and Arabic and German why it won't fit. But then, the lure of a soarer above an Alpine valley makes it all worthwhile.

"*Wild Blue*" solves it all. For the semi-experienced builder, the reasonably skilled flier. 100"in span, it fits, ready to fly in a medium sized suitcase. It is for the business man, the traveling man on an airliner, the vacation bound family man who can tote a single suitcase in a family-crammed compact car. It is a fully competitive sailplane that will soar the windswept ridges, or climb aloft with the hawks when the thermal gods will play. It is a dream of soaring.

A medium sized suitcase. Internally, mine measures 5½"x18½"x25½". The wing is in four pieces, the left two panels faced leading edge to leading edge make a rectangular layer, as do the two tapered right hand panels. The sturdy wire plug-ins slip into a suitcase pocket, as do other odds and ends. The flying stab is in two halves and these stack in neatly, with no protruding horns. The slender fuselage slides apart, a forward pod with tandem radio arrangement, an aft boom with fin attached. The rudder disconnects with the pull of a hinge pin and completes the load. For the sake of the environment, throw in a change of socks and things. There's room for a padding layer of soft T-shirts and light cloth items. And maybe a note of explanation for those who scan the contents on an X-ray scope at airline check-ins. You could find room for a surgical tubing Hi-Start line, and even the transmitter if you tried hard enough, but the weight of the latter would make it a better bet for a camera bag. With your shaving junk.

Not much to compromise. It's a fully capable aircraft. Three joints in a wing, instead of one, that adds a bit of weight and bending potential on the line. Straight lengths of music wire in fiberglass shafts make that easy, a wider chord than usual and built-up ribs try to compensate for the added ounces. A featherweight tail to lessen ballast. A thin-line cross-section for a majestic glide. It's quite a machine. Delicate of rib, but spruce-braced spars. A test of methods, a test of structure. Intended for the skilled modeler who can tool it in on a belly wheel. This is not for your first soarer and not one to smack into a rocky crag. "*Wild Blue*" is a living thing, to soar to the limits.

The Wing Structure

It's my wing and I'll build it the way I want it. That means lots of stupid twigs and sticks and things. You'll either love it or hate it, but each piece has a purpose. Together they form four twist-resistant panels with really rugged triple-wire plug-in connections. Follow the action as described.

The center panels are built first. 3/32" medium sheeting (top and bottom) forms the trailing edge. The extreme rear edge should be razor planed to a 1/32" thick edge, and about 7/16" in to a pencil line mark. Test fit together to see how neatly it will fit. 3/32" leading edge sheeting (bottom camber) extends from the extreme front of the leading edge (beaneath the L.E.) to the point behind the first spar as visible on the plan. 3/32" sheeting also fills in the end bays of each panel as per the plan, grain running chordwise on the bottom. 3/32" squares now form every other rib position (bottom camber, with diagonals as drawn).

Next on the structural program, cut three 1/16" sheet spars to heights indicated. Use a very straight edge to guide your model knife. Position the forward spar, exactly, and with 5 minute epoxy to guard against warpage. (I used this almost exclusively on this glider with good results, at least so far. Certainly had less warpage with it, though it adds an ounce or two.) Use modest weights to hold all firm to the work surface. Incidentally, I suggest Saran Wrap to cover the plan drawing. Neither epoxy nor conventional aircraft glues will adhere to it. Next add the leading edge, a 1/8"x1/4" length of spruce capped with a 1/4" sq. of balsa. Keep it straight, weigh it down. Follow with little sheet rectangles from the back of the L.E. to the first spar. Trim to length and height, then carve to rough airfoil, and razor cut out a little ininterior portion to lessen weight. It's the principle of the thing, dead weight serving no function should not go for the ride. Takes but minutes, so why argue, I didn't ask for a vote. Later when you get a chance to eyeball down the line note each one should be flush with the top spar, following the airfoil curvature and intersecting the leading edge about 3/32" below the top edge of the 1/4" square. Room for the top sheeting. But for the moment, back to construction. A 1/8" sq. spruce spar backs up the bottom rear edge of the first spar. 1/16" squares are next installed chordwise, from the 1/8" sq. spruce behind the foremost spar, to the bevel on the trailing edge sheeting. In other words, above the L.E. sheeting, resting on it, and glued to it, aft to within 7/16" or so of the extreme trailing edge, resting on and glued to the sheeting. Note these 1/16" squares are above the 3/32" squares laid earlier, alternating with them, every other one. Where a 3/32" sq. diagonal passes beneath it, a spot of glue if you please.

Spars two and three, previously cut. It's time for their installation, but first, lay over the structure and ballpoint 1/16" notches where the alternating 1/16" squares will hit. The spar is to be notched for these so that it may rest upon the earlier 3/32" sq. structure. Easy, but fiendish. It's my wing if you remember. Hopefully mine will be the only one, which will make it unique in the annals of aviation. Adhere the center spar in position, glue applied to all structural contacts and follow with a 1/8" sq. of spruce, this resting above the 1/16" squares, but cemented to the spars. I do think my wing ended with more strength than necessary, so 1/8" sq. balsa might be substituted. Note outboard panels will not continue with these spruce or balsa 1/8" squares.

The top rib camber strips are formed with a template. Cut them from medium-firm 1/16" balsa sheet. The 1/16" plywood template is first formed, sanded smooth and used for all ribs, both for the wing and for the stabilator. Slice the sheet to the airfoil curvature, then move down about 3/32" and slice again. With each succeeding cut, one thin (but frail) rib camber. By trimming the ends proportionately, you arrive with a delicate replica of the airfoil. Each in turn is trimmed to length as required and cemented into position. Here again, the center and aft spars will have to be notched 1/16" wide by 3/32" deep, but this is an easy matter as the wood is so thin. It will strike you that such ribs are so frail they will break. And surely you will break perhaps a half dozen in the course of framing the aircraft. However, rest easy, they are a snap to replace just before the final sheeting and the 1/16"x3/32" capstrip which will ultimately be glued over them gives all the strength necessary. Do however handle the aircraft on the field a little more carefully than a heavy R/C and keep your well meaning ham-fisted steamfitter-type friends from assisting you carelessly. It's an airframe for flying, not for wrestling.

Long before those capstrips to come, we have other fun-things for you to do. 1/16" sq. diagonals. Four meet at every other rib, at the top of the center spar. Each descends to the lower camber, socked into their respective corners as per the plans. Each epoxied into position. They serve to prohibit unwanted twisting forces and hopefully reduce the chances of flutter. Desperation dives away from the hungry bowels of a thunderhead has fluttered many a wing. The widespread use of iron-on coverings call for a little more attention to such things, as they are a little more elastic than a tissue-dope type skinning. These panels as designed are difficult to twist. So far, so good, but I do not know how well they'll survive crash type impacts. I hope I don't find out. While these diagonals are just tender young sticks at this stage and easily cracked by a careless finger, once the top sheeting is in place, together with the final rib capstrips, they are recessed below the covering level. And once the MonoKote is ironed on, there is no danger other than flight and landing loads to the structure within.

At this point in construction, it is time to install the tubing inserts. There are four panels, and three wing connections, the center of the wing and two tip panel connections. Two lengths of 3/16" diameter music wire and a shorter length of 3/32" music wire (at the trailing edge) hold the main panels together, while a length of 1/8" dia., another of 3/16" and a short 1/16" dia. wire support each tip panel, as per the plans. Note all wire lengths are straight, no dihedral bends. You may bend them slightly if you wish to increase polyhedral, but this is a two-edged sword. If they rotate in their tubing sockets, the increased polyhedral instantly can switch to no dihedral at all. Such an ailment can be overcome only be a dose of epoxy into the fiberglass tubes on one panel, to prevent wire rotation, but this makes it tough to fit in a small suitcase. "*Wild Blue*" prefers the straight lengths, each in an arrow-shaft type fiberglass tube.

To mount the tubes, cut each to the required length. Now stuff a length of balsa strip into a shaft, to temporarily join two lengths into a straight tube. Block the panels at the desired height and slide the double-tube into position, careful to get the maximum dihedral possible at each joint, limited by the depth of the airfoil. If not alert here, the tubes will bulge through the covering. Remember too, all tubing must be parallel to each other, both in the top plan view and the front view, regardless of slight spar taper angles. If the tubing is not parallel to the others, it is not possible to plug the panels together as the wires will bind. Your eyeball judgement will suffice however. The idea of joining the tubing halves temporarily with a piece of balsa within is to hold each in a straight line and perfect alignment while epoxiing to the spars. The panels are blocked up at this point with careful attention to the mating edges at the leading and trailing edges. Once the epoxy has set, you can razor slice the balsa within the tubing at wing center, and remove the balsa inserts from the tubing. Slide the real 3/32" dia. wires into the fiberglass shafts, and the 3/32" dia. wire into the trailing edge tubing. Between them, your center section is well supported, more so than on most gliders. Fill in around the arrow shafts with scrap balsa and epoxy in the neatest manner possible. Some is hidden beneath the sheeting, while the extremeties are not. I bevelled the balsa fill-in into triangular cross-sections to feather it away from the covering surface as much as possible.

Joining the outer panels to the main panels follows the same procedure, except that three sizes of wire are used, a length of 1/8" dia. along the forward spar, 3/16" dia. on the center spar and 1/16" to align the trailing edges. With all this tubing and wiring, the wing ends up a shade heavier than

I would like, but I have glider tows in mind, some power-pod work and must cope with blustery powerful winds hitting the cliffs on our local shoreline. These winds take the average ¼" dia. soft wire joiner commonly used on gliders and bend it into a "U" shape. I felt the need for more!

Once all panels are joined with the tubing/wire inserts, pull apart again and complete the wing sheeting and capstripping. I used 3/32" sheet again to cap the trailing edge as mentioned, but to build it over again, I would drop it to 1/16". I did elect to use 1/16" sheet along the leading edge, as it is lighter and follows the curvature more easily. Capstrips are on the upper surface only, 1/16"x3/32" wide. These mate well with the leading edge, but fall 1/32" below the trailing edge if 3/32" sheeting is used. I simply bulldozed a thin layer off the forward portion of the trailing edge top sheeting to better follow the airfoil and to match capstrip height. Capstrips are best applied after such razor planing as they catch against the plane otherwise.

Hit the sheeting with a sanding block, position the thin capstrips and you are ready for a final trim and light sanding. Take time for a coke, you deserve it. Modelers completing this insane structure are requested not to throw rocks at the Author. Do remember in the structural process to try to warp in about ⅛" of washout in the tip panels. This means raise the trailing edge of the tip panels ⅛" at the tip, with all other corners of the outer panel flat upon the bench.

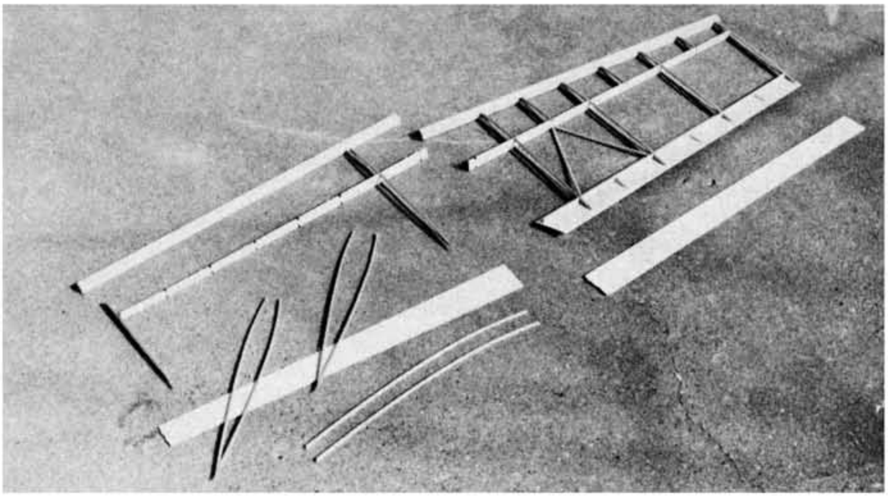
Your flying surfaces are now ready for MonoKoting. After they are covered you will find all the wire tubes slide into the wing and never-ever come back out. You forgot to plug the ends with scraps of balsa, cheeze or whatever your fumble fingers decree suitable to seal off the ends of the arrowshafts. As for holding the panels in place in flight, "U" shape wire clips are the easiest, preferably fitting into little drill holes with a scrap of backing block for durability. There is not much force required, but something, even tape should be used. Otherwise panel by panel parts fall off in roll type maneuvers.

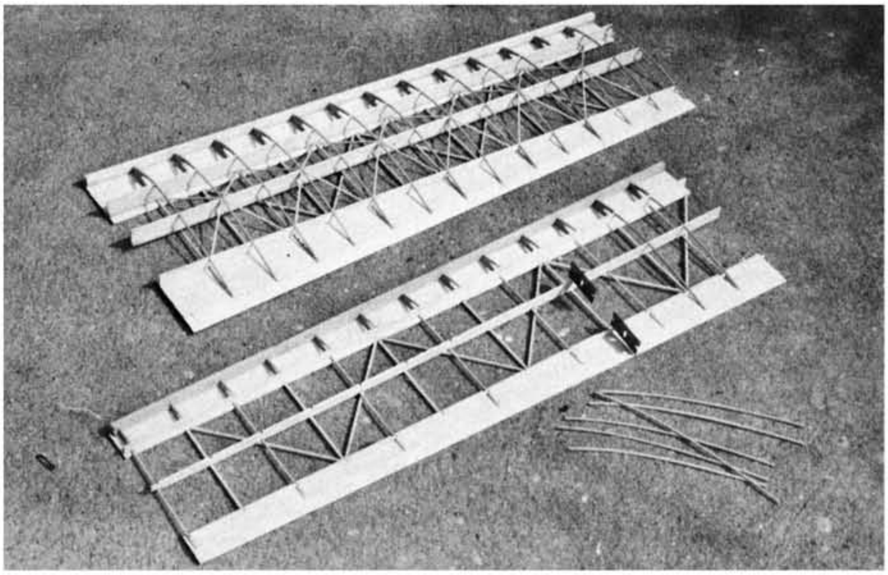
The Stabilators

There are no elevators as such, the whole stab pivots upon a length of ⅛" piano wire. Nyrod tubing receives the wire and makes a perfect free-floating bearing. It in turn is epoxied to the central spar. A 1/16" dia. wire 1½" aft likewise pivots in a short length of the inner type Nyrod. This short wire passes from the right stabilator through the Kraft bellcrank (Part No. 200-100 56 piece assortment) and into the left stab surface. The bellcrank pivots within the fuselage, fin and rudder, upon the same ⅛" stabilator bearing. In so doing, it tilts the surface up and down, as on many other glider designs of this general type. There is a net gain in performance as there is no disturbing hinge line, and drag related linkages exposed to the airstream.

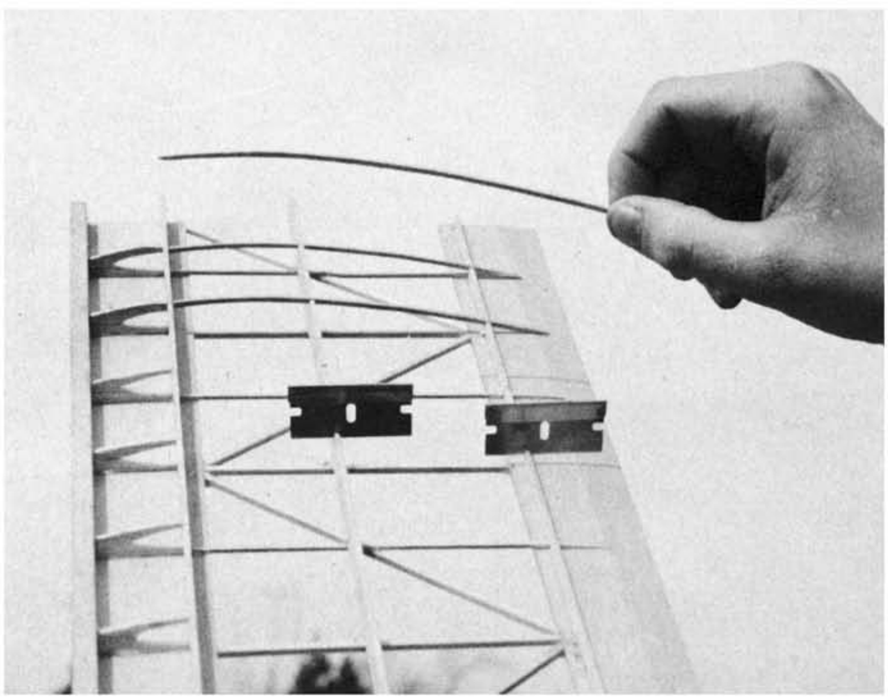
Construction itself follows the premise that dead weight in the tail is not needed. In fact it must be counterbalanced by weight within the nose. Therefore, the structure is very adequate, but light. While it is delicate in the early building stages, it is quite easily built.

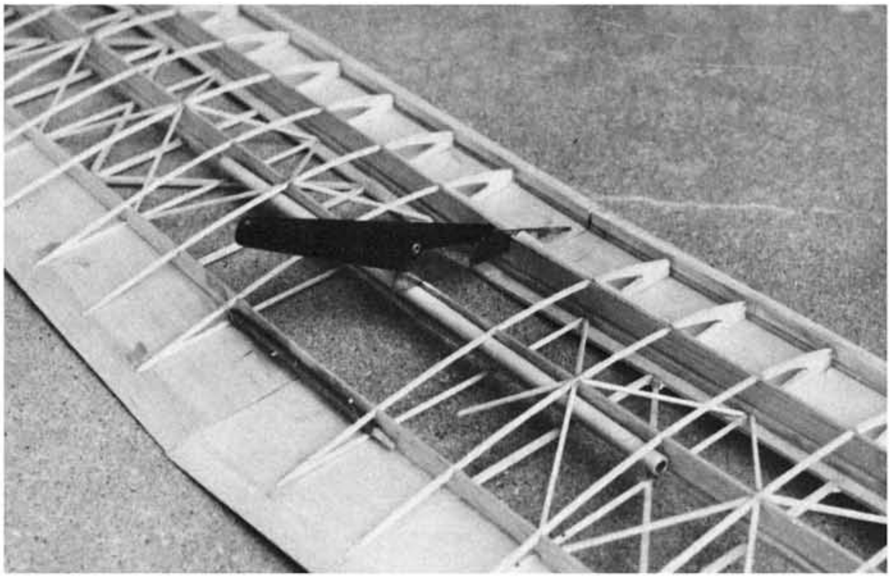
Using the same wing rib plywood airfoil pattern, slice off about four dozen cam-





Above: In the beginning... The stabilator halves take shape. Notched spars, ribs, T.E. of sheet. **Center:** Structure of the panels. Foreground displays early stages, 3/32" sheeting and strip work form lower surface, spars laid upon it. Delicate until final sheeting and capstripping is added. **Below:** Airfoil camber strips are not bent around, but simply cut from sheet. Razor notch spars.





Joining the four panels is a cinch. Fiberglass arrow shafts are cut to size, stuffed with balsa, strip to keep epoxy out. Glue in as straight length, then saw-cut balsa and install music wire.

bered strips from medium grade 1/16" balsa sheet stock. Cut two 1/16" sheet stabilator spars, 1/4" high at the tip and, tapering to 11/32" high at the fuselage juncture. With five minute epoxy dabs, applied with a toothpick, spot each cambered strip in place into notches cut into the stab spears. They will fit flush, and flat upon the plan when the spar is in position over them. The trailing edge is composed of two sheet surfaces, of a firm 1/32" sheet, or 1/20" if available. Near as you can come to a thick 1/32" will do. Or try 1/16" sheet, and sand it a bit harder later. Trim the aft ends of the rib camber strips about 1/4" short of the extreme rear edge of the sheet, and bevel the last 1/2" of the rib camber strips to a feathered edge. These stabilator rib camber strips are cut with the same plywood template airfoil pattern, but utilize the more rearward portion with less curvature. Trim the ends accordingly, as per the plans.

While the stabilator structure will seem incredibly trail to you in the early structural stages, rest assured it ends up tough enough. The leading edge is of 1/4" square stock, and 1/16" squares serve as false ribs of a sort, to keep the leading edge from collapsing inward upon landing impacts with obstacles. Diagonally placed camber strips further brace the surface against torsional loads as might be placed upon it by flutter or shrinking covering. Reference to the plan layout will be self explanatory as you build. It's easy and fun to assemble it, though you might have to shove fat fingers in the pencil sharpener if you have grown too used to the solid lumber of a modern pattern bird.

Once the surface is removed from the board, the upper trailing edge sheeting may be bevelled and mated to meet the lower trailing edge, the leading edge sheeting is added, and the very frail rib camber strips are capped with a 3/32" wide capstrip, of the same soft sheeting thickness which you used for the leading and trailing edge sheeting. Apply the lower center-section sheeting, then adequately brace the tubing inserts, and add the top center sheeting. Rough cut the stab tips of 1/4"x3/8" strip stock and position. Trim and sand ready for the covering. It turns into a warp resistant piece of airframe, but do keep heavy handed friends away from it, as ribs could still be crushed if grabbed carelessly. I do not feel I should have to make solid tin gliders for all to handle. Rather, an airframe to sense lift, and let muscle men leave it be.

The Rudder

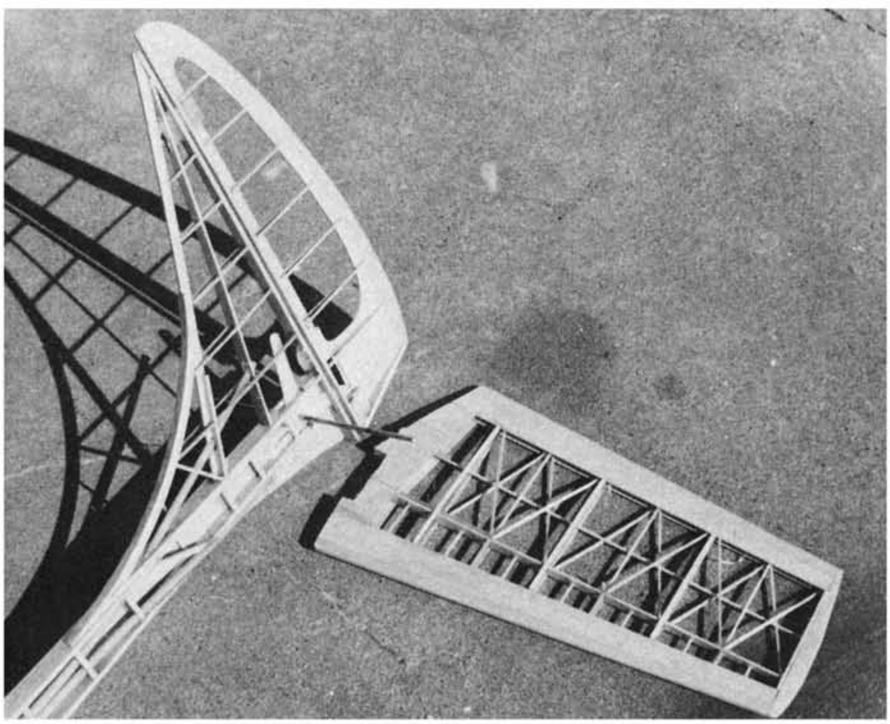
Your servo won't groan too much flipping this one left and right, like all else it's lightly built. Cut two outlines from 1/16" sheeting, as visible in the plan view. Razor plane a bevel on the inner edge of each so that the trailing edge meets in a thin line. I hate blunt trailing edges and I will stomp your "*Wild Blue*" if I catch you with such a gross mess. Takes but an extra minute or two, for the love of soaring. Note the rectangular cut-outs, to pass the stabilator crossbar. The size and shape allows for all degrees of stabilator deflection as well as rudder throw. Cut exactly, beveling sheet edges for maximum rudder swing with stabilator crossbar in position.

Cut a 1/8" sheet rudder leading edge, tapering from 7/16" at the base, to 1/8" at the top. Razor plane a 10 degree bevel on each edge to follow the triangular airfoil. So dressed down, the rudder L.E. may lose 1/32" from those measurements, which is what I hope from your pudgy fat fingers. 1/16" square ribs are now positioned as per the plan. These are on the inner surface of the right exterior rudder sheeting, from L.E. to within a 1/4" of the aft edge. Similar 1/16" squares are next added to create the left side, trimmed to feather into aft edge. Position a hardwood insert to bolt the rudder horn to, then slot to receive the R-K or other hinges. Bend the hinge pivot wire straight so that it may later be removed vertically with needle nose pliers. A length of wire will eventually be used to connect the rudder hinges on the field, permitting suitcase-sized packaging if you wish to so travel. Set the hinges into epoxy, add small blocks around them as necessary. MonoKote the surfaces, or cover and finish as desired before bolting rudder horn to the right lower point.

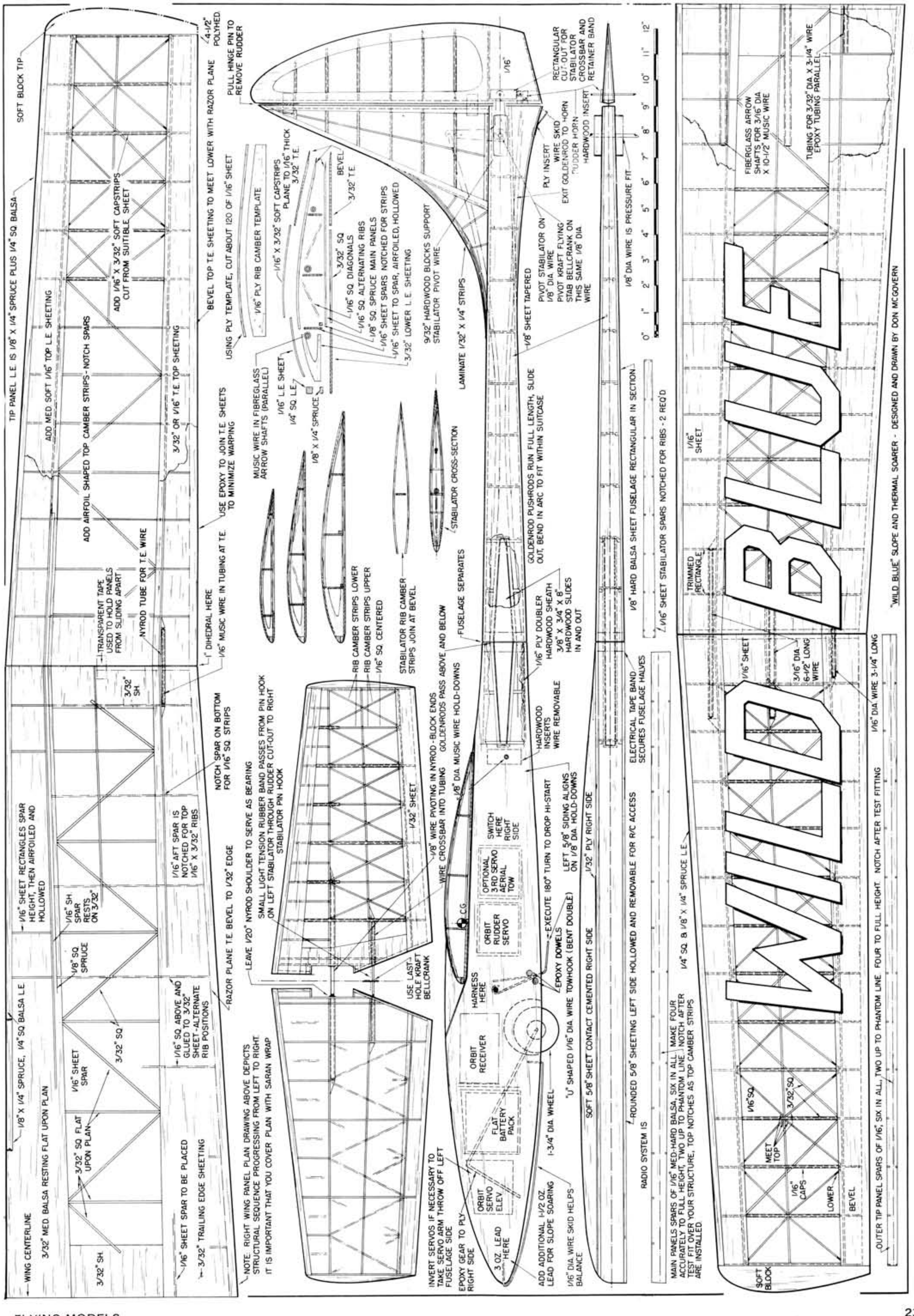
The Forward Fuselage

A 7/8"thick sheet of balsa looked good to me. A Dremel saw tooled it into a streamlined planform, and Orbit servos and system were spread in tandem fashion upon it. Suitable spots for each were cut by the saw. Room for a servo, for the elevators up front, a flat battery pack, the receiver, and the rudder servo. Space for one more if spoilers or an aerial tow is desired. Not much space to spare, even difficult to position the switch.

1/8" sheet forms the right siding. Glue the



1/8" removable wire serves as bellcrank and stabilator pivot. Shorter wire passes through rudder and bellcrank to join and actuate stabilator angle of attack. It works well, all internal, neat.



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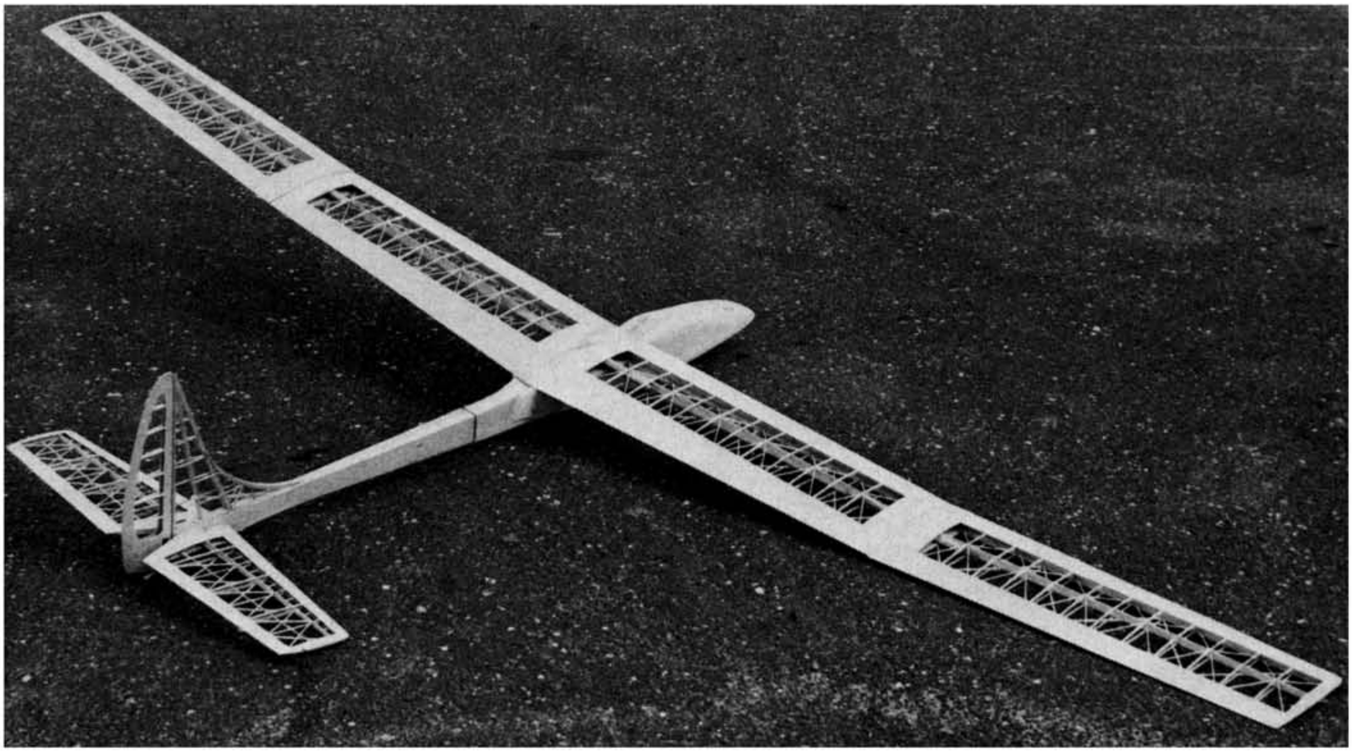

⅞" (or 1") thick pod outline to it and add compartmental bracing as per the plan. The gear is optional, a couple of right angle bends. Add a single 1/32" ply sheet doubler to the right side only and epoxy gear to this, locked in a spruce sandwich of strips, capped with a ½" sheet on the right side for fairing purposes only.

Wing dowels are of ⅛" music wire, sliding into hardwood motor-mount type blocks within. Thus they are removable for ease of traveling in a suitcase.

The forward fuselage is to be joined to the aft portion by a hard maple tapered length. Build up a spruce nest for this to fit into on each end of the fuselage, with tight tolerances to avoid flexing in flight. This is a sticky area as room must be left for Goldenrods to pass through. I next capped the ⅞" stock with another layer of ⅛" balsa. This covers the wheel well, which should be mounted by now. The radio system may be positioned with the aid of foam rubber, scrap strips and mounting tape type stuff. Make the installation as easy to remove as possible to make multiple use of your expensive systems. A left side ½" sheet is eventually added, but never glued in place. Dowel it on.

The Aft End

It's just a rectangle in cross-section, two sides of ⅛" sheet, tapering slightly toward the rear. Cut two pieces to length, tapering from ⅞" wide on the forward end to ¼" at the rear. When between the siding sheets, this will give you the proper width to join the 1-⅛" wide forward body, and just enough width aft to receive a bellcrank to actuate the flying stab. Build it with the left side left open until the very last moment. This will allow you to mount bellcrank, Goldenrods and brace around to receive the hardwood joining tongue. Small clips or rubber bands may be used to prevent the fuselage from separating in flight.

The graceful fin is built as an integral part of the aft fuselage. Start by laying it in position over the plan view. Once roughly assembled, cement to the fuselage. Note clearance holes for stabilator bellcrank. This bellcrank pivots in the fuselage, extends upwards into the fin area, where it connects to the Goldenrod, and actuates the stabilator from an area with the swinging rudder. It's unique, you'll hate me. But it works smoothly. If you have a better idea, so modify it, but to date this seems to work well on mine. The bellcrank pivots on a bearing which Kraft supplies, on an 8" length of ⅛" dia. music wire. This wire extends outward into hardwood blocks airfoiled to meet the stabilator, which serve to support the wire horizontally and vertically. It is a friction tit and slides out for transport. Do fill in around the bellcrank snugly to prevent shifting when the wire is removed. As mentioned earlier, the stabilator halves slide in place with a 1/16" dia. aft crossbar, passes through the Kraft bellcrank, which so actuates the stabilator, providing the desired angle of attack. To prevent the stabilator halves from sliding off the wires, a small rubber band passes through the rectangular rudder slot and snags onto tiny hooks on the bottom-aft edges of the stab halves. But, I digress, go fashion a little wire tailskid and ply insert to attach it to. You'll need it, keeps the landing load off the rudder hinges.

Give great attention to mating the fuselage halves, brace the joint in every way. Also, keep connections to the pushrods neat and tiny, removable. They must be so designed as to slip out toward the rear as halves are disconnected. Some refinements are in order here.

I think I left your fin half built. That curved leading edge is best laminated of four layers of 1/32" sheeting, and the rest really follows stabilator type construction. Lock your hinges in with epoxy and a toothpick or two through small drilled holes. By pulling the hinge pin, your rudder disconnects. Just use a length of wire to connect both and secure the loose end into the structure. Some work on this ship, but the sight of sun glinting through such a frame puts your mind soaring with the birds.

Time to go Flying

Get the balance right. If you're tail heavy I don't know where you're going to put it, but get some lead on the nose. Drill it in, lash it on, but fly it in trim.

Try some gentle glides onto the grass, then from a small slope, correcting if you need with radio commands. From there to slope or towline.

Take it easy at first on the Hi-Start. That is, pull back sufficiently on the line, but hold just a moderate climb angle. To release, if not already free, execute a 180 degree turn. This has to take it off. Soar it gently, all things in moderation. Get the feel of it before you get extreme and reach the fringe of flutter. Gentle turns are desirable, holding altitude as smoothly as your fingers can command. Remember excessive control actions detract from the glide potential. Every command sent is upsetting to the aircraft's chosen path.

When the wind rises to a breeze in your face, head for a slope. An 80 foot cliff facing the sea will give you a blast of lift that will top you out at least 400 feet high. In front of the cliff, or almost over it. Behind, severe downdrafts. If your landing site is behind the slope, lots and lots of luck. Just be quick on the sticks. Try in just a modest breeze at first until you become familiar with it's turning radius and full potential.

I'll close here with the thought and the hope that "*Wild Blue*" will travel safely with you on your airline trips to far off places. No longer shall the "perfect waves" escape us.