DELTA VEE

Some wild flying is in store for those who build this Astro 035-powered electric delta! Full-size airfoil, keel and fin patterns on the following pages.

BY WILLIAM WHITTEN

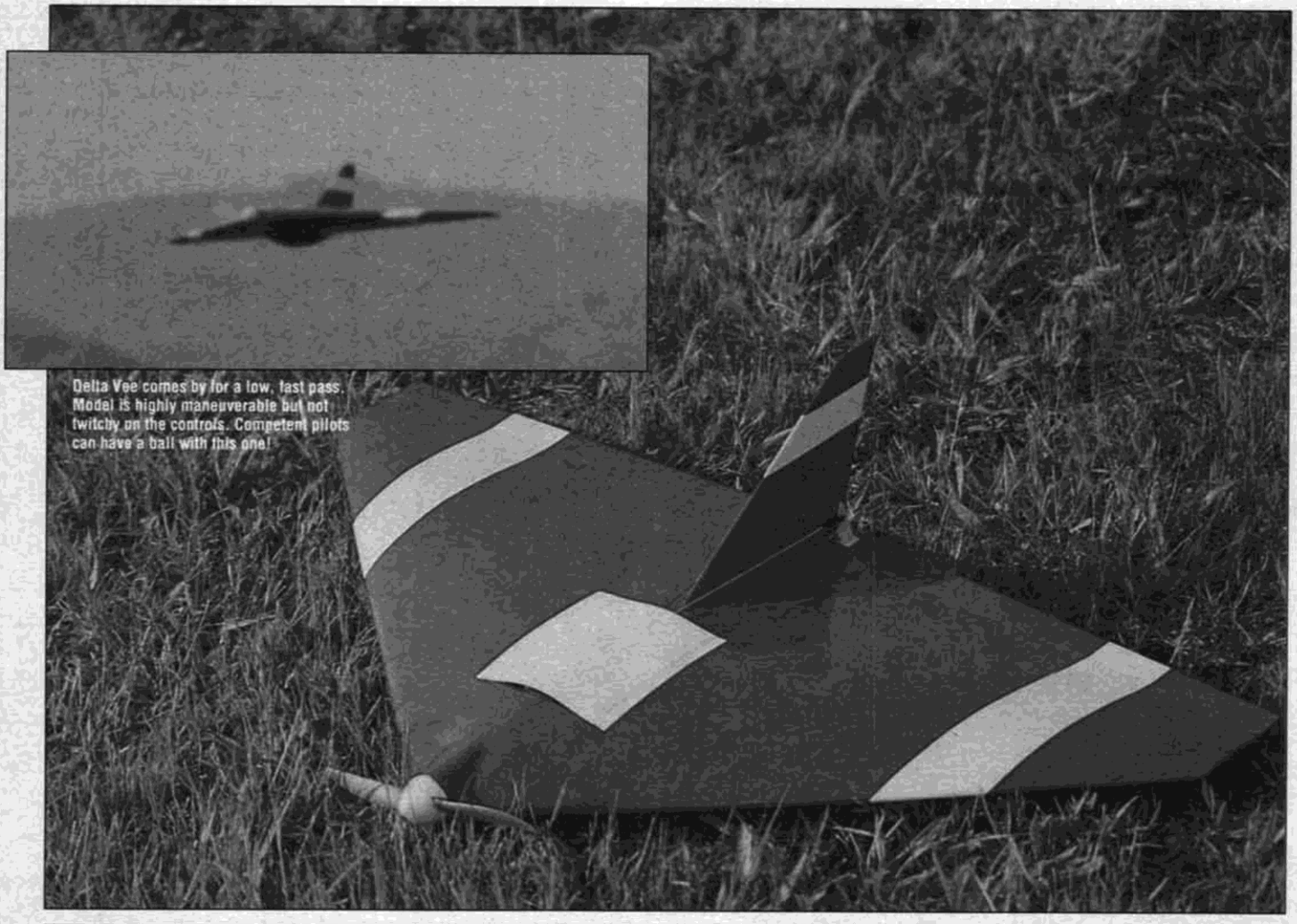
This little electric delta has been more than twenty years in the making. Way back in the Dark Ages (1971), one of the model magazines published a 1/2A delta by Jim Simpson, called the Thunderbird. I wanted to build one, but the CG was left off the plans and I never did track it down, so the project was put on the back burner. Eventually, I quit flying and went on to other interests until just last year, when I found myself hooked on RC planes again.

When one of the local fliers brought out a delta, it reminded me of the one from long ago, so I dug out the old magazine and started figuring how to build an electric version for the '90s. I "lifted" the airfoil and the foam construction and redesigned the rest to suit an Astro Cobalt 035. The wingspan is 30 inches and the all-up weight is 27-28 ounces. Delta Vee is easy to build and flies nicely as an electric. You know you want one, so let's get started!

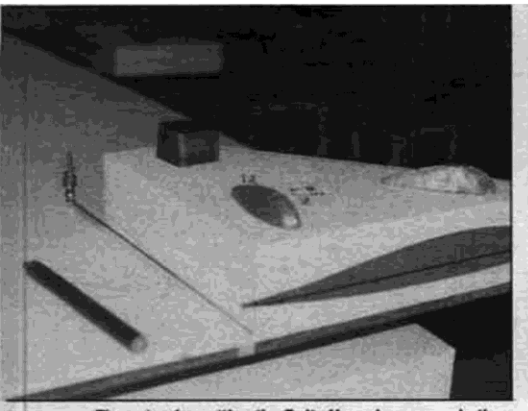
RADIO AND MOTOR

As with most electrics, you should try to keep the weight down as much as possible, so a light radio is a definite plus. I used a micro receiver and a couple of older model mini servos. Delta Vee needs to be landed under power, so an electronic speed control is almost a must. I used an old Jomar SC-5. I don't trust BECs on a plane so I used a 100 mAH receiver battery, which is good for quite a few flights.

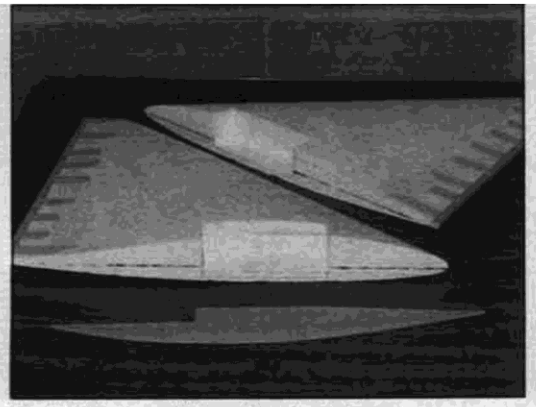
You will also need some sort



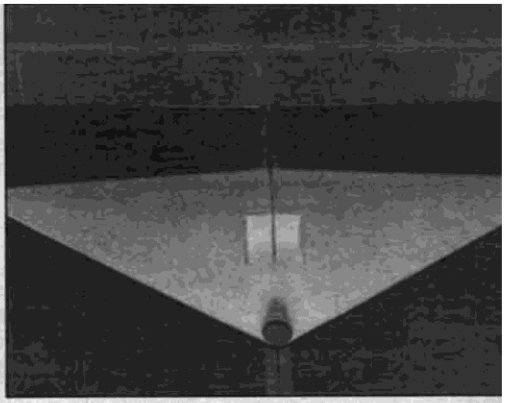
Delta Vee comes by for a low, fast pass. Model is highly maneuverable but not twitchy on the controls. Competent pilots can have a ball with this one!



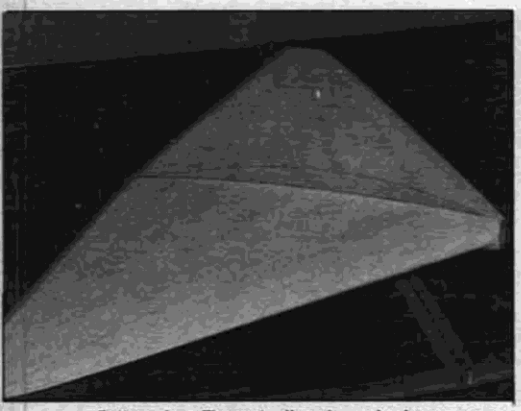
The setup for cutting the Delta Vee wing cores via the "pivot point" method. It's a one-man operation and requires only one airfoil template. This technique was explained in detail in a past "Model Design and Technical Stuff" column by Francis Reynolds—see text for reference.



The finished cores with the equipment cutouts made and the balsa trailing edge strips glued on, ready to be glued to the plywood spine in the foreground.

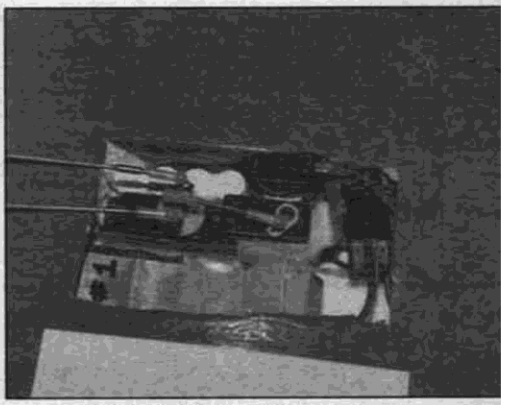


Top front view of the joined wing cores, with the cardboard motor tube installed and faired into the leading edge with vinyl spackle.

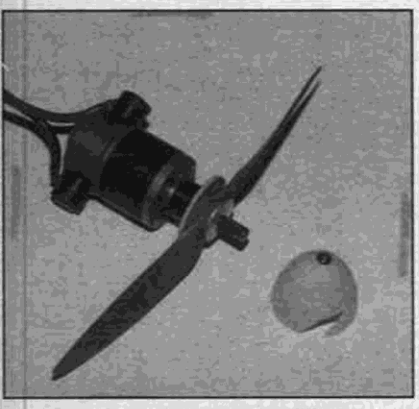


Bottom view. The protruding plywood spine serves as both a skid and launch handle. They don't show up here, but the spine has three narrow slots flush with the bottom of the cores, through which fiberglass strapping tape is passed and stuck to the cores to serve as a wing spar.

Close-up of the equipment area with the spine and motor tube visible.



When it comes to setting up the elevon controls, nothing beats the convenience and versatility of electronic mixing. Lacking that, the next best way to go is with the Du-Bro V-Tail mechanical mixer as seen here.



There are a couple of modifications needed on the Astro 035 to move the prop adapter farther aft and also to make it possible to mount the Ace 1/2A spinner—all detailed in text. (This motor is an 020, but the mods are the same for the 035.)

of mixer for the elevons. A transmitter mixer is best, but a Du-Bro V-Tail Mixer will also do nicely. It takes a bit of grinding and tinkering to get it short enough to fit under the hatch, though.

The only motor I can recommend for this model is the Astro Cobalt 035 with a five-cell 900/1000 mAH SCR battery pack. This gives as much power as most ferrite 05s, but weighs much less and flies the Delta Vee very well if the weight is kept under 28 ounces. You can try a cobalt 05 and seven 1400 mAH cells, but I doubt it will fly much better and the increased weight will make launches and landings more difficult. Stick with the 035 system; if you feel the need for more power, you can always advance the motor timing or go to six cells with the resulting shorter flight times.

CONSTRUCTION

Delta Vee is simple—foam cores covered with plastic film. The only wood is a bit of balsa for the elevons and fin and some plywood for the spine.

Start by making the foam cores. Xerox the airfoil pattern, glue it to a scrap of Formica and cut it out to make the template for cutting the cores. Only the wing root airfoil is shown, as the cores are cut using the "pivot point" method. For those not familiar with this, the usual hot wire bow is not used. One end of the cutter wire is anchored to the workbench and the other is attached to a handle. The wire pivots around the anchor bolt and is stretched tight while cutting. By moving the pivot point, any reasonable tapered core can be cut with just one person and one template. *(Francis Reynolds explained the pivot point method in detail in his "Model Design and Technical Stuff" column in the February '89* Model Builder.*)*

Once you have the cores, sand them smooth and trim the trailing edges so they are a constant 1/4-inch thick. The hot wire will melt the tips some so quite a bit will have to be trimmed. If the final tip dimensions are off a little, it's OK. Glue the 1/4-inch square balsa trailing edges on with white glue or aliphatic resin and sand them flush with the foam.

Spend a little time planning your radio installation and mark the cutout areas on the cores. I cut out most of the foam with a razor knife and hollowed the undercuts for the receiver with a soldering pencil. Rough cut both cores for the cardboard motor tube. Use a section of model rocket body tube or the roller that gift wrap comes on, and remember the cutouts for the motor brushes. A bit of sandpaper around a slightly smaller tube will make it easier to get a good fit in the foam.

Set the cores aside and make the center spine from birch plywood with the grain vertical. The plywood doesn't come wide enough to make the spine in one piece, so laminate two layers of 1/32-inch ply and stagger the joints. (Some 1/8-inch Lite-Ply with the grain going the long way would probably also work.) Note the three horizontal slots just below below the foam line; make these with

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a Dremel tool and a cutoff wheel. Glue the spine to one of the cores with five-minute epoxy. Let it dry, then carefully glue the other core on, making sure it is aligned with the first side. Let it dry thoroughly.

Epoxy the motor tube in place. The front should fit flush with the leading edge of the wing and rest on the cutout in the spine for a small amount of downthrust. Fill in any voids with scrap foam, and fair in the motor tube with vinyl spackle. Epoxy a strip of nylon tape along each side of the hatch opening to add a little strength to the thin foam. If your servos almost poke through the bottom of the foam, it wouldn't hurt to put some there too. Turn the wing upside down and lay three full-length strips of 3/4-inch fiberglass filament packing tape along the bottom. These run through the slots in the spine and function as wing spars. Don't leave 'em off, or your wing might fold up!

If you want to hide the radio antenna inside the wing, bury a section of nylon tubing in the side you plan to put the receiver on. I use the Hayes 18-inch plug-in antennas and find they work just fine.

Cut out the fin from 1/8-inch balsa and the elevons from 1-inch trailing edge stock. Cover the entire plane with one of the low-heat plastic films. Bright colors with contrasting stripes are suggested to help improve flight visibility. Hinge the elevons and glue on the fin. If you have to land on a hard surface, it might be wise to add a small skid under each wingtip to avoid damage. I fly off grass and haven't felt the need.

Smear some five-minute epoxy on the spine where the servos will go, let it dry thoroughly, then attach the servos to the spine with servo tape. The receiver and speed control fit in the hollow area, and the receiver battery snuggles down next to the servos. The motor battery goes on the other side of the spine and is held in place with sticky-back Velcro. Make sure there is enough room for air to circulate to help keep the batteries cool. The switch just hangs loose and is tucked out of the way. The hatch cover is a piece of thin plastic held on with vinyl tape. Leave a little arch in each end to permit some airflow over the batteries.

The motor should fit snugly inside the cardboard tube. A couple wraps of tape around the motor may be needed if the tube is a bit too big. If desired, a thin plywood ring can be glued just inside the front of the tube to limit the motor's forward movement. Wire everything up with good quality silicone wire, keeping the leads as short as possible, and make sure you put a fuse in the line, just in case. The only plug-in connection I use is to the battery pack, and I don't use an arming switch as there isn't a good place to mount it. Just be careful and don't plug in the battery pack until just before you fly.

There are a couple of modifications to be made to the motor. First, the prop adapter should be moved back, as close as possible to the motor casing, to reduce the chance of a bent shaft in a hard landing. You may have to grind a little off the end of the motor shaft and regrind the flat spot. A bent shaft can be straightened, but it's a pain—better to keep it from bending in the first place.

The other mod allows fitting an Ace 1/2A spinner. It is a perfect fit and no one else seems to make one this size. Replace the screw that holds the prop on with one that has the head cut off. Get a hexagonal PC board stand-off from Radio Shack and re-tap it to match the threads on the prop screw. Cut it down and use it as a union nut to hold both the prop and the spinner on. Most of the shank inside the spinner cone will have to be removed to allow room for the union nut. A screw through the front of the spinner holds it on. You'll also need to enlarge the spinner slots to fit the prop blades.

The best prop I've found is the APC 7x4. Other 7x4s will fly the model, but the APC seems to unload better and is noticeably quieter in flight. The APCs do tend to break in a hard landing, so you may want to use one of the flexible nylon ones.

FLYING

Set the CG as shown and line up the elevons to follow the reflex curve of the airfoil. Start with plenty of elevator throw and not too much aileron. (This is where a transmitter mixer makes things easier.) Later on you can try moving the CG back a little to lessen the nose-heavy tendency.

For the first flight, have someone else hand-launch the plane. Later you can hold the bottom skid and launch with one hand while holding the transmitter with the other. Delta Vee doesn't need a real "spearchucker" launch—just a good straight and level toss into the wind. (This is where we "lefties" have it easy if we fly Mode 2. "Normal" people have to launch with the wrong hand or make a quick grab for the stick!) Let it build up some speed and climb out for some altitude, then trim for straight and level flight. Delta Vee flies much like any other aerobatic electric model—fairly fast and it goes where you point it. It will slow down quite well, but it takes awhile to bleed off speed. Loops and rolls are easy, but it won't spin and inverted flight is poor due to the reflexed airfoil. Landing should be done under power, so save a little battery for the end of the flight. Bring it in nose-high and cut power as you grease it in. The prop may touch but doesn't seem to break too often.

That about covers it. In case you're wondering, the "Vee" doesn't refer to anything in particular—I just like the name. (Hey, you try to think up one that hasn't been used!) My Delta Vee has taken a long time to get here, but it's been a lot of fun. Good luck with yours. ***MB***