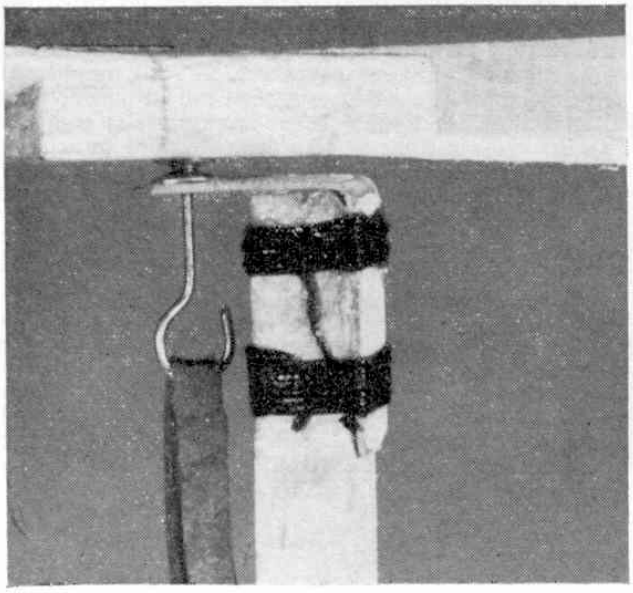
# MINI-COPTER

**A 13¾ in. long rubber powered helicopter of simple balsa construction. This model is not a novelty, it really does fly and hover just like a real 'copter. Full-size plans available from Meccano Magazine office, price 2s. 6d. each.**

WORKING MODEL helicopters are unusual—and often tricky—but in Mini Copter we have adopted a very simple, basic layout, avoiding all the complications of flapping rotor hinges, torque compensations and other bits of mechanical trickery which are usually necessary for stability. Also we have kept the construction simple.

One most important point, is to choose your grade of balsa as detailed on the plan, using *very light* $\frac{1}{16}$ in. sheet, and a light grade for the $\frac{1}{4} \times \frac{1}{8}$ in. balsa strip. A successful performance with Mini Copter depends a lot on keeping weight down to a minimum.

Start by building the basic frame which consists of the motor stick and the "triangle" formed by the $\frac{1}{4} \times \frac{1}{8}$ strips. This should be built flat over the plan. The plan is reproduced exactly one half size, so you need to scale the side view up twice (reproduced) size, or obtain a full size plan **(available from Meccano Magazine office, 13-35 Bridge Street, Hemel Hempstead, Herts.; price 2s. 6d.).**



When this frame has set, remove from the plan and cover one side only with lightweight tissue. Do not water shrink or dope this tissue. Just get it taut and free from wrinkles when you apply it.

Now cut the two sides, pieces A, B, C and D—all from the very light $\frac{1}{16}$ in. sheet you have selected; and two pieces of $\frac{1}{4} \times \frac{1}{8}$ strip $3\frac{1}{2}$ in. long. Mark the position of the sides on the motor stick, cement the $\frac{1}{4} \times \frac{1}{8}$ strips either side of the motor stick and cement the sides onto these strips. Hold in place with pins, as necessary, and then cement in pieces A, B, C and D between the sides to complete the fuselage assembly.

Cut the top bearing from 20 gauge dural or similar hard, light metal (springy brass strip would do). Pierce this to take the prop. shaft and then bend at right angles. Bind in place to the top end of the motor stick and then coat the binding with cement.

Bend the skid mount from 22 gauge wire to the shape shown and bind and cement to the bottom of the motor stick. Cut the two skids from $\frac{1}{4} \times \frac{1}{8}$ strip and bind to the wire mount.

The rotor hub is a $1\frac{1}{4}$ in. length of $\frac{1}{2} \times \frac{1}{4}$ balsa. File or saw-cut slots at an angle in each end, as shown in the detail sketch. Open out these slots to $\frac{1}{16}$ in., if necessary, with a small flat file. Pierce a hole through the centre of the hub.

Cut two rotor blades to the shape shown from $\frac{1}{16}$ in. sheet balsa and cement into the slots in each end of the hub. This completes the rotor. The rotor is mounted in position on the prop. shaft with a bead between the hub and the bearing. Bend over the top of the prop. shaft and turn back into the hub to secure. Coat with a skin of cement to hold in place.

Take a 1 in. length of $\frac{3}{32}$ hardwood dowel. Pierce a $\frac{1}{16}$ in. hole at an angle near the bottom of the motor stick and cement the dowel into this hole. The dowel anchors one end of the rubber motor.

To finish the fuselage, sand down the sides lightly, if necessary and add the acetate sheet "glazing"—one piece on each side and one between parts A and D at the front. The fuselage is open at the top and bottom near the motor stick to pass the rubber motor. Finally, cut a 2 in. circle from acetate sheet and cement to the end of the tail strut.

To fly properly the model needs to balance at the motor stick position. This may mean having to add a little ballast weight to the front, but you can check this when flight testing.

A single loop of $\frac{1}{4}$ in. rubber will be adequate power. Wind on about a hundred turns and see if the model will lift and rise. If not, try more turns—but most probably you will need a little more power. If the model rises and tilts backwards, you will need to add some ballast weight to the nose. If the model tips forward, you may need a little weight at the rear end to balance. Slight out-of-balance will not matter very much.

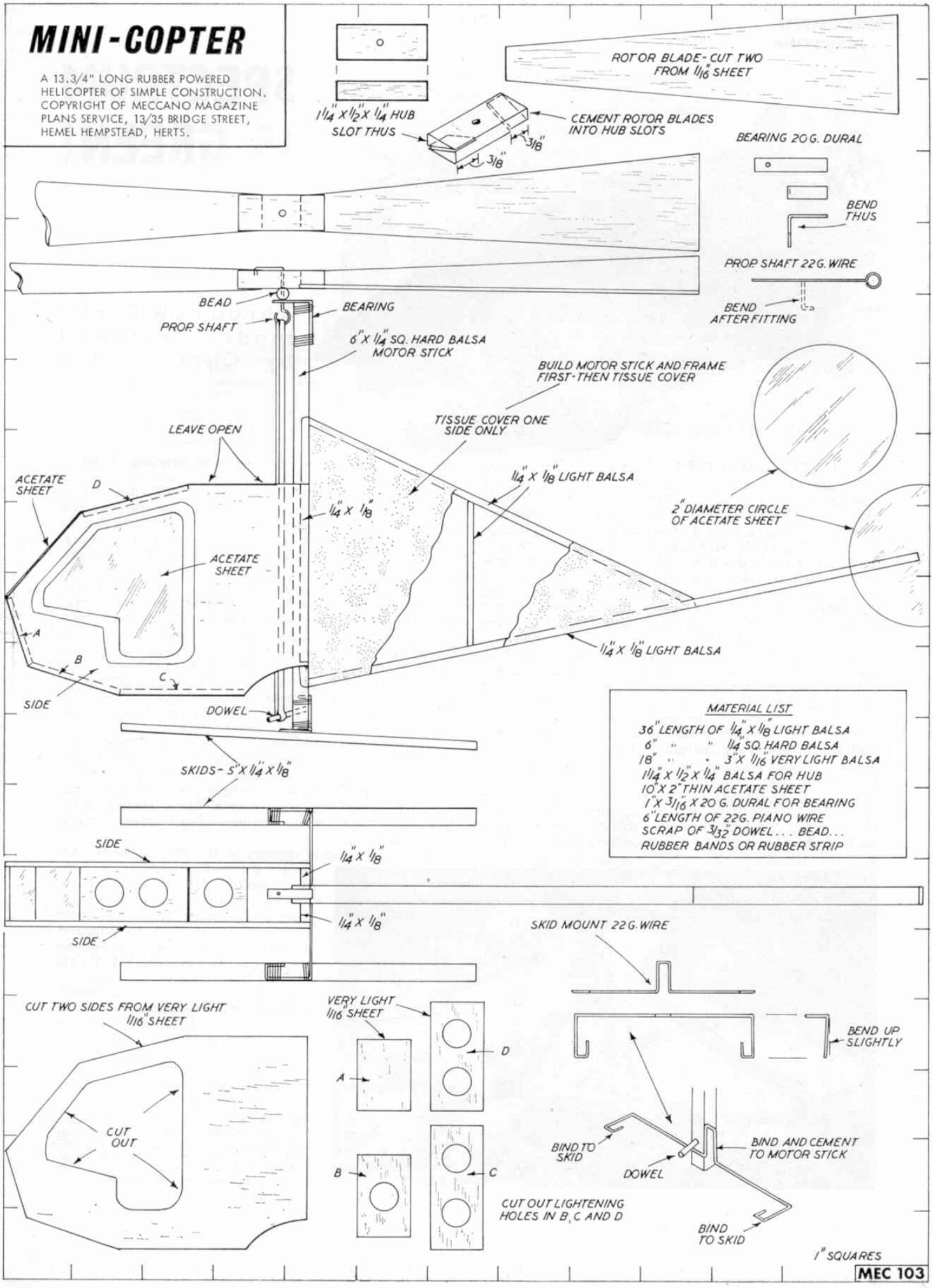
The ideal is to try to fly on the *minimum* power necessary—i.e., the smallest section of rubber for the motor. This will not only give you the longest flights, but almost true hovering for part of the power run. It will also reduce the rate at which the fuselage rotates in the opposite direction to the rotor. A drop of thin oil on the bead and bearing will also help reduce rotation of the fuselage by reducing friction. Another way of reducing the rate of rotation of the fuselage is to cut down the length of the rotors (which is another way of adjusting the model to fly on a relatively weak motor).

Mini Copter is best flown indoors—or outdoors only in dead still air. With the best size of motor—which you can only determine by experiment—you can get quite reasonably long semi-hovering flights between floor and ceiling level.

**The motor stick top end at left clearly illustrates the alloy bearing bracket, cup washer bearing, and propeller shaft that passes through and back into the motor blade hub.**

# MINI-COPTER

A 13.3/4" LONG RUBBER POWERED HELICOPTER OF SIMPLE CONSTRUCTION. COPYRIGHT OF MECCANO MAGAZINE PLANS SERVICE, 13/35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTS.




MATERIAL LIST

36" LENGTH OF 1/4" X 1/8" LIGHT BALSA
6" " " 1/4" SQ. HARD BALSA
18" " " 3" X 1/16" VERY LIGHT BALSA
1 1/4" X 1/2" X 1/4" BALSA FOR HUB
10" X 2" THIN ACETATE SHEET
1" X 3/16" X 20 G. DURAL FOR BEARING
6" LENGTH OF 22 G. PIANO WIRE
SCRAP OF 3/32" DOWEL . . . BEAD . . .
RUBBER BANDS OR RUBBER STRIP