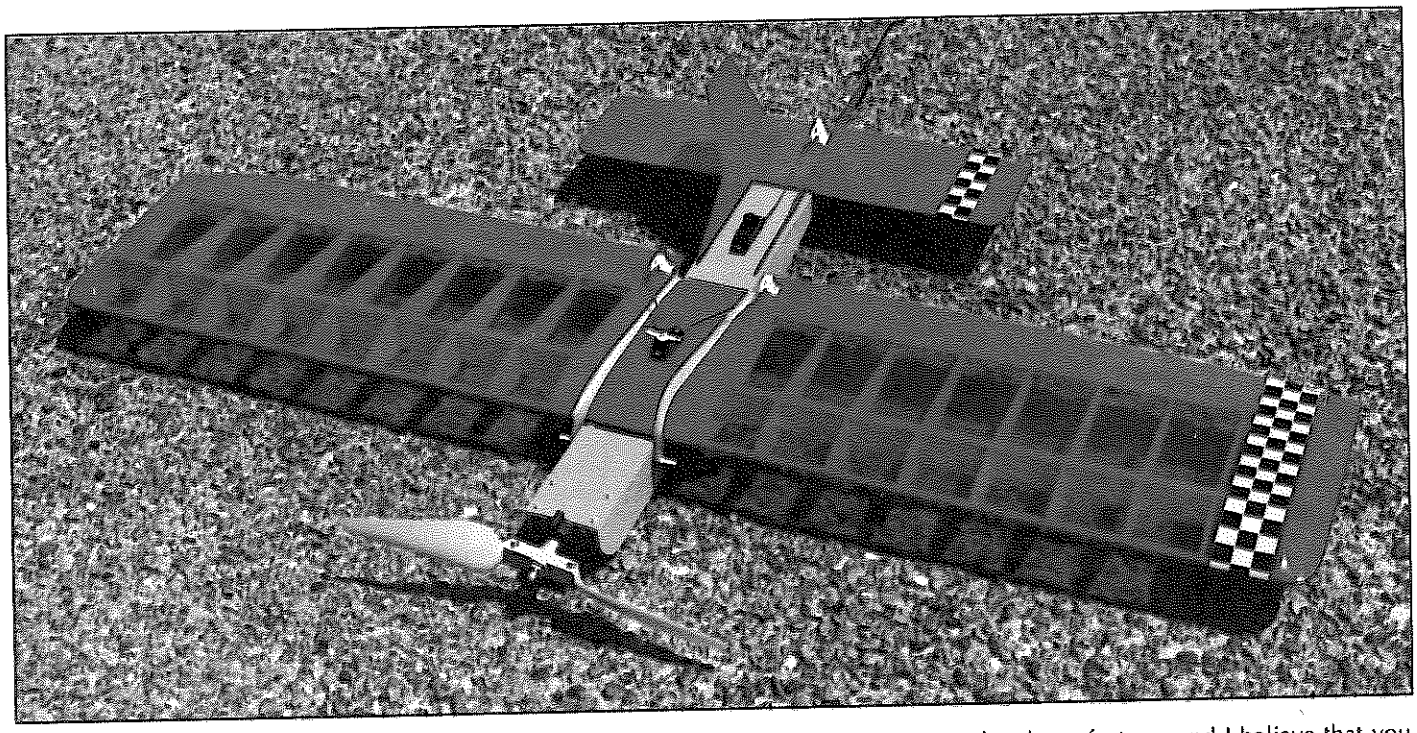
BY SCOTT HARTMAN

THE TERMI



Would you be interested in an electric design that climbs almost straight up, does about 1-1/2 rolls per second, allows quick battery changes, and easily fits in the smallest car? The Terminator will do just that. Its construction steps outside traditional design limits and it flies like no traditional electric model. Its fuselage is small but roomy enough to easily enclose the receiver, speed control and motor/gearbox. The motor battery is attached to the belly of the fuselage with Velcro for fast battery changes for more after-work flying time. The servos and pushrods are externally mounted for ease of installation.

The Terminator combines the performance of today's fun-fly type aircraft with an electric model's convenience and lack of noise. It will climb at better than a 70 degree angle and is capable of all of the looping and rolling maneuvers—I particularly enjoy doing consecutive loops with half rolls at the top. Outside loops are just as easy since the airfoil is fully symmetrical. The roll rate can be set as fast as you like. One thing I noticed right away about this model is that all the controls are tight—the short pushrods and lack of slop make the controls instantaneous.

I wish I could say the first Terminators flew right just off the board, but in truth, several prototypes had to be built before the right combination of size and power system was found. The final version has about 7 percent more wing area than the original for increased lift and easier launching.

One early prototype experienced high-speed aileron flutter; the problem was corrected by trimming the aileron tips to the design shown on the plans. All of my prototypes also use MonoKote ironed across the hinge line to help reduce the likelihood of flutter and for positive control response. The nose was lengthened to allow use of 11-inch folding propellers, and the tail was extended to reduce elevator sensitivity. The final plans show the best of the above features and I believe that you will find that the final Terminator is one fine flying machine.

The prototypes have been powered with a variety of seven-cell systems, both direct drive and geared. My personal preference is the geared setup, which provides a faster climb at a slightly slower flying speed than a direct drive system. I've had good luck using a double-wind car motor and a Leisure Electronics short gearbox, however any strong seven-cell system should work fine.

CONSTRUCTION

Fuselage and Tail

Glue the plywood doublers and 3/32 balsa wing saddle doublers to the fuselage sides to make a right and left hand side. Drill the four holes for the 2-56 screws in F1 and install the two pieces of balsa triangle stock that support the motor.

Pin the horizontal tail and F1 to the plans. Glue on the fuselage sides and formers F2 and F3. Install the 1/8 square sticks at the junction of the tail and the

No, it doesn't look like a "real" airplane, but so what? This bare-minimum electric is designed to *perform*, not look pretty!

NATOR

fuselage sides. Sheet the bottom of the fuselage with hard balsa. Install the 1/8 square balsa sticks at F1 to reinforce the glue joint.

Take the whole assembly off the board and sheet the fuselage top using medium balsa. Rough sand the edges flush. Cut a notch for the battery wire and drill the hole for the arming switch. Cut the opening for the elevator servo and install the servo rails. Make up the vertical tails and glue them in place; be sure they angle outwards as shown on the plan. Sand the tail surfaces to fit and attach the elevator using short pieces of iron-on hinge material.

Wing

Like the fuselage, the wing is built upside-down over the plans. Pin the spar and 3/32 hard balsa trailing edge to the plans using a couple of ribs to align the spar. Glue the outer ribs to the spar and trailing edge. Glue on the four middle ribs using scrap 1/16 balsa as a spacer to allow for the sheeting. Glue on the top spar and 1/4 square leading edge.

Cut out and glue 1/16 balsa vertical-grain shear webs to fit tightly between the top and bottom ribs. Glue on the 1/16 center sheeting. Cut an opening for the aileron servo and install the servo rails. Glue on the wingtips and reinforce the joint with 1/2-inch triangle stock as shown. Sand the ailerons to fit and attach them to the wing using short pieces of iron-on hinge material.

COVERING

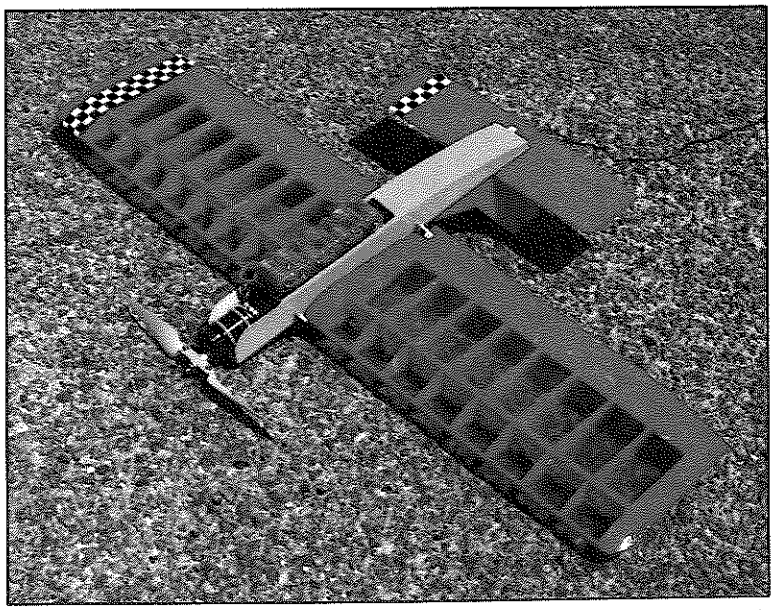
Finish-sand all parts using a sanding block and sandpaper. Dust off all parts using a tack rag and/or a vacuum cleaner.

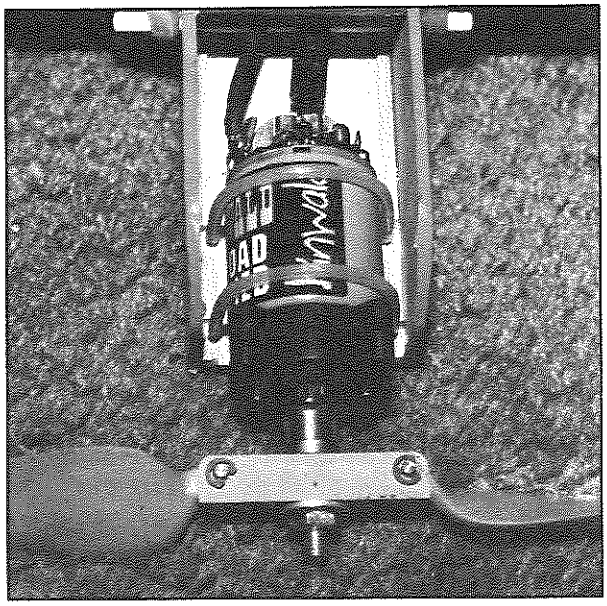
The Terminator relies on the covering for torsional stiffness,

THE TERMINATOR

Designed by Scott Hartman

WINGSPAN	38 in.
WING AREA	288 sq. in.
FLYING WEIGHT	34 oz.
WING LOADING	17 oz./sq. ft.
OVERALL LENGTH	22 in.
AIRFOIL	15 percent symmetrical.
POWER	Any seven-cell electric system.
RADIO	Three channels required (ailerons, elevator, throttle).
CONSTRUCTION	Balsa, spruce, plywood.





LEFT: The Terminator has the best possible access to the motor batteries—they're simply Velcroed to the bottom of the fuselage! We voiced our concerns to Scott about the possibility of damage to the batteries when landing on anything but soft grass, but he's been flying his models from unimproved fields for some time and says he has yet to hurt a battery. We'd be tempted to use a double layer of shrink wrap on the battery, just to be sure. RIGHT: Close-up of the motor installation in the latest version of the Terminator. One of Scott's favorite combinations is a 13-turn Trinity "Buggywald" car motor with a Leisure Electronics #6005B 3.8:1 short gearbox and an 11x7 Sonic-Tronics prop. Scott also favors the strap-type motor retaining method using lengths of inner Nyrod pulled tight with 2-56 screws from the top of the fuselage.

so you should use one of the stronger high-temperature iron-on covering materials. My prototypes were covered with transparent red MonoKote on the wing and light blue MonoKote on the fuselage.

POWER SYSTEM

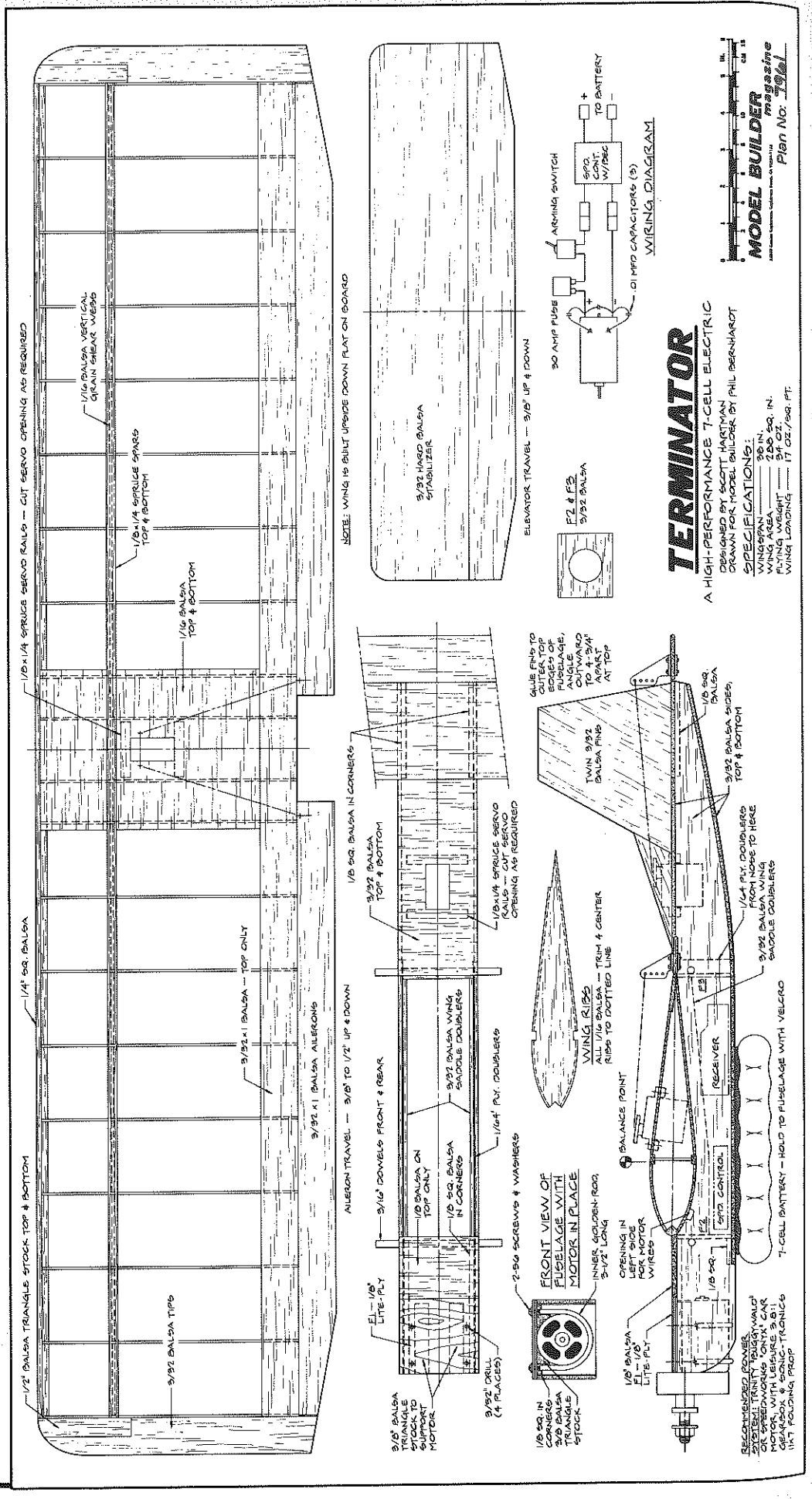
My prototypes were powered with double-wind car motors using 3.8:1 Leisure Electronics gearboxes. The specific motors I used are the 13-turn Buggywald motor from Trinity and the 14-turn Onyx motor from Speedworks. Both provide sparkling full-throttle performance and near-vertical climbs. The Buggywald motor runs about 3 minutes at full throttle, the Onyx motor about 3-1/2 minutes. The Onyx is a good match for normal altitude flying fields. The Buggywald motor likes to unload more than the Onyx and seems to work better at higher altitudes.

I used an 11x7 Sonic-Tronics folding propeller on my prototypes; it works very well at 3,600 feet of altitude. You might try a 10x6 Sonic-Tronics if you fly closer to sea level.

Installation of a gear drive on a car motor is easy. Install the pinion and capacitors on the motor and adjust the motor's timing about 1/8 to 1/4-inch clockwise as viewed from the rear of the motor. Break-in the motor as per the manufacturer's recommendations, noting the proper motor rotation. Now install the gear drive on the motor, paying particular attention to the gear mesh. The mounting screws, prop adapter set screw and pinion must be secured using Lock-Tite to prevent slippage.

Wire up the motor using the fuse, arming switch and Sermos connectors per the diagram on the plans. The fuse and switch are located between the speed control and the motor; this maintains power to the radio even if the fuse blows or if the arming switch is accidentally turned off during launch.

The commutator on the car motor requires periodic cleaning to insure top performance. I use a commutator cleaning stick after the first couple of motor break-in flights and about every 10 flights afterward. A commutator cleaning stick looks like a thin piece of eraser; you can find them in the RC car section at your local hobby shop. The cleaning takes only takes a few seconds and is done with the motor still in the airplane. Remove one of the motor springs and its brush, push the cleaning stick into the brush holder, apply a small amount of pressure on the cleaning stick to contact the commutator and turn the propeller a few turns. Reinstall the brush and motor spring. This is the only mainte-

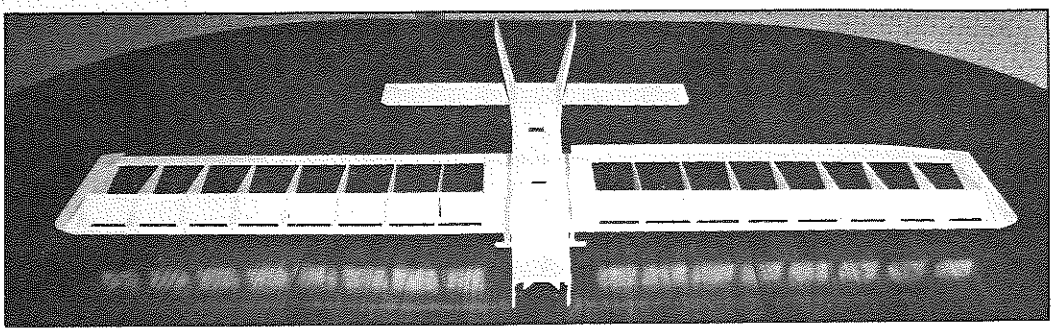


nance that's normally required to keep the motor running its best.

RADIO INSTALLATION

Attach the receiver and speed control with Velcro and mount the servos using screws and washers. The prototypes used pushrods made from short pieces of threaded rods and nylon hardware. My models use Flightec SEC-SP speed controllers, which have a battery eliminator circuit (BEC), so a receiver battery is not required.

Two widths of Velcro should also be used to attach the batteries to the bottom of the fuselage; one width does not provide sufficient strength to hold a battery pack in place during flight. I've found that the adhesive on some brands doesn't hold up to heat, so I normally attach the Velcro to the battery with silicone glue.



All framed up and ready to cover—total airframe weight is about 5.5 ounces at this point. Note how the two fins angle outward at the top.

Designer Scott Hartman strikes a launch pose for photographer Don Rice. Scott recommends a fairly steep nose-up angle for launch, as the model will tend to settle until it picks up enough speed to get "on step."

FLYING

The Terminator has lots of power and a very fast roll rate; it's best to have an experienced flier make the first flights if you haven't flown a model of this type before. Have a friend launch the model for you until you're used to the way it handles. The model settles a few feet when the it's first launched, so to compensate we normally launch it upward at anywhere from 20 to 45 degrees. Apply up elevator as required until the model is up to speed.

I normally climb to altitude and then proceed to do aerobatics. The Terminator does both inside and outside loops easily. It also has a very fast, although controllable, roll rate. Although there's no rudder, I've found that the model does very crisp four-point rolls and stops rolling immediately when the aileron stick is released.

I normally set the elevator rate so that when full up is applied, the model loops quickly without snapping. If your Terminator does a torque roll when full elevator is applied, it either has too much throw or is tail heavy. My models are set up closer to a pattern type airplane than a combat airplane.

The motor duration depends directly upon the throttle setting you choose. I've found that I fly the model at nearly full throttle most of the time and get about 3 to 3-1/2 minutes of invigorating performance. If you back off on the throttle the flight times can easily be extended to 5 or more minutes.

Be the first at your field to have a Terminator. It's really a fun design that will put some excitement back in flying. The large, slow-turning propeller is barely audible in flight, and therefore the model can be flown in many schoolyards and other areas where you couldn't fly gas models due to noise restrictions. Build it light and fly electric! *MB*