



**The laws of Nature
decree that hot air rises.
Why not make some, then
harness it in a tissue
envelope called ...**

MIDAIR

**... a three-foot diameter,
24 cubic foot capacity
hot air balloon
designed by S. T. MIDSON**

Up, Up and Away! The designer, having felt the 'model' become first weightless, then lighter-than-air, as the methylated spirit burns in its chimney, releases his brightly decorated MIDAIR to the elements.

colours available can be used to advantage. The 12 panels are made from 6 sheets of tissue each formed by joining two standard sheets along the 20" length, to give a 59½" length by 20" wide. Tissue paste or PVA glue should be used for the envelope - the plastic spouts from the small size PVA glue containers are very handy when gluing seams.

Fold one sheet in half, lengthways, and mark out one

STAGE 1. Make up six tissue panels, each formed by joining two standard sheets along their 20 in. lengths. Having folded and marked out the top panel, cut out as shown.

STAGE 2. Lay the first panel flat on the table, then run a thin line of glue down the right-hand curved edge. Use of different coloured tissue aids appearance greatly.

STAGE 3. Gluing the second seam. Note how the second panel has been folded, the glue line, and the newspaper separating the first seam. Repeat until all twelve panels have been glued.



panel to use as a pattern. A free-hand smooth curve is adequate between the marked points, but at no time must the panel go outside the 30° inclusive angle at the point, or a pumpkin-shaped balloon will result. Fold the remaining sheets and pin the pattern to them, making sure that they are flat and all pins are in the waste material. Cut out carefully to ensure all panels are the same shape.

Lay the first panel flat on a table, then run a thin line of glue down the right-hand curved edge. Place the next panel on top of it and press the edge on to the glue. Fold this panel in half along its centre line, so that the left hand edge lies above the glued seam then run the next line of glue along the new right-hand side curved edge and repeat until all 12 panels have been glued into a concertina-like shape. The left hand edges of the top and bottom panels should then be glued to complete the envelope.

If you are heavy-handed with the glue it is likely that sufficient will have soaked through the tissue to fix adjacent seams together; in order to prevent this from happening some newspaper should be inserted to keep the layers apart.

Cut the last 1" of the point off, and when the glued seams are dry, open the balloon up and glue on a 3" diameter disc of tissue to make a neat cap. The impatient will find that a hair dryer can be used to inflate the envelope at this stage to give a taste of things to come! For neatness the envelope can be turned inside out, but the outside seams make very useful grips when handling and it is recommended to leave them as made.

Make the opening framework from 1/8" square balsa, cut to length to match the panel, and glue to the edge of the tissue. Cut and add the angled joiners when dry - for this job a fast drying cement is best. All care must be taken to prevent the flame reaching the envelope, and the burner is enclosed in an aluminium foil chimney for this reason. Since this bears no load, cooking foil with folded seams is sufficient. With the blank flat on the table, start by folding the longitudinal seams as shown on the drawing, then press flat to give sharp edges. To make it into a cylinder fold in half to bring the ends together and fold over as at the edge. Open up and shape into a cylinder, then pierce four holes at 90° for the support wire in the middle fold.

The burner is made from a deep-drawn aluminium canister 1¼" to 2" diameter and about 3" long which can be obtained from obliging chemists as old pill boxes. The only important dimensions are shown on the drawing - the position of the lowest hole being critical in controlling the burning time, the author's being set for a 1½ minute burn. A trial burn before installation in the balloon is recommended; if too long, file the hole lower to reduce the volume of fuel. Two pieces of 18 swg. soft steel wire 18" long should be used to hold the burner and chimney inside the opening framework. Start by twisting the two together at the centre and forming the loop for the burner hook - it should then be bent as shown on the drawing before easing it into the burner chimney. For this it must be squashed-up to fit inside the chimney, then fed out through the holes in the middle fold. After assembly both the support wire and chimney should be bent to the correct shape, before hooking into the opening framework.

For the purist the basket could be made from scale size cane, but the author's is made from a simple balsa framework covered with thin paper. Inside the basket a lining of aluminium foil, as shown on the drawing, is fitted to prevent meths spilled from the burner from igniting the basket.

In order to give more clearance for filling and lighting the burner it is found best to string the basket direct to the

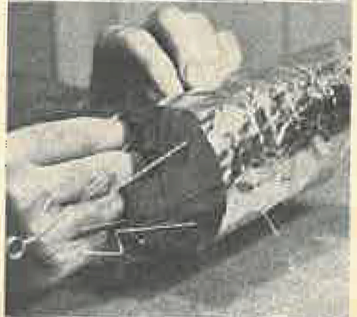
STAGE 4. Cut off the last 1 in. at the tip and when the cement is dry, open up the balloon and add the 3 in. diameter tissue disc cap. A hair dryer will show an impression of the finished article.



STAGE 5. The burner chimney is made from aluminium foil - here the final seam is made with the aid of a knife - all earlier seams were made similarly.

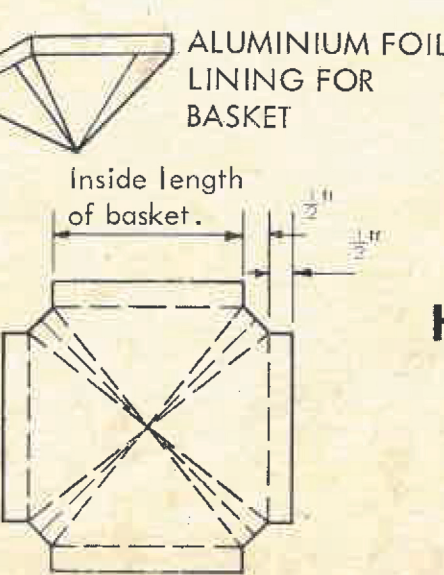
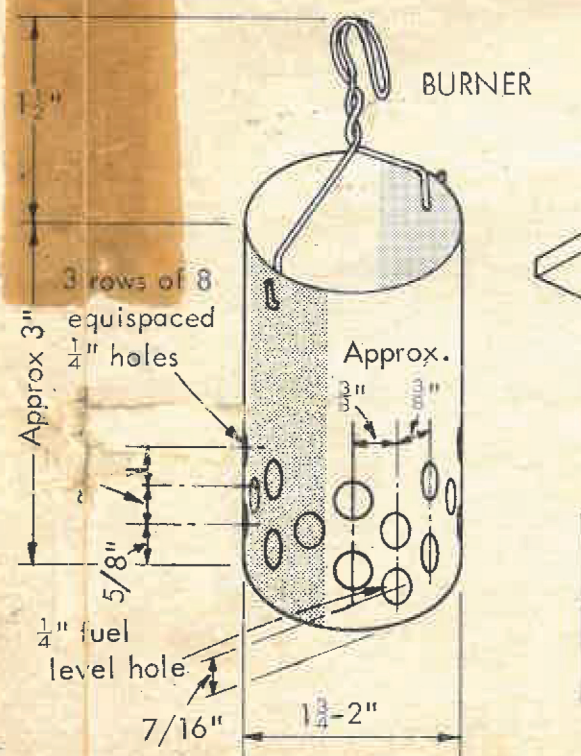
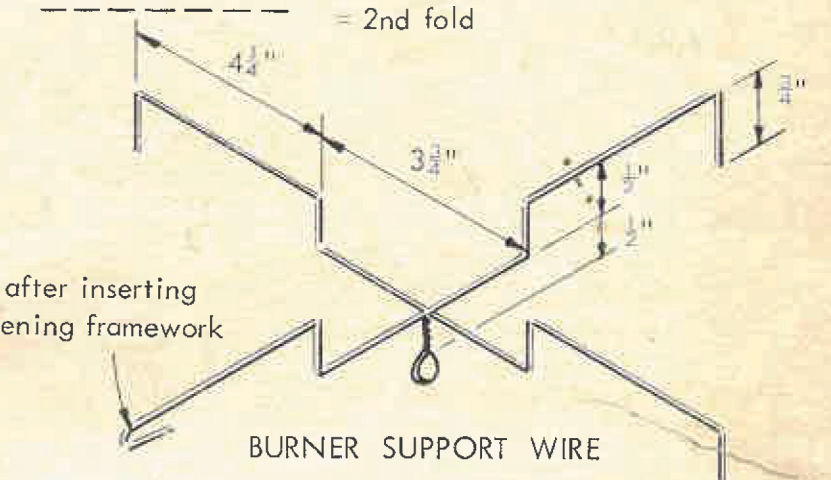
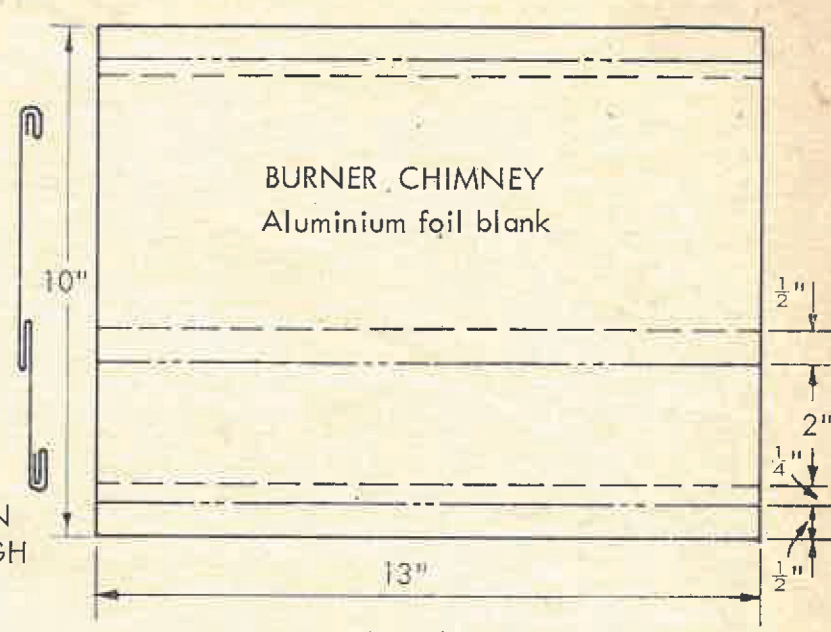
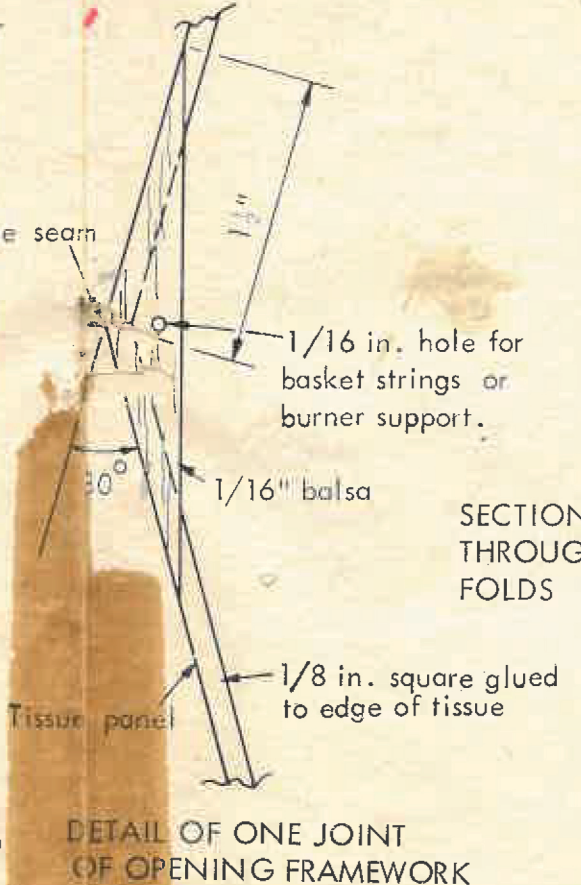
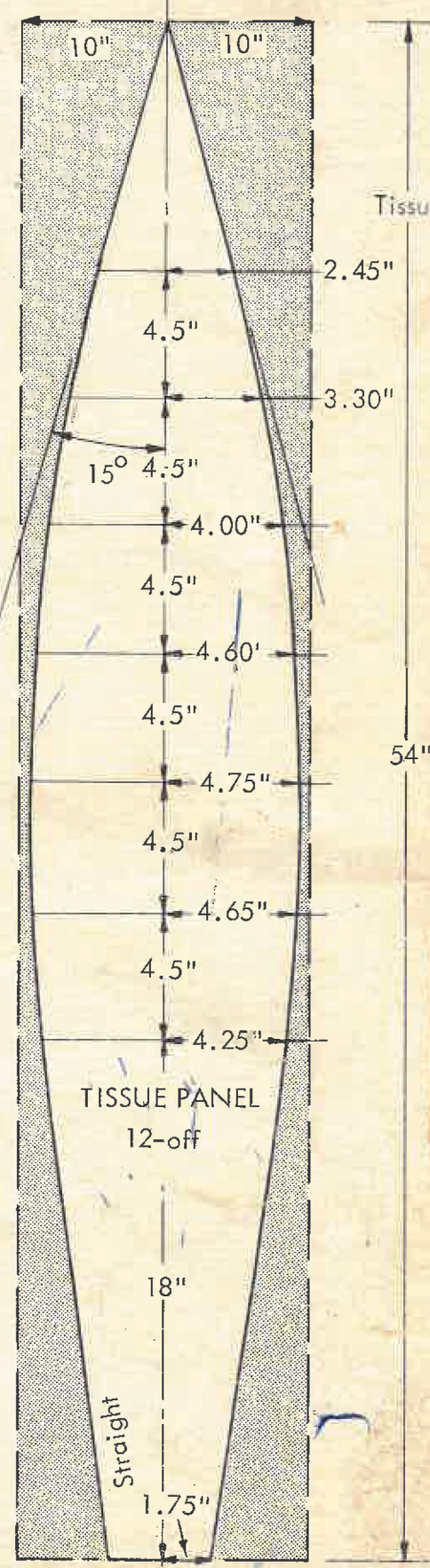
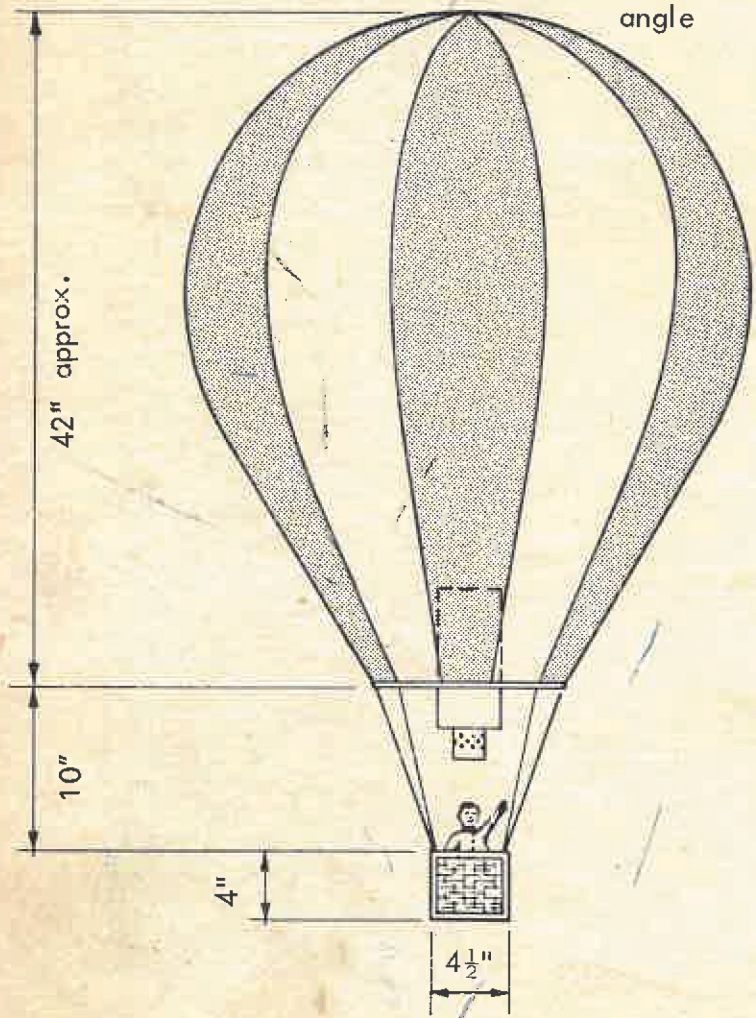
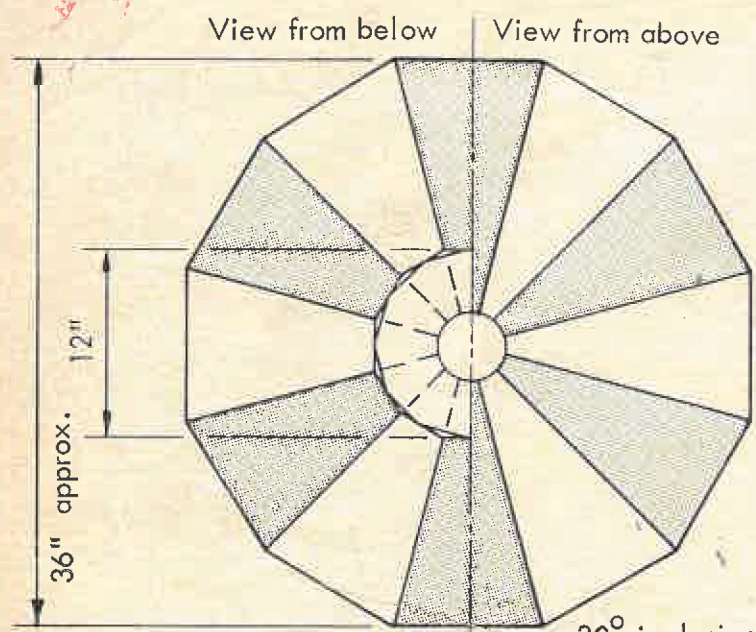


STAGE 6. The supporting wire for the burner is compressed to fit within the chimney, then expanded through the holes in the middle fold.



STAGE 7. The chimney and support wire assembled in the opening framework - made from scrap balsa as shown overleaf.





Midair
HOT AIR BALLOON
S.T. MIDSON.



Full size balloons are inflated in a similar way – the flame from the propane gas being directed into the mouth of the balloon, held open by willing helpers who have to 'waft' the hot air to the apex.

Hold tight, folks! The 'pilot' gives a blast of flame to keep the retaining wires taut before setting off on his silent journey. Note the load-ring mounted burner used on the full size – and the oft-repaired underside!

opening framework rather than using an intermediate load ring, as on the real thing.

The 'balloonist' is up to you, but he must be light – thin card is the most suitable material. This size of envelope produces about $4\frac{1}{2}$ ozs. of lift, so the whole balloon must weigh less than $3\frac{1}{2}$ ozs. without fuel.

Use only methylated spirit in the burner – a plastic 'squeeze' bottle being useful giving the minimum spillage. Fill to the overflow level – any fuel that has dropped onto the basket must be soaked up before ignition. Never be tempted to use petrol or diesel fuel – a large sheet of flame and severely singed hair, if not worse, will be the certain result. Paraffin will not burn in this type of burner.

The balloon will rise at about 5 feet per second and will sink at about 4 feet per second in *still air*. Thus a $1\frac{1}{2}$ minute burn will take the balloon to some 300 feet, and assuming no thermal activity is met during the descent, will touch earth again about 85 seconds later. In a 3 mph wind it will have thus travelled 200 yards or so from its launching point. Unfortunately it is nearly impossible to pull the balloon into the wind, however slight, since the tension in the tether not only pulls the balloon down but tips it – something that must be avoided at all costs with the flame alight.

Flights on a short, fixed, tether in the open are therefore not practical. If, however, the operator carries the end of the tether along with the wind and balloon, it will remain in its safe, correct flight attitude – a further method of controlling height and flight length is to attach a string tether which the balloon lifts until the weight of string

in the air balances the balloon lift, the length remaining on the ground being pulled along by the balloon. Lift produced varies with a number of factors and the length and weight of the string must be found by trial and error – a piece of wood on the end, fastened so that it cannot catch as it is pulled along, can also be used.

Launching the balloon requires two persons. Firstly, choose a still day and plenty of open space, then starting at the upwind edge of the area, pull the envelope open using the seams as grips, and hold in the flight attitude. Fuel the burner and (making sure the tissue is well clear of the flame) light the burner applying a match to the bottom. There is usually some meths spilt on the metal and this will give immediate ignition. Full flame will not develop for another 15 seconds and lift off will take place a few seconds later. As the flame builds up the balloon will fill completely until you find yourself holding something weightless; when lighter than air – release it to the mercy of the winds.

Hot air balloons present a tremendous range for experiment and individual design: they are obviously an excellent scale subject. Shapes other than the traditional can be made – airship, flying saucer, rocket, etc., and single channel radio control of the firing rate would give the operator the same control as a balloonist in the real thing. A smaller balloon with panels made 30" long and suitably scaled-down other dimensions will satisfactorily lift its own weight, but not with a basket attached, so in this case use a burner made from tissue paper soaked in meths and hung in the burner chimney.

One word of WARNING. You are playing with fire and you must never forget the fire risk. Once the burner has flamed out it is still very hot, but safe, and landing is not dangerous. However, spillage of burning fuel on dry grass during launching could cause trouble. Do not be frightened or put off by this though, however, since any fire can be quickly blown or stamped out, and if the whole envelope burns it will all be out in a few seconds. With such a rise rate a burn longer than say 3 minutes should never be used (unless radio controlled) since the balloon will quickly be in aircraft altitudes, not to mention who's back garden it might land in, miles away.

Guaranteed to draw spectators, I hope that brightly coloured balloons will now start rising from all flying fields. For those who must have competition as part of the model flying fun, the 'fox and hound' system used in real ballooning works well. Release one balloon – the winner is the one which lands nearest to it. A small trailed grapnel ensures that the balloon is not dragged along by the wind after landing.



Take care when fuelling the burner – use a plastic 'squeeze' bottle with extended spout as shown, for convenience. Fill through the holes in the burner until the meths reach the level hole.