PAZMANY PL-4A

By LEO BENNETT . . . Before the limits were lowered, four-foot-span-and-over Jumbo Scale rubber models were the glamerous and colossal "big guns" of rubber scale. This 56-1/2" span ship represents that category.

• OK, why build it? The drawbacks are obvious; a lot of work, a lot of materials. But stay with it; the virtues are just as real. Here is a machine whose flight pattern is stately, even lordly. She climbs slowly to about seventy feet and cruises for about twenty-five seconds. When the prop folds, she drifts downward for another twenty-five seconds. None of the usual dips and lurches in response to turbulence or motor run kinks. The glide is the flattest I have seen in forty years of rubber-powered scale work. Those big wings really help. The overall scale-like quality of flight is awesome; Peanut fliers actually stop in the middle of winding to watch this one go by.

The Pazmany PL-4A was designed for the basement builder by Ladislao Pazmany, a California engineer. By using a boxy design, he helped us keep the model's weight down (260 grams, ready to fly).

In short, Pazmany had done us the favor of designing a machine well-suited for large scale modeling. And this one is large. How large? Well, let's put it this way. You're familiar with the usual hassle involved in getting the rubber motor on the rear peg; the wires, bits of string, etc. On this model, you reach into the cockpit with your fist and then thrust your entire forearm into the fuselage, simply carrying the motor to the rear peg in your hand. Now that's large!

Interested? Start by getting your scale presentation material together. *Sport Aviation* (March 1973, Vol. 22, No. 3) has an excellent article, including three-views and thirteen photos, of which two are in color. *Private Pilot* (Feb. 1973, Vol. 8, No. 2) has no three-views, two black and white photos, and one in color. As an alternative to the old magazine road, send four dollars to Pazmany Aircraft Corp., Box 800515, San Diego, CA 92138, and ask for the introductory package on the PL-4A. The scale of the model presented here is one inch to five and six-tenths inches full size.

Construction is a bit novel. Study those fuselage cross-sections before you start. For one thing, the idea is to use lapped joints wherever possible in the fuselage, instead of butt joints, so as to get more gluing area. Further, do not use white glue on the fuselage or on the wing center section. You must use epoxy to get the necessary strength. Use it sparingly . . . the stuff is heavy and does not shrink; if you start with a blob, you end up with a blob. All strip wood is medium balsa, not contest balsa. Ordinary, run-of-the-mill, eight to twelve lb. wood is fine. The only exceptions are the carved blocks (rudder top, nose block, prop) which should be softer.

FABRICATING THE WING

Make all the ribs in two separate batches, using the mass production technique. One batch is to consist of twenty-seven full ribs in 1/32 sheet, plus two full ribs in 1/8 sheet. The other batch consists of twenty-six false ribs, or riblets, which stop short at the front spar. The first step of this technique is to make a pair of rib templates from 1/32 plywood. Sandwich oversize rib blanks between the templates and bolt through at two locations, say midway between the leading edge and the front spars for one, and midway between the trailing edge and the rear spars for the other. Use a 6-32 bolt with washers and get them as tight as you can without crunching the blanks. There is a variation on this technique, wherein pins are used instead of bolts. Forget it. The carving stresses are much too high and the pins will skew. Now carve and sand the package right down to the rib templates.

Laminate the wing tips out of three oversized pieces of 1/32 sheet that are soaked for half-an-hour in hot water, then formed around a balsa block carved to the proper interior shape. Use white glue for the lamination process, after placing a sheet of wax paper between the form and the first layer. Use a lot of rubber bands to hold the lamination together for the next twenty-four hours. Now carve and sand the tips to a half ellipse configuration of about 1/8-inch minor diameter and 1/8-inch major radius. Thin it out a bit, working towards the trailing edge. Viewed from the side, the tip lamination is straight, i.e. it contains no droop.

Cut trailing edge sections out of 1/32 sheet, and you are ready for assembly. Start by pinning down the lower trailing edge. Lay down the lower spars, but don't pin them to the board. Place the main ribs over the lower spars and insert the leading edge. Use pins pressing against the leading edge, so as to push the assembly together. Check to see that there are no gaps between pieces or built-in stresses in the lower spars (are they still straight?). Trial fit the false ribs by inserting a few. If all looks well, try inserting the upper spars, opening rib slots (if necessary) to maintain alignment. Now check the upper trailing edge member for fit. Use no glue until you're sure it all goes together, then bond. Now put in the diagonals, after whittling a pointy end on each and inserting the pointy end between the top and bottom halves of the hollow trailing edge. The forward end of each diagonal rests immediately behind the upper rear spar.

Continue in this manner until you have three separate wing panels. Now add the wing tips, after blocking up the trailing edges to accommodate the 1/4-inch droop supplied by trailing edge parts A and B. The wing tip rib blank is inserted now. There is no drawing of this part; it was simply whittled on location from an oversize blank until it looked reasonable (Pazmany gives no details in his three-view). The upper and lower spars are carried through the tip rib. These, too, are to be faired by eye, from 1/16 sheet, until the fit seems reasonable.

To assemble, sand the center section members (4 spars, l.e., and t.e.) until the parts butt to the outboard panels with the proper dihedral (3-3/8 in.) set under the last full rib. Washin or washout is not used. Dihedral doublers are not used . . . simply butt and glue. The butt procedure is practical only if the wing is secured to the fuselage with the rubber band and rubber cushion technique. If you plan to glue the wing to the fuselage (which will probably get you more scale fidelity points), I would recommend a lot of dihedral spar doublers, for the dihedral break will then become an obvious weak point. The current design, despite the usual encounters with trees and cars over a three-year period, has failed only at the wing tip. Those apparently frail ribs, hollow T.E., and butt joint dihedral solutions are really OK, so long as you attach the wing with rubber bands.

FABRICATING THE FUSELAGE

Start the fuselage by laminating the wing support section (stations six through nine) out of two pieces of 1/32 sheet. Use the rib templates to carve the proper shape into a supporting block. When dry, cut the laminate to a width of a 1/4 inch.

Now build one side right over the plan, in the traditional fashion. Note, however, that the vertical supports lap the longerons. This means that the main longitudinal stringer must go in before the supports. When complete, you have the right side. To make the left side, smear the plan with oil and turn it over. You will see a ghostly image. With the aid of the old pin holes, work to make the second (left) side similar to the first. Fortunately, great precision is not required . . . the fuselage is so large that errors of as much as 1/16 inch cannot be seen in the final product.

Join the sides in the usual fashion, except for two factors: the cross members lap the vertical supports, and many of the upper cross members are only temporary. Temporary upper cross members (stations one through twelve) will ultimately be taken out to clear the motor. Attach temporary members with a light dab of white glue or traditional model airplane cement. Do not use epoxy. To remove, saw through near the middle of the member using a hacksaw blade (without a handle), or razor saw, and then twist each portion separately. They will come out with an ease that is disturbing.

With the temporary bracing in position, do the upper structure. The best approach is to make the cockpit frames (stations six and eight) first and mount them. Run longitudinal members between the cockpit frames and each end of the fuselage (stations one and fifteen). Then put in the horizontal cross braces between the longitudinal members. Next, put in the slanting side members.

Take out the temporary members and put in the diagonal floor braces between stations five and nine. Be very gentle at this point; the fuselage doesn't have much stiffness yet, and an oversized member jammed into position may well twist the entire assembly.

You are now ready for the upper and lower inner braces on each side, between stations five and nine. No precision is required here, just make sure that the braces are snug against each vertical support and well cemented. The fuselage should now possess considerable torsional stiffness. Drop the shelves in.

The noseblock consists of a large fixed piece, into which is set a removable portion, permitting passage of the winding protector tube. Finally, the propeller assembly, also removable, is set into the removable portion of the noseblock. I suggest that you make all the associated pieces at this point, before assembling the noseblock structure to the fuselage; otherwise there may be real problems of fit later on.

The winding protector tube is made of epoxy-bonded plywood. While it requires more work and expense than the usual golf tube, it offers more room for the rubber and can be made straight, whereas the usual golf tube is banana shaped. The only tricky part is coating the inside of the plywood tube with a protective surface. Stuff a rag into one end of the tube, pour in about half a cup of shellac, varnish, glossy paint, or whatever you have around, and then plug the other end with a rag. Turn the tube as though it was a baton, until the entire inner surface is coated, then pour out the excess. Repeat until the interior is glass smooth. The outside doesn't matter.

Carve the main noseblock out of relatively soft balsa and hollow it out to about 1/8 inch thick everywhere. Now saw out the removable portion, using a combination of knife scores to mark the outline, followed by the drilling of a small hole to permit the entry of a hand-held broken jigsaw blade. As the cut develops, you can switch to a razor saw or a hand-held hacksaw blade. To make up for the thickness of the cut, bond in 1/32 sheet liners to the removable part. If the cut seems crooked, trim the good side and build up the low side with a commercial mixture of balsa dust and epoxy, such as Epoxolite.

The removable portion is now reattached with some system of dress snaps or screws. Remember, the finished connection must take thrust and torque while being readily removable. My solution consists of one size 3/0 dress snap at the top center and one screw (plastic, 4-40) at the bottom center. While it does the job, this particular combination is too finicky for real contest conditions (rain, wind, nervous hands, etc.). In particular, seating the tiny screw is unrealistic. Give it some thought and you'll come up with something better.

Make up a nose ring out of 1/16 inch epoxy-glass PC board material, as shown on the plan. This ring will serve to key the propeller assembly. Do not glue the nose ring to the cowl yet.

Cut side and downthrust angles into the matching removable noseblock piece. When all the pieces go together, bond the main noseblock portion to the fuselage.

Cut the cowling formers and mount them. Do not notch the formers for stringers. While the plan supplies the number of stringers used on my model, the actual number is not critical. Simply put in enough to convey the impression of a rounded surface. Butt-glue overlong stringers, one at a time, to the noseblock and over the first former. Let dry. Then bend the stringer towards the last (aft) former. When it touches, saw off the excess length and bond. You will have to maintain pressure until the glue "takes"; use five-minute epoxy. Sheet in the gap between the fuselage and the first former; ditto the last former.

We're now ready to bend wire. The cockpit windshield wire suggestions are on the plan. Most any light spring wire will do. Balsa or soft aluminum tubing will not work . . . I've tried these. In a turnover landing, the windshield wire gets much of the load; a lot of give is required here.

Laminate the tail wheel as given on the plan, insert an aluminum tube hub, feed some 1/32 music wire through, and bend as shown. Epoxy to the frame after covering.

FABRICATING THE RUDDER AND TAIL

Make the rudder center post over station fifteen on the plan. Mount the "ladder" to the aft end of the fuselage. Carve the rudder top of soft balsa and balance on the ladder. Glue in the rudder leading edge. Put in the trailing edge, along with the sheet top and bottom supports. Glue in straight horizontal pieces of 1/16 square from each ladder rung to the leading edge (These are shown only in the rudder section view). Next comes the inclined 1/16 square members near the leading edge. Now bend in the 1/32 ribs from the l.e., over the inclined members, then over the ladder to the t.e. Last comes an extension of the main fuselage stringer to the rudder t.e.

The tail is built over the plan. The construction is pure Earl Stahl. First the 3/32 ribs, l.e., and t.e. are put down. Then the top spar goes on. Bits of 1/32 sheet are now spot-glued to the base ribs and then streamlined by sanding in place. The entire tail structure is removed from the board, turned over, and the lower spar glued on. Again, bits of 1/32 sheet are added on to the base ribs and trimmed. To mount the tail within the rudder, add the piece of hardwood dowel between the

center ribs. Before gluing, slide a 1/32 plywood retainer on to each side of the dowel. The retainer shape is given on the rudder plan. Inlay the retainer into the rudder top block.

PROPELLER

The propeller is a standard single-bladed folding affair. It's acceptable for AMA scale, but you do, in principle, require a freewheeler for FAC scale. This is a gray area . . . you'll have to check the local rules. If there is any choice permitted, go with the folding prop. The issue is not flight time, but one of simple survival. The only tall green things sticking out of the ground in my neighborhood are beer cans and mossy rocks. The life span of a free-wheeling prop is usually about three flights. If you must make one, try one 14 inches long by 1-1/4 inches thick by 2 inches wide, carved in the traditional style. I can't vouch for its performance; the one I carved didn't even survive the test flights. Now, that folder is something else; after three years of abuse, it's still going strong.

FABRICATING THE LANDING GEAR AND WHEELS

Pazmany's spring-type landing gear is probably best modeled in fiberglass. However, the forms are tricky, and I settled for a bent rectangular spring arrangement. The plans give all the bends in three-views. If you can't find rectangular spring steel, use 3/32 music wire. Good old 1/16 music wire just isn't stiff enough. The torsion bars help absorb energy and also stabilize the main gear. Soft solder these to the main gear, after wrapping the connection with copper or brass wire.

The model wheels were made of an unusually tough plastic foam "rubber" specified in the plans. Ordinary foam or sponge materials won't do . . . too soft or heavy . . . or both. If you can't find the cross-linked foam plastic, try the usual carved soft balsa wheels. To glue the ply hubs to the foam wheels, use rubber cement or contact cement.

To attach the landing gear to the wings, chop slots through the bottoms of the middle five ribs and false ribs. The torsion bars should fit alongside the thick landing gear ribs. Only the aft end of the torsion bars is glued to the thick ribs, the main landing gear is not. The main landing gear must be free to move within a clearance slot cut into the thick ribs. After inserting the landing gear, close the slots within the middle three ribs by gluing doublers on both sides of each rib. Now add the false fuselage portion between the landing gear.

COVERING AND DECORATING

Everything above the main longitudinal stringer receives white Japanese tissue; everything below, red. The wing is all red, with no decoration of any kind except the aileron outline. The tail is all white, with no decoration except the trim tab outline. The rudder outline coincides with the "ladder". The entire vertical tail surface is white. A black tapered band is cut from tissue and applied to the fuselage sides after the basic red and white covering is complete. Check the plan for band dimensions. The large identification letters and numbers are traced from the plan and cut from black tissue.

The smaller letters (EXPERIMENTAL and PAZMANY PL-4A) are too difficult to make in the above manner. I used transfer letters (Letraset 28-point Helvetica Medium) rubbed on to a small piece of white tissue, which was then glued into position.

Use any conventional covering procedure. I use the thinned white glue routine, not out of conviction, but simply because there is less smell. The cowling and wing tips require many individual pieces of tissue; the rest of the machine is straightforward. Water shrink the tissue, then brush on two coats of dope mixed 50/50 with thinner.

Cut trial-and-error windshield patterns out of ordinary paper. When you have one that fits, transfer the outline to acetate sheet or celluloid of about two to five-thousandths thickness. Cut and glue. Bond a strip of 1/4 inch wide rubber motor in the wing well as a cushion.

FINAL ASSEMBLY

Mount the nose ring so that the propeller balance weight is roughly downward and the folded blade is over the left cowl. Make the rear peg as shown, and also a straight 1/8 inch diameter piece of music wire about a foot long, to be inserted into the rear peg as a means of holding while winding. Make a winding rod to fit your winder and the bobbin hook.

Make up the test motor as per plan and insert it into the fuselage. Check the CG location. It must be at or forward of the rear spar. If necessary, glue steel washers or other weights to the inside front cowl to get the CG located properly . . . mine required eleven grams of ballast. Any attempt to fly with the CG significantly rearwards of the rear spar will result in a spirally unstable model.

FLIGHT

Set the tail to a horizontal attitude and glue lightly at the dowel to retain the setting. Fold the propeller after putting enough turns on the rubber to prevent any slack.

Get on your knees over the softest terrain you can find, and thrust the machine into the breeze with the nose slightly down. Despite its size, the machine flies slowly . . . do not throw extra hard. The best place to grasp the fuselage is at the two lowest longerons, just behind the wing. Correct the glide for stalling or diving by changing the tail incidence angle. When satisfied, stand up and test again. If there is any pronounced turn, glue on a transparent rudder tab and deflect to offset the turn. Keep changing the tail attitude until you are getting the optimum glide.

Hand wind about seventy-five turns and release with your left hand at the prop tip and your right hand in the usual spot on those two lowest longerons. Watch for steep climbing or any strong circling tendency. A too-steep climb means that more downthrust is required; pronounced circling means that either the side thrust must be changed or that you have some horrible warp. Watch the transition to glide . . . does the prop fold correctly? Slowly work your way up to about one hundred and fifty turns. You should now see some climb, about twenty feet. Switch from hand winding to the full protector regalia at this point. At high turns, bond the rear peg to the fuselage with epoxy; should it vibrate loose, things will become awkward.

For maximum performance, switch to the contest motor. Check the CG position again to make sure that all is well. Do a few glides and then slowly increase the turns on the contest motor until you reach about 85% of handbook value (roughly 600 turns). At this power level, you can profitably change your launching technique. A release at about fifteen degrees above horizontal is best.

Should you have any questions, send a stamped, self-addressed envelope to me, care of **Model Builder.**

Now, let's go back to the beginning. Why build it? If you have the necessary experience, i.e., you can build a peanut or walnut or coupe and get an honest thirty seconds, and derive delight from flight realism, you will enjoy this one. •