Whirling Rotors Lift This Gyro-Kite

LOOK, MA, NO WINGS! Revolving blades alone hoist this frisky model on the breeze. Inspired by Igor Bensen's man-carrying gyro-kite (right), it has two contra-rotating rotors for stability.

Here is the liveliest aircraft-on-a-string you have ever flown. It's a cinch to put it together from balsa, wire and cardboard.

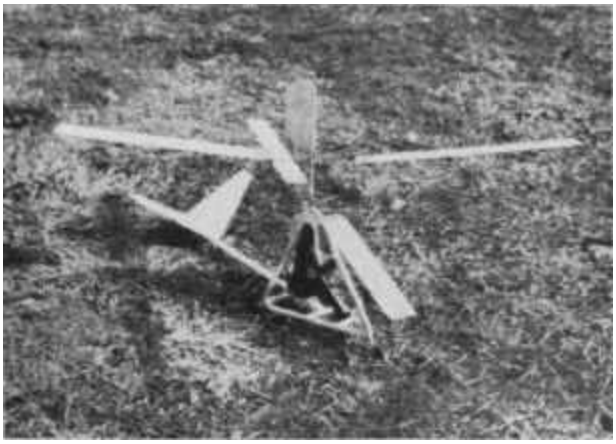
By Roy L. Clough

MUCH more fun to fly than an ordinary kite, this gyro-glider gets up in a moderate breeze and rides steadily aloft, rotors plopping about like a helicopter's.

Instead of a single tilting rotor like Igor Bensen's man-carrying machine (PSM, July '54, p. 98), which requires a pilot on board, this model has two semirigid coaxial rotors. These turn in opposite directions, keeping gyroscopic and lift forces in balance. A mast-mounted fin prevents sudden wind shifts from tipping the model over, while a boom-mounted tail takes over the pilot's function of keeping the rotors at the correct angle to the wind.

Build cabin first. Cement 1/4"-square balsa sticks together as shown in the drawing on page 199 to make the cabin, doubling them for the front strut and rear cross member. Reinforce the corners with gussets of 1/8" sheet balsa. The apex through which the rotor shaft passes may be built up of

IT SPINS AS IT FLIES. There's action aplenty with both rotors whirling rapidly when the kite is up. Gusts will drop it a few feet or cause some rolling, but the craft regains flying trim so long as it has enough altitude.



TOO SKINNY TO FLY? There doesn't seem to be enough wing area for the breeze to lift it, but when the rotors start spinning the model is eager to climb. Landings are best made by hand: kite is unstable close to ground.

three gussets and a cap, or **carved** from a bit of hard balsa.

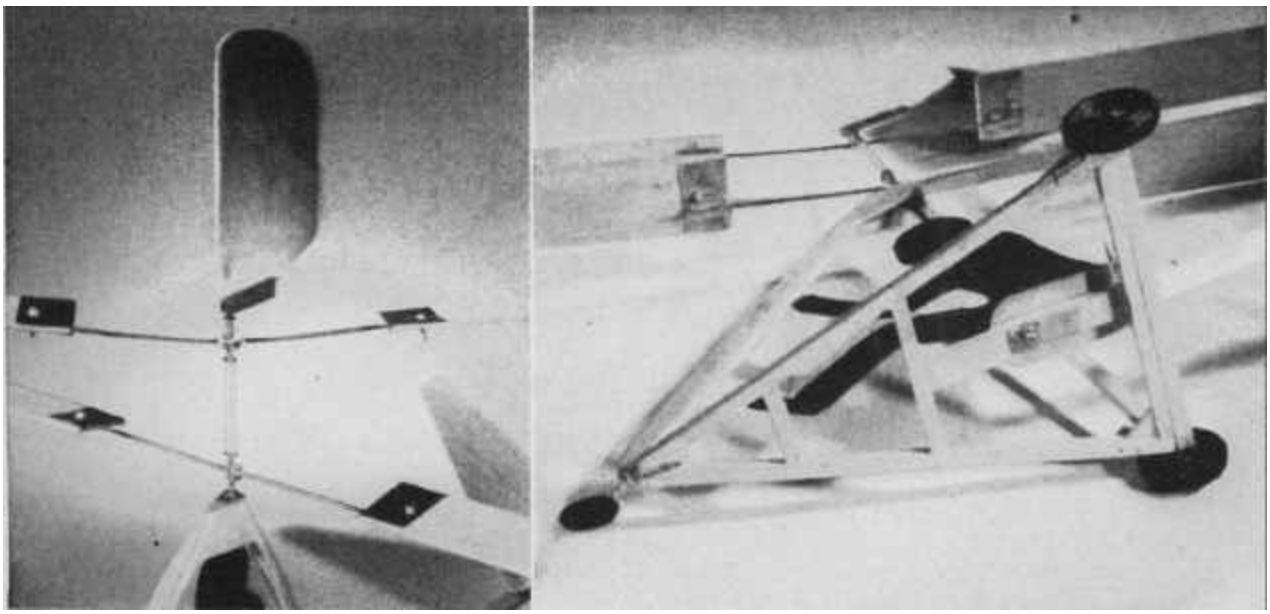
The tail boom, also two 1/4"-square members, is cemented on top of the rear crosspiece but behind the middle one. This gives it an upward slope. Cut the tail out of 1/16" sheet as shown, score it down the center, break and re-cement to give a dihedral of 3" under each tip. Cement it to the boom with a wedge between, as shown.

Wheels may be from a model airplane or a toy, and of course need not turn. Cut out the pilot and his seat from stiff cardboard. Cement the figure slightly off center to let the rotor shaft pass.

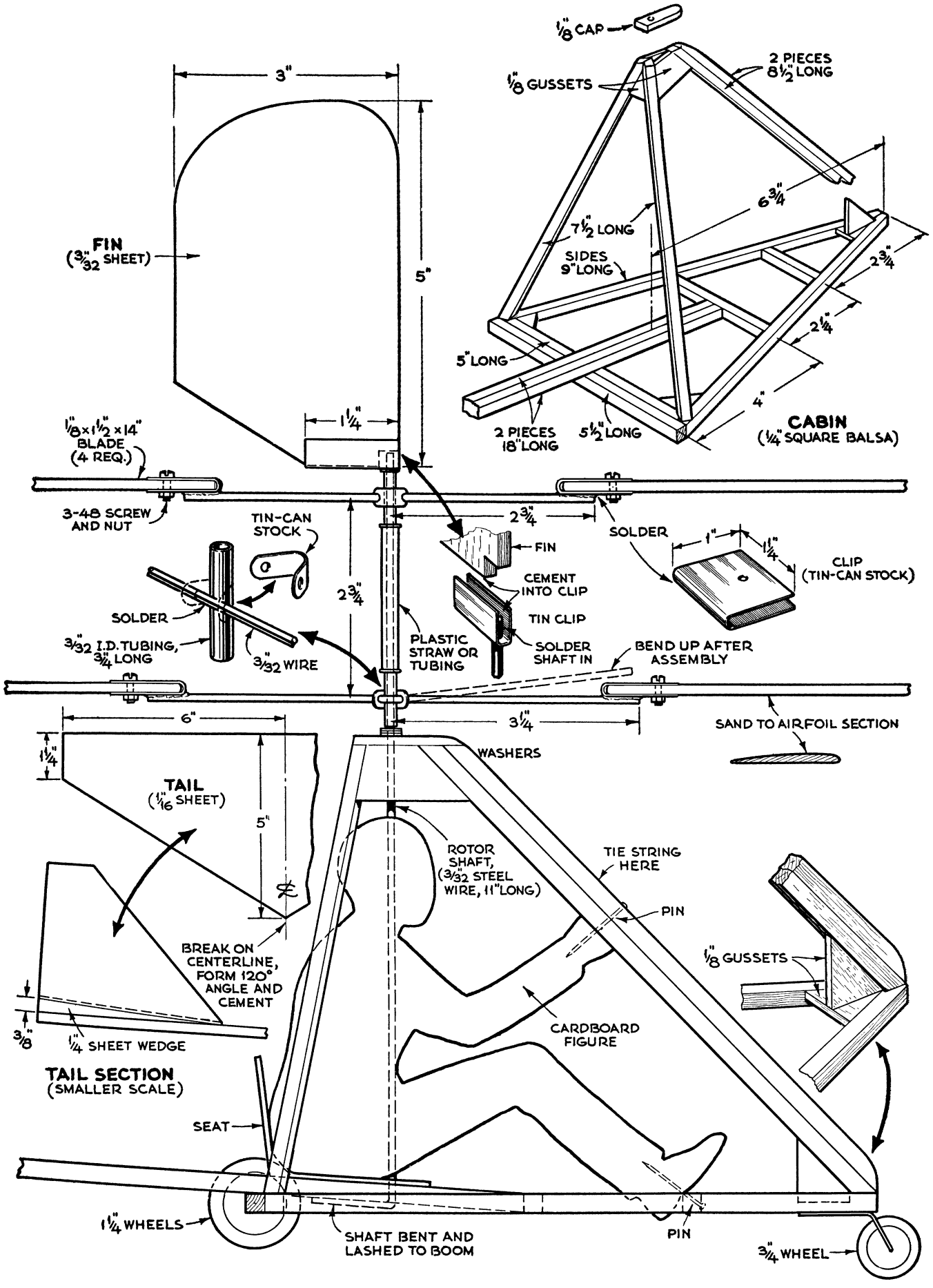
Making the rotors. Secure the rotor shaft from turning either by bending the lower end over and lashing it to the boom, or by soldering it to a bit of tin plate clipped around the boom as shown in the photo.

Make the rotor mounts from 3/4" lengths of brass tubing, tin-plate clips, and 3/32" steel wire as in the drawing. Compensate for the off-center mounting by bending the wire slightly. Use acid-core solder for a good bond with the steel, but wash the joints afterward with baking-soda solution. Solder tin-plate clips to the rotor mounts at a right-hand pitch on one rotor and a left-hand on the other.

Use small washers and a piece of plastic tubing between the hubs to insure free turning. Solder a washer above the lower



ROTOR SHAFT is stationary, with metal clip for fin soldered to top. Rotors must spin freely. Upper wire mount of rotor is bent to form a dihedral, with about 4½" between rotor tips. Bottom view of cabin (right, above) shows lower shaft end fixed against rotation. Tin-can clip with a hole in it is crimped around tail boom. Shaft, pushed through hole, is soldered to clip. Rear wheels are pinned to back frame member; front one is mounted in wire yoke lashed to frame and cemented. Wheels do not turn.


1/8" CAP
2 PIECES 8 1/2" LONG
1/8" GUSSETS
3"
FIN (3/32" SHEET)
5"
7 1/2" LONG
SIDES 9" LONG
6 3/4"
2 3/4"
2 1/4"
5" LONG
4"
2 PIECES 18" LONG
5 1/2" LONG
CABIN (1/4" SQUARE BALSA)
1 1/4"
1/8"x1 1/2"x14" BLADE (4 REQ.)
3-48 SCREW AND NUT
TIN-CAN STOCK
2 3/4"
FIN
SOLDER
1"
1 1/4"
CLIP (TIN-CAN STOCK)
CEMENT INTO CLIP
TIN CLIP
SOLDER
3/32" I.D. TUBING, 3 1/4" LONG
3/32" WIRE
PLASTIC STRAW OR TUBING
SHAFT IN
BEND UP AFTER ASSEMBLY
6"
3 1/4"
SAND TO AIRFOIL SECTION
1 1/4"
WASHERS
TAIL (1/16" SHEET)
5"
ROTOR SHAFT, (3/32" STEEL WIRE, 11" LONG)
TIE STRING HERE
PIN
1/8" GUSSETS
BREAK ON CENTERLINE, FORM 120° ANGLE AND CEMENT
CARDBOARD FIGURE
3/8"
1/4" SHEET WEDGE
TAIL SECTION (SMALLER SCALE)
SEAT
1 1/4" WHEELS
SHAFT BENT AND LASHED TO BOOM
PIN
3/4" WHEEL

rotor hub to the shaft so that the weight of the top rotor rests on the washer, not on the lower hub. Make four blades of 1/8" balsa, sanding them to a uniform airfoil section. Bolt them into the clips, and bend up the upper blade mounts to separate the tips of the two rotors by 4½" or 5". This prevents blade clash and minimizes interference due to rotor wash.

Do not try to simplify the rotors by using a solid wooden hub. The spring wire mounts take the place of drag dampers in the real thing; without them, the blades would shatter in anything more than a mild breeze.

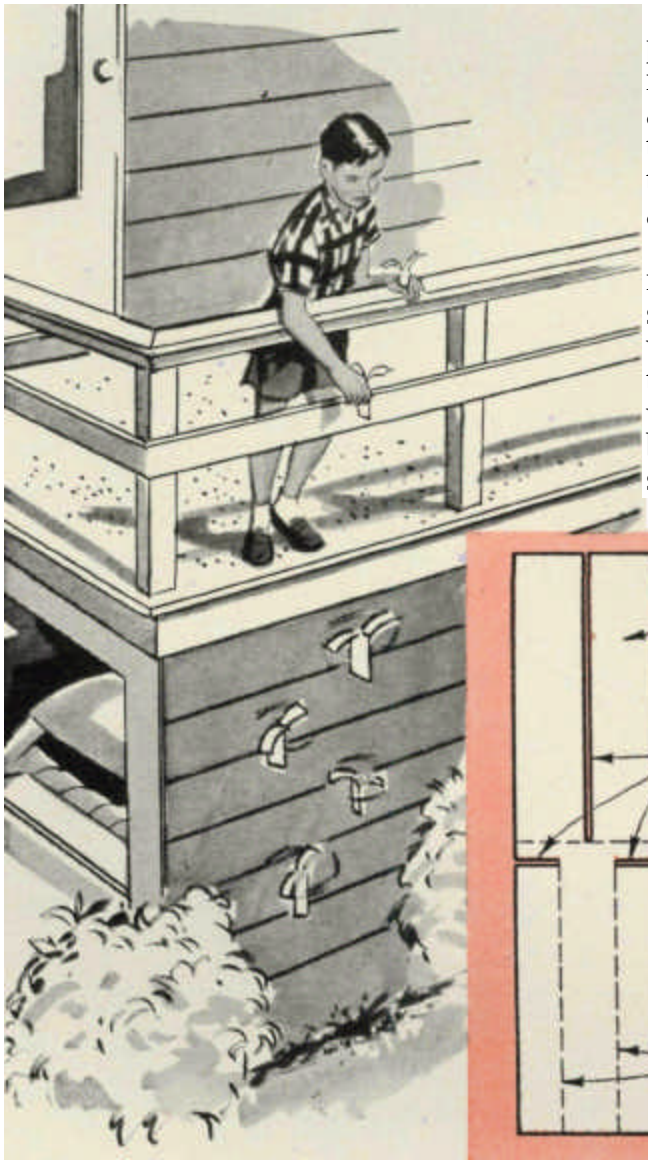
The fin clip at the top of the shaft retains the rotors. Be sure it is aligned with the tail boom; then cement the fin into place and squeeze the clip around it.

How to fly it. Tie strong kite string to the front cabin strut just above the pilot's arm. In a moderate breeze, hold the model at about 45° to the wind and let the rotors come up to speed. When both are spinning as fast as they will go, release the model and quickly pay out a few feet of line to let it reach its own equilibrium. If everything is right it should continue to rise, with the rotors spinning freely, until it reaches its ceiling. This is determined by the weight of the string, the wind velocity and where you tie the bridle.

Should the model tend to roll over, first check the alignment of the tail and fin. If this is correct, one rotor is probably turning faster than the other.

Twist a bit more pitch into the slow rotor by bending the blade clips gently. For top lifting efficiency, however, keep the pitch of both rotors as small as is consistent with fairly high turning speed. END

Twirlichutes Are Fun to Sail, Take Only 30 Seconds to Make



WHAT'S a twirlichute? It's a spinning parachute, made of paper, that twirls merrily as it glides to a soft landing or soars aloft on a breeze. Maple seeds do the same thing every spring, but with these paper toys you, plus all the kids who'll gather around you, can have fun at any season.

Use ordinary pad or typewriter paper, not card or stiff stock. Slit and fold a strip three or four times as long as it is wide. Crease the wing roots lightly, letting the wings droop in opposite directions. They work best if floppy, not stiff. Weight the bottom with a small paper clip or two staples.-O. *P. Ortberry, NYC.*