#541

Pronto Biplane

There's a great love of model biplanes, but too few are built because of rigging difficulties, etc. This model for a three-channel radio and plain-bearing-type .25 engine avoids these problems and has great aerobatic abilities.

Dave Robelen

KNOWN FOR its simple construction, great three-channel performance, and sporty, realistic appearance, my popular sport-flying Pronto captures the very essence of fun. The design has long been a favorite of mine, so when fellow modeler Chuck Cusick challenged me to convert it into a biplane, I couldn't resist.

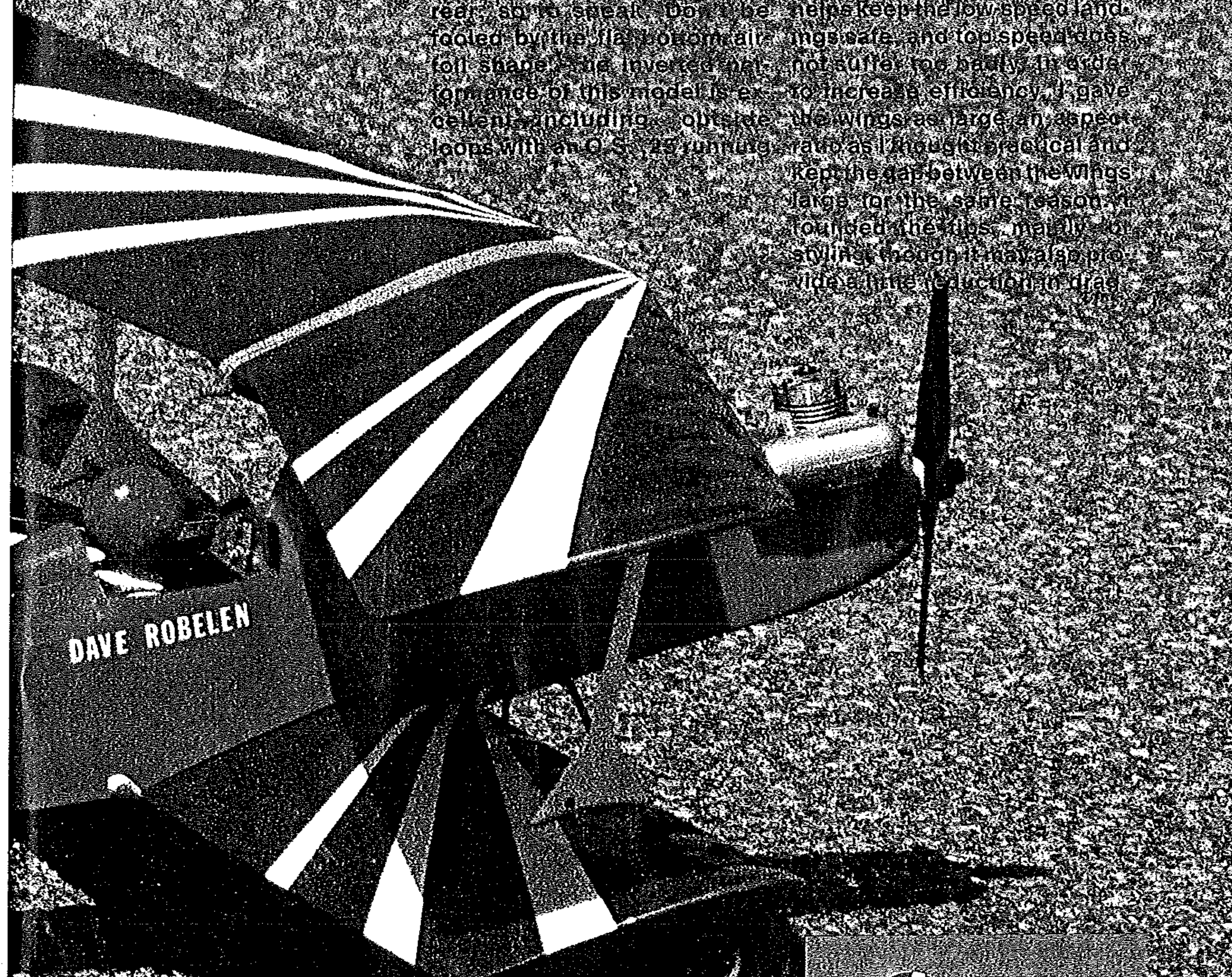
I didn't want to lose the fun in the midst of the modifications, so cost and simplicity became important considerations. I've used stock sizes of balsa (3 in. wide x 36 in. long), and all of the major parts can be laid out and cut from these or similar stock material sizes. Three-channel control is totally adequate, even for lively aerobatics, and it greatly simplifies overall construction, saves weight, and, in most cases, even assures a spare servo. Of course the parts count should be kept to a minimum for easy building.

Some modelers have created a "Pronto Biplane" by simply adding another wing on top of some struts clamped onto the fuselage sides. My own approach was to use the same concepts that the successful Pronto employs but to start from scratch with a biplane lay-

out. My choice of model size was strongly influenced by the available engines. Experience has shown that those in the .15 to .25 group run extremely well and give a satisfactory flight time on only four ounces of fuel. This range of engines gives me excellent results with a model weight from 2½ to 3 lbs., fueled and ready for flight.

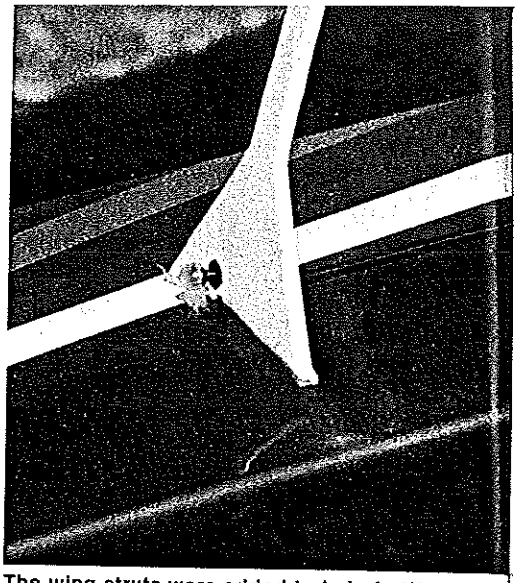
The Parakeet airfoil is taken directly from the earlier Pronto design in which a good speed range and excellent stall behavior were the main considerations. Again, stock sizes were the rule, and an ... dowel provided a perfect leading edge. Sig trailing edge material helped to bring up the rear, so to speak. Don't be fooled by the flat-bottom airfoil shape. The inverted performance of this model is excellent, including ... outside loops with an O.S. .25 running on ... with 10% nitro.

The Pronto monoplane has just the right amount of wing area. An equivalent biplane has twice as many wing tips, for losses as well as some interference losses between the wings. To compensate, I enlarged the wing area by 20%. It helps keep the low speed landings safe, and top speed does not suffer too badly. In order to increase efficiency, I gave the wings as large an aspect ratio as I thought practical and kept the gap between the wings large for the same reason. I rounded the tips, mainly for styling, though it may also provide a little reduction in drag.



Big Picture: Look, Ma, no ailerons! Although simple to build and set up, this little bipe offers realistic appearance and top-notch performance. Right: Our author's son, Daniel, gives us a better look at the colorful paint scheme. Note the generous tail area and long moment arm that are so necessary for good biplane stability.

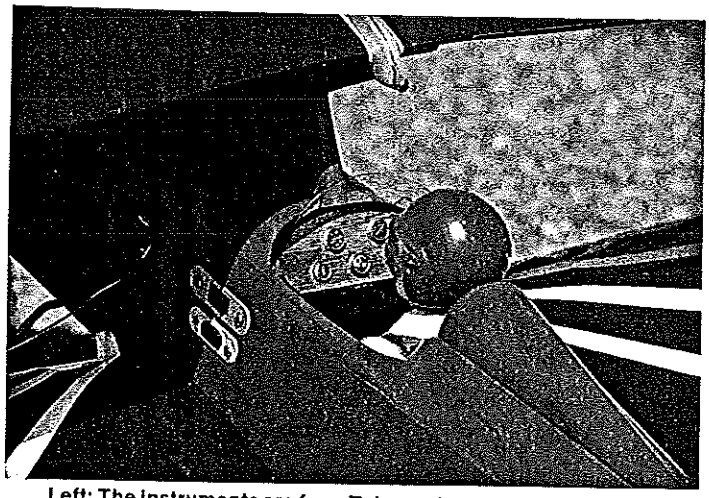
Our author checks the Parakeet over carefully before another action-packed flight. Always be watchful (with any model) for wing warps or changes to control reactions from inputs.

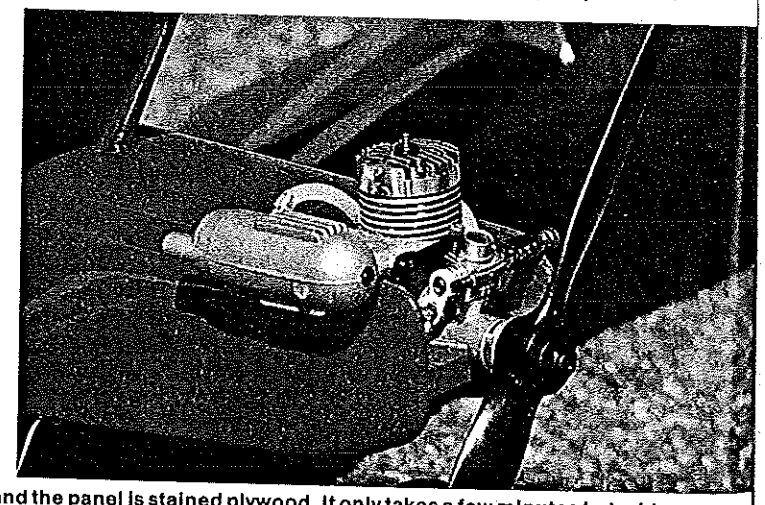


The wing struts were added to help fortify the wing against occasional nose-overs. Ball-and-socket joints allow excellent knock-apart protection in a really rough landing.

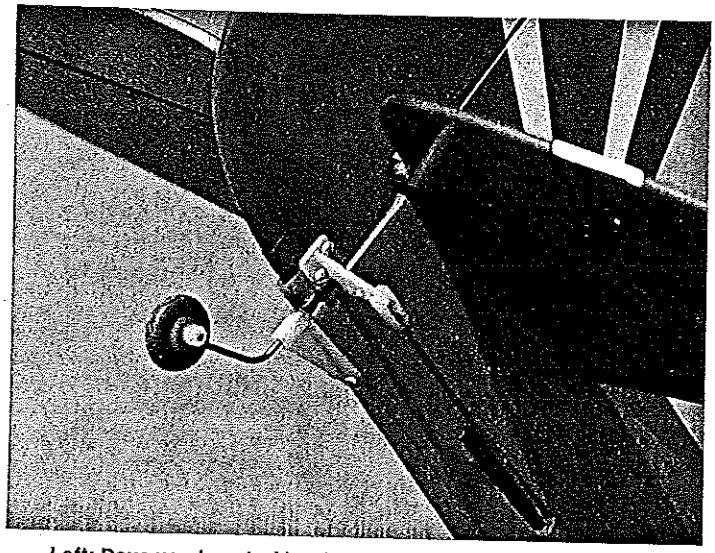
Wing setup. To perform smooth axial rolling maneuvers with rudder input (yaw) requires strong yaw-roll coupling (YRC), and this is directly influenced by the amount of effective dihedral that is present. Of course you could obtain sufficient YRC with straight wings and generous dihedral angle, but there are other possibilities. For example, sweeping a wing back will produce the effect of dihedral and increase the YRC value for any given dihedral angle.

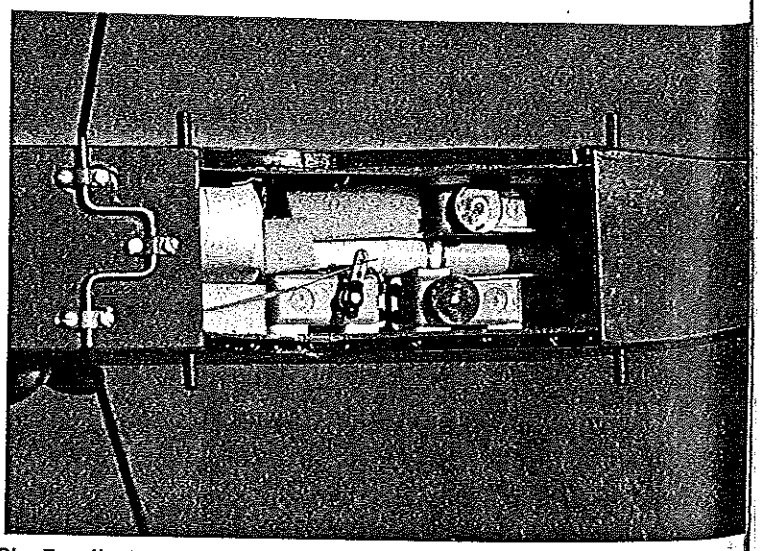
Since many full-scale biplanes use some sweep in the upper wing, I chose to sweep the Parakeet's top wing a moderate amount, enhancing the YRC without exaggerating dihedral. For years, Free Flight modelers have, on occasion and with good results, used a top-mounted forward fin (or pylon) to enhance the YRC of various models. This pylon-type mount for the top wing seemed to be a natural choice for the Parakeet since it is rugged, simple, and adds to the YRC value. As a result of all this, the actual dihedral angle of the Parakeet's wings is rather modest; still, this little





Left: The instruments are from Tatone, the pilot from Williams Bros., and the panel is stained plywood. It only takes a few minutes but adds much realism. Right: The O.S. Max .25 engine is the perfect mate for this model. Use wooden engine mounts to dampen the vibration.

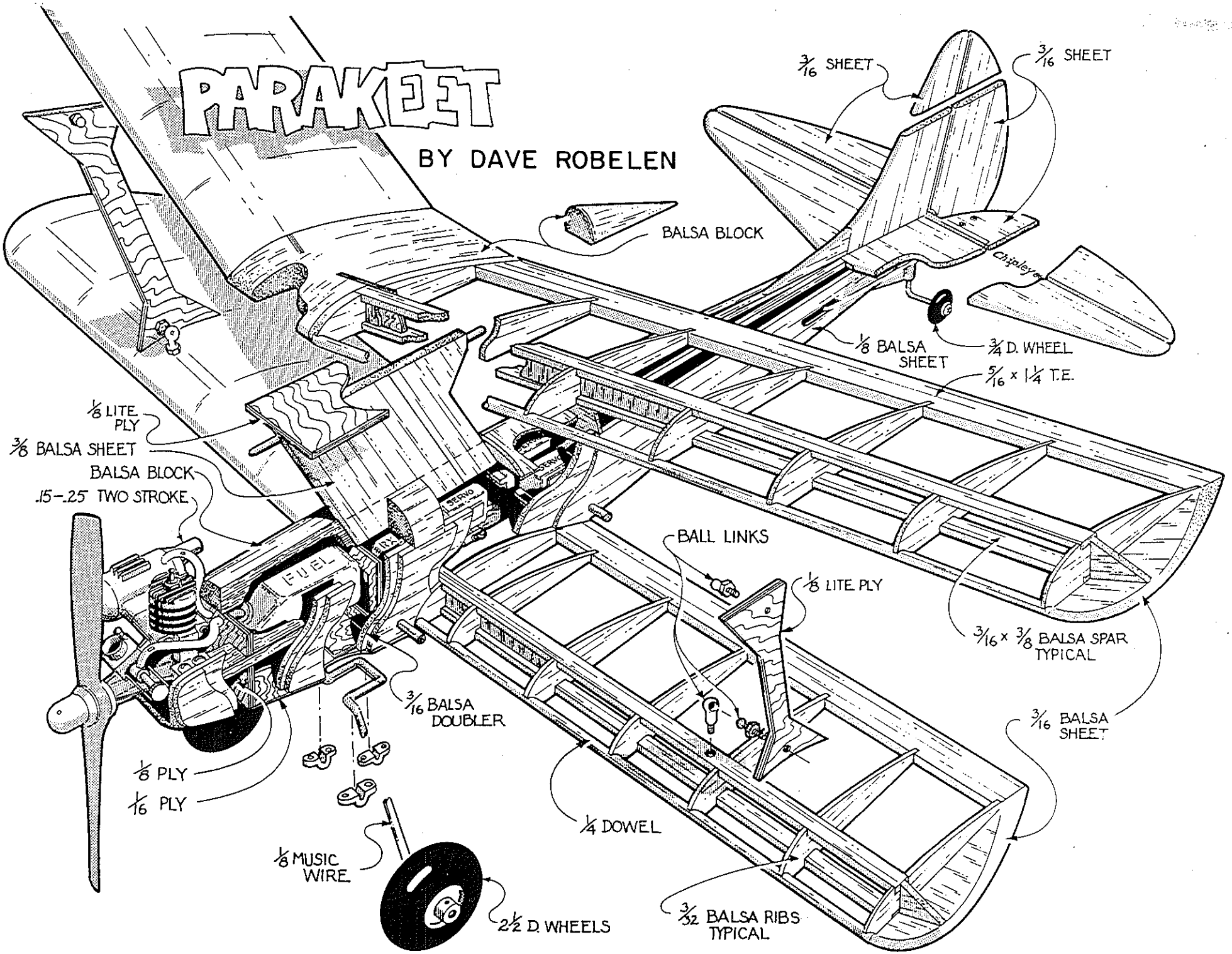




Left: Dave used control hardware from Goldberg and a tail wheel from Sig. Excellent accessories abound; check with your local dealer to find what suits you best. Right: Plenty of room for the servos. Simple and rugged wire landing gear provides plenty of shock absorption.

PARAKEET

BY DAVE ROBELEN



bird has tremendous roll response with just rudder control.

There were no interplane struts on the early models, but after a season's flying, I began to notice some chronic problems. The biggest nuisance was keeping the top wing tightly clamped in place during roll maneuvers; it wanted to tilt into the roll. Then, too, an occasional top wing spar would crack in a violent nose-over on landing. It was in order to minimize drag that I hadn't used the struts in the first place, but the drag penalty turned out to be small, comparatively, so I added the struts Refer to the plan for a novel, hassle-free method of mounting them.

Having settled on a wing system, I decided to use a fuselage and tail design patterned generally after the home-built single-seat EAA-type biplanes. In addition, I followed the design concept of the earlier Pronto model whenever suitable and stuck to the stock 3-in.-wide wood—less expensive and more readily available.

I selected a tail-dragger landing gear setup since a nose wheel on this biplane would look just plain ridiculous. Equally important, the tail-dragger model can operate out of many small, bumpy fields without problems, while a nose wheel drags in the grass, gets knocked out of alignment, and adds needless weight. (That's right; I'm prejudiced!) At any rate, the ⅛-in. wire landing gear has proven to have excellent tracking on takeoff (no ground loops), reasonably low weight, and superior resistance to damage. The wheel position shown on the plans is a good average for both smooth grass and paved runways. If you fly off really bumpy strips or thick grass, just bend the wheels forward about one inch.

To get the most from the Parakeet, you need to consider your own flying preferences before choosing an engine. For example, a strong .15 (Enya .15 IV) is completely adequate for normal flying and moderate maneuvering. For the pilot who wants really strong aerobatics capability, the .25-size engine is a good choice. (I do not recommend FSR-type engines for the Parakeet.) With most of these engines, I get best results from a Master Airscrew 9-4.

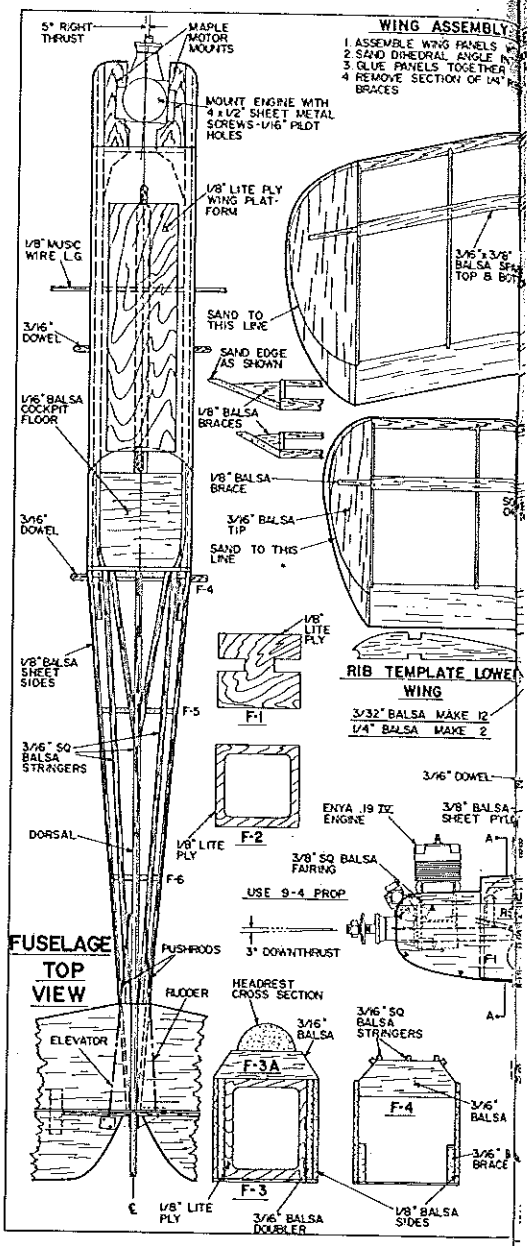
Whatever your flying style and preference, start with modest control movements (rudder, ½ in. left and right; elevator ⅜ in. up and down). Use the balance location shown on the plans as a good starting point. Most of you hotdog pilots will want to use more control movement, and you'll probably move the balance point rearward to enhance the snap roll maneuvers. But changes should be made and tried out one at a time using ample altitude (about two mistakes high) during check flights.

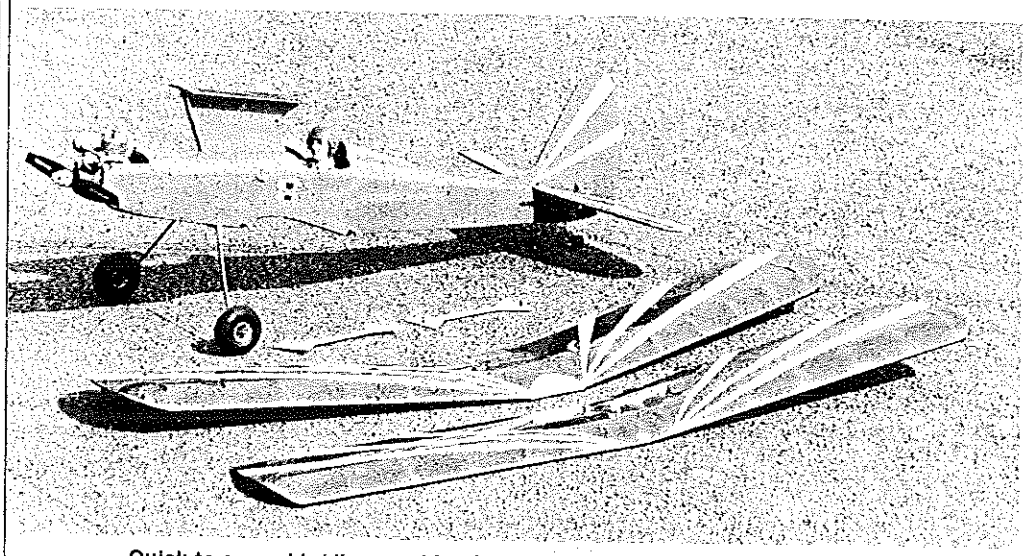
Construction notes. My approach to building the Parakeet is to round up all necessary materials and then make a "kit" of prepared parts before beginning assembly. Many builders have excellent results using the thick cyanoacrylate (CyA) glues exclusively. If you have concerns about strength, I would recommend Sig Epoxy (or something similar) for the engine mounts and wing center joints. Sig Contact Cement is a good choice for the fuselage doublers, or, if you prefer, use thick CyA.

The following construction sequence has been established to facilitate rapid assembly of your Parakeet "kit." Starting with the fuselage, laminate the 3/16 doublers to the ⅛-in. sides, making sure to end up with a left and right assembly. Lightly score the inside of the sides just aft of the doublers; it will help them to bend later. Place the right fuselage side over the plan side view, and mark the location of cross braces, engine mounts, and formers F-1 through F-6. Carefully transfer these marks to the inside of the left fuselage side.

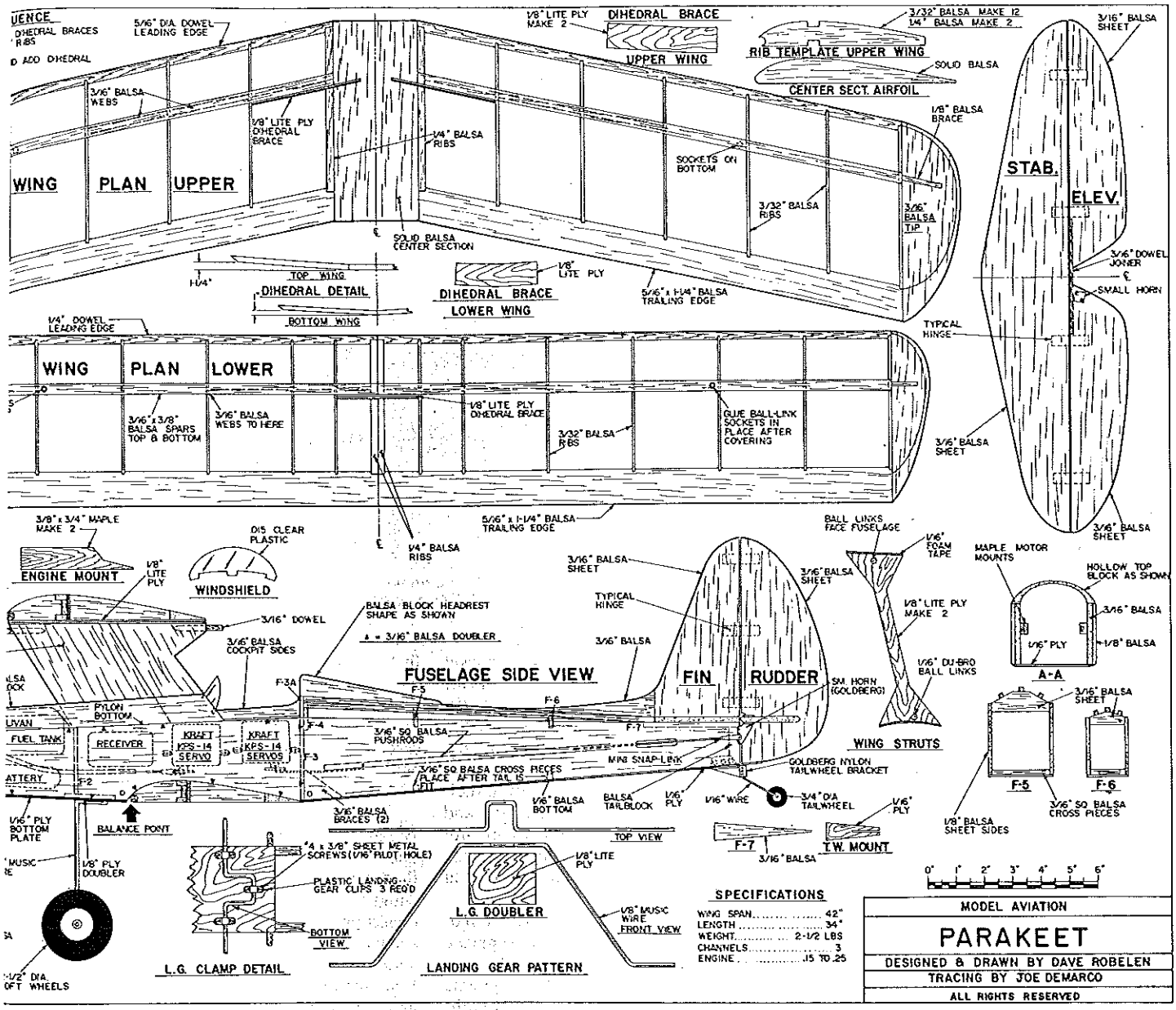
With the right fuselage side flat on the work surface, cement F-1, F-2, and F-3 in place, checking for square alignment before continuing. Add the left side, and again carefully check the alignment before proceeding. Cement the engine mounts in place with a suitable glue. If in doubt, use epoxy. Bend the fuselage sides together at the tail, and lightly glue them. Check the alignment by placing the assembly over the top view. When you are satisfied that all is in order, add the tapered tail block, the F-7 horizontal former, and the 3/16 square cross braces. Install the triangular braces behind F-3, and thoroughly cement the scored areas to restore strength. Glue in the tail cone formers, then add the top stringers as shown on the plan. Glue the F-3A bulkhead in place, and add the 1/16 balsa cockpit floor. Glue the landing gear doubler in place and also the 1/16 plywood nose bottom. Add extra glue fillets around the landing gear doubler and the engine mounts as needed.

Shape the outside of the top block, and confirm that the ⅜ in. balsa pylon will fit correctly. Hollow out the inside of the top block for fuel tank clearance, leaving a wall thickness of ⅛ in. minimum. When satisfied with the shaping, glue the top block in place, and add the ⅜-in. square nose fairing pieces. If you are going to finish the cockpit with plastic film, do it now before adding the side pieces. In fact, the inside surface of





Quick to assemble/disassemble, the Parakeet makes transportation and service a snap even for biplane types. Time-honored rubberbands provide protection in minor crashes.



the side pieces should also be covered before assembly. Glue the side pieces in place, stripping away any covering where there is a glue joint. Glue the 1/16 balsa tail cone bottom and the plywood tail wheel mount in place.

After checking all glue joints once more, shape and sand the entire fuselage to the contours shown on the plan. Shape and sand the headrest also, but do not attach it yet. Assemble the balsa pylon pieces and sand to the contours shown. Leave the top and bottom surfaces square, as well as the portion glued into the top block. Shape and sand the 1/8-in. plywood wing mount, but leave it loose also.

Round up the various 3/16 balsa tail pieces, and make sure that they fit properly to the fuselage and to each other. Join the elevators with the 3/16 dowel as shown. Shape all of the tail surfaces, and sand them smooth. Edges should be rounded except at the hinge lines. Refer to the plan for the contour, and sand a sharp bevel on the front of the rudder and elevators. The back edge of the fin and stabilizer should be left

The pylon-mounted top wing is a major departure from the usual array of cabane struts, wires, etc. It builds easily and makes for easy assembly and problem-free wing alignment.

square.

Set the fuselage and tail components aside, and prepare to construct the wings. The idea is to complete all construction work before applying any covering material; that way, the covering process can be completed without interruption. For the wing construction, select a flat, smooth work surface that is free from any bends or twists. I use an old hollow door, and it works great. A sheet of Celotex ceiling material placed on top of the work board will provide an ideal surface to stick pins into. Fasten the plan sheet in place, smoothing out any wrinkles, and cover the wing areas with a clear plastic sheet, such as the backing from Super MonoKote.

Begin by pinning the bottom spars and trailing edges to the plan. Cement the various ribs in place, taking care not to stick the two center ribs together. Install the spar webbing and then the top spars. Cement the leading edge dowels in place, and clamp them securely for good glue joints. When the glue is really dry, remove the two panels from the plan, and smooth the ends with a sanding block. Trim the tip plates to fit, adding the ⅛-in. balsa braces as shown.

Carefully use the sanding block to trim the center ribs to the dihedral angle shown. Then glue the two panels together. Once the glue is dry, remove the section of the center ribs as shown, and install the plywood spar brace. *Glue carefully, please.* Trim and sand the entire wing until it is smooth.

The top wing follows this same pattern of construction except for the center panel and sweep angle. Take care when trimming and fitting the various spars and leading edge dowels to the sweep angle. A proper fit is necessary to ensure strong joints. Shape the dihedral angle into the ends of the two wing panels, leaving the center block with square sides.

Borrow the household vacuum cleaner and thoroughly remove all dust. Cover all of the various components with the material of your choice. (I recommend Super MonoKote.) Recheck the wings very carefully for warps, and correct any problems at this stage. You should check again after 48 hours or so, since the amount of shrinkage can be dependent on aging, humidity, or other factors.

Assembly. First, glue the tail components together, and mount them on the fuselage. Strap the bottom wing in place in order to check alignment. Make sure that the stabilizer is level when viewed from both front and rear and that it is parallel to the bottom of the lower wing. Be sure that the fin is on the centerline and standing exactly vertical.

Cut away the covering where the parts are joined, then install the pylon and its top plate. Glue carefully for a good joint. Strap the top wing in place while gluing on the plywood plate, and again check the alignment thoroughly. Check the incidence, too. The bottom surface of both wings should be parallel.

Once you are satisfied with the wing alignment, mount the struts. Fasten the ball pieces to the struts at the locations shown, and mark the location of the nylon socket pieces. Drill or pierce holes in the spars for the sockets, snap the sockets onto the balls, and slip the strut assembly back between the wings. Force the nylon sockets into the holes as you bring the wings tight against the struts. Twist the nylon sockets in their holes to remove all play from the strut, and glue the sockets securely in place with Hot Stuff or other CyA glue. Now you can unsnap the struts sideways and put them in a safe place for a while.

The long-legged Parakeet is equally at home on pavement or grass. Tracking is great, and there's ample prop clearance. The model's compact size makes it great for schoolyards.

Carefully fit the control surfaces into place on their hinges. The goal is to have a minimum gap in the hinge line, yet retain very free movement. I use flexible plastic strip hinges and fasten them with Hot Stuff, but there are other excellent choices.

Make up the tail wheel assembly, and fasten it in place with the appropriate glue, screws, etc. Once again, check carefully for smooth, free movement before proceeding. Mount the two control horns where shown, and construct the pushrods from 3/16 square balsa with wire ends. I use mini snap links with their rods at the tail and soft 1/16 wire inside the cabin. Slip the rods into place, and check for smooth, easy movement by hand. Install the windshield and pilot. (Mine is a 2-in.-scale Williams Brothers'.)

Make up the fuel tank, and mount it where shown. Install the tank by sliding it in from the rear until the metal tubes extend through the firewalls. If you wrap some strapping tape around the tank and leave a tab on the back, it will be mighty handy for future maintenance. Mount the engine, checking to get the proper side thrust. I am partial to ½ x #4 sheet metal screws for holding the engine, but if you like nuts and bolts, be my guest. Trim the nose to clear the muffler and maybe the needle valve, and install the throttle drive linkage.

Remove the engine, coat the nose with fuel proofer (thin epoxy glue works great), and paint the engine compartment to match the model. Mount the landing gear with nylon clamps and ⅜-in. x #4 sheet metal screws, and install the wheels of your choice.

Balance and test fly. Remount the engine and place the RC equipment loosely into the fuselage as shown on the plan. Strap the wings on, and support the model with your fingertips under the fuselage at the location shown. If necessary, move the battery and/or servos to achieve this balance. Final-mount your RC equipment, wrapping the battery and receiver softly in sponge. I get excellent results with servo-mounting tape; however, you should consult the literature with your set, and use the method the manufacturer recommends. Finish the pushrods and throttle linkage, and set the control movements: elevator ⅜ in. up and down, and rudder ½ in. left and right.

Range check your radio with the engine running at *all* speeds, and make sure that the engine will maintain good power at full throttle when you point the nose up 45°. Fill the tank, and taxi around a bit if your field surface permits. For your first takeoff, point the Parakeet *directly* into the wind, and advance the throttle evenly. Do not punch it open quickly. Once the tail is up, and the ground speed looks normal, a small tug of up will lift her off easily.

Once you are acquainted with your new little beauty, feel free to try different control throws and CG positions until your bird feels just right to you. After you have some practice, crosswind takeoffs and landings are fine. Just get the ground speed up before attempting to lift off.