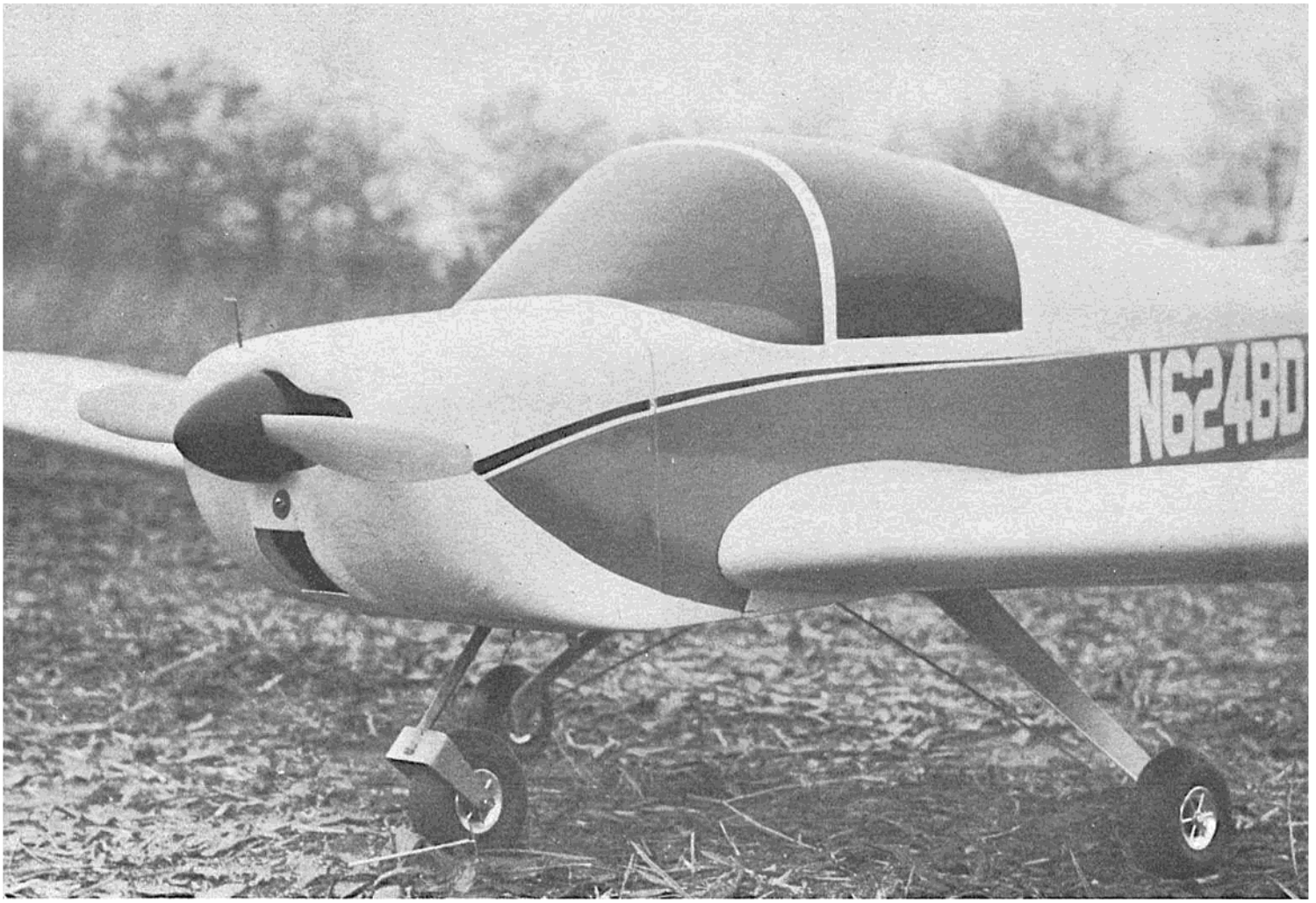

BD-1

By Nick Ziroli

RCM design contest
RCM
award of merit

For proportional or reeds, a scale model of Bede Aircraft Corporation's phenomenal $2500 entry in the light aircraft field.

The pretty young lass is almost smaller than Nick's outstanding RC version of Bede Aircraft Corporations BD-1.

THE small plane boom that was predicted and expected after World War II, just never came to pass. Not that there weren't numerous attempts to get the public in the air. The Piper "Skycycle" and the Lockheed "Little Dipper" were two attempts that, for one reason or another, never quite made it.

Now, twenty years later, it appears that the "boom" is on its way to becoming a reality. This could be made possible by pilot designer, James Bede of Bede Aircraft, Inc., and his amazing BD-1. I say "amazing" because this is an all metal, low wing, two place fully aerobatic plane with a price tag of $2,500! This is with a re-manufactured 65 H.P. engine. The lowest price plane currently on the market has a price of more than twice this amount.

Price is not the only amazing feature of the BD-1. As stated before it is fully aerobatic, stressed to 9 G's, upright or inverted. The wings are removable. A single 6½" tubular steel wing spar plugs into stubs protruding from the fuselage sides in a fashion that has been used on models for years. Wing span is 23½ feet.

Construction is almost completely metal. A honey comb structure is used in a good portion of the fuselage. Very few fasteners are used in construction, with parts glued together with epoxy, instead.

Sound familiar? Parts that aren't metal, are constructed of fiberglass. This includes engine, cowling, wing tips and fairing, tail plane tips, and tail cone. One unique use of fiberglass is the landing gear. It offers light weight and better shock absorbing capabilities than conventionally constructed gear.

Possibly the biggest factor in making the low price possible, is the small quantity of parts required. There are 385 parts in a plane, most of which are interchangeable, adding up to only 175 different parts. For instance, horizontal and vertical tail surfaces are identical and interchangeable!

Many options are planned to be made available. Engines up to 108 hp. can be supplied giving a top speed of 155 mph. The price will go up according to options desired, but even with every option available you won't be able to spend over $5,500.

Only the future will tell whether or not the BD-1 will become a reality.

The good appearance and straight-forward lines are what inspired me to build the BD-1 as a model. It cannot be claimed that this is an exact scale model but rather semi-scale, or scale-like. The drawings were scaled up from an available three-view. Areas and moments were juggled a bit in the interest of flying ability. Stabilizer area was increased as the scale area is quite small. A thicker airfoil was also used to aid low speed characteristics. This proved to be of great value on the very first flight since I am used to long tail moment arm designs, such as the Taurus, and their rearward center of gravities. The BD-1 was set up this way. After a short take off run it was in the air, mushing along and hanging on its prop. Excessive elevator travel and insufficient trim travel made it impossible to keep it in a proper flight altitude. There was little tendency to fall off on either wing even in the extremely nose high attitude. The first flight ended in a rough cross wind landing followed by a cartwheel.

The center of gravity was then moved forward to the 25 per cent point. Further flights went off with no problems at all. The appearance in the air is very realistic.

It is assumed that anyone who plans to build the BD-1 has some building and flying background. Not that it is difficult to build, but it is not for a beginner. With this in mind, we will not use up precious space with detailed construction details. Instead, only a general outline of building steps will be covered.

A fiberglass cowl was used on the original model. Due to the tail heavy condition and the fact that the BD-1 nose is so squarish it was decided to show a built up block nose on the plan. The fiberglass cowl is very light, which is fine, but not when you need weight in the nose!

You may have noticed the extensive use of 1/8" plywood in the fuselage. The large size of the formers made this necessary for strength. I use a furniture grade of plywood for low stress areas such as formers, and doublers. This is available at kitchen cabinet manufacturers and some lumber yards. It is quite inexpensive. High stress areas such as fuselage sides, firewall, dihedral braces and landing gear mount, should be Sig or another quality grade of plywood.

The front section of the fuselage is built first. Take care that this assembly is square and not twisted. Cement the 1/4" square longerons and uprights to 1/8" sheet sides. Epoxy these to the front section and join at the tail. Reinforce the joint with light fiberglass and resin. Rear formers are added next.

Build the stabilizer and elevator from light balsa, except for the 1/4" x 3/8" spar which should be hard. Make sure no warps are built in as they will be practically impossible to remove when completed. Join the elevators with 3/32" dia. wire horn assembly. Use nylon hinges. Cement stabilizer in place and plank rear deck. This is best done with 1/8" sheet strips tapered from 3/4" to 1/4".

The fin and rudder are cut from medium soft 1/4" sheet. A 1/4" x 3/4" hard balsa strip is used as a leading edge and brace. This goes through a hole cut in the planking. Glued to the rear side of F-7 it gives the fin ample strength.

Build the wing over the plan. Pin lower wing main spar down, and block up trailing edges of ribs. Cement remaining spars and leading edge in place. When dry, remove from board and sheet bottom with 3/32" medium balsa. Join wing panels with 1/8" plywood joiners. Use 2 1/2" of dihedral under each tip. Epoxy 3/8" diameter wing hold down dowels and trailing edge reinforcement in place. Install aileron bellcranks and pushrods. Block the wing panels up so that leading and trailing edges are parallel and then sheet the top surface. Cement the wing tips in place and carve to shape.

Cut aileron bottom to shape and glue ribs on it. Add front and top sheeting. Epoxy fiber horns and end ribs in place. Tips are glued on, and carved to shape. Install hinges and pushrod links to aileron horns.

Cement the 1/8" plywood fuselage fairing sides to bottom of wing. The bottom of the wing center section will extend below the sides. Sand this off even with the sides with rough sandpaper on a large block. Mount the aluminum landing gear to its 1/8" plywood mount with 4-40 screws and "T" nuts. Remove gear and epoxy mount in place on bottom of wing. Cover remaining area with 1/8" hard sheet balsa.

Due to the long springy landing gear legs, a 1/16" diameter wire brace was found necessary. This runs from one axle up to the center of the fuselage and down to the other axle.

Mount wing to fuselage with 1/4-20 nylon screws and "T" nuts. With wing in place on fuselage cement 1/8" thick fairing rib to the wing. Leave a 1/32" space between the rib and fuselage.

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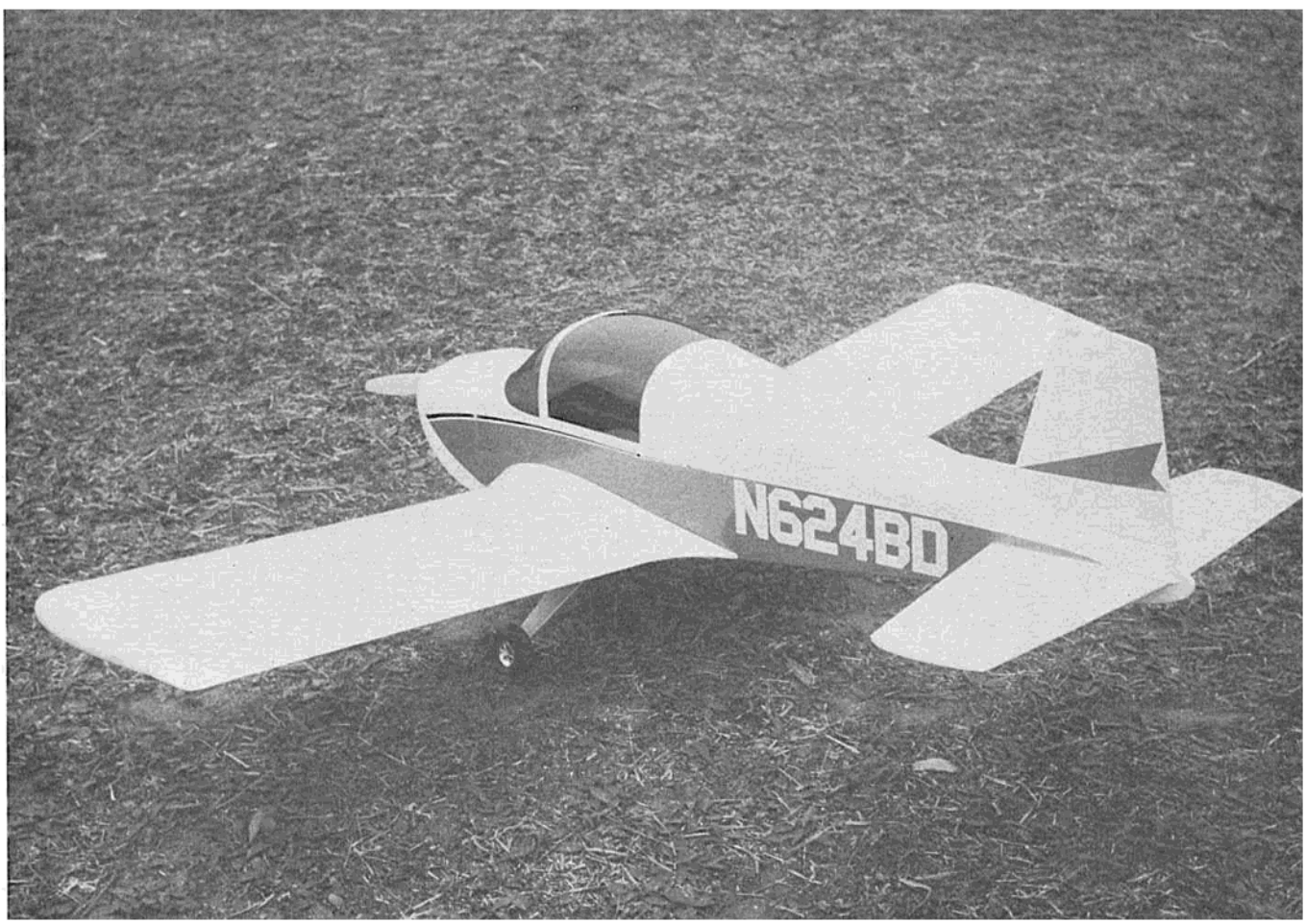
From any angle the red and white Bede is a popular favorite and sure to be a hit on your field. Canopy is blue molded plexiglass.



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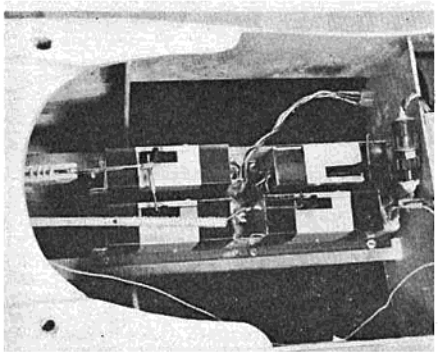

Add the trailing edge fillet and cover fairing with 1/16" sheet.

Use your favorite procedure for applying the finish. The original was covered all over with silkspan to strenghten the wood and fill the grain. Sprayed on Hobbypoxy gave a smooth glossy finish with a minimum of work. The full size prototype BD-1 was white all over with red and black trim, and the model followed this color scheme.

The canopy was molded of blue 1/16" thick plexiglass. This was made in two pieces. A form must be made of laminated pine blocks and carved to shape. The plexiglass is heated in a 400° oven and pulled over the form. Epoxy the canopy pieces in place holding with masking tape until dry. Cover the joints with strips of white plastic tape.

Forming and fitting the canopy is one of the biggest jobs in building the BD-1. A simpler, but less shapely canopy can be made of heavy celluloid. One piece is wrapped over the top and one around the front for the windshield. This does not have the nice lines of the molded canopy, but would serve just as well.

Control pushrods and servos are now installed. I prefer a servo board mounted on rails. This is easily transferred from one plane to another. The servos could also be mounted directly to the plywood sides. Keep all equipment as far forward as possible, to concentrate weight in the nose where it is needed.

Since all my flying is done from grass fields I do not use a steerable nose wheel or brakes. I have found them unnecessary, and the steering hard on servos. They, however, may be installed as in any other multi plane.

Flying the BD-1 is no different than any other low wing multi, though no serious threat in class III competition, the attention it gets on the field makes the BD-1 a very rewarding project.