



EDMONDS



Deltie!



Edmonds
AEROSPACE

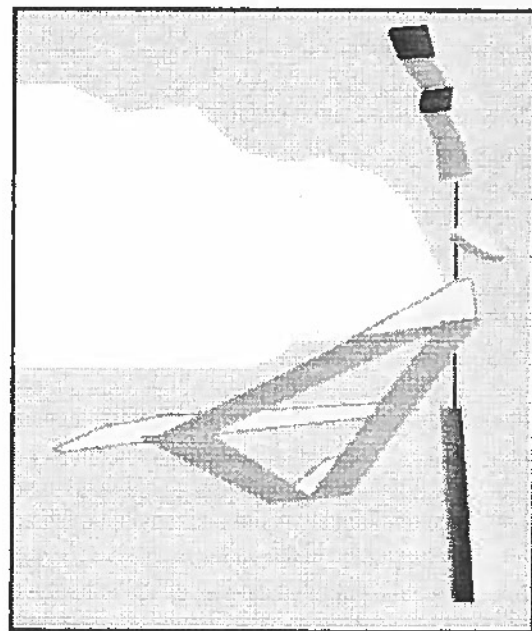
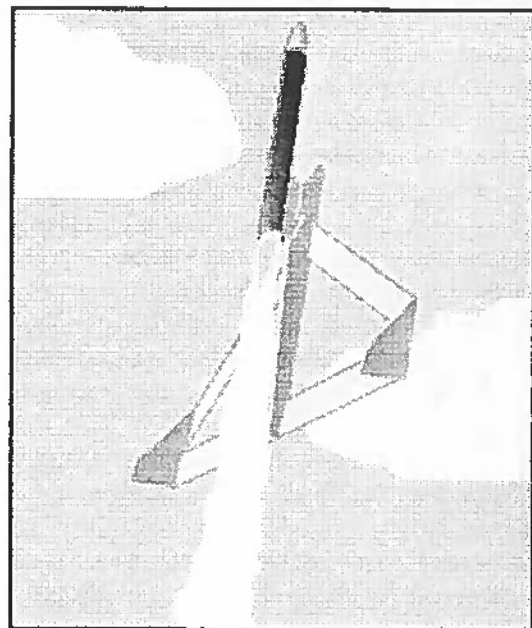
13326 Preuit Place * Herndon, VA 22070 * 703-471-9313

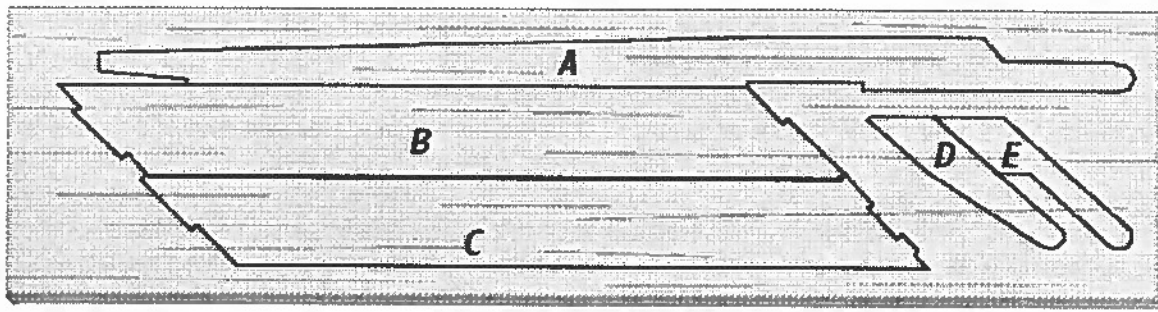
You're about to have some fun. Your Deltie will delight you with many exciting flights, but even before that, you're going to have the joy of knowing that you built your own aircraft. If you're a young person, why not get your parents to watch while you build your model? You'll impress them when they see how well you do, and if there is something you don't understand, they'll be able to help you.

Your Deltie is a special type of aircraft called a **boost glider**. A rocket motor **boosts** it straight up to a high altitude, and then it glides back, just like the NASA Space Shuttle that you see on TV. For a rocket-powered model to go up in a straight line, it needs to have lots of weight in the front, and fins at the back. For this reason, the rocket motor is mounted in a pod that attaches to the nose of the glider, and adds weight to the front. The glider's wings and tail act like fins at the back. After the model has climbed to altitude and slowed down, the **ejection charge** in the rocket motor fires. The ejection charge creates a puff of gas that pushes a paper streamer out of the front of the pod and also pushes the pod backward off of the glider. The streamer is tied to the pod by a long string called a **shock line**, and it helps the pod drift slowly back to the ground while the glider circles around the field.

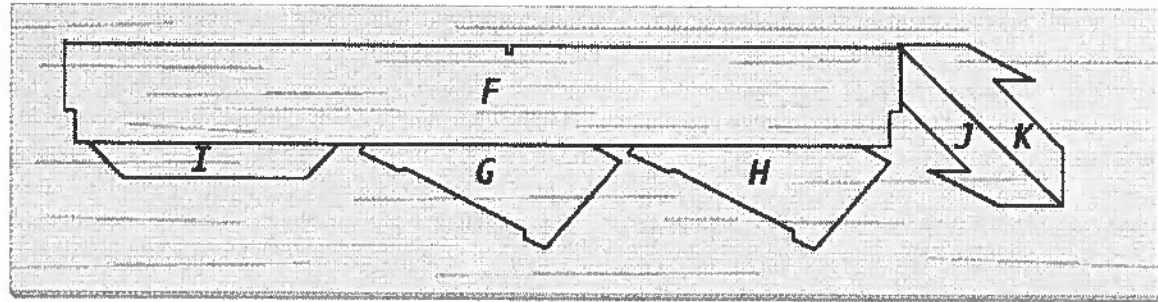
I've given you almost everything you need to build your Deltie right here in the kit. The only other things you will need are a bottle of glue, a pencil, a small piece of sandpaper, and a board or table to work on (don't use a good table that you want to keep clean). There are just a few steps involved in building this model. First you're going to put the balsa parts together to make the glider. The positions and angles of the parts are very important to the aerodynamics of an airplane or rocket, so I've put lots of notches and tabs on the parts to make them go together just right. Then you're going to make the engine pod. You'll make the balsa clip that holds the glider on during the boost, and mount it on the pod. Next, you'll put on the shock line, which must hold very strongly to keep the nose cone and streamer from tearing off, so I'll have you attach it in two places. After that, you'll balance your glider to make it fly right, and then you can take it out in the yard for some test glides. Finally, you'll learn how to set your model up for a rocket-powered flight, then take it to the field and let fly!

I, by the way, am Robert Edmonds, Jr. I wanted to design you a model kit that is not only easy and fun to build, but also one that is almost certain to give you good flying results if you follow the directions. Many models of this type require very careful adjustment in order to work properly. I've rounded up a group of manufacturers from all over the United States to produce the parts for this design. Their job is to make sure that the parts are so consistent that every model will fly well on the first attempt, with no need for special adjustment. Future Flight, Balsa Machining Service and Euclid Spiral Paper Tubes are just some of the companies that have made parts for your Deltie. Together, I think we've put out one of the best kits for its price that you can get today. It's here waiting for you to build, so turn the page!

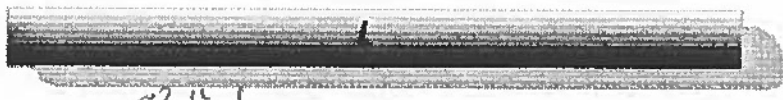




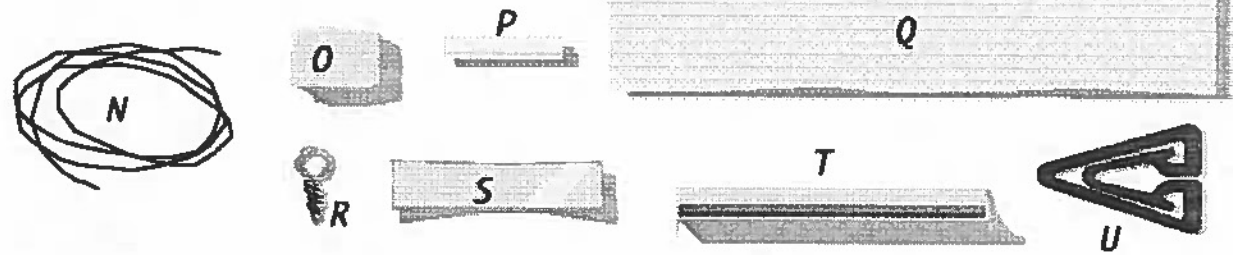
1/16"



1/16"



8" long

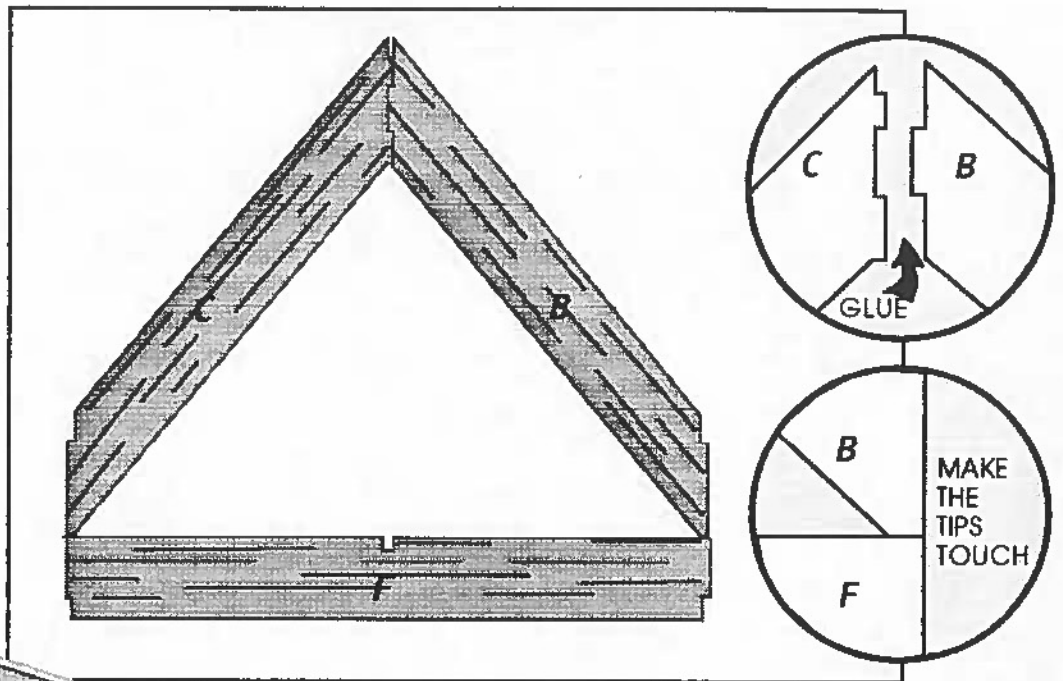


These are the parts for your model. The two balsa wood sheets have been die cut for you by Rol Klingberg at Future Flight out in California, so all the parts are already the right shape. Balsa parts *A* through *H* make up the glider. Balsa pieces *I*, *J* and *K* become parts of the pod. *L* is the tube that holds the motor and streamer in the pod, and *M* is called the nose cone (even though it isn't really shaped like a cone). It was turned for you from a block of balsa by Bill Saindon of Balsa Machining service. *P* is a "launch lug", used to guide the model along a rod to make it lift off straight. *Q*, the streamer, together with *R*, *S* and the string wrapped around *N* make up the **recovery system**. You will be using some of the clay from *O* to balance your glider. *T* and *U* aren't even parts of the glider, they are tools to help you build, as you will see.

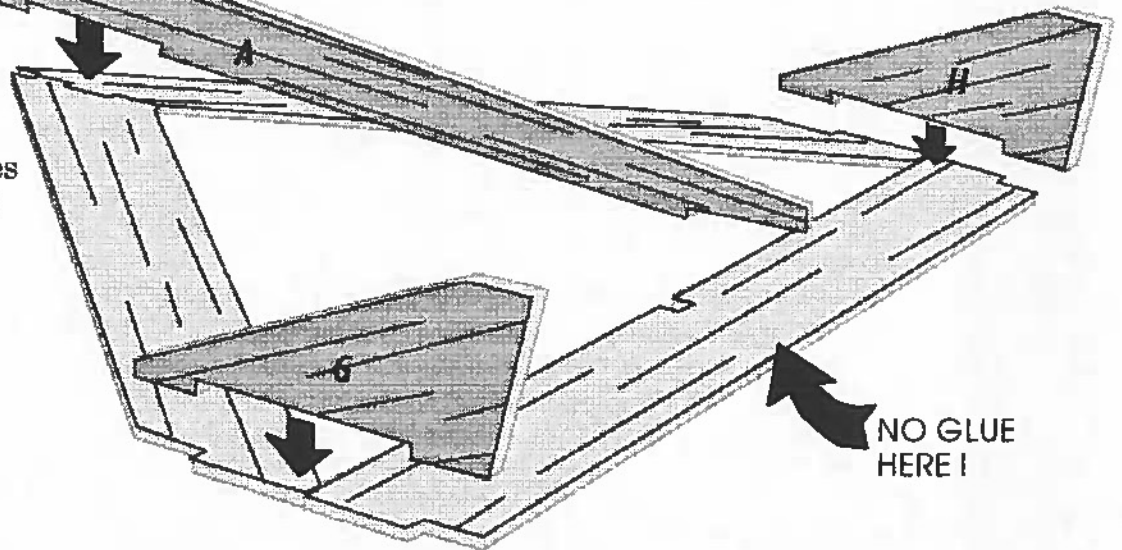
Right now, I want you to perform the most important step in building your Deltie. Take *A*, the **fuselage**, from the balsa sheet put it inside the outline below, and make a mark on it where I've shown. You have marked the balance point of your aircraft, often called the "**Center of Gravity**". We will be using this mark in a little while.



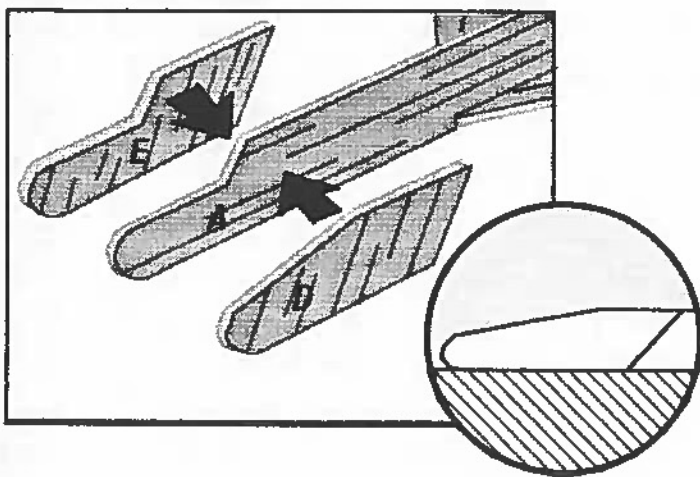
1 Begin your Deltie by removing pieces *B*, *C* and *F* from the balsa sheet. Put some glue on parts *B* and *C* where they will be touching, then arrange all three on your table so that the tips of *B* and *C* meet the tips of *F*. If you want, you may also put some glue where the tips touch. Make sure the glue doesn't end up sticking to the table, or it will ruin the table and the model!



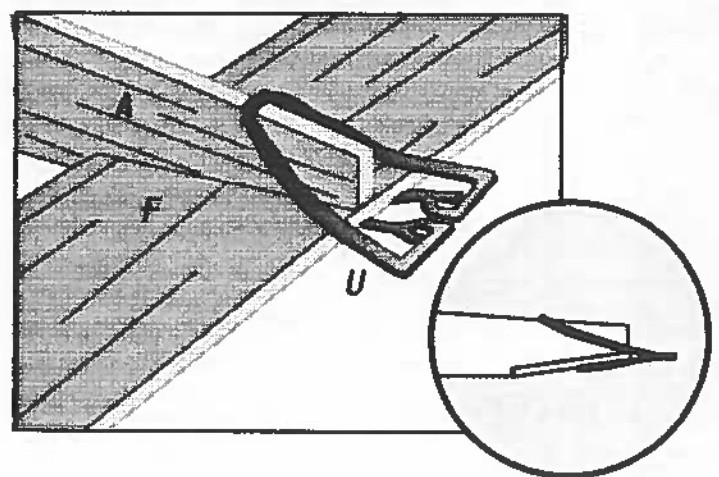
2 Now remove the fuselage (*A*) and the vertical fins (*G* and *H*) from the balsa sheet. Glue the fins into the notches at the wingtips, with glue at every place where the fins touch the wings. Put glue where the fuselage touches wings *B* and *C*, but **DON'T** put any glue between the back of the fuselage and *F*. (We're coming back to that later). Slide the fuselage down into the notches.



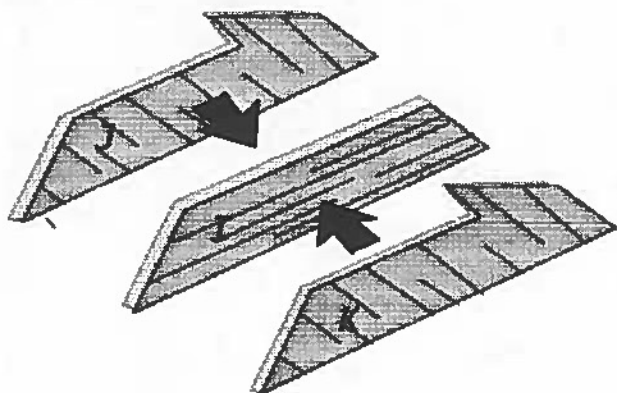
3 Glue pieces *D* and *E* to the sides of the nose of the fuselage. The pieces should rest on the table along with the fuselage, so you'll know that they're parallel. The pieces make a little pocket for clay on the right side of the nose.



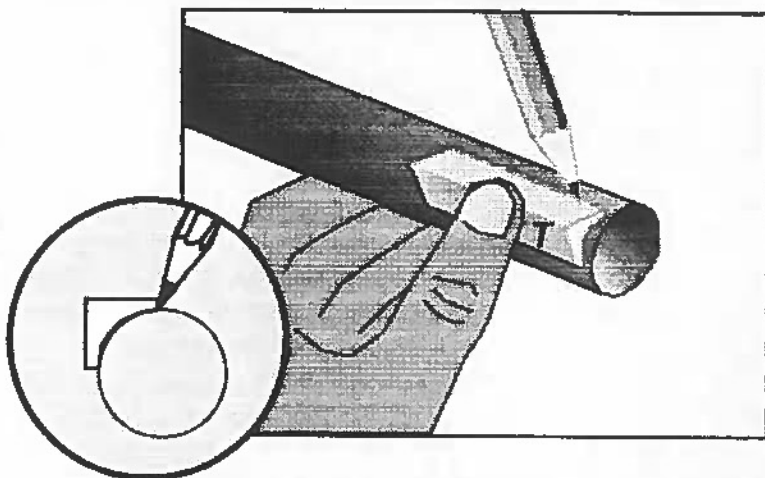
4 After giving the other joints a half hour or so to dry, put some glue under the back end of the fuselage and use *U* to clip *F* to the fuselage. This will twist *F* a little bit. This step is **EXTREMELY** important; we'll explain why soon.



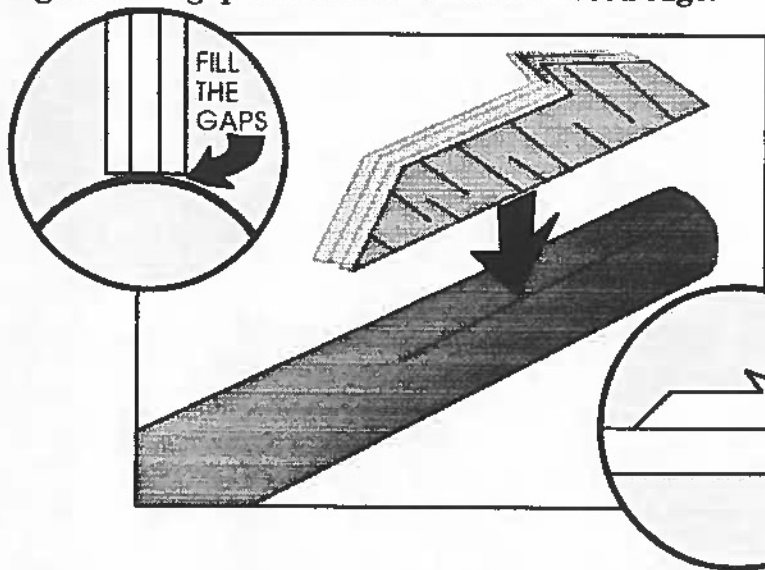
5 Remove *I*, *J* and *K* from the balsa sheet and glue them side by side. You are making a clip that will hold the pod to the glider for liftoff. It will fit on the two pieces you glued to the side of the fuselage nose.



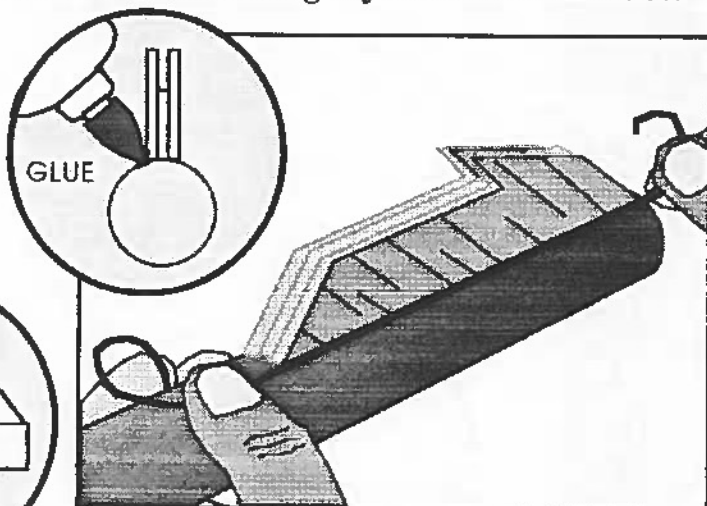
6 Mark a straight line along the side of the tube (*L*) by holding *T* on the side of the tube and drawing along it with a pencil. Save *T* for marking other models in the future.



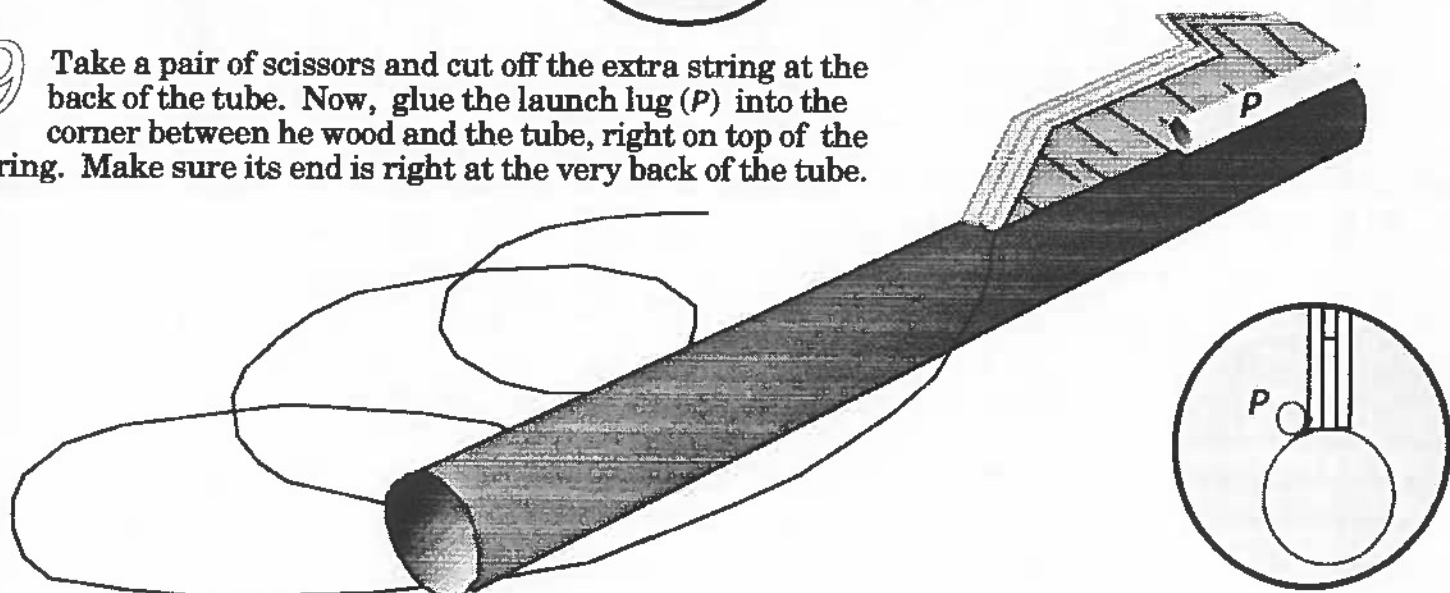
7 Glue the clip that you made from *I*, *J* and *K* to the side of the tube, with one edge along the line that you drew. Pay close attention to that line, this piece must be glued on parallel to the length of the tube! Use extra glue to fill gap between the tube and wood edge.



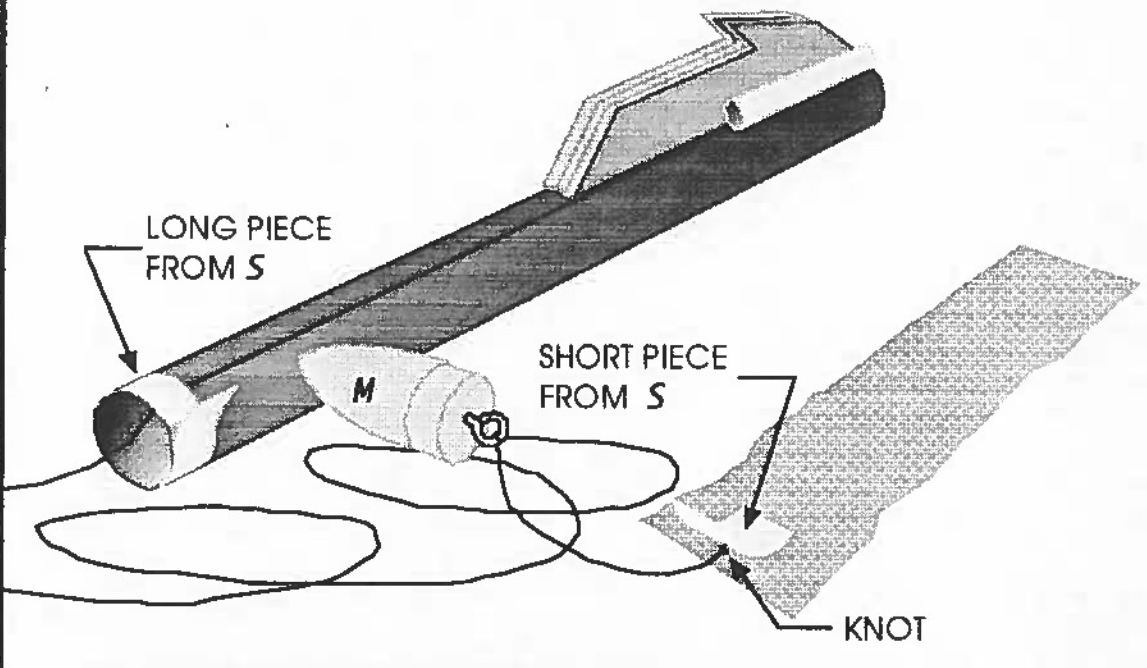
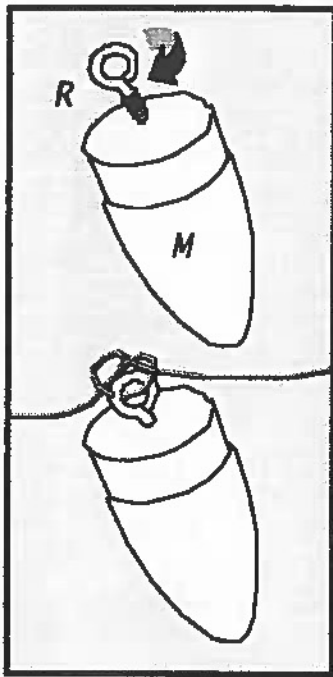
8 Let the joint between the wood parts and the tube dry for about a half hour. Then unroll the string from *N*. Hold the string near its end and glue it down into the corner between the wood and the tube, leaving no more than an inch of string beyond back of the tube.



9 Take a pair of scissors and cut off the extra string at the back of the tube. Now, glue the launch lug (*P*) into the corner between the wood and the tube, right on top of the string. Make sure its end is right at the very back of the tube.



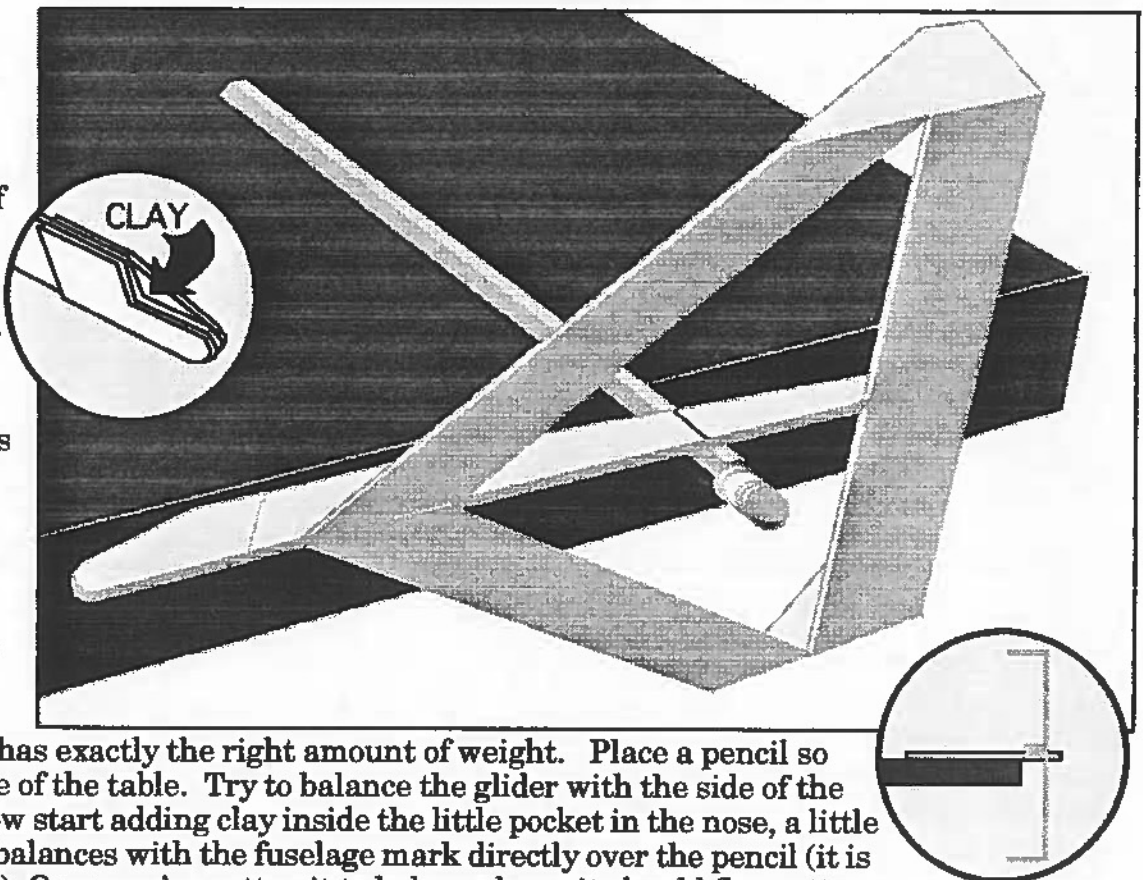
10 Now you will assemble the **recovery system** that lowers the pod to the ground. Part **S** is a strip of **adhesive-backed plastic** that you will use as really strong tape. Use scissors to cut a piece about 1/2" long from **S** and save it. Pull the backing off of the leftover piece of **S** so that you can see the sticky side, then wrap it around the front of the tube and the string so that it holds the string to the tube. Pull the string so that it is tight between the launch lug and the front of the tube. Now screw **R**, the **screw eye**, into the back of **M**, the nose cone. Then tie the string through the screw eye, making sure to leave about 2 inches of extra string beyond the knot. Finally, put another small knot in the string near the end, and stick it to one end of the streamer using the 1/2 inch piece from **S**.

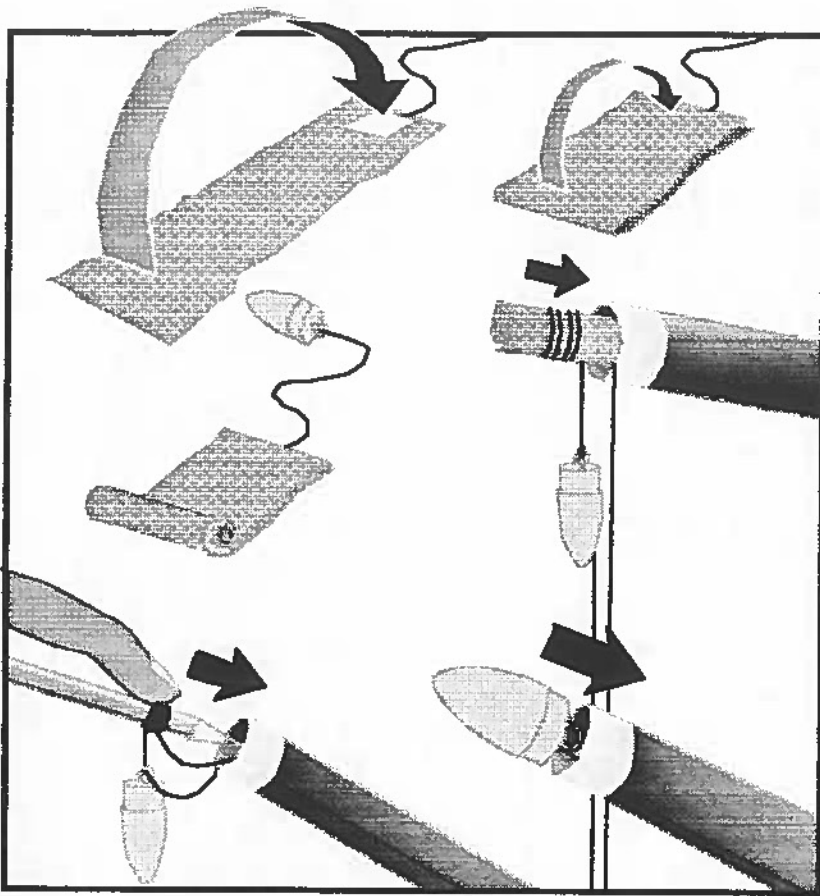


11 Now, here is the reason you made that very

important mark on the side of the fuselage. To fly, a glider (or any type of airplane) must be sort of heavy in front, just like a rocket. If it is just heavy in front, though, the glider will just go straight down. We have to do something special with aerodynamics to hold the nose up. For this glider, the little twist you put into **F** keeps the nose up while the glider is flying. When the nose is up, the wings can produce **lift** and let the glider fly. This can only work right

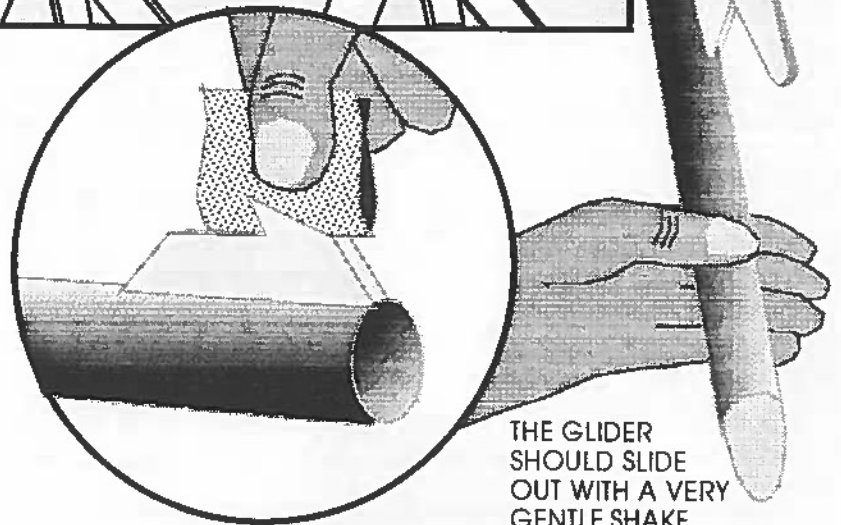
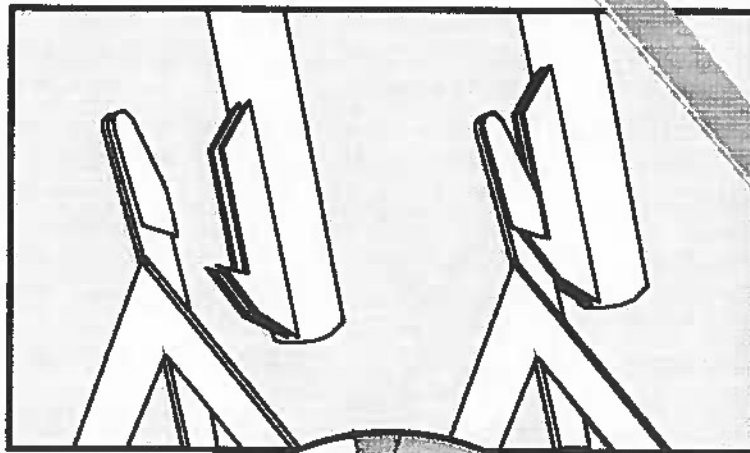
if the front of the aircraft has exactly the right amount of weight. Place a pencil so that it hangs over the edge of the table. Try to balance the glider with the side of the fuselage on the pencil. Now start adding clay inside the little pocket in the nose, a little at a time, until the glider balances with the fuselage mark directly over the pencil (it is OK to overflow the pocket). Once you've gotten it to balance here, it should fly pretty well when you take it outside and toss it by hand. If you fly the glider outside, and it seems to come down a little bit too steep, you might want to take a little clay off.





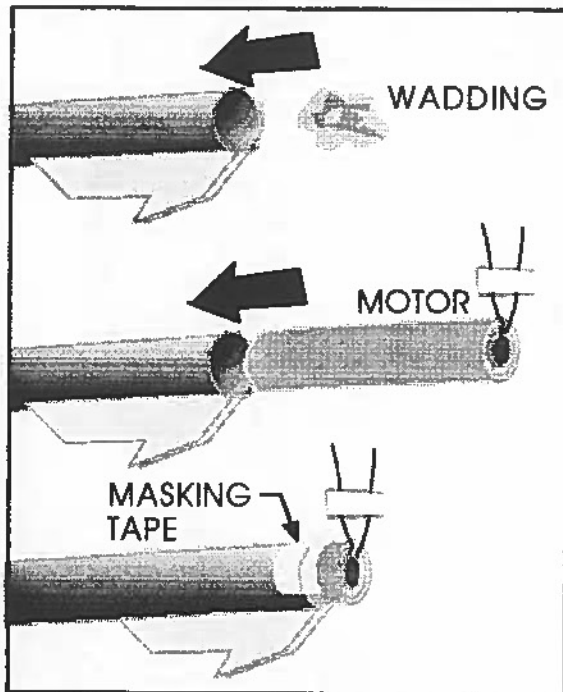
12 Now, you're pretty close to being ready to fly. The things you're going to do in this step need to be done for every flight. Basically, you have to get the entire recovery system inside that tube. Start by folding the streamer over a couple of times. Then roll it up like a snowball, and keep rolling until you have wound most of the string leading to the nose cone around it. Slide the streamer in through the front of the tube, and let the nose cone dangle from the short string. Now take the long string between the nose and the tube, and start winding it loosely around a pencil until you just about use it up. Then slide the string off of the pencil and into the tube with your finger. Finally, push any remaining string inside the tube, and then push the nose cone in. Only the piece of string from under the tape between the cone and the tube should stay outside.

13 Now test the fit of the glider into the clip on the pod. Notice that the two balsa prongs on the pod should fit snugly up against the pieces glued on the side of the nose, so that the glider won't move around while the rocket motor is running. Now, hold on to the pod with one hand and see if the glider slides out easily when you turn the whole model upside down. The glider should either slide right out by itself, or come out with just a little bit of shaking. If it doesn't come out easily when you test it, it will not separate when it is flying, and may get broken when the glider and pod hit the ground together. If it takes more than a light shake to make the glider slide out, find a piece of small sandpaper and gently sand between the two prongs on the pod. Sand a little, then test again, and repeat this until the fit is loose enough to work.



THE GLIDER SHOULD SLIDE OUT WITH A VERY GENTLE SHAKE

14 Your Deltie is almost ready to go! You should do these last few steps at the field where you're going to fly. Deltie flies pretty well, which means that if the wind is blowing, it might go a long way before it comes down. You should use a big place, like a park with several baseball diamonds or soccer fields, or a farmers field out in the country. That will help make sure you get your model back. Get a set of **1/2A3-2T** motors to make your first flights (for later flights you may also use **A3-4T** motors), along with a package of **recovery wadding**. If you can't find the wadding, you can fly without it a couple of times, but the streamer becomes very sooty. Carefully follow the instructions that come with the motor for



putting in the igniter. Now, take about a half of a sheet of wadding, loosely crumble it into a ball, and gently stuff it into the tube from the back. When the motor shoots that small puff of gas out of its front to eject the streamer and separate the glider, the wadding will keep the streamer and string from getting burnt. Don't put the wadding in very tightly, though, or the puff of gas might blow out the motor rather than the streamer, and you model will crash! Put the motor in after the wadding leaving 1/4 inch of the motor outside the tube. Tape the motor in place by wrapping masking tape around the outside of the motor and the back end of the tube, to make sure it doesn't eject itself.

15 Now, you're ready to take the model out to the launch pad. If you plan to use your own launch pad, make sure you use a 1/8 inch launch rod 36 inches long. Since the glider has to hang down from the pod for liftoff, you need to wrap a piece of tape around the launch rod to hold the pod just high enough for the glider to clear the pad. Put the launch lug around the end of the rod, then slide the pod down until it rests on the tape. Finally, hang the glider onto the pod. If the weather is very windy and the glider keeps blowing off of the pod, put the model away for another day. The pod cannot fly without the glider, because, as we said, the glider acts as the fins for the model during the climb. Even if you did manage to launch on a windy day the glider would probably fly away. When everything is ready, hook the clips to the igniter. Make sure that, when the wires fall down after ignition, they won't catch the glider on its way up! Tell everyone to stand back, and proudly make your countdown. When you get to zero, start the motor. You will probably be surprised at how fast it goes! Once the glider starts gliding, watch it carefully. If it comes down very steeply and very fast, you should take off a little bit of clay before the next flight. If it follows a very bumpy path on the way down, it probably needs a little more clay. While you're walking over to pick up your Deltie after the flight, think about how proud you are. You built and flew your own aircraft, something that not very many people have done. There are many other types of airplanes and rockets out there waiting for you to try, but for now, enjoy your Deltie!

