For the novice, the ideal combination of easy flying and Scale appearance. Story and photos by Fred Reese.

BD-4

The large, boxy fuselage is easy to construct and there is lots of room for your radio and extra foam padding. The high-lift wing allows very slow flight speeds and is very forgiving of mistakes. The airplane will recover hands off from stalls, spirals or dives.

The following is an excerpt from the cover letter that accompanied Mr. Reese's article submission. It so aptly and concisely describes his motivation for this project that I felt it should be included as a preface to the article. It should also be noted that the article contains not only step-by-step instructions for building the aircraft but some valuable tips on learning to fly R/C, particularly valuable to the novice who does not have the assistance of an instructor. The flight-training segment should also be valuable to anyone about to fly R/C for the first time. JCW

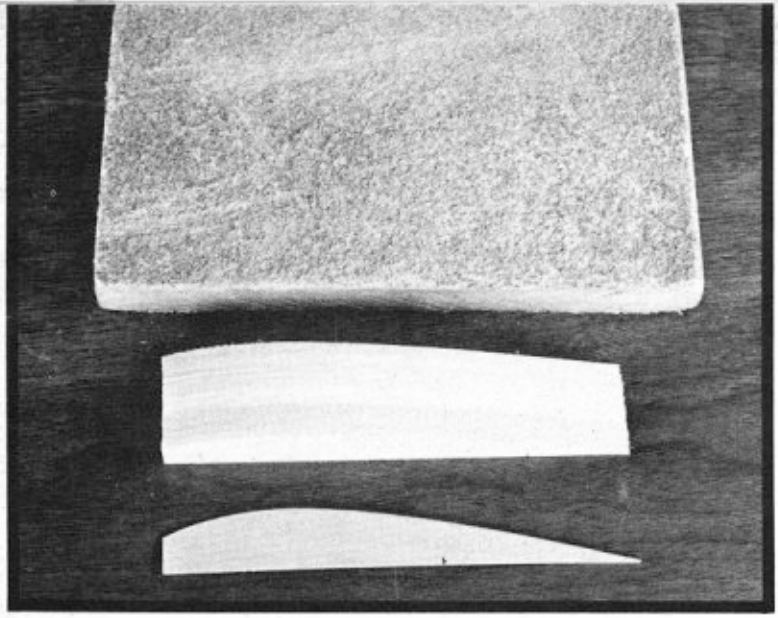
"Enclosed is a copy of an article for a basic trainer which I would like you to consider for publication. It is a semi-scale BD-4 with a rather lengthy text that includes basic flight instructions which I feel have been lacking in other trainer articles. My wife and I have traveled around the U.S. for the last two years and discovered many cities with no R/C activity except for the magazines on the newstands. People wanting to fly in these areas need more than just a "good luck" wish, yet with the right trainer and some preparation they can learn to fly without an instructor.

I chose a semi-scale design because it represents a full size aircraft even though it is not a P-51. There is just something special about a scale machine."

This semi-scale version of Jim Bede's two-place homebuilt airplane is a radio-controlled basic trainer, designed to fly like a large, Sport free flight that is inherently stable. Like a free flight, the BD-4 could be flown from take off to landing without ever touching the controls. In fact, my BD-4 was developed from plans for a 12½" rubber-powered version, designed by Bill Hannan. The BD-4 will quickly recover and return to level flight from any dive or spiral induced by a new pilot by simply letting go of the control stick.

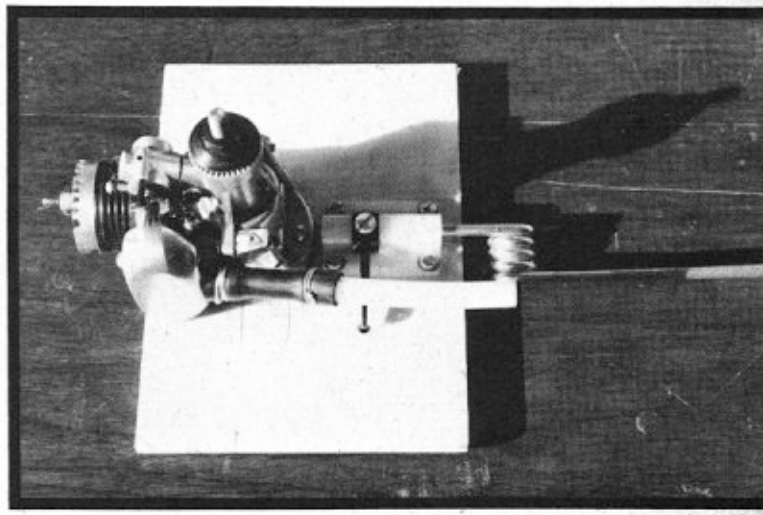
The BD-4 is intended to be flown with three servos and a .19 or .20 engine, using rudder, elevator and throttle control. Two-channel radios can be used for rudder and elevator control with a .15 or .19 for power. If the flying field you will be using is rough or grassy or above 4000', the plane will probably need a .25 engine and larger wheels to take off. Once in the air, the throttle should be reduced since the BD-4 is designed to climb rapidly under full power and cruise at reduced power.

CONSTRUCTION—Use Titebond, Wilhold or other white glue for general construction and Hobbypoxy Formula II or other epoxy for high-stress areas and use liquid contact cement such as Weldwood to bond the plywood doublers to the fuselage sides. Do not use "model airplane cements" as they are not strong enough.



ABOVE: Use a thin plywood rib template to cut out the wing ribs and then pin the ribs into a stack. Sand the wing ribs to uniform size with the large sanding block. The block is made from coarse-garnet sandpaper, contact cemented to a piece of plywood. The sanding block is useful for shaping and truing up surfaces for tight glue joints.

BELOW: As most of the hardware in this airplane is bolted to the firewall, it is easiest to do all of the fitting before the firewall is epoxied into the fuselage. The Tatone exhaust manifold acts as a muffler and also dumps most of the oil residue from the engine out the bottom of the cowl. Make sure it all fits together easily now, including the exhaust extension, as it must be assembled later when access is not as simple.



Epoxy the engine mount to the firewall with the 1/16" plywood shim behind the left side of the mount to provide right thrust which will counteract the torque of the engine. Note that the mount is about 1/8" to the left of center on the firewall. Drill out the engine-mount bolt holes through the firewall and bolt down. Mark on the engine mount where the throttle pushrod will pass and drill through with a 1/8" bit. Similarly, position and bolt down the nylon nose-gear mount and drill through the firewall for the steering pushrod, behind the outer hole in the steering arm. Fit the Tatone exhaust manifold to the engine and trim off the unused nipples and drill out the one on the bottom.

It will be necessary to glue two or three pieces of 3" wide sheets together to make the fuselage sides. Note on the plans that the 1/8" sides extend only about one inch forward of the firewall to utilize standard 36" length wood. Use masking tape and pins over waxed paper to hold the pieces together while gluing. Mark the positions of the 1/32" plywood doublers on the fuselage sides with a ballpoint pen and coat the sides and plywood both with contact cement and allow to dry before bonding. When the cement is dry to the touch, press the plywood pieces onto the balsa, being careful to get the pieces straight the first time. Contact cement is permanent and very strong. Contact cement the balsa nose doublers(F4) and the 1/8" x 1/2" balsa strips to the fuselage sides. Do not use White glues on large, flat areas as the moisture will cause the wood to warp or twist.

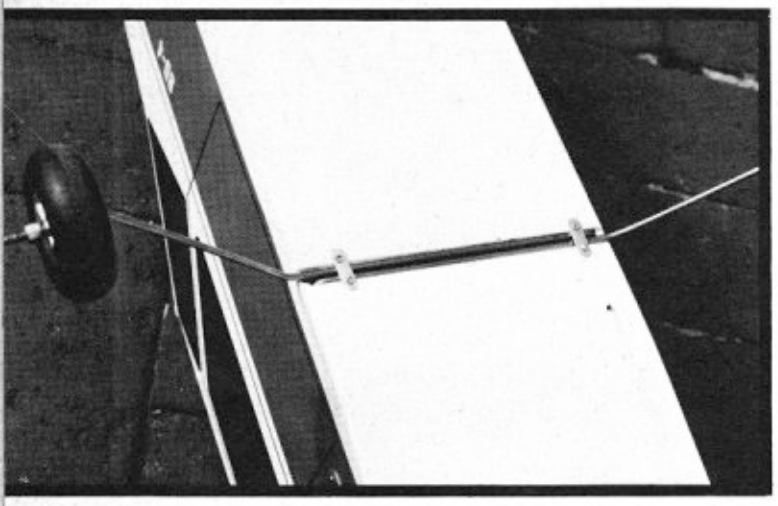
Epoxy the firewall (F2) and bulkhead (F3) to one of the fuselage sides using a square or blocks or jars to hold the bulkheads upright until the epoxy sets. Epoxy on the other fuselage side, taking care that the two sides are parallel. Glue on the 1/4" balsa top front and hold in place with pins until dry. Epoxy the triangle stock around the firewall and top front (3/4", 1/2" triangle or even square stock could be used in place of the 1" triangle stock, if it is not available). Partially cut through a piece of 1/16" plywood for the bend in the cabin floor behind the firewall. Gently crack the plywood over a table edge and glue in place. Leaving a 5/16" gap in the floor, glue on the 1/8" plywood section of floor behind the landing gear. Mark the position of F5 inside the fuselage and then epoxy it in place. Wipe away any excess epoxy in the landing-gear slot. Contact cement a 1" x 6" piece of 1/16" plywood forward of the landing-gear slot on the outside.

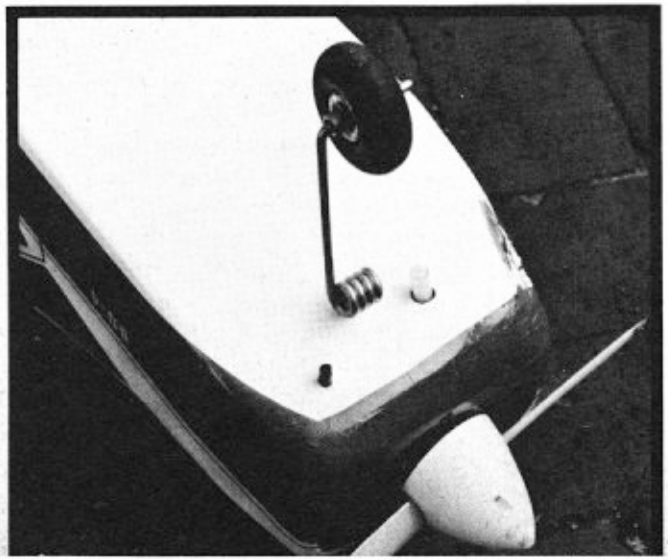
Pull the tail of the fuselage together and glue, sighting down the length of the fuselage as it is drying to be sure it is straight. Glue in the 1/8" x 1/2" cross braces and then add the top and bottom 1/8" sheeting with the grain crosswise.

Make a large sanding block (6" x 10") by contact cementing #80 garnet paper to 1/4" or thicker plywood. This will be used to shape, trim and true-up surfaces for gluing.

Glue on the remaining pieces of the engine cowl, using the sanding block to true-up the edges before gluing on the next piece. When dry, rough shape the fuselage front with the block and then final sand with 220 grit garnet paper. Cut a slot in the top of the fuselage for the tab on the rudder R1) and slide in the stabilizer (S1) and the rudder (R1) and glue. Add R3 and epoxy R4 to the bottom of the fuselage.

Begin wing construction by making the 8" wide sheets of 1/16" hard balsa for the wing skins. Use masking tape to hold the edges together while gluing the narrower sheets together. Mark the rib positions on the bottom skins and then pin them down over waxed paper. Glue the 1/2" x 3/4" up against the skin and follow with the 1/8" x 1/2" glued behind the leading





LEFT TOP: The wing panels are made from 1/16" sheet balsa and constructed flat on a table. The ribs are glued down to the bottom sheet along with the leading edge and spar joiners and then the top sheet is glued on, using pins and jars, canned goods or socks filled with sand to hold in place until the glue dries. The wing sections are then joined with epoxy and a plywood spar. LEFT BELOW: The cross-torsion main landing gear is sturdy and easy to repair, if needed. The wire gears are inserted and screwed down with metal straps after the model is finished.

edge and sewn to the wing skin. Glue the ribs in place and add the 1/8" x 1" spars, using scrap 1/8" sheet between the spars for spacers. When dry, remove the spacers and trim the trailing edge to the final wing chord of 8". Apply glue liberally to all of the ribs, spars, leading and trailing edges and pin down the top wing skins. When dry, trim the ends and add the 1/4" wing tips.

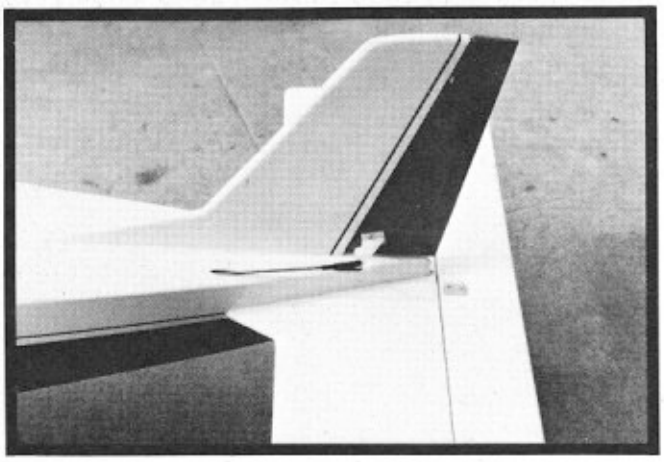
Bevel the ends of the wing to be joined with the sanding block and trial fit the plywood spar W3 into the slots. When satisfied with the fit, lay down waxed paper and epoxy the wing panels to the center section, blocking up the wing tips 2½". Notch the trailing edge and glue on the 1/8" dowel to protect the wing from the rubber bands.

Bend the wire landing gear in a vise and cut the wire by filing a notch on two sides of the wire and then bend and break. File off any sharp edges. Drill holes through F5 for the landing gear and slip the wire in place and epoxy the two F6's to the inside of the fuselage with the wire in the slot. Remove the wire before the epoxy sets. The landing gear is screwed down after the finish is applied. Cover the model with Solarfilm or Super Monokote and add desired trim with contact paper or super Monokote and add desired trim with contact paper or Monokote trim sheets.

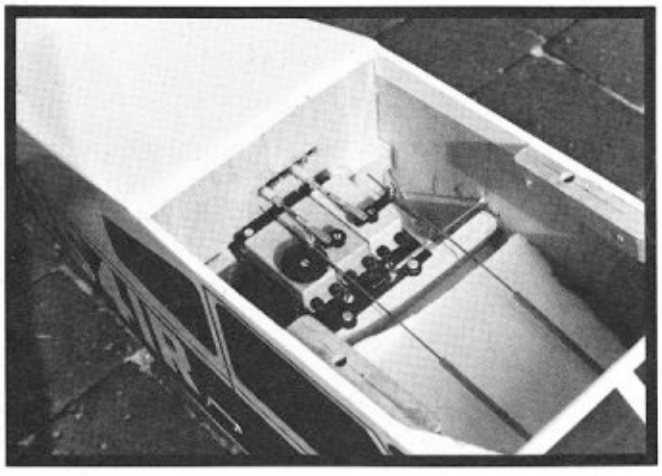
Wrap the radio receiver and battery pack loosely and separately in foam rubber and then seal in baggies. Install the servos in a servo tray and screw the tray on to the servo rails in the fuselage. I use pine trim molding from the lumber yard for servo rails. Mount the switch on the side of the fuselage, away from the exhaust, up in the window area. Plug the servos into the receiver and slide the receiver and battery pack under the servos, for now. The receiver and battery will be positioned later to balance the airplane.

Install the nosegear and throttle pushrods and secure them in the front with 1/16" wheel collars. Slide 8" lengths of scrap plastic tubing or Gold-n-rods over the pushrods to prevent the pushrods from binding in the foam-rubber packing. The wire pushrods should work smoothly without binding. File a flatspot on the nosegear for the steering-arm setscrew and tighten the

LEFT ABOVE: The model is covered with Solarfilm or Super Monokote, which is applied with a household iron which cuts the finishing time in half and at comparable cost to silk and dope. The trim colors, windows and numbers are cut out from Monokote trim strips or contact paper and pressed on. The fine lines are 1/16" DJ Multistripe tape. Seal all of the trim edges with clear urethane for longer life. Also seal the engine compartment and cabin with two coats of urethane or clear dope. LEFT BOTTOM: The clear tube is the exhaust and the black tube is the fuel overflow. Center the nosewheel using an additional wheel collar under the axis of rotation.



TOP: The outer fixed portion of the Gold-n-rod pushrod is trimmed off flush with the fuselage top and side and the inner moving portion is trimmed according to the length of metal rod used between the clevis and control horn. The inner nylon rod does not have to extend out of the fuselage. BELOW: The original wing was held down with 1/4" nylon bolts which proved to be too strong and resulted in some wing damage. The rubber bands [see plans] should be more forgiving and easier to install. The nosegear and throttle pushrods are attached to the servo outputs with DuBro EZ connectors. The Gold-n-rod pushrods are connected to the servos with DuBro Solder-links on threaded rod screwed into the nylon inner pushrod. Scrap Gold-n-rod was used over the wire pushrods to keep them from binding in the foam packing.



airplane reaches about 300'. If the airplane turns sharply, move the control stick in the opposite direction about 1/2" or until the airplane begins to straighten. Hold the airplane in a gradual turn (1/4 mile circles) until altitude is reached. When the airplane reaches 300', reduce the throttle to 1/2 or less to reduce the rate of climb but still maintain altitude. Turning will cause the airplane to lose altitude, so some climb is desirable at first. Adjust the rudder trim for straight flight. To turn, move he stick about 1/2" for about two seconds and release. The airplane will dip its wing, turn slightly and then rock back into level flight. If the rudder is held too long, the nose will drop, the plane will quickly gain speed and if the control is still held, the plane will go into a spiral dive. If that happens, release the control stick and let the airplane recover by itself. Continue making turns to keep the airplane overhead or upwind, always turning your body to face in the direction the airplane is flying, even if it means looking over your shoulder. If a crash seems inevitable, cut the throttle completely, straighten the rudder and give up-elevator if the nose is down. It is better to have to make some minor repairs from a rough landing than to destroy the airplane by a crash at full throttle. If the airplane gets too high, reduce the throttle until it gets lower, then add power again. When the engine stops, pull the elevator trim back slowly to achieve the slowest glide speed without the airplane stalling. Maneuver the airplane around into the wind for the landing approach. Let the airplane descend at its own rate until just before touchdown, then, gradually give up-elevator to flare the airplane for a gentle landing, *hopefully*. Make any

[*Continued on page 52*]

The BD-4 on the runway, ready to take off. Much of the learning process of how to fly can be accomplished on the ground by taxiing around a parking lot while breaking in the engine. This type of ground school will keep you from getting disoriented while flying later and also teach automatic use of the throttle.

[*Continued from page 30*]

necessary adjustments and do it again. As you gain flight experience, you will be able to make power on landings and even do some aerobatics with your BD-4. It is an enjoyable and easy plane to fly and has been my Sunday Sport model for several months.

BD-4 MATERIALS LIST

All balsa strips are 36" long
2-1/2 x 3/4" balsa
1-1/4" x 2" balsa
1-1/4" x 3" balsa
1-1/4" x 4" balsa
2-1/8" x 1/2" balsa
1-1/8" x 1" balsa
4-1/8" x 3" balsa
2-1/8" x 4" balsa
8-1/16" x 4" balsa or 8-1/16" x 3" plus 2-1/16" x 2" balsa
1-1" triangle stock or may use 3/4" or 1/2" triangle or square.
4-1/32" plywood 6" x 12"
1-1/16" plywood 6" x 12"
1-1/8" plywood 6" x 12"
1-1/4" plywood 6" x 12"
1-3/8" x 3/4" x 12" pine, fir or spruce
1-1/8" x 36" dowel
1-1/4" x 36" dowel
1-Goldberg nosegear steering assembly G16N
1-pk. Klett nylon hinges RK2-7
1-pk. Goldberg long nylon control horns CH1
1-Sullivan fuel tank SS-4
1-pk. Nyrods or Sullivan Gold-N-Rods GRSF-48
1-pk. DuBro Solder links
1-pk. DuBro 6" Quick links
1-pk. DuBro 1/16" wheel collars
1-pk. DuBro 5/32" wheel collars
2-2-1/2" DuBro or Goldberg wheels
1-2" DuBro or Goldberg wheel
1-Tatone Engine Mount .19 short
1-Tatone Manifold EM-1
1-Williams Bros. 2-1/4" spinner (specify color)
1-Top Flite nylon propeller 9 x 4
2-rolls Solarfilm, Flite Kote or Super Monokote (specify color)
2-Monokote trim strips (specify color)
1-Monokote trim strip-black
1-1/4 lbs. #64 rubber bands
1-pk. 6-32 blind nuts
3-6/32 x 1/2" bolts
8-#4 x 1/2" sheet-metal screws
1-12" x 1/8" OD brass tubing
12" medium fuel tubing
1-5/32" x 36" piano wire
1-1/16" x 36" piano wire
1-pk. Devcon 5-minute epoxy 1.25 or Hobbypoxy Formula 4
1-2 oz. Titebond glue
1-3 oz. Contact cement (Weldwood, Scotch, or Sig)