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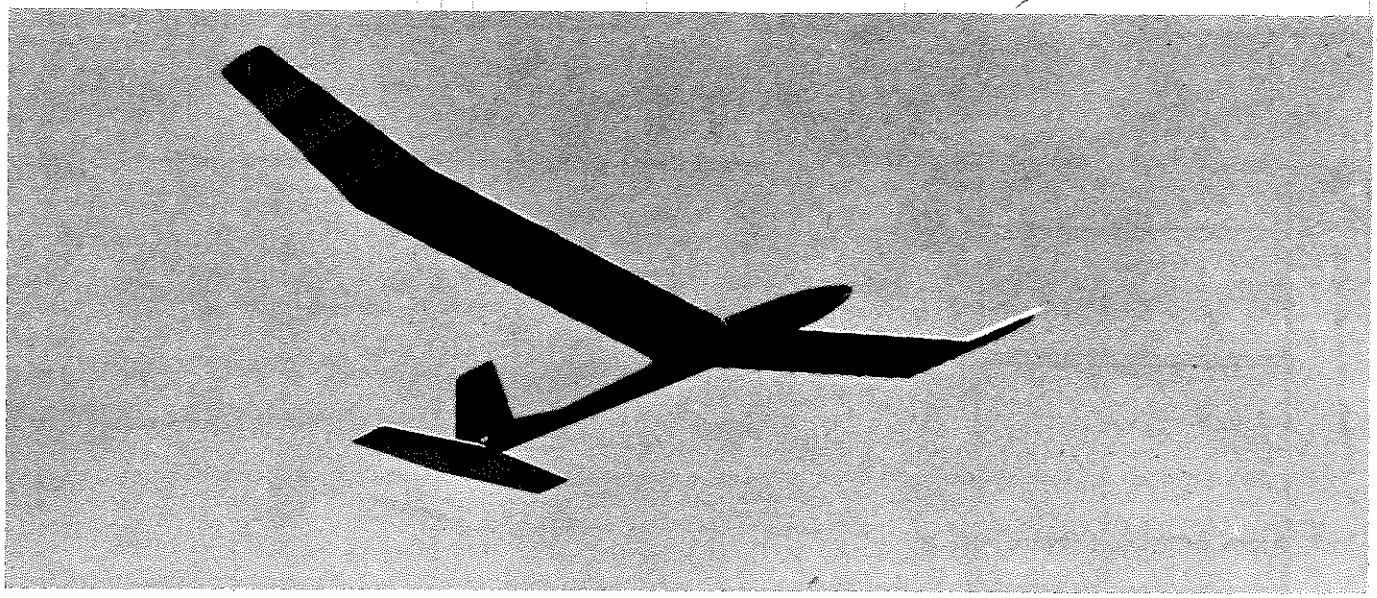
PHOTOS BY MAT TENNISON



The California Coaster drifts by on final approach. Similarity to White Trash is apparent, though stab is further aft. All sheet balsa construction.

the California Coaster

by Mat Tennison

● *The first time we spotted the California Coaster was during the North-South (California) Soaring Tournament in Bakersfield (reported by Bob Hahn in the March/April issue of M.B.). At first sight, when the plane happened to be some 3 or 400 feet in the air, we thought it was Rick Walters' popular White Trash (Jan. '72 M.B.) . . . The general configuration is quite similar . . . pencil-thin fuselage, polyhedral wing, fairly high aspect ratio, etc. And not only did it* look *the same, there was obvious similarity in its performance . . . a thermal hanger that could hold a tight, flat circular pattern . . . able to take advantage of the smallest "up bubble."*

Once on the ground (and in the 100 point rectangle, incidentally) we knew for sure that this was a trash, er, plane of quite different breeding. The peculiar 2-1/2 inch wide color stripes from leading to trailing edge, which we had noticed on the total underside of the wing, now made sense. A 9 foot, "Jedelsky" style, single surface, sheet balsa wing yet, with the exposed ribs acting as color dividers!

Immediately we switched hats from contestant/spectator to editor - looking - for - construction - article - material. The perfect answer for the modeler who is short on building time and long on wanting a high performance R/C sailplane. With all sheet flying surfaces, a simple box fuselage and clean, functional lines, the California Coaster is right on! *With materials on hand, a week's work should do it . . . depending on your building speed and finishing methods.*

Don't read this construction article . . . unless you're willing to risk getting hooked. 'Course, if you do, we just happen *to have full size plans. Bill Northrop.* ● ●

If you've never built a Jedelsky type wing, you'll find it an interesting new experience in model construction, so save it for later and let's get on with the more mundane business of creating the fuselage.

Experience points out that the nose of a sailplane takes the most punishment. That, and providing protection for the valuable bunch of electronics that will be housed in the nose, are good reasons for lining the interior of the fuselage sides with 1/32 inch plywood as far back as the rear wing dowel. Contact cement is the best adhesive for this job. Make sure of two things during this operation: One, that you make a left and a right hand side. (If you forget, and build two left sides and somebody sees them, you'll have to build *two* Coasters in order to hide your stupidity!). Two, that you align the doublers very carefully when making contact. The way they meet is the way they stay!

Next, for added strength and to give you enough meat to round off the corners, glue 1/8 inch square longerons from the ply doubler on back to the tail post. These also provide extra gluing surface for the 3/32 inch top and bottom sheeting. Incidentally, the fuselage sides are designed to be cut from one piece of 3/32 x 4 x 48 inch sheet stock.

The 3/32 inch plywood piece which is contact cemented to the floor of the cabin under the forward wing dowel, is for the tow hook, and is most important. The tow hook is doubled 1/16 inch music wire, bent and passed through a hole drilled in the cabin floor, one inch behind the wing leading edge. Epoxy in place to prevent wobble.

The nose block is built up from 1/2 inch hard balsa pieces and its size and shape is designed to hold a square shaped battery pack wrapped in 1/4 inch plastic foam. Of course, the idea is to get the equipment weight as far forward as possible to avoid carrying dead ballast. The original California Coaster required no additional balancing weight. Bundle the receiver in plastic foam and stuff it in right behind the battery pack. Two KPS-10 servos were taped to the fuselage sides, as far forward as possible. This puts everything in the front compartment, leaving only the 1/4 inch square balsa push rods to go back to the tail. Carl Goldberg's bicycle spoke and nylon clevises make the hook up from the servos to the short nylon control horns on the tail.

A few improvements have been made in the plans that are not on the plane in the photos. For example, the original had the elevator push rod exiting on the left side to a bottom mounted elevator horn. The plans show the elevator horn on top. It's better this way unless you

like to untangle bits of weed and grass from it after every landing.

The 1/16 inch plywood elevator platform is glued on the fuselage with 1/8 inch positive incidence. This causes the fuselage to fly "tail high" and more nearly in line with the true flight path. The horizontal stabilizer bolts onto this platform with six 2/56 brass machine screws. The nuts are epoxied to the under side of the platform. This allows the horizontal stabilizer to be removed for packing in small cars and/or on long trips.

The elevator and horizontal stabilizer are both covered with Super Monokote so I could use my favorite hinge system. Monokote hinges are most easily made by cutting two strips about as long as the surface to be hinged and about one inch wide. Turn them "sticky sides" together, and carefully overlap about 1/8 inch. Now seal them to each other with the tip of your iron. From this strip, cut off hinges about one inch wide and iron them on in the best U-control, cloth hinge tradition. Use at least six sets of three hinges each for the elevator and three sets for the rudder.

The fin runs through the top sheeting down to the bottom of the fuselage. The triangular dorsal piece adds strength to the rather skinny fuselage forward of the rudder.

Note how the hinge line of the rudder is slightly swept forward. It helps to maximize the movable area and reduce the fixed area. Don't forget the doubler at the bottom of the rudder. One-thirty second inch plywood on the horn side only, stiffens this "barn door" enough to prevent bending under air loads. The odd angle at the bottom of the rudder allows it to swing without hitting the elevator push rod. Both push rods exit from the fuselage top, without any bends on either side of the rudder.

I used K & B "Super Poxy" finish for everything except the tail and found it to be almost ideal for high performance sailplanes. Use one coat of a good wood filler, sand it all off, leaving the holes filled. Then use one coat of K & B primer, sand with 400 - lightly. Add one coat of K & B as per their instructions, and wow! Very little weight increase and it looks like a million. If you really want to show off, let the color cure for a couple of days and rub down with compound. Put on a coat of hard wax and buff. Better wear dark glasses so you won't be blinded.

The wing is built around the incomparable "Jedelsky" type of construction which has proved its worth many times over. It is virtually indestructable, when built as shown, and seems to have been invented to make life easy for the beginner. The wing imparts that "hanging" type of flight that is so partial to thermals. Don't worry too much about the exact airfoil as you finish carving the wing, since small differences aren't noticeable at R/C sailplane speeds anyhow.

Materials selection is one of the most important elements in the construction of any model aircraft, and this is certainly true in all balsa, high performance sailplane. Since the wing is larger than any other part of the craft and will account for about half its total weight, we will start our materials selection here.

Choice of wood is, especially critical in this wing because, unlike a built-up wing, the thick leading edge plank is the reference point for "trueness". In a built-up wing, which is constructed of many small parts, the trueness of the wing is taken from the flat working surface, or the wing jig, upon which it was built. An un-true work bench usually results in warped wings. Not so in the case of Jedelsky wings. The thick leading edge plank is the "backbone" of the structure. If it is true and straight, the rest of the wing is likely to be straight also. A little time and effort spent in the selection of materials now will be well repaid when your California Coaster climbs out on the tow line.

The very lightest and softest balsa stock is needed for the leading edge plank. Take a small postal scale to the hobby shop and select all the lightest weight 3/8 inch material, putting back any planks which are obviously warped. Now go through the remaining stack and eliminate those pieces which are warped as shown in Figures 1 and 2. This type of warp is non-recoverable, and at today's balsa prices . . . forget them!

The illustrations are grossly exaggerated, of course, to make the short comings obvious.

Try to find a pair of planks as nearly perfect, and of the same weight, as possible. A difference of up to 1/4 ounce can be corrected by adding an extra coat of paint on the light wing, or mating the light leading edge plank with a heavier trailing edge sheet. Remember that the finished wing must be very carefully balanced. About half of the weight of each leading edge plank will be planed away when the wing is shaped.

Chances are that perfect leading edge sheets will not be obtainable and some compromise will have to be accepted. By the way, do not limit yourself to only one hobby shop in this quest for good lumber. If more than one is available in your area, check every shop, weighing and sighting material until you have what you need. The hobby dealers may hate you for it, but chances are that the wounds he will inflict will heal long before your wing warps. If you run into enough really good material, it would be wise to buy wood for a second wing.

Now, about allowable defects: Probably the most common fault of balsa and one that you can do something about is "bow". Bow is illustrated in Figure 3 and is just what it says. The sheet is bent along the thinnest dimension as if it had a bow string on it. If the bow is no more than one-fourth inch over the entire length of the sheet, it can probably be used if you can find two pieces just alike. Just turn the bow so it is the same way for both wings and forget it. I turn mine down to form a slight gull effect.

The second most common type of warp in material is "bend" shown in Figure 4. It is the same as bow except the plank is bent along its wide dimension. This type of warp can be trimmed off. If the bend is no more than one eighth of an inch total, you will lose only one fourth inch total width (both edges, remember). *Under no circumstances try to bend the piece straight.* It will always return to its bent condition eventually and ruin your wing in the process. I have a shelf full of them like this to prove it!

Once three suitable pieces of 3/8 x 4 x 36 inch stock are available and an equal number of 3/32 x 4 x 36 inch sheets are selected, half the battle is over. The rest is fun. Remember that the 3/32 inch trailing edge sheet is flexible, so warp, curl and bow will not affect it as much. Bends as in Figure 4 are important and will have to be trimmed off, at least along one edge. If you don't have a perfectly straight trailing edge, who is to know? I won't tell if you won't. And if any of your friends start peeking, well, just check a few of theirs.

Decide *now* which piece is the right inboard wing and which is the left inboard wing and which is to be cut into two parts for the tips. Mark them with a felt tip pen on the top surface near the leading edge so that they won't get mixed up. This part will be carved off later, so the marks won't show. Be sure to mark the 3/32 inch sheets too, but mark these on masking tape.

Now is a good time to measure and mark off the lower surface for rib posi-

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tions. A good ball point pen works well here. Glue on the 1/8 x 1/4 inch spruce leading edge and 3/32 x 1/8 inch spruce trailing edge pieces. Hold in place with strips of masking tape applied between the rib markings so that construction may proceed even while the glue is still wet.

By the way, a few words about glue are in order. After going through all this hassle to avoid warped wood, it would be a little silly to use glue which shrinks and can cause warps. Tite-Bond or equivalent is recommended.

You should now have eight pieces of choice wing lumber with leading and trailing edge spruce "ding preventers" glued in place. Next, cut thirty-six ribs of 1/8 inch medium balsa, six ribs of 1/16 inch ply and two root ribs of 1/8 inch ply. It's a good idea to cut out the 1/8 inch ply ribs first and then use one as a template for the rest. From here on in, construction is rapid and easy. Just proceed as shown on the plans.

Since sanding of the bottom surface is very difficult after the ribs are in place, it is wise to round the lower edge of the spruce leading edge strip before proceeding with Step 1. Note that although the tip panels are tapered, the ribs are left at full length, until after the panels are completed. The outer ribs are then trimmed to match leading and trailing edges. Also, note that since the trailing edge sweeps forward more than the leading edge sweeps back, "wash-in" is automatically produced.

During construction, it is better if all the ribs are glued to the leading edge plank in one evening and then the trailing edge sheeting installed the next evening. This allows time for thorough glue drying and, in my case, keeps me from running out of pins!

The brass tubes to hold the two wing halves together are epoxied in place, then covered over with fiberglass cloth and resin. When this mess has all hardened, the plywood ribs are trimmed to fit over the tubing "lumps" and fiberglassed or epoxied in place. Take care that tubes in one panel align perfectly with tubes in the other. Tilt the 1/8 inch plywood center rib so that, at the aft edge of the 3/8 x 4 leading edge plank, the bottom of the rib is approximately 1/16 inch off of vertical, leaning away from end of plank. See Figure 5. The amount of "lean" should be the same on each panel. Also, do not glue in rib at outboard dihedral break, yet.

Step 2 takes only a little while to do, especially if you put tiny ink marks on the top side of the trailing edge sheets so you won't be spending a lot of time stabbing away with pins trying to find that rib underneath.

The next night, when the glue is dry and the pins are all pulled out, the tip panel ribs may be cut to length while you wonder just how this mess of lumber can ever fly. Cheer up. Under that untidy pile of expensive scrap, a high performance wing lurks. A fairly sturdy block plane is needed to bring it out however. The razor blade variety will work but something a little heavier is better. I find the X-acto plane with a one inch blade almost ideal for the purpose. Carefully shave the extra material away so that the trailing edge sheet is continued to its natural intersection with the upper surface as shown by the dotted line in Step 2 on the plans. Next the leading edge can be trimmed down to a natural curve, keeping the leading edge well rounded. Now shave some more off the top 'till it fairs in with the overall curve. Apply a sandpaper block carefully, and all of a sudden, there appears a graceful thing of beauty.

When all four sections are carved and sanded to your satisfaction, begin to fit the tips to the center sections. I use a large disc sander here but any method of sanding to produce the required dihedral angle shown on the plans should be satisfactory. The amount shown is not gospel and a lot less would probably still be OK. The Coaster will circle flat and hang into a thermal like a homesick angel with the dihedral angle shown, however.

Use one to one and one-half inch wide strips of very light fibreglass cloth and resin to join tips to center panel. Resin cloth strip from trailing edge around leading edge and underneath to trailing edge again. Add the rib at the polyhedral break after the fiberglass resin has set. By the way, I use a few dabs of five minute epoxy to hold the tip section joined to the center section while the fibreglass cloth and resin are being applied. The bottom of the rib at the dihedral break takes quite a beating from skidding in for landings. If you get tired of replacing this rib, you might try covering it with fibreglass cloth. *(Or making it out of plywood in the first place. Ed.)*

Before installing the plywood ribs, add the 1/16 inch plywood sheet over bottom of 1st and 2nd root ribs on end panel. Fill gap thus created with scrap balsa. Carve and sand to a pleasing contour.

The steel wing dowels are 5/32 dia. x 12 in. long landing gear wire, bent to a 10 degree angle. The brass tubing is 3/16 inch inside diameter . . . not 5/32 inch. We want the wing to be able to flex in the center but not to bend the dowels. The latter arrangement is very forgiving in this respect.

When the wing is assembled for flight, I support mine inverted and slide the halves together onto the steel dowels. Then wrap a turn or two of one inch masking tape around the center to keep the two halves together. The whole unwieldy thing is then turned upright and rubber banded on to the fuselage. Presto! Ready to go.

This wing seems to prefer the old standard of 1/3 back from the leading edge as a balance point for thermaling, and perhaps a little farther forward for sloping. On a high-start launcher, with one-hundred feet of 3/16 inch inside diameter surgical tubing and three hundred feet of nylon line, the California Coaster will leap off the ground and climb almost straight up. She mounts up to the sky and drifts over the top, often without ever having to be guided at all. This combination puts her up four hundred feet or more on a good day. The Coaster does even better on the electric winch.

Thermal hunting is sheer poetry. Just don't slow her up too much. All those ribs under the wing are very effective skid stoppers. This bird can turn on a dime to stay in a thermal and never get a wing too far down while doing it. It takes practice, though. Learn to make spot landings in a wind with it, because it does not penetrate like a heavier machine. The California Coaster is a floater.

The aluminum skid which is servo taped to the belly is a real life saver. My radio died one day, causing a spin-in onto a black topped parking lot. Aside from a few scratches and a dinged aluminum skid, there was no damage. The skid, curved up almost in front of the nose had distributed the impact shock so there was no damage. However, the slick aluminum skid isn't much help when you want to stop in a landing spot. The Coaster can and has touched down in the 50 point circle, skidded into the 100 point circle, and on out the other side into the 50 point circle again. A few layers of masking tape over the skid, lets the black top grip it better and stop it fairly short. Maybe the new plastic skids will work better in this respect.

Flying weight should be about three pounds.

If you have any problems or comments, drop me a line in care of The MODEL BUILDER and I will try to help. ●

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