BD-6

A semi-scale RC basic trainer with hands off stability for the beginner in RC or the sport flyer who prefers a docile easy to fly airplane. By Fred Reese.

Jim Bede combined the technology gained from previous aircraft development programs of the BD-4, BD-5, and the BD-5J to offer the homebuilder a safe, quality aircraft at an absolute minimum price. All surfaces are aluminum and the fuselage uses the same bolt-together construction as the BD-4. The BD-6 is a single seat design that will cruise at 140 mph and give 40 mpg economy. The two-cycle, two cylinder, 650cc Hirth engine has 55 horsepower. Best of all, the complete homebuilt airplane kit, including the engine, is only $22.00. According to Jim Bede, " . . . the BD-6 fills a very special need for the first-time homebuilder. It's simplicity of construction enables him to gain valuable basic home building knowledge and experience before tackling the more complex airplanes." Similarly, I developed the BD-6 as an RC trainer using simple, proven construction techniques that will give a first time flyer an opportunity to gain valuable flying experience. The BD-6 model is a second generation semi-scale trainer design, as I too used concepts developed from a similar BD-4 design. The design is first, and foremost, a basic trainer with complete hands-off stability and very gentle handling characteristics. The BD-6 also makes a nice Sunday sport machine for those who like a docile airplane. It can do loops and barrel rolls and other aerobatics not requiring brute power. The BD-6 would be an ideal way of entering sport-scale competition as the model virtually flys itself. The design concept was to produce an easy-to-build airplane that looks real, and a pilot, with no previous flying experience, could learn to fly without the expert assistance. Many of us learned to fly this way but aircraft design and radio unreliability caused more crashes than can be expected now. Naturally, I recommend getting an experienced pilot to assist a new flyer and feel that all steps should be taken by a novice to locate such a teacher. It is only if no assistance is available that this type of design is invaluable.

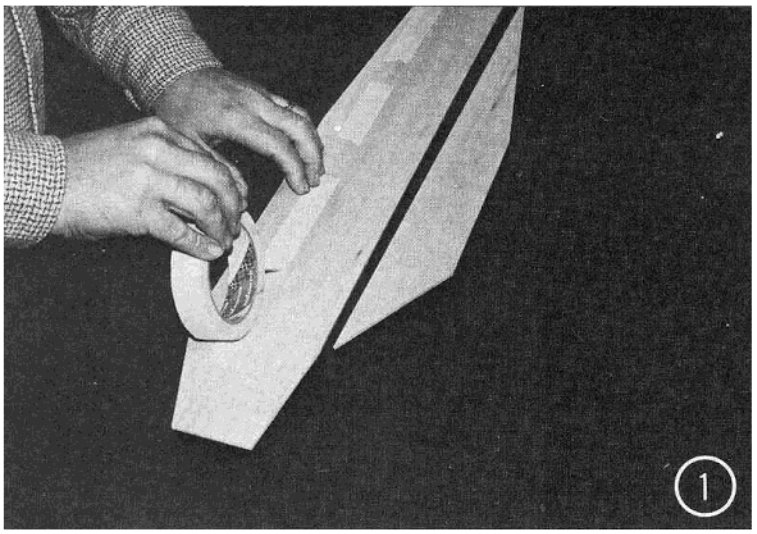
You will need three types of adhesive for construction. Contact cement is used for joining doublers or other strips to large flat areas. Epoxy is used only for high stress areas such as the firewall, landing gear mount, joining the wing panels and attaching the tail surfaces. White glue such as Wilhold or Titebond is used for the remainder of general construction. Begin the fuselage construction by bolting the engine mount and the nosegear unit to the firewall and drill holes for the throttle and nosegear steering pushrods through the firewall with a 1/8" drill bit. Cut out the other bulkhead, fuselage sides and plywood parts. Sig Lite Ply was used on the original for the front top and bottom parts, but any other 1/8" plywood will work as well. Contact cement the nose doubler to the fuselage sides and then continue contact cementing the various diagonal and vertical fuselage reinforcement strips to the sides.

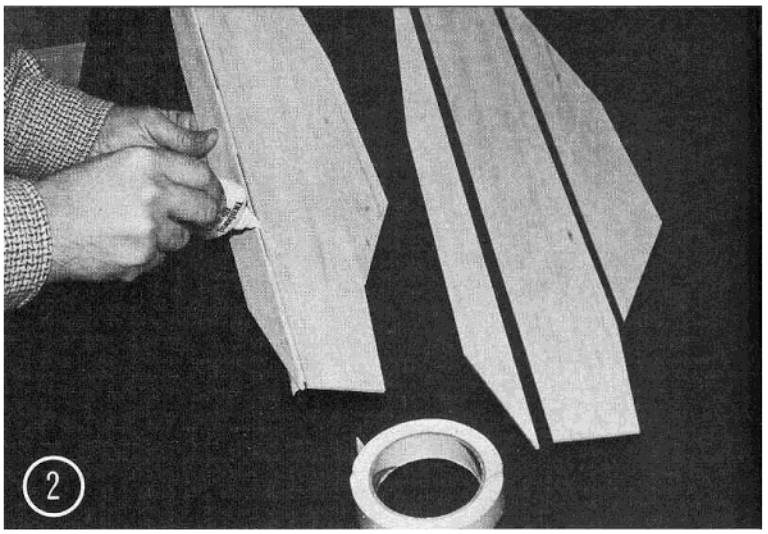
Epoxy the firewall and bulkhead to one of the sides, taking care that they are square to the sides and then add the other fuselage side. Glue or epoxy on the plywood top front and cabin bottom pieces and the remainder of the cowl pieces. Pull the tail together and glue. Add the 1/4 square cross pieces and the 1/8" balsa top and bottom cross grain sheeting. Epoxy the stabilizer into the slots in the fuselage sides and epoxy the rudder on to the top. Epoxy on the plywood sub-rudder. After sanding, the fuselage is ready for covering. Cut out the wing ribs using a thin plywood template as a guide. Pin all the ribs together and sand to uniform size with a sanding block. Pin down over the plans, using waxed paper or Saran Wrap in between, the 1/16" bottom wing sheeting and 1/4" square spar. Glue down the ribs and add the 1/16" trailing edge top sheet, the top spar, and the 1/2" square leading edge. When dry, add the top 1/16" leading edge sheet and the top capstrips. When dry remove from the table and trim the two panels to fit together at the proper dihedral angle. Pin down the panels again with one wing tip blocked up 5½". Epoxy the wing panels together with the 1/8" plywood spar joiner in place. When set, add the wing tips, center sheeting and trailing edge dowel and remaining capstrips. Shape and sand the leading edge and the wing is ready to cover.

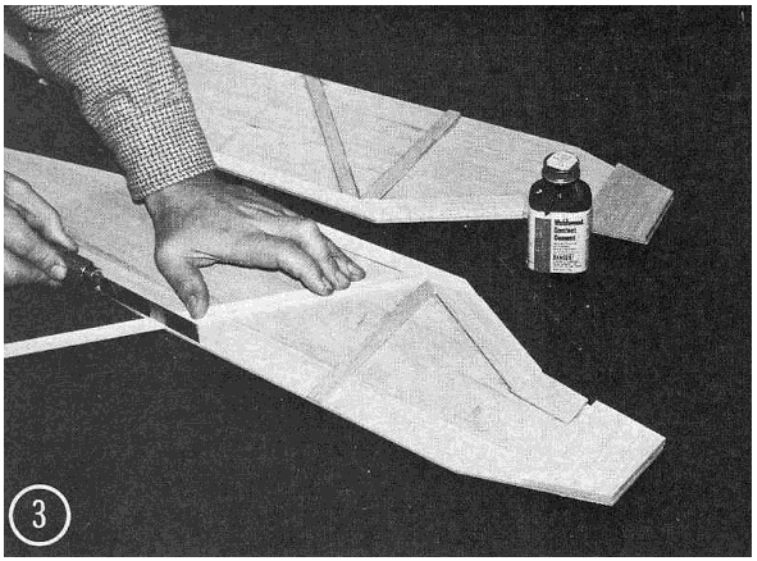
The BD-6 was designed to be covered with Super MonoKote or Solarfilm and to be decorated with other adhesive backed trim colors. The windows are cut from black Contact shelf paper or black MonoKote trim. The side trim and numbers are MonoKote trim. Fine lines are DJ Multistripe tape. I seal all the trim edges with clear gloss urethane. Urethane is also used to seal the wood in the engine compartment and the cabin to protect the wood from becoming oil soaked by the fuel. Hinge the rudder and elevator with nylon hinges and epoxy. Rubbing alcohol will clean off wet epoxy if it gets into the hinges. Epoxy the servo rails in place and install the servos and radio switch. Loosely wrap the receiver and battery pack separately in foam and seal inside Baggies. Hook up the servos and stuff the receiver and battery down to the bottom of the cabin with the battery in front. Hook up the pushrods as shown on the plan to the rudder and elevator and use 1/16" or .045" piano wire for the throttle and nosegear steering pushrods. I use 1/16" wheel collars to attach the pushrods to the nosegear and throttle arms. Slip 6" lengths of plastic tubing or straws over the wire pushrods inside the cabin to keep them from binding in the foam rubber. Attach the pushrods to the servos with Du-Bro Solder Links, EZ-Connectors or threaded brass rod ends with adjustable clevis. Adjust the throttle linkage not to bind at either high or low throttle. Adjust the nose wheel to track straight with the rudder trim centered. The rudder servo should be hooked up to operate from the right hand or aileron stick on mode II transmitters as the rudder is acting in place of ailerons on this airplane. The

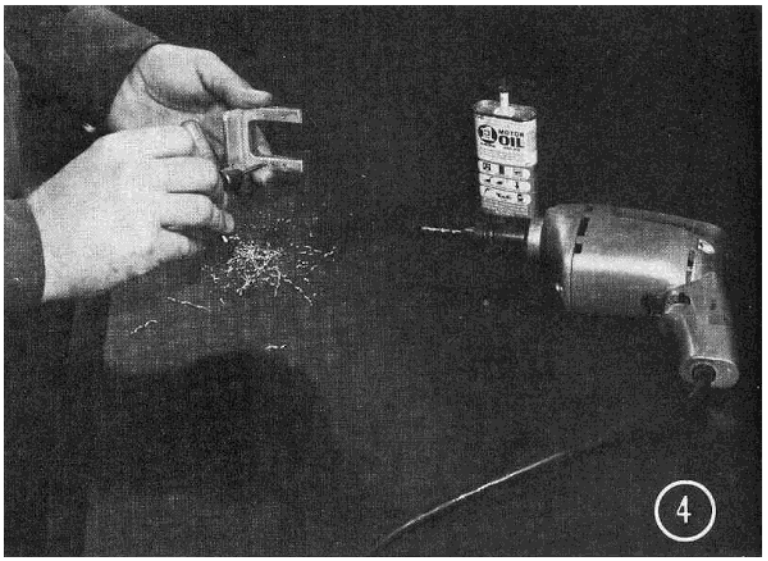

N6BD

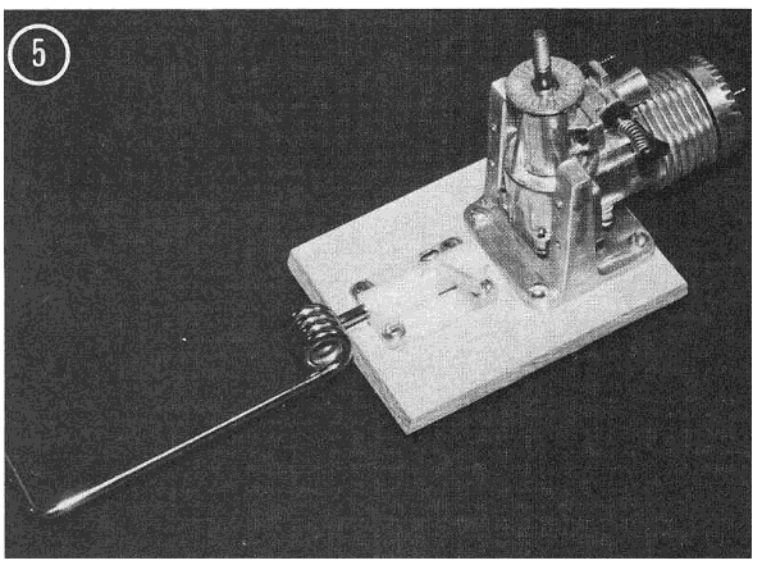

N6BD

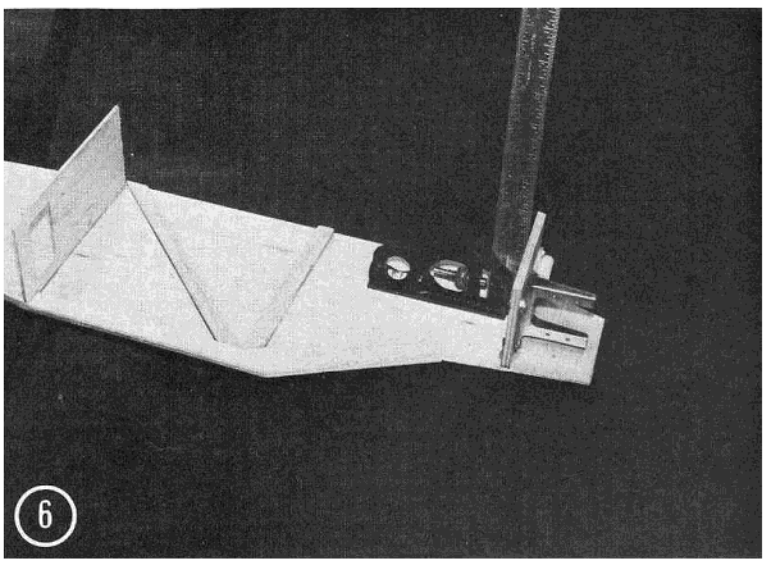




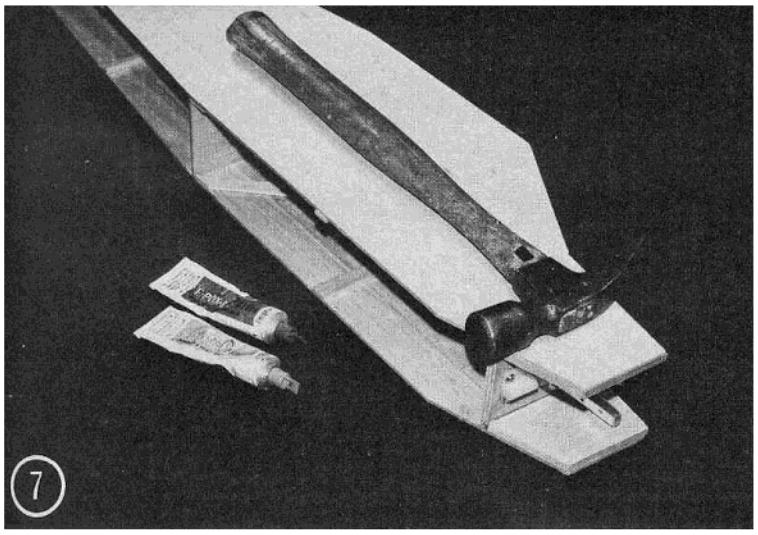


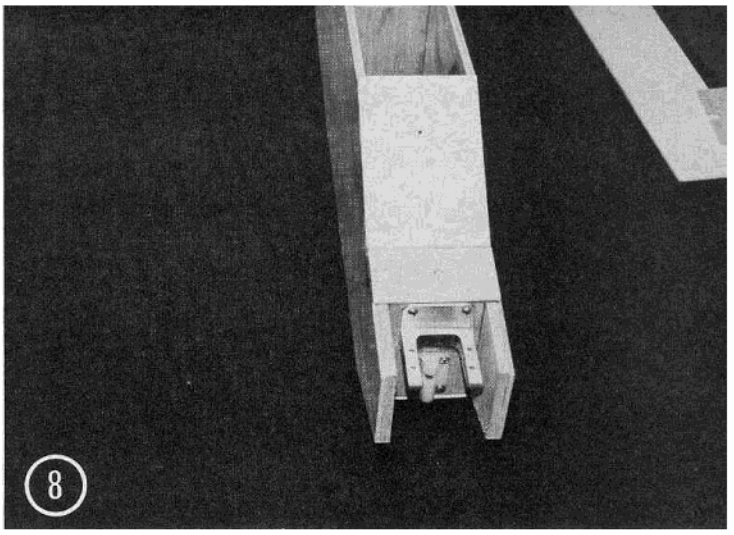


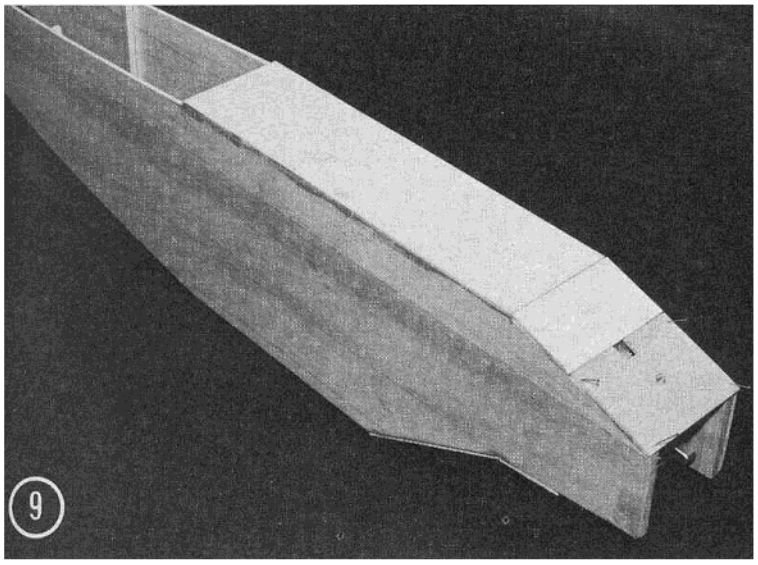


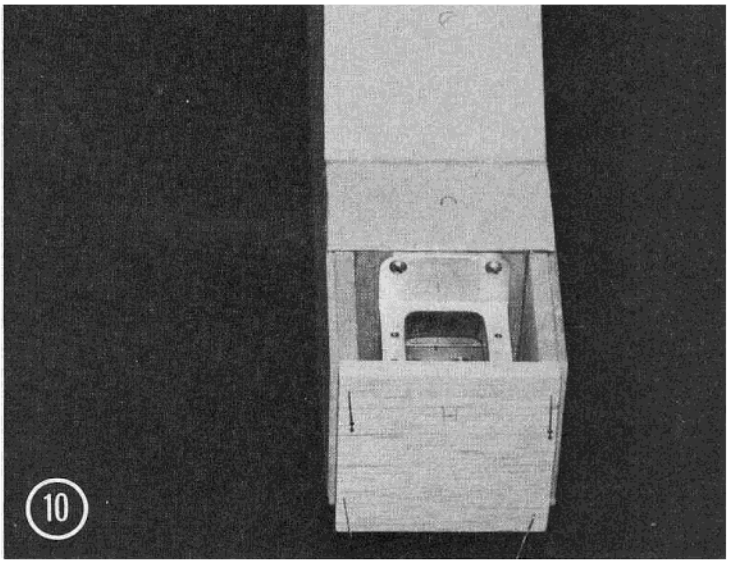


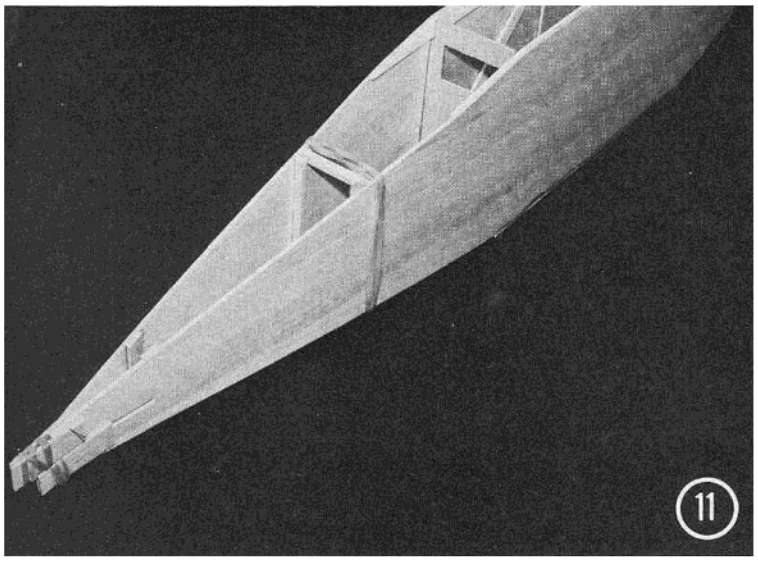
The three pieces that make up each fuselage side are taped together (1) and then glued together (2). The nose doubler and reinforcing strips are glued in place using contact cement (3). The aluminum motor mount is marked for the engine mount bolts with a pencil and then is drilled through with a 5/64" bit. Turn in a 4:40 tap (4) with a drop of oil until it feels tight. Back out the tap a half turn, then forward one full turn, then back out a half turn. Repeat until all the holes are threaded. Bolt the motor mount and the nosegear to the

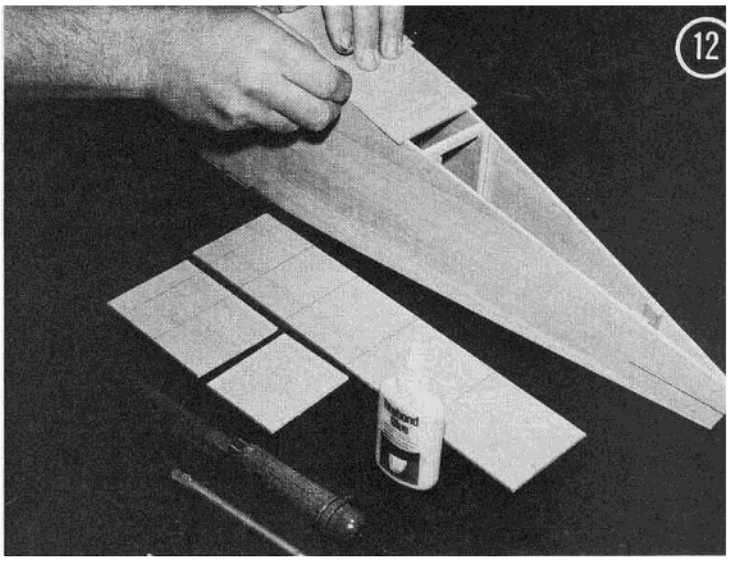




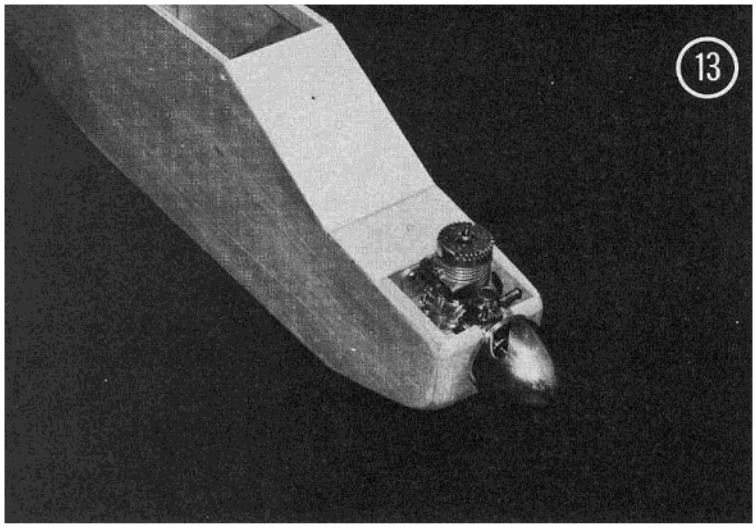


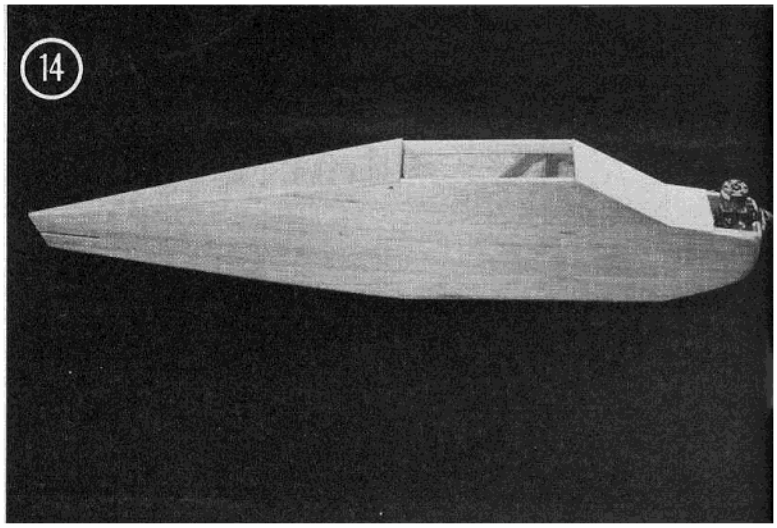


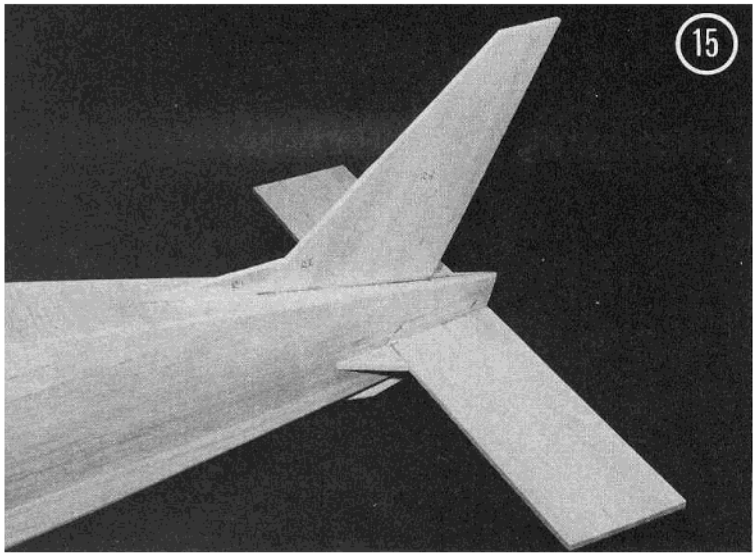


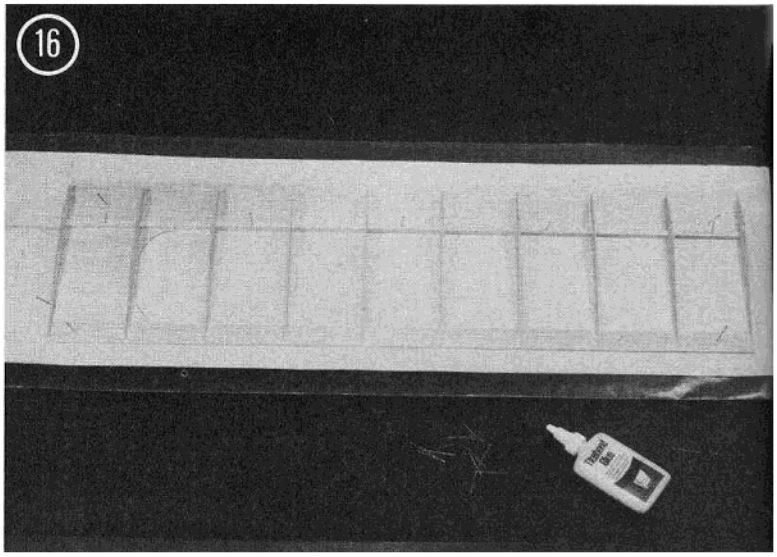


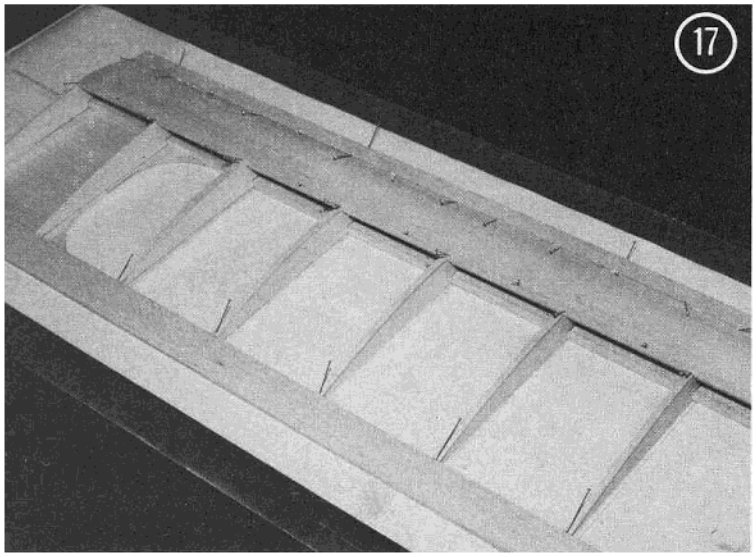
firewall (5) and also drill holes through the firewall for the throttle and nosegear steering pushrods and fuel lines. Epoxy the firewall and bulkhead to the fuselage side (6). Then add the other side (7). Glue on the top front pieces (8) and then add the cabin bottom pieces (9). Finish the cowl construction by adding the triangular filler and the front block "A" (10). Pull the tail together and glue. Add the 1/4" sq. cross braces. Note the balsa clamps at the tail (11). Glue on the top and bottom rear crossgrained sheeting (12).

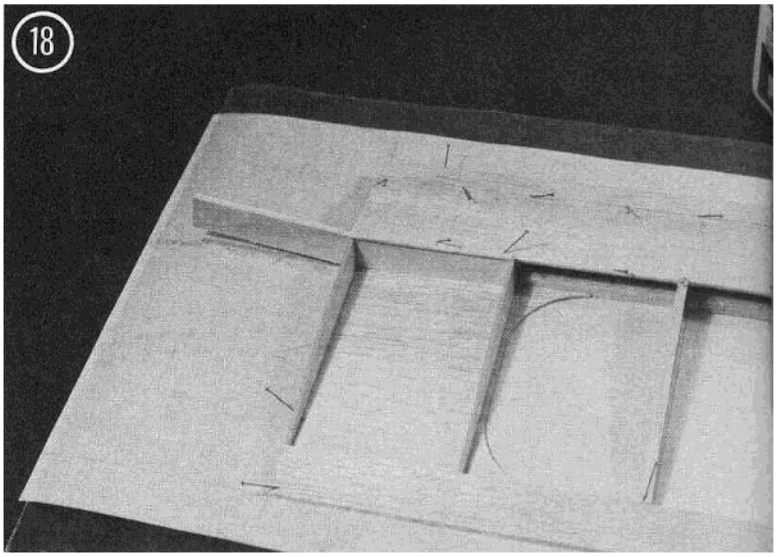




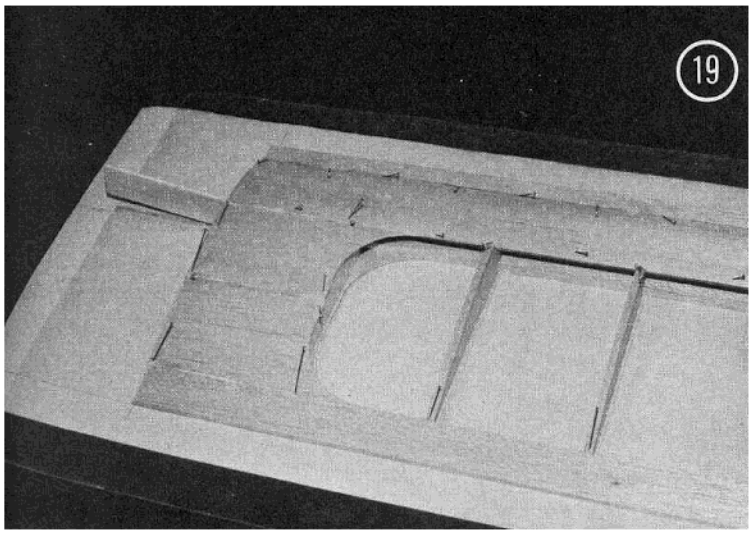


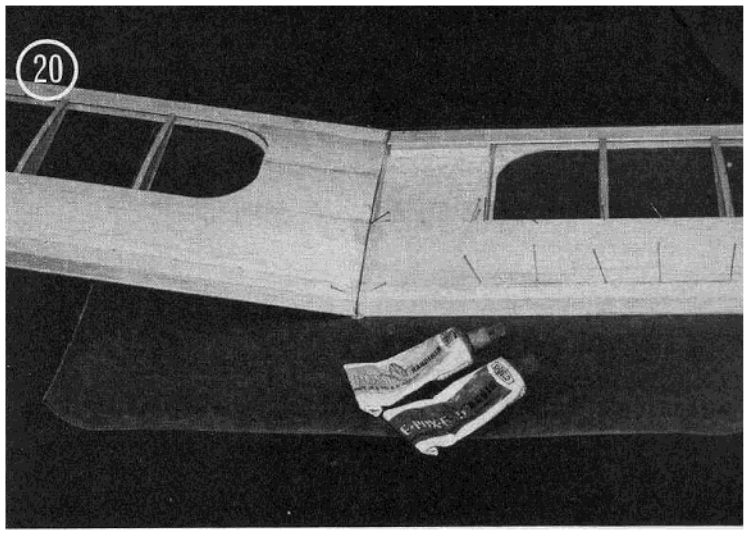


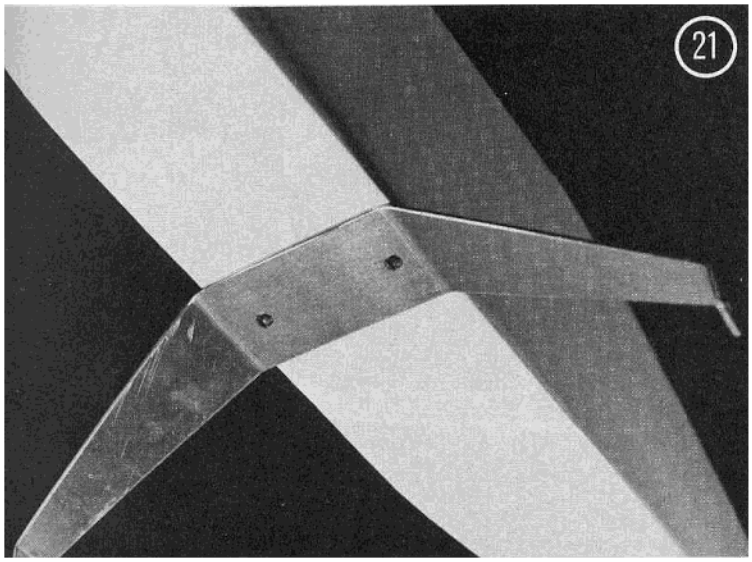


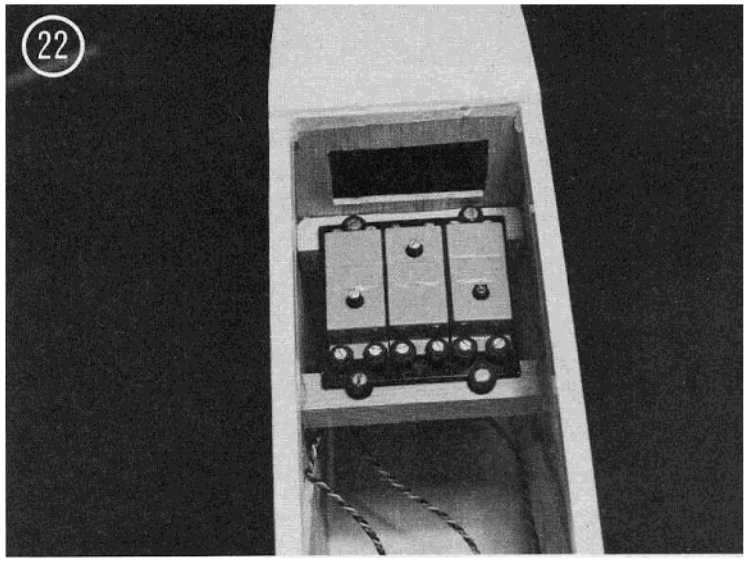


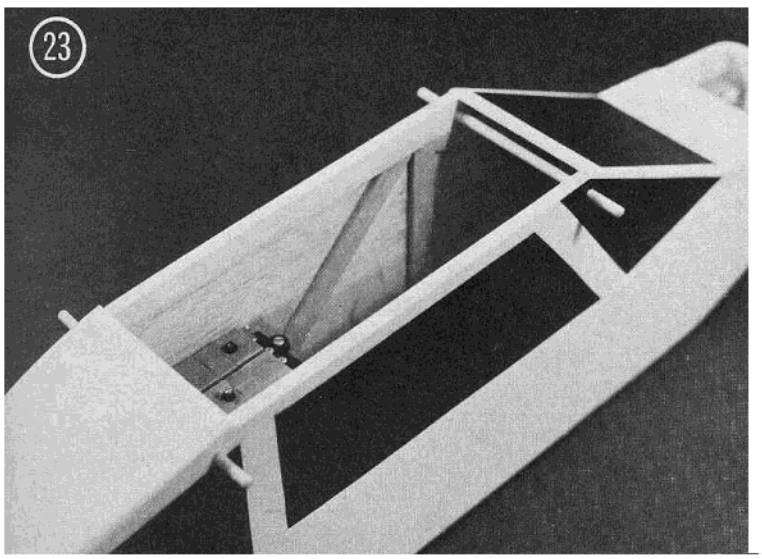
Finish shaping the cowl and fit the engine (13). Cut away "A" to clear the throttle linkage and the needle valve. Sand the entire fuselage smooth with very fine sandpaper before covering (14). Epoxy on all of the tail section and the plywood skid on the bottom and sand smooth (15). Build the wing panels by first pinning down the bottom sheets and glue in the spar. Glue the wing ribs down to the bottom sheets and spar (16). Add the top spar, 1/2" sq. leading edge and then the 1/16" top balsa sheeting (17). Glue on the capstrips. Cut a 1/8" slot in the center ribs behind the spars for the plywood spar joiner and epoxy the spar joiner into one of the panels (18). Add the remainder of the center sheeting (19). Fit the two wing panels together and epoxy

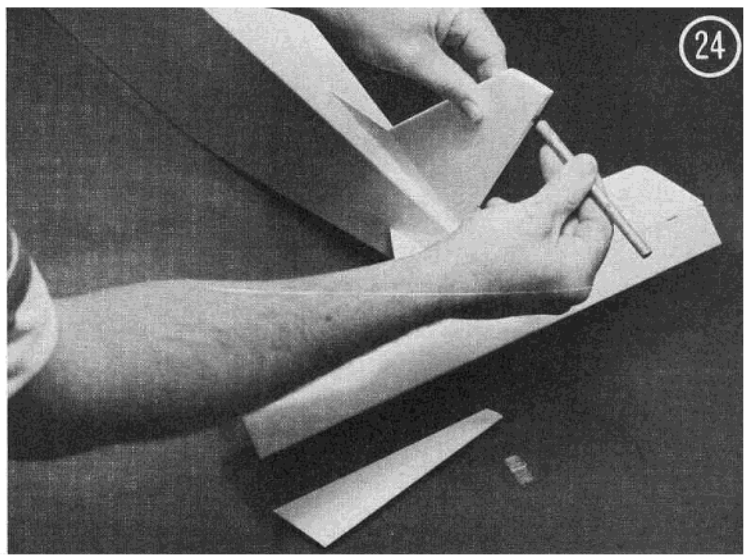




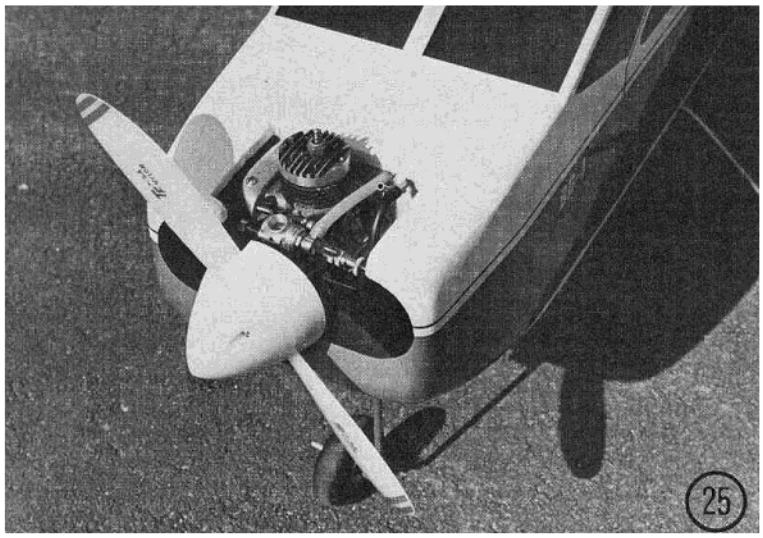


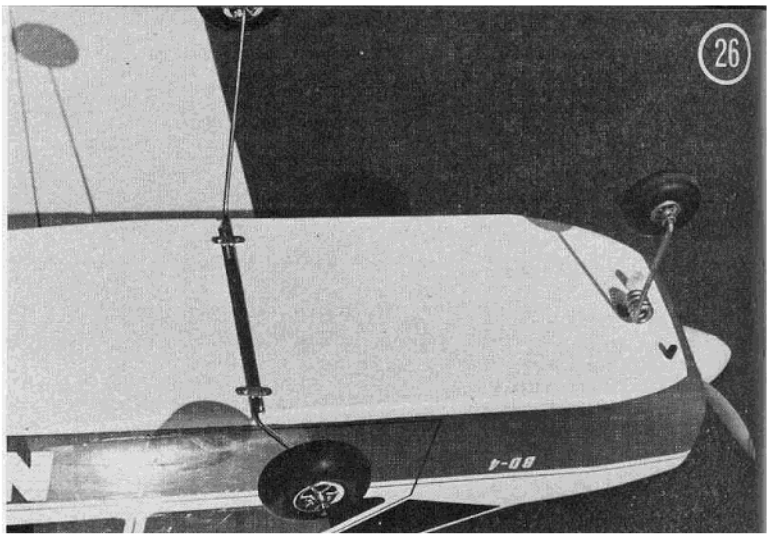


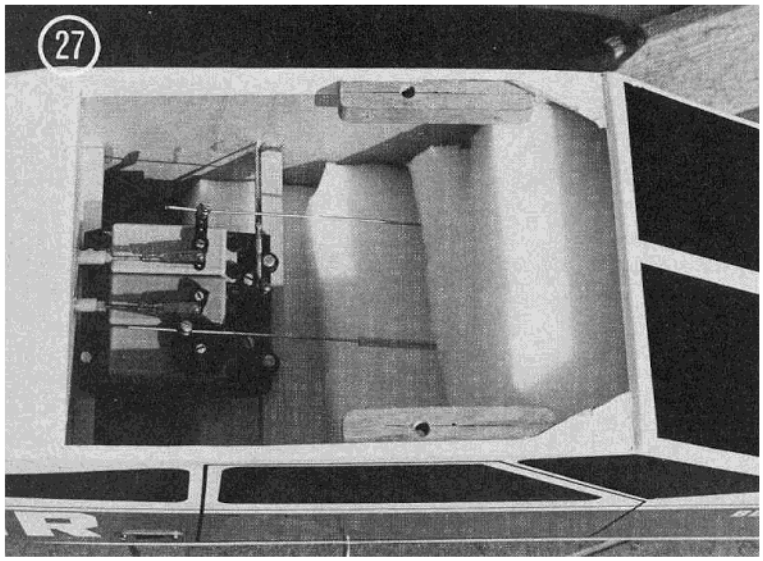


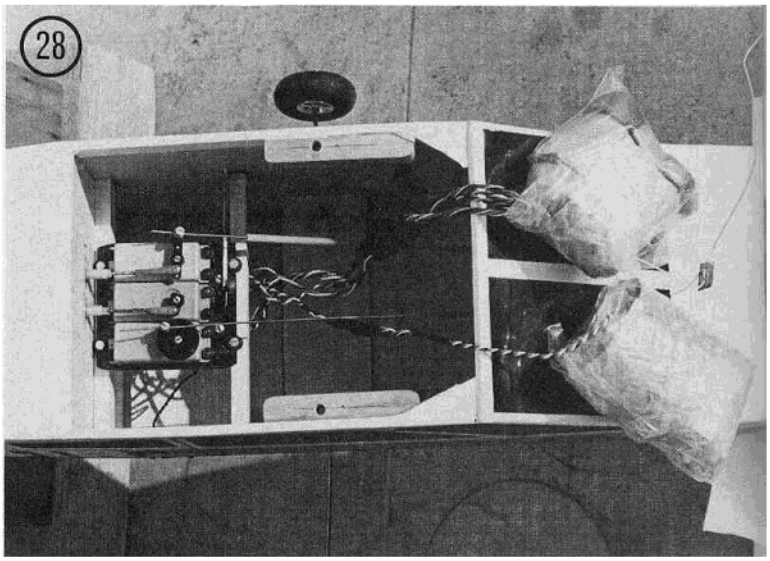


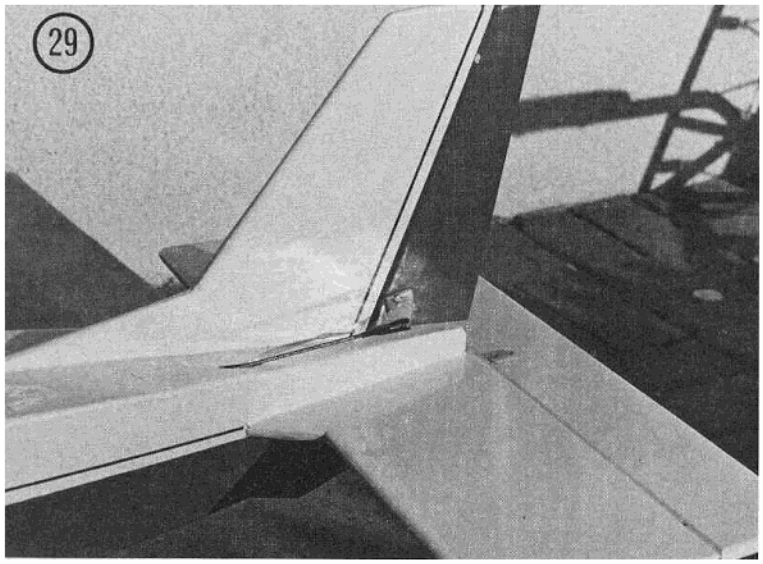
them together (20), blocking up one wing tip 5½". Add the wing tips and sand the wing to the final airfoil shape. Add the 1/8" dowel to the center section trailing edge. Cover the entire airplane with a base color of Super MonoKote or Solarfilm and seal the cabin and engine cowl with two or three coats of clear dope or urethane varnish. Bolt on the landing gear (21) and the servos (22). Cut out the windows from black MonoKote trim or contact paper and apply (23). Glue in the wing hold-down dowels. Cut slots in the rudder and elevator for the hinges (24).











View of nose section showing O.S. Max .19, muffler, fuel lines, Top Flite 9/4 prop and spinner (25). The simple and conventional single strut main landing gear wires are held in place with two metal straps and sheet metal screws. Note fuel overflow vent next to steerable nose gear (26). There's plenty of room for any radio equipment plus plenty of foam packing in the BD-6's cavernous radio compartment (27). This view shows the foam padding removed and illustrates how the receiver and battery pack are wrapped in Saran Wrap for fuel protection (28). View of conventional control horn linkage at empennage. Hinges are epoxied in place and wet epoxy removed from the hinges with rubbing alcohol (29). The color trim and numbers on the finished BD-6 are cut from MonoKote trim sheets while the trim stripes are DJ Multistripe Tape (30).

rudder, at the widest point, should move only 3/8" in each direction. The elevator moves up when the right hand stick (mode II) is moved back or down on the transmitter. The elevator should also move about 3/8" in each direction. Install the Sullivan RST-4 fuel tank with the brass tubing passing through the firewall. Instead of the Clunk provided in the fuel tank package, I use a fixed pickup at the bottom of the tank made from fuel tubing. This installation will not allow inverted flight, but it does not get kinked or stuck from hard landings causing the engine to run erratically or quit unexpectedly.

Balance the airplane by shifting the receiver and battery pack until the airplane hangs level within a half inch of the balance point on the plan.

If you have never flown before, a good way to start learning is while breaking in your engine. Run 3-4 tanks of fuel through the engine at full throttle but with the needle valve open and gradually close the needle valve until after 3 tanks the engine is running at nearly full power. Adjust the idle for the lowest, reliable rpm. The airplane should sit still or just barely creep at idle on a smooth surface. Use an 8/4 or 9/4 prop depending on the engine used. Take the airplane to a large parking lot free of obstructions and practice taxiing for several more tanks full or until steering becomes natural. Learning right and left is the most difficult part of learning to fly. It is easy to become disoriented with the airplane moving towards you or at an angle.

If you can find an experienced pilot, let him test fly the BD-6 for you and adjust the trims for straight flight and a gentle climb under full power. Power is used to gain altitude and most flying is done at reduced power. Once the airplane is adjusted, the experienced pilot can turn the controls over to you and let you fly. If you have difficulties you can return the transmitter and have him fly the airplane back to where you want it. If no help is available, find a large area free of trees and brush and lots of room to land. If the grass is too high for the airplane to take off, hand launch the airplane straight ahead, into the wind at full power. The airplane should climb out as it moves away from you and will probably begin a slight turn to the left. If the turn is gradual and the airplane is climbing, don't do anything until the airplane is about 300 feet high, then reduce power. If the airplane banks sharply after take off, correct with opposite rudder just enough to straighten the flight path into a gradual turn. Allow the airplane to climb to 300 feet altitude and then adjust the rudder trim for straight flight after reducing power to just maintain altitude. If you are nervous at this point, adjust the trims so the airplane just circles overhead and you can relax and just watch for a couple of minutes. Maintain altitude by increasing or decreasing power. Make your first turns gradual by moving the control stick only about 1/2 inch to the right or left for about two seconds and then releasing. The airplane will dip a wing, turn some, and then return to level flight as you release the stick. If the rudder is held too long the nose of the airplane will drop and the airplane will quickly gain speed and go into a spiral dive. If you, at any time, get into trouble with a nose down, tight turn, **release the controls** — the airplane is designed to return to level flight on its own. If the airplane is too low and this happens you will have to give some "up" elevator to raise the nose more quickly after you release the rudder.

Keep the airplane overhead and upwind as much as possible and avoid letting the airplane drift downwind as most beginners have trouble maintaining a straight course on long upwind flights. As much as possible face the direction in which the airplane is flying to help you from becoming disoriented even if it means watching the airplane over your shoulder. If the airplane gets low and a crash seem imminent, cut the power completely, give up elevator if the nose is down and land. The damage from a rough, or unplanned, landing will usually be less than a full power crash while trying to fly the plane out of trouble. If the airplane just gets too low, increase the power until the airplane has reached a safe altitude again.

When the engine quits, the airplane is a little less responsive but still is easily controlled. Set up your landing approach so the airplane is flying into the wind when it lands. As the airplane approaches the ground, gradually give up elevator to flare or raise the nose for a smooth touch down. Check the airplane over, clean it up and do it again. Remember the two things that cause most beginners trouble are over-controlling the airplane and getting the airplane too far downwind and not being able to fly back. As you gain experience, you will be able to land with power on, do touch and go's and even acrobatics with your BD-6. It is a very easy airplane to fly. □

BD-6
Designed By: Fred Reese

TYPE AIRCRAFT
Stand-Off Scale/Trainer & Sport
WINGSPAN
54⅜ Inches
WING CHORD
7½ Inches
TOTAL WING AREA
408 Square Inches
WING LOCATION
High Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, Each Tip
2¾" Rud.-Elev. Version
1/2" on Aileron Version
O.A. FUSELAGE LENGTH
37¼" (incl. spinner)
RADIO COMPARTMENT AREA
(L) 7" X (W) 2¾" X (H) 6"
STABILIZER SPAN
17½ Inches
STABILIZER CHORD (incl. elev.)
4½" Average
STABILIZER AREA
79 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid Fuselage
VERTICAL FIN HEIGHT
7 Inches
VERTICAL FIN WIDTH (incl. rudder)
4¾ Inches (Average)
REC. ENGINE SIZE
.15-.35 Cu. In.
FUEL TANK SIZE
4 Ounces
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
3-4 Channels
CONTROL FUNCTIONS
Rudder, Elevator, Throttle
(Optional Ailerons)
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Ply and Balsa
Empennage	Balsa
Weight Ready-To-Fly	47 Oz.
Wing Loading	16.8 Oz./Sq. Ft.

From RCModeler Aug. 1975