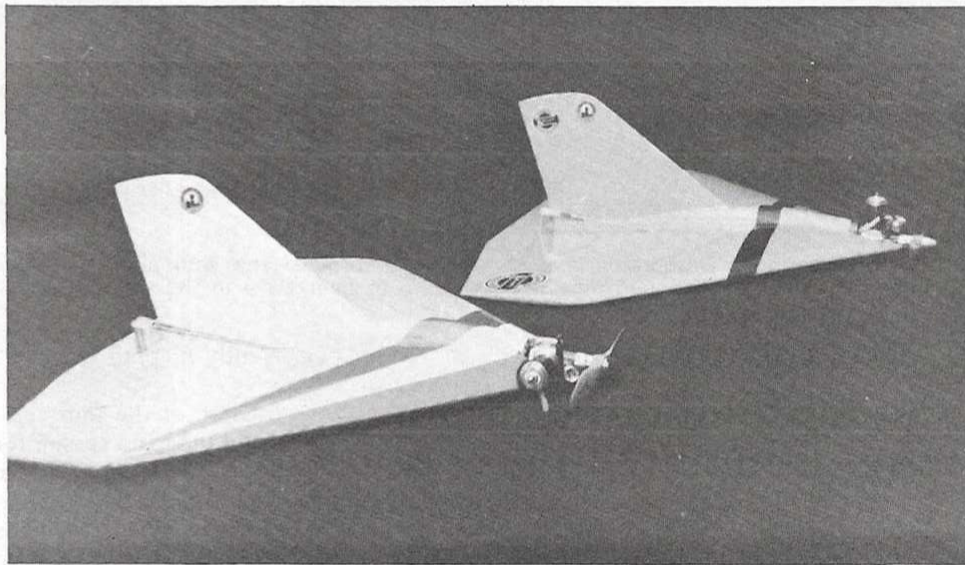




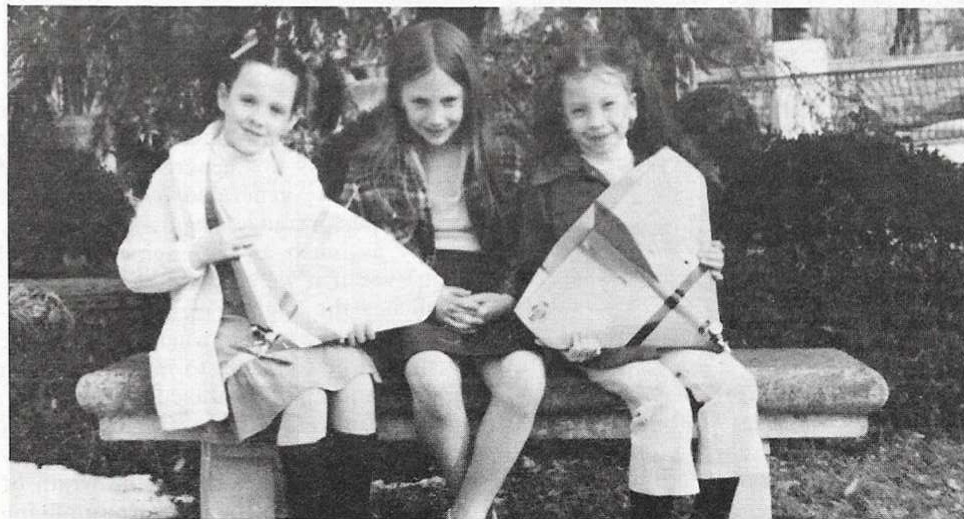
# 1/2 A DELTA

BY GREG DOE . . . designed primarily for 1/2 A Unlimited racing our little pointed bird can really move it out for you! Like all Delta-type aircraft it is clean, maneuverable and, of course, fast and good looking.

Coming up on 2-3 pylon it's really honking—built and trimmed properly, it's fast.



Two versions of the Delta, one in front has engine side mounted, rear is upright.



Katie Doe(L), another of Pop's modelling projects with friends Wendy and Christy Moore.

• For some time, Delta wing airplanes have held a fascination for me. After admiring the performance of a friend's .60-size Delta, I decided to try my luck at a 1/2 A size ship. At the time I was looking for a new design for unlimited 1/2 A racing.

I asked a lot of questions and copied everything I could. I made several mistakes, but learned a lot from them. The Deltas shown here are numbers four and five of the series. Most of the experimentation was done with the first Delta. The next four followed the plans presented here and all flew very well. Ship number three was raced one time, and clocked at one minute, fifty seconds for ten laps on the two-mile 1/4 Midget course.

Some of the theories presented here were learned from my experience, and may disagree with known aerodynamic principles. However, they worked for me, so they are presented for your interpretation. More about this later.

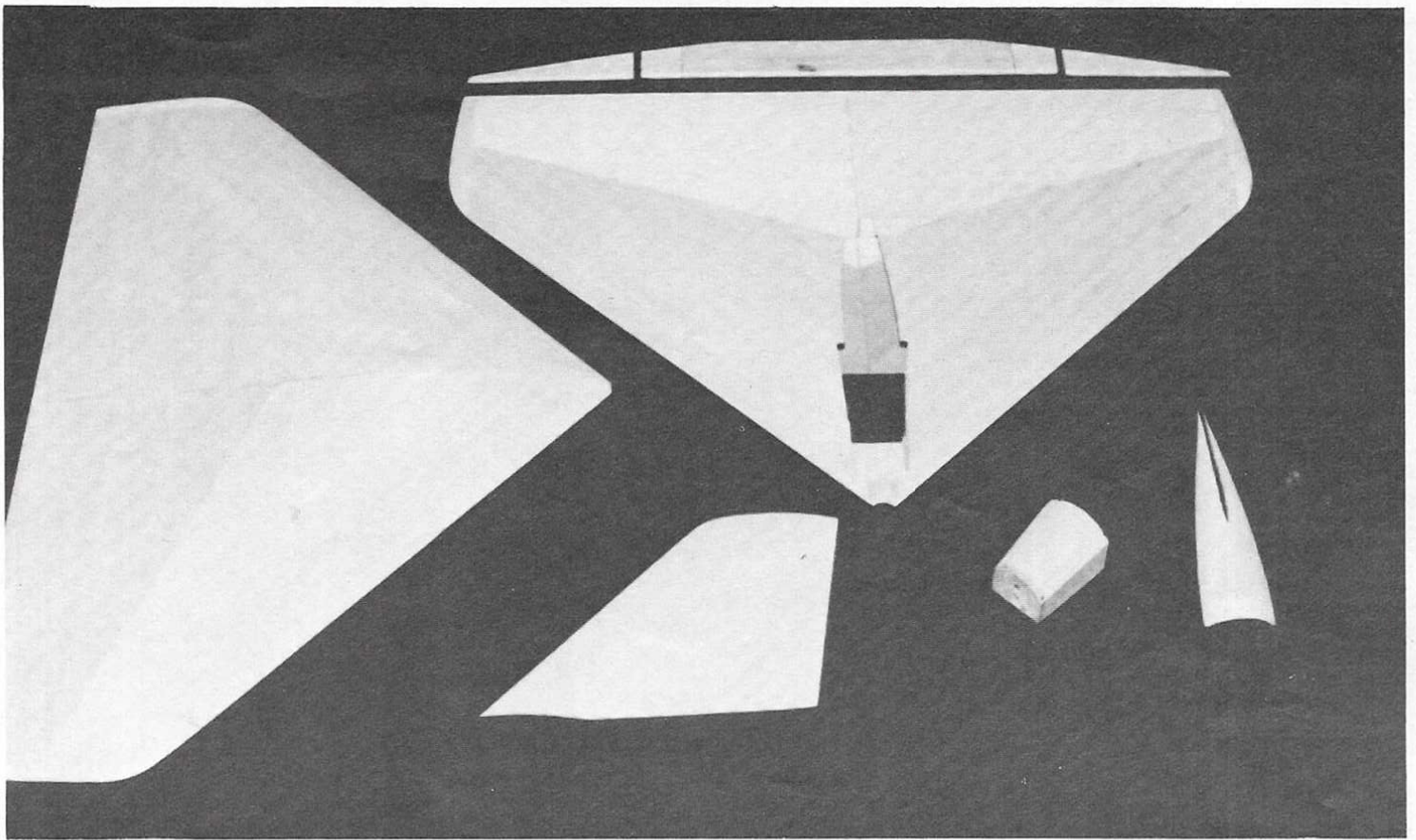
It is strongly recommended that only experienced flyers consider this project. Control response is fast and quick reflexes are necessary, especially for the trim flights. For those wishing to gain some delta wing experience before taking on this project, North American Model Enterprises, Inc. offers a 1/2 A Vulcan Delta. Their ship is about twice the size and weight of the one shown here.

This design will only accept the smallest of the miniature radio systems. The wing thickness, and radio compartment were designed around the Cannon Mini system. The new Kraft KPS-18 servos are smaller still, and fit neatly into the wing.

The most difficult part of the construction sequence is cutting the foam wing cores. I have no desire to make wing cores available. Anyone wishing to make them available has my best wishes.

**CONSTRUCTION:** Formica counter-top material makes the best templates for cutting foam. You should be able to pick up some scraps at any good cabinet shop. Cut out the templates and sand them smooth. They must have no ridges or roughness, especially the tip template. Note on the plans that the templates have a small protrusion at the leading edge. This will support the hot wire as the cutting operation begins. The templates are also a 1/4" longer at the trailing edge to provide the hot wire with support as it exits the foam. The tip template at station 15 should be thicker, about ten-thousandths, than the center template at the same location. This is to compensate for heat radiation from the hot wire, which moves more slowly at the tip.

Since many excellent articles have been written about foam cutting, I won't go into any detail here. The only difficult part about cutting these cores is the



Wing on left sheathed and joined. One on right cut-out for motor mount and top block. Note that the top block is slotted to accept rudder.

rapid taper from the root rib to the tip rib. If at all possible use a shorter cutting bow, 15 to 20 inches long. Always enter the foam at the leading edge. Have your steadiest, non-drinking buddy operate the bow at the tip. Be prepared to cut several cores, as your first attempt may not be usable.

Cut out the radio compartment from the foam cores and save the pieces. Line the vertical sides of the radio compartment with  $\frac{1}{16}$ " balsa. Trim  $\frac{1}{16}$ " from around the scrap foam from the radio compartment. These scrap pieces are put back in the core to provide support while sheeting the wing.

Make up all four wing skins by glue-

ing  $\frac{1}{16}$ " sheeting together. Lay the sheeting on the core and mark the outline of the radio compartment with a pen. This area will not have any glue applied to it.

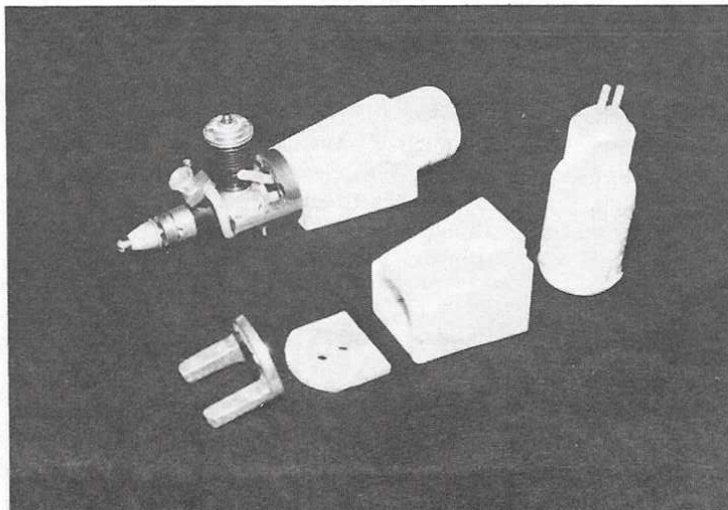
Start with the bottom sheeting. Use a good contact glue such as Sorghum or Blue Goo. Use Tite Bond, or a similar glue, where the vertical sheeting around the radio compartment touches the wing skin. After applying the top sheeting, remove the foam plugs in the radio compartment (before the Tite Bond glue dries).

Join the wing panels together, keeping the trailing edge straight, no dihedral. Prepare the wing for the leading and trailing edges and tips by sanding all

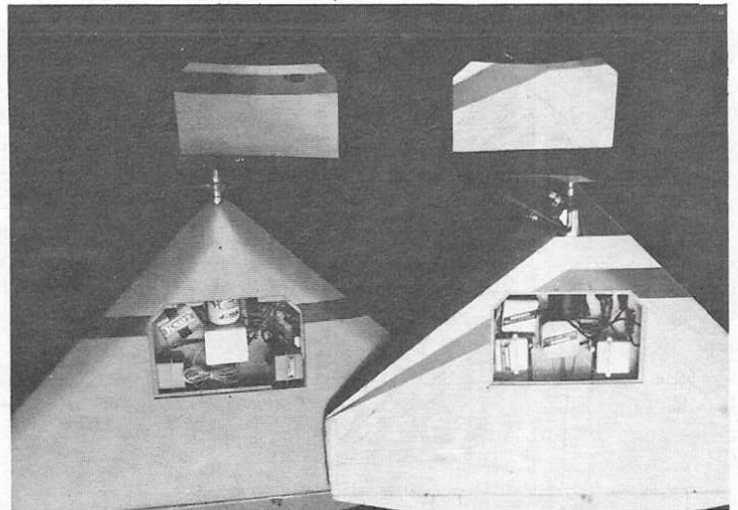
edges on a flat surface. The leading and trailing edges and tips can be glued on with Hot Stuff. Sand the wing down and set it aside.

Make up the "mini" fuselage and engine mount. Triangle stock is used on the inside top corners only, for the top contour. The fuel tank is made from a large Zap or Jet Glue bottle. For more information on the fuel tank, see *M.A.N.* February 1977, CAM Racer.

At this point you must decide whether to mount the engine upright or side mount. Side mount is more difficult but more pleasing. There has been no noticeable difference in performance.



Engine, mini-fuse and fuel tank. Kraft or Tatone mounts are suitable.



Installation on left shows Cannon radio, battery in center and receiver on right. Left shows Kraft battery and servos, Royal receiver.

## 1/2 A DELTA

Screw the motor mount and engine to the firewall. Lay this assembly on the bottom of the wing and mark the area to be cut out. Note that the back side of the prop hub should fall at the point of the intersection of the two leading edges. Cut out the area for the "mini" fuselage and engine. Next cut out the top block and sand it to a rough shape. Hollow out the top block, lay it on the wing, and mark the area of wingskin to be cut away under the block. Mix up a small quantity of polyester resin and paint the bottom sheeting on the inside of the radio compartment. This will help to strengthen the bottom sheeting, which will later be cut out to make the hatch to the radio compartment. Be careful not to get resin on any exposed foam, as it will dissolve it.

Glue in the "mini" fuselage and top block. Glue scraps of 1/16" balsa around the motor mount and engine, covering all exposed foam. Fair in the engine where possible. Sand the "mini" fuselage and top block together.

Cut out, sand to shape, and fit the rudder. For convenience, the rudder will be glued on later.

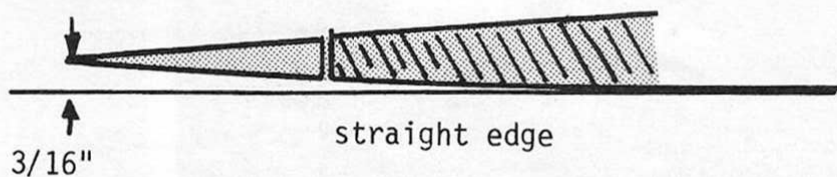
Apply 3/4 oz. glass cloth to the top and bottom of the wing with finishing resin. Cut out the hatch, using a light bulb to see through the wing. The bottom hatch should be cut so as to make it 1/8" smaller on all sides than the radio compartment. This will provide a lip onto which you can glue the 1/16"x1/4" balsa strips. These strips, on the inside of the wing, will provide a ledge for the hatch cover to rest on, thus keeping it from falling in.

Make up a set of aileron torque rods and install them. Locate and cut the push rod holes. Cut out the elevator and ailer-

ons and sand to shape. Check that the fuel tank and all the radio gear will fit. When you are certain that everything is ready to begin the finishing process, glue on the rudder.

Finish as desired. It is my preference to finish with resin and epoxy paint. This seems to add strength, and thoroughly seals the wood against fuel and oil. The first ship was MonoKoted because I was in a hurry to get it flying.

The ailerons are hinged with sheet film "live" hinges, such as the Sullivan hinge. The elevator (because of torque rods) has to be hinged with MonoKote hinges. I used clear MonoKote for my hinges.



TO TRIM FOR FLIGHT: with a straight edge on the flat portion of wing bottom near the trailing edge; the elevator should have approximately 3/16" up elevator.

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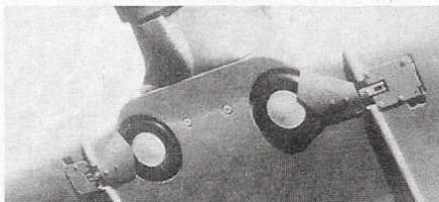
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ABOVE PHOTO IS AN EXAMPLE OF A PERFECT INSTALLATION  
OF GIEZENDANNER ELECTRIC RETRACTS IN A SCALE MODEL

## 1/2 A Delta

Install the engine and all radio gear, and check the balance. The center of gravity should be between 45 and 50 percent of the root wing chord, measured from the intersection of the leading edges, back of the prop. Favor the 45 percent location if at all possible.

As was mentioned earlier, control response is fast. The elevator is sensitive around neutral, but you will need  $\frac{3}{16}$ " to  $\frac{1}{4}$ " of elevator throw in each direction. The ailerons are very sensitive and require only  $\frac{3}{32}$ " to  $\frac{1}{8}$ " of travel in each direction.

The photos show two different radio systems and installations. All radio gear was tape. The Cannon Mini system has the tape. The Cannon Mini system has the smallest receiver and was used in conjunction with their 225 mah battery. The Kraft equipped delta used the 7-M receiver, 225 mah battery, and the new KPS-18 servo. The size and quality of the Kraft KPS-18 servo is difficult to describe. By today's standards it is way ahead of its time. This little jewel must be seen and operated to be appreciated.

The photos show a Royal 2-channel receiver which will be used in the delta with the KPS-18 servos. To date, this receiver has only been test flown in a .60-size Ugly Stick. The Royal receiver is reasonably priced, and available in kit form as a 2-channel unit, with an optional 4-channel modification. Although the receiver has only



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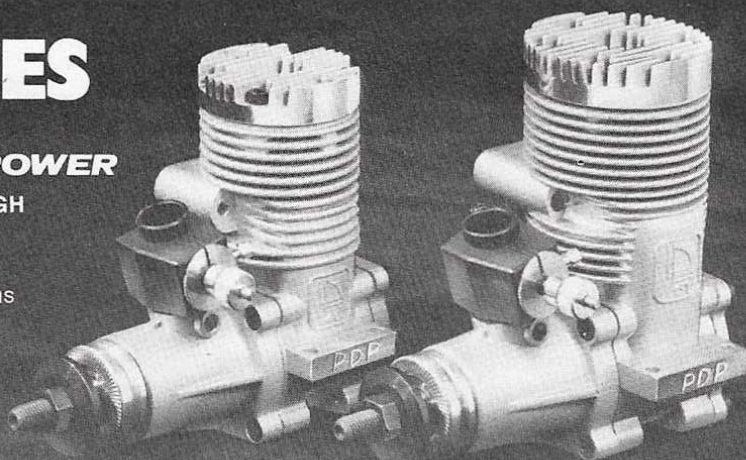
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been test flown once, it seemed to work very well. It was built with the 4-channel modification, and this is strongly recommended for anyone considering building this unit.

The equipment hatch is held on with Scotch brand clear plastic tape, available in most department or drug stores. This is the type of plastic tape which also comes in colors and may be used for repair work. It is a handy addition to most tool boxes, since it can be used to repair or patch minor damage at the flying field.

**TRIM:** With a straight edge or the flat portion of the wing bottom near the trailing edge, the elevator and ailerons should have approximately  $\frac{3}{16}$ " up elevator.

**FLYING:** Test flying this little delta may provide some heart-stopping excitement. If you are among the weak of stomach and know a flier whose reflexes are better than yours, you might consider asking him to test fly your delta.

Hand launch the delta underhand, grasping it by the tips. Take a few running steps and throw it with a slight nose up attitude and the right wing down. This is very important. Two undesirable forces affect the delta drastically at the moment of launch. The first is torque which immediately tries to roll the delta to the left. Engine offset to the right, to counteract torque, is not used on this design because it is not necessary at flying speed. The delta is launched with the right wing low to allow the pilot a little more time to correct the rolling to the left with opposite aileron. Only a slight up angle is used to launch because the delta must be allowed to accelerate as fast as is possible. It cannot do this if it is climbing. After launch maintain the climb at a shallow rate, since large deflections of the elevator at slow speed will cause the delta to roll to

the left. This results from the second undesirable force, called the "P" effect. Briefly the "P" effect is the reaction which an airplane experiences as a result of the spiraling air flow caused by the prop wash. It has been my experience that at slow speed under power, if the delta starts into a left turn, right must be applied to correct the turn. If only elevator is applied, in an effort to gain altitude, the roll rate to the left increases. In fact, full up elevator immediately after launch will cause the delta to roll so rapidly to the left that there is not enough aileron throw available to stop the roll. More aileron throw is not the solution, since the aileron response is already very rapid at flying speed. The solution is to use caution when launching, stay off the elevator if at all possible, and control the tendency to turn left with right aileron.

That about covers it. If you have any questions, write me in care of the magazine.

My thanks to John Gibson for his assistance. The Vulcan Delta may be purchased directly from North American Model Enterprises, Inc., 7639 Grapevine Highway, Fort Worth, Texas 76118. ■

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