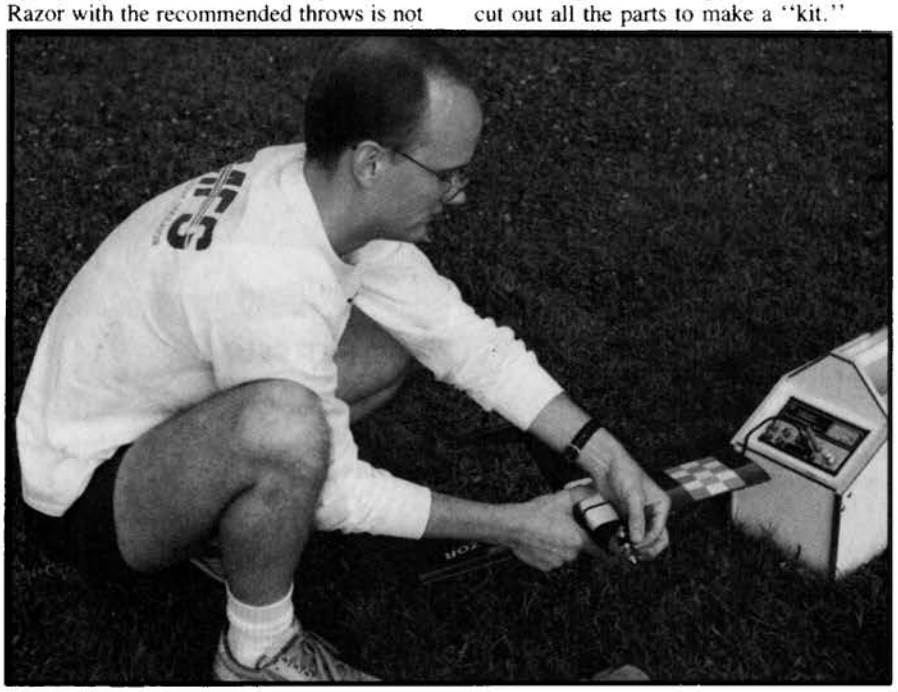
Razor

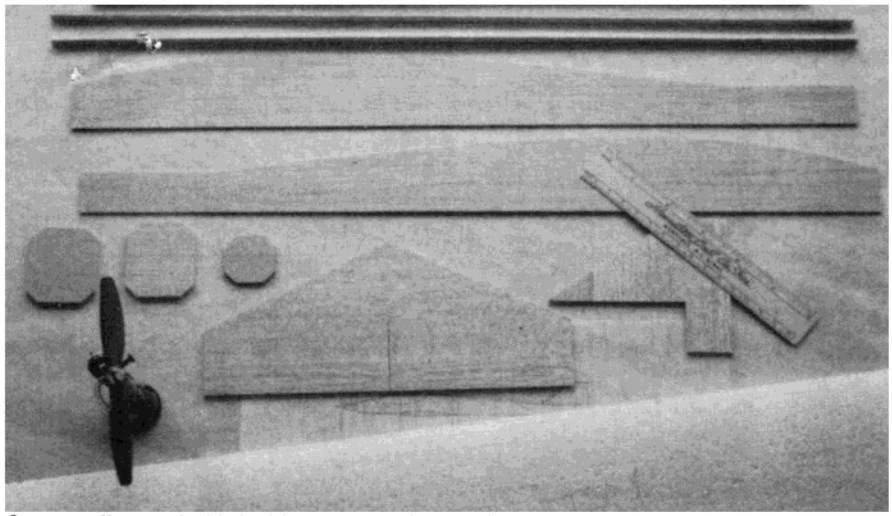
Got a limited budget, but want to put some real excitement back into your flying? This may be your answer!

By Carl Dowdy

I dare you. Very simply I dare you! Build a Razor and you will be pleasantly surprised at the speed and agility a plane of this size can possess. A Razor with the recommended throws is not "twitchy" like alot of small airplanes; however, it can and will be a handful with increased throws! If the truth be known, the first flight of the Razor nearly gave me heart failure. Its flight speed for such a small model is incredible. The Razor can be used as a schoolyard flier, sport mini-aerobatics plane, or as a Quickie 100 racer. However, I do **not** recommend flying it indoors. As you might imagine, it hauls "groceries!" All that is needed is a radio with micro servos, about $20.00, and a few evenings of spare time. You will probably need to purchase a smaller battery pack; one in the 75 to 100 mAh range should work nicely. SR Batteries carries excellent packs with more juice for the size than just about anyone.

On to the building of this beast! Since the Razor is not for beginners, I'll keep the construction article to a world record minimum. Let me say before you begin, that it really does save a great deal of time to cut out all the parts to make a "kit."





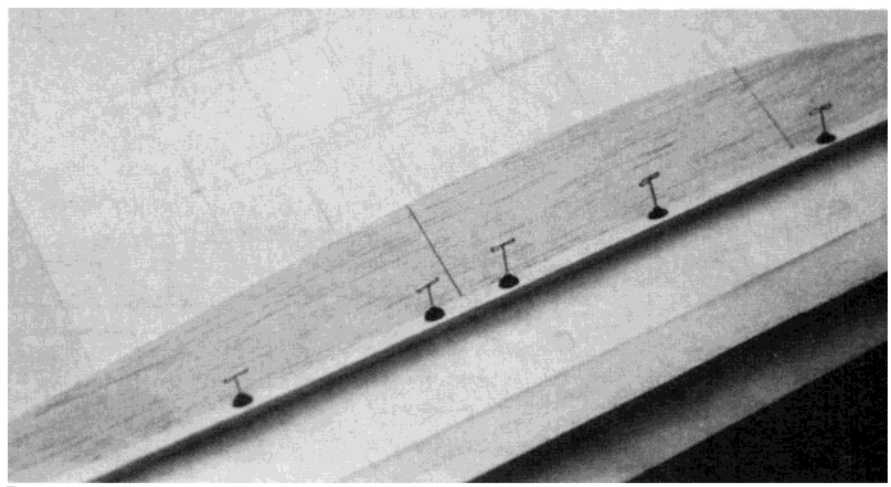
Cut out all parts in kit-fashion to save time during construction.

RAZOR
Designed By:
Carl Dowdy
TYPE AIRCRAFT
Quickie 100 .020 powered
WINGSPAN
20 Inches
WING CHORD
5 Inches
TOTAL WING AREA
100 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
NACA 0010 (Symmetrical)
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
None
OVERALL FUSELAGE LENGTH
18 Inches
RADIO COMPARTMENT SIZE
(L) 7¾" x (W) 1½" x (H) 1¾"
STABILIZER SPAN
8 Inches
STABILIZER CHORD (incl. elev.)
2½ Inches (Avg.)
STABILIZER AREA
20 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
2 Inches
VERTICAL FIN WIDTH (incl. rud.)
2½ Inches (Avg.)
ENGINE SIZE
Cox Tee Dee .020
FUEL TANK SIZE
Standard Tank Mount
LANDING GEAR
None
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Ailerons and Elevator
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Foam
Empennage	Balsa
Wt. Ready To Fly	7.5 Ozs.
Wing Loading	10.8 Oz./Sq. Ft.

Therefore, as long as the control power of one aileron is sufficient to generate the desired roll rate, you really do not need the other. The use of one aileron is asymmetric, however. It probably would not be a wise choice for a pattern plane, but, for pylon racing it does have merit. If you are always turning left, one aileron on the right wing (in theory) will help hold the nose up through the turn. A downward deflected aileron creates more lift, but also more induced drag due to the lift, thus yawing the aircraft opposite to the direction of bank (i.e., adverse yaw). For the Razor, this means when turning left, the single aileron should cause a right, or nose-skyward yaw. Besides, it just simplifies construction!

The wing is made up of a very small foam core using a NACA 0010 airfoil. I am sure that a similar built-up wing woud work just as well, but **make it strong and light.** I just get a kick out of making foam cores! First, using the templates, cut the core and sand the leading and trailing edges of the core to shape. Next, glue the 1/32" sheeting in place using the foam saddles as forms until the glue has cured. Finish by gluing the 1/4" x 3/8" leading edge and 1/32"

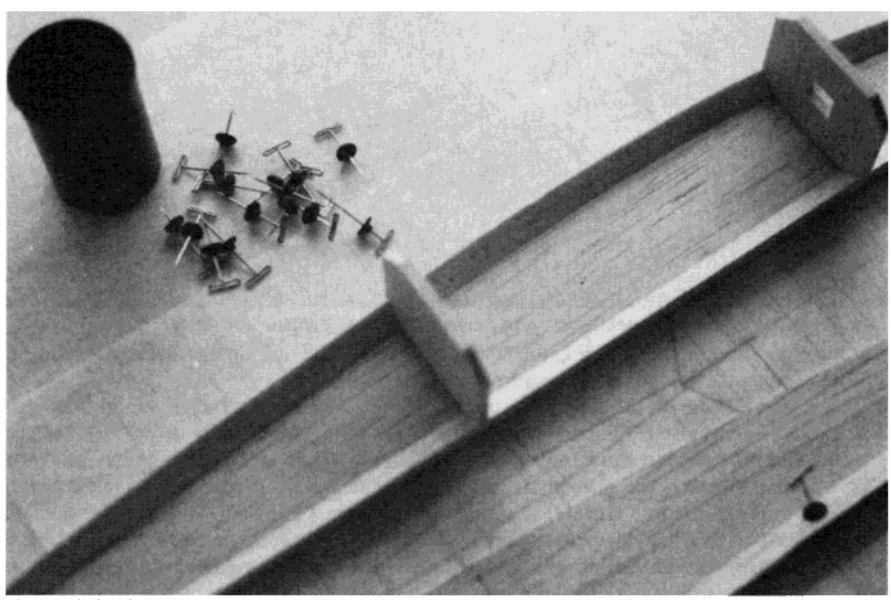


Prepare each fuselage side by gluing the 1/4" triangle stock in place.

CONSTRUCTION

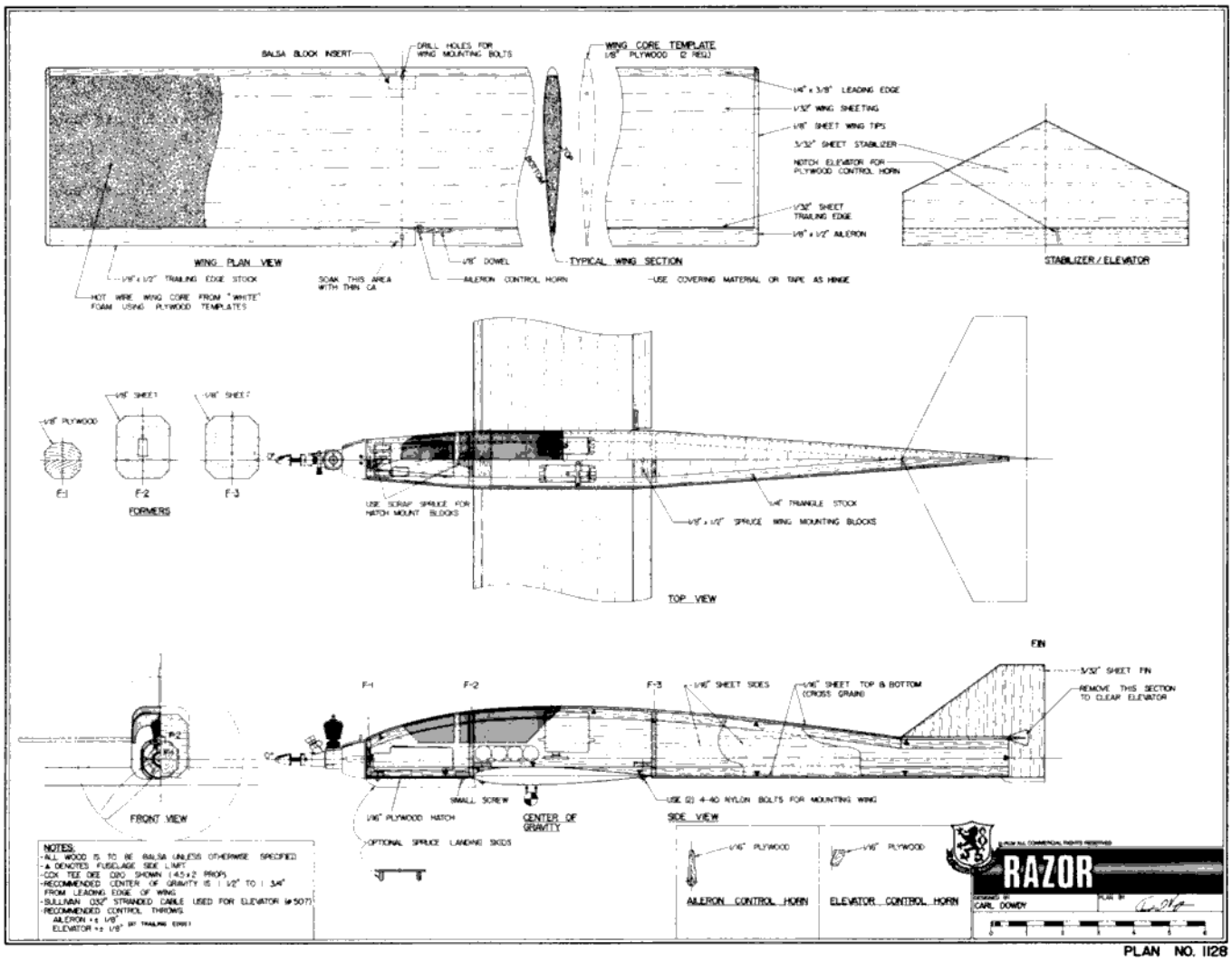
Wing

Before you begin construction of the wing, I probably should explain the use of one aileron. As it turns out, an aircraft's roll rate is primarily determined by the roll rate generated from the wing's control surface(s) and the roll damping of the wing.



View of the left fuselage side shows triangle stock and Formers 2 and 3.

FULL SIZE PLANS AVAILABLE SEE PAGE 219



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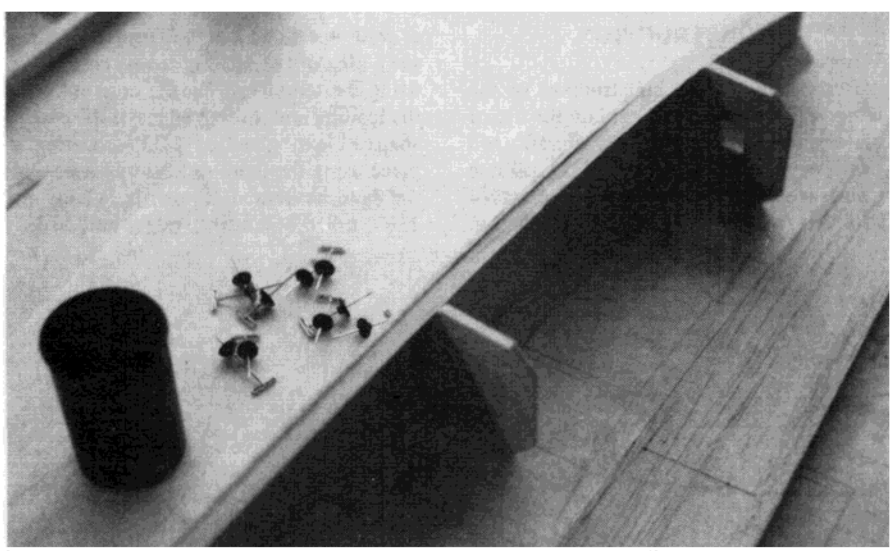


Lay the flat bottomed fuselage on the board to insure proper alignment.

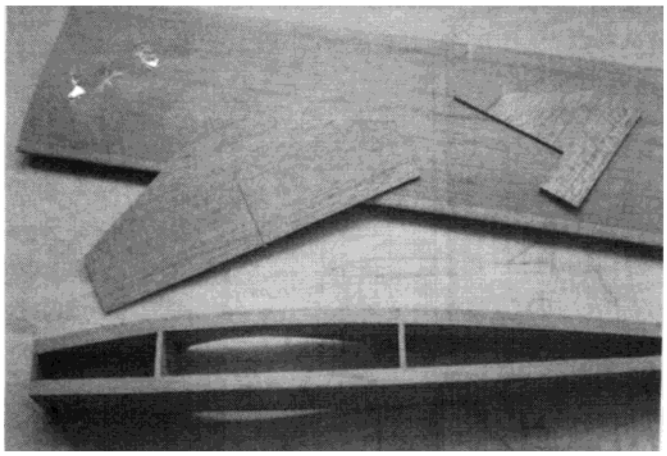
trailing edge sheet in place, adding the 1/8'' tip ribs, gluing the 1/2'' trailing edge stock in place, and tacking on the single aileron. The aileron is cut loose from the wing after sanding and is beveled to allow movement. Don't forget to notch the aileron for the 1/8'' dowel extension. The 1/16'' ply control horn is then added to the aileron extension. Be sure the aileron control horn/dowel joint is strong. The holes for the nylon wing mounting bolts will be drilled after completion of the fuselage.

Fuselage

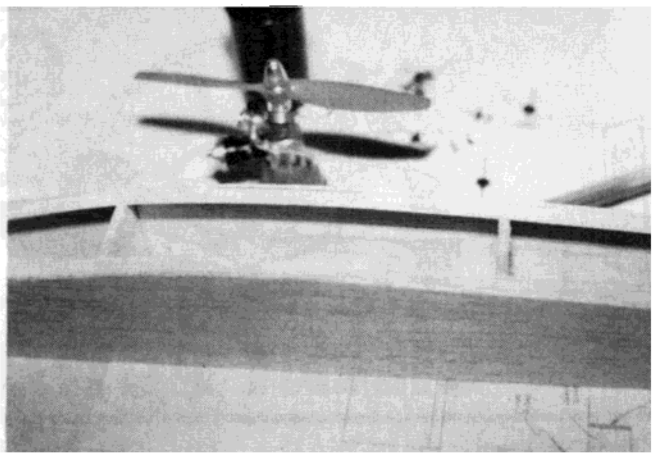
The fuselage is rather straightforward. Assuming you already have the fuselage sides in your ''kit,'' follow by trimming the sides to make wing saddles using the airfoil templates. Glue the 1/4'' triangular stock to the 1/16'' sheet fuselage sides by first wetting the triangular stock to allow it to bend easily. At this point, you may want to go ahead and glue the small cable housing to the left fuselage side. Note that it crosses through the right fuselage side near the elevator to exit to the control horn. Now glue the 1/8'' sheet formers in place, perpendicular to one side. Lay the fuselage bottom flat on the building board and glue the opposite fuselage side in place. The fuselage sides must then be wetted to allow them to bend to meet the 1/8'' ply firewall and to meet at the tail. Keep working at it, they will meet! Now add the 1/16'' cross grain sheeting on top and bottom. The hatch for battery (or receiver) placement is made of 1/16'' ply, and bolted into place using small wood screws and scrap pieces of spruce to receive the screws. The wing hold-downs are 1/8'' x 1/2'' spruce and are glued to the formers above the triangular stock. After completion of the wing and fuselage, drill and tap the holes for the nylon 4-40 hold-down bolts. Finish the fuselage by drilling the engine mounting holes (use small wood screws for mounting), coating the fire wall with epoxy, and cutting a slot for the radio switch.

Tail Surfaces

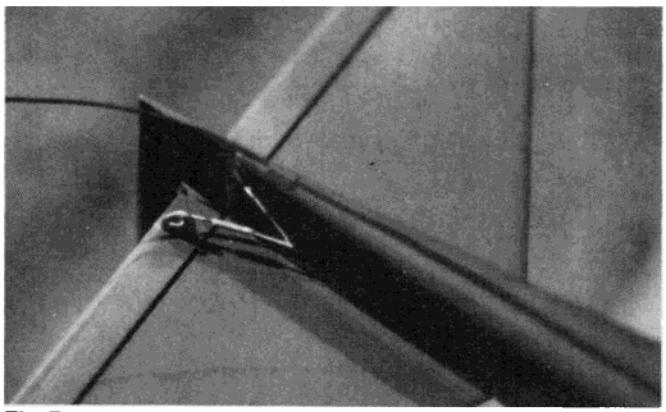
Cut the tail surfaces from 3/32'' sheet balsa. Sand both surfaces to airfoil cross-section and follow by cutting the 1/2'' wide elevator loose. Bevel the elevator for movement. Note that the entire elevator can move within the area removed from the fin.



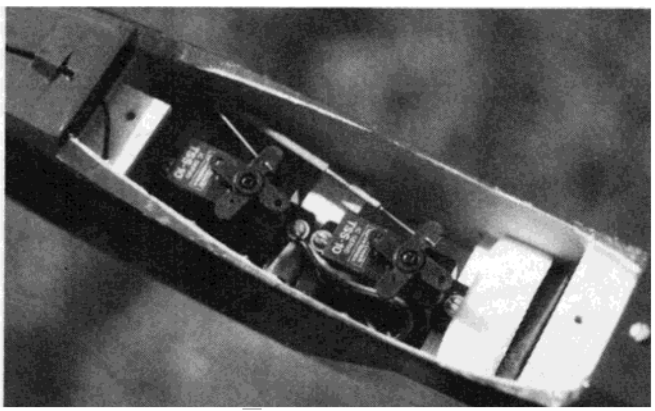
Sheeted foam wing and tail surfaces are ready for rough sanding.



Fuselage ready for top and bottom cross-grain sheeting.



The Razor uses small stranded cable for elevator pushrod. Note entire elevator passes through vertical stabilizer.



Radio compartment is small, but adequate. Single aileron pushrod is made from music wire using two Z-bends.

The elevator control horn is made from 1/16" ply. A groove must be cut into the elevator to accept the horn and ensure a firm joint. The hole for the pushrod wire can be made with a straight pin and should be soaked with glue to ensure a hard bearing surface. After completing the tail surfaces, set them aside for mating to the fuselage.

Final Assembly

Be sure to give the entire model a good final sanding prior to covering. And, unless you love to poke billions of holes in your covering, be sure to remove all balsa dust before starting to cover your Razor. I suggest that you use one of the many "plastic" covering materials because of their abrasion resistance. Since the Razor has no gear, it must flop in the grass on landing. This can be rather tough on a covering! I also suggest that you make the aileron and elevator hinges from matching MonoKote Trim Sheet or Scotch Tape. This not only seals the surfaces for maximum effectiveness, but is simple and plenty strong enough for this size model. Be sure to take great care in gluing the tail surfaces in place. Remove any unnecessary covering from the surfaces/fuselage to allow a solid glue joint. Ensure that the surfaces are exactly in-line or perpendicular, as required. Now that your Razor is pretty well completed, all that is left is the radio installation. Note that you may have to switch the battery/receiver location in order to get your Razor to balance properly. The servo rails can be made from scrap balsa or spruce and the servos mounted to them with small wood screws. The elevator pushrod should be made from the smallest Sullivan stranded cable (.032"). Rather than use the large clevises, I chose to use a small portion of the brass joining tube to mate the stranded cable with small music wire. The music wire at each end of the pushrod was Z-bent to connect with the control horn/servo arm. As a final note, I seem to never get a perfect fit between wing saddle and wing. With a model the size of the Razor, it is important to get a snug fit. A simple solution is to place Saran Wrap over the wing (for protection), run a bead of silicone along the wing saddle, bolt the wing on, and overnight you will have a perfect match. Trim the excess silicone away with a sharp knife and you are finished.

Flying

First of all, check to see that you have the right control throws and that the Center of Gravity is in the correct location. Believe me, they can have a significant effect on a model of this size and speed. If your transmitter has dual rates, use the **low** setting for the recommended throws and use the **high** setting for increased elevator and aileron throws during landings.

The first flight of the Razor was not uneventful. I must admit to having hoped in the beginning of the design process that the Razor would be fast and exciting. Had I known! After a somewhat slow launch, the engine torque generated a left bank until the speed picked up. The next feeling I remember was that I had somehow grasped a force greater than myself. The Razor began to climb at about 30° above the horizon until I retrimmed it for level flight. The rest of the flight was spent holding on for dear life. The sound of a Tee Dee .020 turning nearly 20,000 rpms is bad enough. To have the Razor screaming at blood-curdling speed, up and down the field, was more than I could stand. After the engine exhausted its fuel (thank heavens), I found that the glide was acceptably flat, but fast. Landing the Razor might require the most practice. The speed must be kept reasonably high during the glide. As the Razor gets within a few feet of the ground, add up-elevator until it can no longer hold itself up and it will flop onto the grass. Don't let it get slow very high off the ground unless you like planting props for harvest. The best place to land your Razor is probably in that tall grass located just a short distance from the runway. You know, the stuff you invariably hit with your bigger models **anyway!**

I wish you much success with your Razor. Get your flying pals to build one and you can race around the goalposts at the local high school football field. Keep the rules simple. Use a stock Tee Dee .020 and propeller, hand launch, and make about four or five laps. Hey, this could turn into a half-time event. We could get announcers. Yes sir, and cheerleaders. We could have national coverage. Just think of the possibilities . . . □