

### Nearly a Success Story!

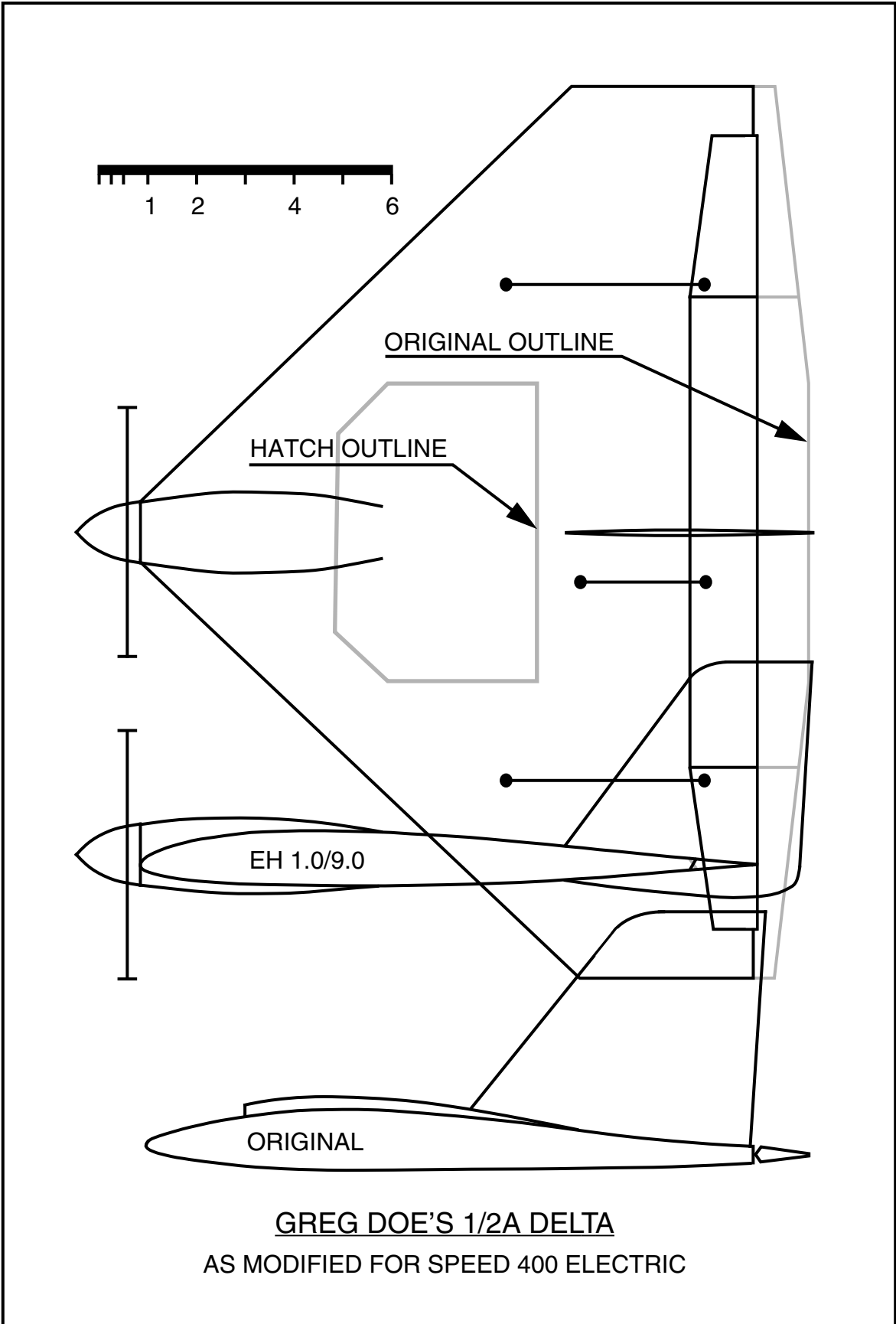
Dennis Weatherly's JackWabbit (*RCSD* July 1997) was all the impetus we needed to get seriously involved in electric power. Without having a firm design in mind, we purchased a "Rocket" Speed 400 motor, Graupner 5x5 CAM prop and SoftStart speed control, and two seven cell battery packs.

Equipment in hand, we set about designing the "killer" e-machine. Several days at the drafting board yielded a beautiful swept wing mounted on the beginnings of a fuselage. That basic layout languished on the drawing board until November, the month we travelled to Portland Maine for the New England RC Soaring Convention sponsored by the DownEast Soaring Club. There we met Rick Hallet who, knowing our love of tailless aircraft, presented us with a large box filled with 'wing plans. We couldn't wait to dig through the pile and see what treasures might be buried. We didn't have far to go. One of the smaller plans was of Greg Doe's 1/2A Delta, originally published in the November 1978 issue of *Model Airplane News*.

Back home, we went through all of the plans again, this time with the idea of perhaps finding something more suitable for the Rocket motor, but we kept coming back to the delta. It looked like it would build easily, be large and robust enough to carry the equipment we had already purchased, and offer the performance we sought. This was not to be a thermal soaring machine — no, it was to be a real speed demon!

Looking over the details of the design, we found five areas which we felt needed modification:

- In 1978, airfoil design was not what it is today. Greg's delta used an airfoil with a thin trailing edge and a large amount of reflex. Our experience has been that such sections are not efficient. We exchanged the original airfoil for the EH 1.0/9.0 section. We've included the original airfoil within the planform drawing so readers can get an idea of how the sections differ. The two airfoils have nearly identical thickness in this application.
- The entire trailing edge, consisting of a central elevator and two ailerons, was constructed of trailing edge stock. We would cut the control surfaces directly from the wing.
- The fin seemed large and too far forward, and there was no ventral fin. We decided to make the fin a bit smaller, move it rearward, and ensure about 3/4 inch protruded below the wing so that during landing the wing would be driven to a negative angle.





- The carved balsa cowl would be replaced with a lighter foam and fiberglass structure.

- The two ailerons were shown linked to a single servo. Our concern was that the micro servo we would be using (18 in. oz. torque) could be overloaded at high speed if forced to drive both surfaces.

Our first task was to cut the foam cores for the wings. We have a large plywood sheet set up as a single pivot jig. A 4-40 machine screw is screwed into a blind mounting nut in one corner, and the template is held to the end of the blue foam with large T pins. The 1/2A Delta wing cores can be cut fairly rapidly, due to their small size.

Per the original, the foam core was sheeted with 1/16th inch balsa. After the control surfaces were cut free and faced with 1/16th inch sheet balsa, the two elevator halves were connected using a small piece of 1/16th sheet spruce. This modification reduced the projected wing area from 170 to about 160 square inches.

Using the face of the motor as a guide, we made a 1/8th inch plywood motor mount. This piece was then glued to the front of a motor tube made from 1/16th inch balsa. The nearly completed wing was blocked on the building table so that the airfoil data line was parallel to the surface and at an appropriate height. Being careful not to get CA on the exposed foam, we then used micro-balloons and CA to mount the motor tube in a cut out at the leading edge of the wing.

We made the fin smaller and moved it rearward, as planned. Since the control surfaces are now a part of the wing instead of "add-ons," the trailing edge of the fin wound up well behind the trailing edge of the elevator. Installation of the fin entailed deflecting the elevator 90 degrees upward so the elevator connector would slide through a thin slot cut in the fin. It is free to rotate in an arced cutout. Once in place, the fin was firmly mounted using CA.

The entire airframe was then covered with MonoKote, as using 0.75 ounce fiberglass cloth would have meant painting and then determining a suitable hinging material.

The foam cowl was created from segments of the foam wing beds. This made matching the surface of the cowl and the surface of the wing relatively easy. Sanded down to an aerodynamic shape, the cowl was covered with three ounce fiberglass cloth.

Three servo wells took just a few minutes with a Dremel MotoTool router, and brass tubing quickly cut out the short tunnels needed to carry the wiring. Direct linkage from servo to control surface was easy.

Final assembly was fairly simple. The motor slid into the motor tube and was mounted to the plywood bulkhead by means of two machine screws. The plan was that the motor could be slid out of the tube through the main compartment and out the large access hatch if it ever needed to be replaced. The servos were lightly glued in place using a drop of Shoe Goo. The two battery packs each got a strip of Velcro on one side, and the matching Velcro strip was glued to the inside of the upper wing skin.



We programmed our JR PCM 10 to use four channels: throttle, aileron, rudder slaved to aileron, and elevator. The transmitter was also set up such that three rates are available for both aileron and elevator function, each from a single switch. The 1/2A Delta construction article provided control surface throws, and the middle rates are set for these maximum deflections. The other two switch positions give slightly more and slightly less throw.

Greg's plans show the original weighing 12 ounces (approximately 10 ounces/ft<sup>2</sup>), less fuel. Ours comes in at just under 16 ounces (under 14.5 ounces/ft<sup>2</sup>), ready to fly. The seven cell 600 mah battery pack and third servo make up the difference.



Granddaughter Alyssa holds the completed 1/2A Delta

Our first attempts at flying this little beast came during the Puget Sound Silent Flyers Fun Fly in Lacey Washington in May, one year after the appearance of Dennis' JackWabbit at the same event. From the outset, things did not go well. Hand launching is nearly impossible because there is nothing to grip below the wing. Grabbing the ventral portion of the fin is scary because it's well behind the CG and somewhat flexible. Still, Bill managed some good tosses in high grass to check the CG location. The CG was right on for a flat glide, but despite the tall grass the CAM prop broke on the first landing.

Several more attempts were made at hand launching with the motor turning a 6x3 folding prop donated to our project by Dieter Mahlein. As is usually the case with deltas and high torque motor-prop setups, the airplane rolled spectacularly into the ground on each attempt. The *MAN* construction article, sent to us by Mark Nankivil, recommends an underhand tilted launch, but prefaces that by saying, "this little delta may provide some heart-stopping excitement." After several tries, we were still rolling into the ground and not finding it very exciting.

Dieter, who was flying an extremely fast all moulded P-51 using a zip start for launch, suggested we install a tow hook well forward of the CG and use his zip start to get our delta up to flying speed. A piece of 1/8th plywood was quickly epoxied to the inside of the bottom wing in front of the hatch area. This eliminated the possibility of removing the motor through the aft end of the motor tube, but there were really no other options.

We were making pretty good progress at launching from the zip start when the elevator trim somehow got messed up and the delta went nose first into the

ground right in front of the bungee stake. The sudden stop forced all of the internal components out the top of the wing. What a mess! And Dieter's folding propeller was broken, too. This marked the end of flying attempts for the day.

Everything is now fixed, but, as the title of this column suggests, we haven't yet achieved the success which we know is within reach. We'll keep *RCSD* readers informed of our progress on the road to success.