COUPE de PLASTIQUE

By HARRY STEINMETZ . . . Putting an end to the theory that "Plastic is toy and wood is supreme", our author also agrees that picking air is nearly everything about winning . . . and then goes on to tell you how.

● In accepting this article, the editor of **Model Builder**, Bill Northrop stated, "I feel that picking good air is 90% of the trick. The constant search for the ultimate design is a farce!" I don't agree with his ratio, but there's no denying that the modeler who can't pick air doesn't win, no matter what he's flying. The irony of all of this is that I've always been a theory designer, rather than a competitor. The record of this little Coupe is by far the best of any plane I've ever built. I enjoy the pursuit of good design and improved building techniques. I have file drawers full of plans and airfoils by the score. But success cannot be denied, so let's talk a little bit about picking air.

If you don't take time to learn some of the techniques of picking good air, then any success you will have will be blind luck. A Coupe that has less than 145 square inches of wing area, weighs 80 grams, and struggles into the air on a third of an ounce of rubber with a generally less-than-efficient plastic prop which is "too small", needs all the help it can get to fly two minutes. There are, in current use, a number of exotic gadgets and some rather wild theories, all intended to help the contest flier pick rising air. NONE OF THEM ARE INFALLIBLE. At Taft, it is claimed by some, if you wear polarized sunglasses, you can actually see the thermals coming. I keep losing sunglasses, so this method I do not find reliable. Of course, we can all piggyback, and some meets consist of hours waiting for some brave soul to throw his plane into the air while others wait and watch. As the contest day wears on, or time limits for launching are imposed, the waiting to be certain sometimes proves disastrous as your hopes are dashed when your plane misses the broomstick thermal and sinks in down air.

So what methods can be used with some consistency to give you at least a notion of when to launch? One of the simplest and most readily available is the use of cattails, or "fluffies", as they are called. A well-ripened cattail can be wrapped in newspaper (so you don't fill your car with fuzz) and a friend or your wife stands upwind, fluffing little pieces of fuzz into the breeze which drifts them toward you. They are so light that any up air is easily detected. If there are power fliers on the same field, they may curse you; it seems that fluffies play hob with model engines when inhaled.

The second method, also requiring a helper, is to go to "Toys-R-Us" or other large toy store and purchase a Bubble Factory. This device has a reservoir for bubble fluid, multiple circles which automatically dip when a crank is turned, and a small fan which blows the bubbles away. They act very much like the fluffies and are good indicators of rising air. Several of these devices have been fitted with larger reservoirs, so time need not be taken for refilling during a contest.

The third method, which I like very much, is to use a long pole (the longest I know of is some fifty feet high) from which flies a forty or fifty-foot mylar streamer. With practice, you can learn to read the undulations of the streamer about 90% of the time. Of course, you must be immediately downwind! Now, all three of these methods have drawbacks. The first two tire your friend or your wife if you ask her to continually loft fluffies or bubbles into the breeze, and the streamer pole is not always immediately upwind, since the wind has a way of changing.

In normal flying conditions, there is some breeze, sometimes gentle, sometimes almost a wind. With practice, you will find that often there is a moment of calm just before the warm air arrives. Fluffies or bubbles which were wafting along just hang or settle to the ground. The streamer droops. After the calm, there is often a directional wind change which can be confusing. It is caused by the circular pattern of the thermal. Thermals look a lot like the vortex in your sink or tub when it is fairly full and you pull the plug. Incidentally, thermals and water vortexes move counter-clockwise in the northern hemisphere, and clockwise in the southern. It has to do with the earth's rotation. Now that you have detected a lull in the breeze, don't be fooled. Some calms are not followed by rising air. As the breeze freshens, ask your helper to loft fluffies or bubbles; watch them. If your streamer begins to swing in several directions and then balloons gently up, get ready. If there are several streamers on the field, they will all point toward the patch of rising air.

All of these methods involve helpers or paraphernalia. Is there any way to improve air picking if you are alone on the field with just your model? Yes, there is!

Years ago, I was impressed by an article in a British magazine which reported the techniques of three Finnish fliers, all of whom had made the flyoffs in the World A/2 Championships. As I recall, they wore no shirts, only short pants, and had their hair freshly cut. They stood with their backs to the wind while waiting to launch their planes. In short, they got in touch with their environment. You can learn to do something of the same sort if you work on the secret ingredient of successful model flying: patience. Rising air, or thermal air, is several degrees warmer than static air. Down air is often several degrees cooler than static air. There are battery-operated temperature sensing devices available on the market, but you can learn to be your own. I can testify that the haircut, especially a close trim on the back of your neck, does tend to sensitize you to a remarkable degree. Scrubbing your arms and face clean just before going out to fly has much the same effect.

If you fly regularly at one site, you should get to know the wind patterns and temperature variations throughout the day. A little time spent in such study will go a long way toward improving your competitive record. Remember that I said that the secret ingredient was patience . . . patience to pick the best time during the day or round, and patience to wait for good air, even within that part of the day. Don't be in a hurry; try to stay mentally alert. We've all seen more third-round mistakes destroy the chances of good fliers than can be blamed on bad luck alone. Finally, know your model, its flight characteristics, and test fly, test fly, test fly.

Now, a word or two about that plastic prop. The San Diego Orbiteers have been developing the P-30 class of rubber model as a small field, category II, rubber event for nearly two years now. The idea is to provide a competitive model without the giant hurdle of carving and hinging a wooden propeller. Both Kaysen and Peck-Polymers offer good 9-1/2 inch free-wheeling plastic propellers. They work very well, if not overwhelmed by too much torque. In other words, match your motor to your prop. For Coupe flying, we have found that six strands of 3/16-inch is just about optimum. This gives about a twenty-inch motor on ten grams. (Remember that a free-wheeler requires that the motor go slack.) We have used both six and eight strands of 1/8, four and six strands of 3/16, and four strands of 1/4. All seem to work well, with the four strands of 3/16 taking nearly 300 turns and giving nearly a 50-second motor run, but not enough torque for Coupe flying. Now to the model itself.

Clarence Mather, John Oldenkamp, Bob White, and I have spent some time discussing why this model seems to fly so well. We've concluded that, aside from picking good air, matching the motor to the prop, and a lot of luck, there is something to the design. (Sorry about that, Bill!) The polywog airfoil and the incidence set-up seem to be a perfect match for the free-wheeling propeller. The large stabilizer gives it a rather tail-high-kicking glide with remarkable recovery in case of an upset. I should

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point out that the plane has been flown successfully in rain and wind in Albany, Oregon, in 100-degree breeze in Fresno, in gray overcast conditions in Los Angeles, and in ideal and not-so-ideal conditions at Elsinore, Taft, and the Mexican border. It has performed well everywhere. What determined its moment arm, its nose moment, the height of the pylon, the ratio of areas, and the location of the center of gravity? I must confess it was not intense theoretical study. You might say it was intuition derived from thirty years of poring over plans and listening and watching. All I know is, that in three days time, a disparate collection of parts became a rather attractive and successful Coupe d'Hiver. Try one. I'm sure you will be pleasantly surprised.

In building any free flight model, it is best to construct the flying surfaces so they have time to age a bit. This seems to reduce the likelihood of warps. First, cut out the ribs and the four wing tip pieces. Sand them true and cut the six tip ribs to length. Do this by cutting off the trailing edge, and then use the rib template to reduce the height, slicing off the top of the rib so the trailing edge is no more than 1/8-inch high. Next, cut and notch the trailing edge. Pin this in place with 1/16-inch packing under the front edge so the t.e. angle matches the undercamber. Cut the five pieces of the spar and pin them to the plan with 1/16-inch packing underneath also. Now glue all the ribs in place except the six tip and four dihedral ones; these go in later.

Fit and glue the wing tip pieces in place. You will need to pack them up with scrap, and be sure to include the 1/8-inch washout in each tip. Don't forget to groove the front piece to receive the leading edge. To help hold things in place, glue in the tip ribs. Now attach the leading edge. The center three pieces should be quite hard, but the two tip pieces should be soft enough to bend easily. Set the wing aside and build the stabilizer. Since this is flat-bottomed, no packing is needed. Cut out the ribs. The two tip ribs are reduced in size the same way as for the wing. Cut out the t.e. and notch it, then pin it in place. Pin the spar in place and glue in the ribs. Cut and fit the tip pieces. Be sure to groove the front piece for the l.e. Glue in the l.e. and cut out and glue in the riblets on the stab only.

Back to the wing. Cut out the six 1/16 ply spar gussets. Now cut the five panels apart and very carefully sand in the proper bevel on each end of each panel. Glue the two tips to the long center panels. With the center panels flat, the tips should rise 2-1/2 inches. With everything in place and the angle correct, glue in the spar gussets. I use clothespin clamps for this. Build the rudder while these are drying. The entire rudder is built flat. After it is dry, add the 1/32 cap strips to both sides, extending them on to the leading and trailing edges. This entire unit is then sanded to a symmetrical section and set aside. If you prefer not to have your rudder mounted on your stab, the plans show an alternate rudder and sub-rudder of 1/16 sheet construction. Either one is fine, but I prefer the built-up one myself.

Back to the wing again. Pin the short center section to your board. Pin and glue the main panels so that each tip has 3-1/2 inches of dihedral. Now add the center spar gussets. While this is drying, cut out the wing riblets. Glue in the dihedral ribs and all of the riblets. Set the wing aside and build the fuselage. The balsa used for the three main parts should be straight-grained and should roll easily. Either soak them in hot water or, if you are brave and have a well-ventilated workshop, soak them in ammonia mixed with an equal amount of water. The motor tube blank should be 4-1/2 inches longer than the finished tube, to allow for the doublers. It can be wrapped around any straight form . . . dowel, tubing, or fluorescent light tube.

The tail boom was wrapped on a straight pool cue. I hold the sheets in place with 2-inch wide gauze bandage strips, but rubber strips or old shoe laces would do. When these are dry, carefully glue the seams together. Add the doublers in the motor tube and one in the tailboom. Do not add the long doubler key to the tailboom at this time. Add the two circular formers and the snuffer tube brace to the tailboom. The snuffer tube and lower DT wire go in easily at this stage. Cut out the two 1/32 ply rings and carefully line up the motor tube and the tailboom. The top of the fuselage is straight. Sand the joint until it is perfect. Now glue on the ply rings and the doubler key. Notch the parts for the motor tube. Now that you have determined the top of the motor tube, sand in the down and side thrust and glue on the 1/16 ply nose ring.

Cut out the two symmetrical formers, the bulkhead, and the short 1/8 x 1/16 stick for the pylon. Assemble these, as per the plans, into an open frame for the pylon skin. Glue together several pieces of 1/16 flexible balsa so you have a piece 2 inches by 12 inches long, with the grain going in the short direction. Draw a line perpendicular to one edge of this piece, in the middle of it. Glue the edge of the 1/8 x 1/16 stick to this line. Be sure that the smaller former is at the edge of the skin. Now, gradually roll the frame down onto the sheet skin, gluing as you go. Hot Stuff is ideal for this operation. When one side is attached, trim and bevel the end; then roll down and glue the other side, overlapping the skin at the rear. Trim the top so the pollywog ply platform can glue directly to the former. Its shape was determined by a scrap I had on hand; if you reshape it, do not make it any narrower.

Now wrap a piece of medium sandpaper around the form you used for the motor tube, with the rough side out. Being careful to keep the pylon straight on the form, rub it along sandpaper until the bottom fits the motor tube perfectly. A word of caution: Coupe has a minimum cross-section required, so don't sand past the bottom former. Epoxy in the wing hold down dowels and add the two shim pieces to the platform. Sand all your various parts and pieces, and pick your covering scheme. Cover the tail surfaces and the tailboom with the lightest grade tissue you can find. The motor tube should be wrapped with a spiral covering of silk, lightweight fiberglass cloth, or at least, heavy duty silkspan. Then cover it with tissue. Glue on the pylon, lining it up carefully. Cover the wing, being sure to attach the tissue to the undercamber of each rib. Assemble the nose block from five pieces of 1/8 hard balsa plus 3/32 ply plug. Drill a straight 3/32 hole through the middle. I shaped the nose block on a drill, using a file. Cut out the stab platforms and epoxy them in place. Bend the top dethermalizer wire and glue it in place on the stab. Cut the four rubber band hooks for the fuselage from hard balsa or basswood. Scratch the surface of the fuselage and epoxy them in place. Drill the nose block and install the propeller. That short sentence is what makes the Coupe de Plastique unique! There are a number of thrust bearings on the market, but I find that the brass tube and a brass and teflon washer work fine. If need be, balance the prop with a little clay on the back of the light tip.

You may now think that you are ready to go flying, but you are not. Key your surfaces!! Assemble your model, and by measuring from wing tip to tail, be sure that the wing is square. When it is, glue short pieces of split dowel to the underside of the wing next to the platform; two at the spar and two at the trailing edge. Now do the same thing with the stab. With the rudder on the stab, you do not want any shifting to take place. Now, let's go fly.

A few hand glides are fine if you have some of that scarce long grass, but free-wheeling props can bend shafts on hard, rough surfaces. If your center of gravity is as marked on the plan and your incidence is correct, you are ready to put in 50 to 60 winder turns. I use a Sterling winder, which has a 5:1 ratio. Now release the model gently in level flight. Watch it! You want it to fly right/right. Bend the rudder trailing edge for right turn and/or tilt the stab (shim up the right side). If you tilt the stab, be sure that the key is still holding your stab in alignment. Now add 10 winder turns and try it again. Keep working a little bit at a time. The speed of the glide should be controlled by the incidence of the stab. The angle of the climb is regulated by down thrust. As you approach 140-150 turns, the plane should jump out of your hands. It is very important not to throw it or to launch it crosswind or downwind. If there is a bit of a wind, launch your plane just to the left of it. If you practice enough, you should learn to pick good air. You have an excellent plane, so now go find the experts and beat them. ●

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