The Rose-a-Roc 12

Art Rose's Helicopter Duration Model

by Craig Beyers

Art Rose is well known indeed— especially on the East Coast— for his well-designed (if somewhat different) rockets. He is one of the few individuals who examines the rules, considers the physics, and then *engineers* his models in the strictest sense of the word. The *Rose-a-Roc 12* is one of Art's latest designs. Art did something no one has done before: he sent the model instead of a plan! Having the model to draft from was a novel experience and had its positive moments.

Members of the PULSAR Section have scaled *Rose-a-Rocs* up and down, using rotors of every size from 6" (152.4mm) to 24" (610mm). Typical times for various models have ranged between one and two minutes with A8-3's, and four to five minutes with C6-3's.

Two factors make the *Rose-a-Roc 12* a significant departure from the legendary *Rotaroc*, George Gassaway's well-known and well-copied helicopter design [3/80 *Rocketeer*]. First, the rotors fold span-wise, reducing the chord and presenting a smaller surface to the boost airflow. Second, the rotors are hinged below and within the "drag shadow" of the nose cone, keeping them out of the direct air path. These factors combine to reduce drag and to let the *Rose-a-Roc* boost higher than other designs. Of course, the higher you go, the farther you have to fall— and that's the competitive edge in this duration event.

The plans show a model suitable for A through C engines, according to Art. Since this model is stable with C's, smaller fins are practical for A and B classes. Make three identical fins from either 3/32" hard balsa or 1/32" plywood. (The plywood is neat— it buzzes happily on the way up!) Make sure you attach them well.

Punch holes in the upper end of the BT-20 with a hole punch before you install the balsa block and main shaft, because you won't be able to do so later! Coat the inside of the body tube with epoxy near the exhaust holes to reduce damage during ejection and improve durability. Put the engine block in, allowing the engine to stick out just about 1/4". An engine clip adds weight— don't install one. Just be sure the engine is *tight* before you fly.

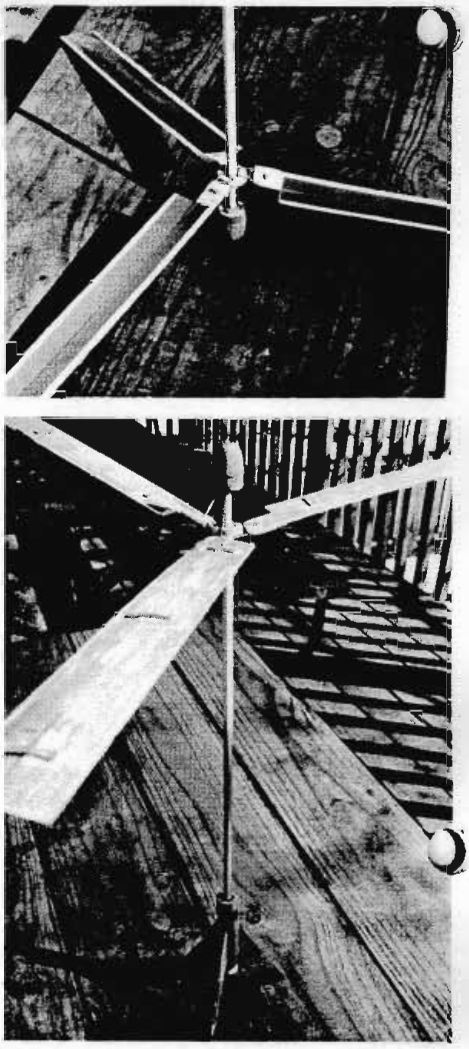
The rotors are made from three pieces of 1/16" or 3/32" balsa. Two form the lifting portion and a small piece reinforces the rotors at the rotor head. This small piece is attached when the hinges are attached, so don't bother with it now. Note the grain direction of the rotor blades, as it is very important. Sand the airfoil into each rotor before you cut the rotors in half. Wax the inside edges so that when you attach the rubber bands in the next step you don't glue the halves back together! Put *Trim Monokote* on the bottom of each rotor before attaching the 3/16" *Sig* rubber pieces to the tops with *Hot Stuff*. Art used red *Trim Monokote* for visibility, and colored the top of each rotor with orange marker to make the model easier to find on the ground.

Instead of the heavy plastic *Klett* hinges, Art uses two sizes of galvanized iron wire available at his hardware store. The rotor-mounted, "U-shaped" hinges are 22-gauge wire, epoxied or *Hot Stuff*'ed to each rotor. The small piece of balsa is mounted, cross-grained to the rotor, at the end of each rotor blade. The plan is your best reference for this assembly. With a jeweler's drill set or pin vise, drill small holes into the hardwood hinge disk and thread the 28-gauge wire through the holes to "sew" the hinges on. Put two loops around each hinge, as shown in the plan. This is obviously the most difficult assembly on the model, so take your time and do it correctly. When all the rotors and hinges are attached to the hinge disk, set the whole assembly aside.

You can use either a 3/16" dowel or 3/16" square stock for the shaft. If you use the square stock, you must round down the upper end to fit the hinge disk and nose cone. Art used a drill gauge to round the square stock, pushing the wood through successively smaller holes until it fit the hinge disk. Glue the entire rotor assembly into place with the hinges on the *bottom*. Carefully drill a hole into the base of the nose cone and glue the shaft into it. Glue the balsa block to the bottom of the main shaft at this time.

(The plan shows a "freewheeling" option, published by "Captain Video" in NIRA's Section newsletter, *The Leading Edge*. Art has never built this himself, but thinks that one of his club members may have. It works this way: rather than gluing the hinge disk and nose cone to the main shaft, the modeler attaches them to a long piece of 3/16" launch lug. This allows the assembly, which is held in place by additional 3/16" lugs above and below, to rotate around the main shaft. Everything else is essentially the same.)

Slits in the bottom of the nose cone and in the rotors are used to attach the actuating rubber bands. Put the 1/8" *Sig* rubber about 3/16" deep into the nose cone and glue each piece in place. Pull the rubber through the holes in the rotors and adjust the rubber for equal tension in each blade *before* gluing it in place. (According to Art, he adjusts the rubber "to about E-flat above high C." Got that?) Adjust the dihedral of the rotor blades so that the tips are even with the top of the nose cone. Make sure you hold the rotor tightly between your fingers at the place where the rubber goes through. Adjust the rotor for a slight forward pitch at the same time as you are setting the dihedral.



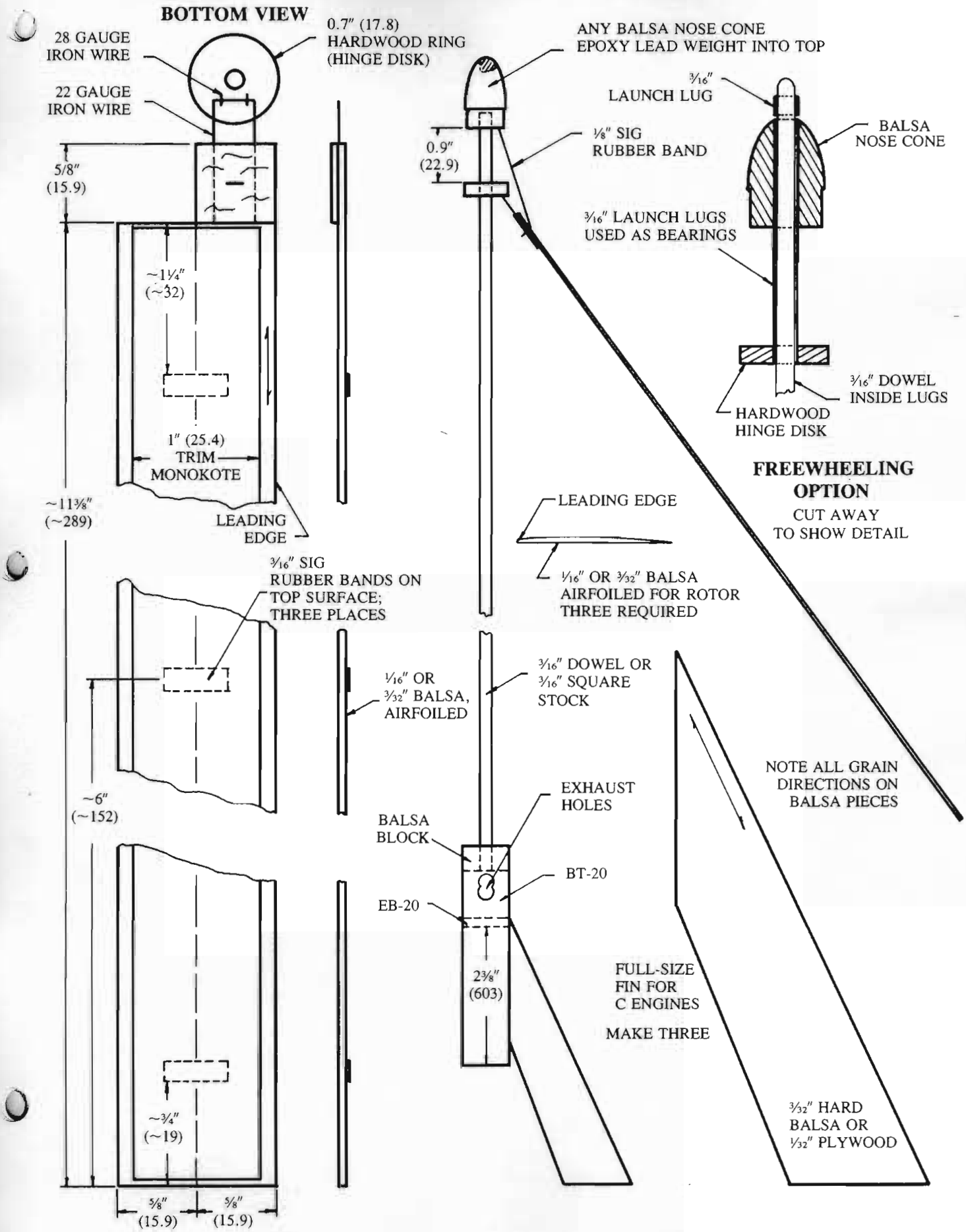
These photos show good detail of both sides of the rotors, as well as an overall view of the finished bird. (Photos by Craig Beyers)

When you attach the body/fin assembly to the shaft/rotor assembly, align the fins with the rotors. Glue the balsa block at the end of the main shaft into the body tube with epoxy or *Titebond* to ensure that it stays attached. Paint the lower section a bright color for visibility.

There is no launch lug, and, unlike the *Rotaroc*, the *Rose-a-Roc 12* cannot be flown from a standard launch rod. Art uses a tower instead.

To prep the model, fold each rotor in half and pull it down against the shaft. Wrap 2½ to three turns of nylon thread (CMR shroud line is perfect) around the rotors and through the exhaust holes. Tape the thread to the body tube— *don't* tie knots! Insert your engine with plenty of tape around the bottom to prevent ejection. Set it in the tower and you're ready to fly.

Whichever version of this model you attempt, build it slowly and carefully. The *Rose-a-Roc 12* is a difficult model to build, but its performance justifies all of your effort. Try one and you'll see!


BOTTOM VIEW
28 GAUGE IRON WIRE
22 GAUGE IRON WIRE
0.7" (17.8) HARDWOOD RING (HINGE DISK)
5/8" (15.9)
~1¼" (~32)
1" (25.4) TRIM MONOKOTE
~11⅜" (~289)
LEADING EDGE
3/16" SIG RUBBER BANDS ON TOP SURFACE; THREE PLACES
~6" (~152)
~¾" (~19)
⅝" (15.9)
⅝" (15.9)
ANY BALSA NOSE CONE EPOXY LEAD WEIGHT INTO TOP
0.9" (22.9)
⅛" SIG RUBBER BAND
1/16" OR 3/32" BALSA, AIRFOILED
3/16" DOWEL OR 3/16" SQUARE STOCK
BALSA BLOCK
EXHAUST HOLES
BT-20
EB-20
2⅜" (603)
3/16" LAUNCH LUG
BALSA NOSE CONE
3/16" LAUNCH LUGS USED AS BEARINGS
3/16" DOWEL INSIDE LUGS
HARDWOOD HINGE DISK
FREEWHEELING OPTION
CUT AWAY TO SHOW DETAIL
LEADING EDGE
1/16" OR 3/32" BALSA AIRFOILED FOR ROTOR THREE REQUIRED
NOTE ALL GRAIN DIRECTIONS ON BALSA PIECES
FULL-SIZE FIN FOR C ENGINES
MAKE THREE
3/32" HARD BALSA OR 1/32" PLYWOOD