



CUB SCOUT BOOMERANG TEST 10 – DISCOVERY

AIR MOVEMENT

Make a Hot Air Balloon

Resources

- Light weight garbage bag
- Fine wire
- Cotton wool balls
- Shellite (White Spirit)
- Matches or lighter

Instructions

1. Cut a piece of fine wire, ~1650 mm long, and attach it to the rim of the garbage bag. Lay the wire on the outside edge of the garbage bag, fold the edge of the bag (5 – 10mm) over the wire, and then tape the edge back onto the body of the bag. Fold the two ends of the piece of wire together where they meet, and tape the join to the bag;
2. Cut a second piece of wire, ~560 mm long. Bend this piece of wire in the middle and twist it to form a small (5-10 mm) loop in the middle of [the length of] the wire;
3. Attach the ends of this piece of wire to the wire around the edge of the garbage bag, at even intervals (*i.e.* '180°' apart);
4. Cut yet another piece of wire, ~100 mm long, and thread it through the loop in the wire (formed in 2. above);
5. Tie this piece of wire, just twisting the ends together, firmly around one or two cotton wool balls. Don't squash the cotton wool balls up too much, as this will reduce the amount of Shellite that they will absorb, and hence the heat that can ultimately be generated. Using a single cotton wool ball, will generally provide a modest degree of lift (up to 100 m), depending on the prevailing air temperature. For 'serious' flight, two cotton wool balls, soaked with Shellite can just about take the 'balloon' out of sight;
6. Soak the cotton wool balls in Shellite (just hold them over the mouth of the Shellite bottle and up-end it briefly);
7. Have one or two Cubs hold up the top corners of the garbage bag, so that the opening and the cotton wool balls are close to the ground. If necessary, bend the wires so that they hold the mouth of the garbage bag open nicely and suspend the cotton wool ball(s) as evenly as possible, in the middle of the mouth of the bag;
8. Light the cotton wool ball(s). Keep the flame in the middle of the mouth of the bag, to avoid melting it, and hold the garbage bag upright and steady until it starts to float (usually less than a minute or so). Let go of the bag as it begins to float, and steady it if necessary, as it begins its flight. The 'balloon' may fall to one side, momentarily, as it rises, but it will generally right itself and continue climbing.

Resource Preparation

Garbage Bag

Home Brand	1200 x 800 (80 litre)	\$1.99/10	Woolworths
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The bag needs to be as light as possible, around the same size and 'weight' as a dry cleaning bag. If the bag is too small, it will not hold enough air to lift the weight of the stiffening wire and cotton wool ball, and may be too close to the flame (and hence melt!). If it's too big, it will not be easy to heat up the volume of air required for 'lift off'.

Wire

Whites Wires 'wire-pac'	0.71mm x 75m	\$5.53	Bunnings
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This wire needs to be as light as possible, but needs to be stiff enough to hold the mouth of the 'balloon' open and out of the way of the flame.

You will need one piece of wire that is slightly longer than the opening of the bag being used (~1650 mm in the present case, for a bag 800 mm wide), another piece approximately 50 mm longer than the diameter of the opening (~560 mm in the present case), and a third piece ~100 mm long.

Sticky Tape

Sellotape	18 mm x 6 m	\$1.61	Woolworths
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Any sticky tape will suffice, but remember that the aim is to minimise weight (without compromising the structure).

Cotton Wool Balls

Home Brand	150	\$Cost	Woolworths
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White Spirit

Recochem Shellite	1 litre	\$7.26	Magnet Mart
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Shellite is actually a trade name, used by Shell, for White Spirit, Petroleum Spirits or hexane. Methylated Spirits can also be used. Methylated Spirits burns much more cleanly than White Spirit, but does not produce as much heat, and so is somewhat less effective in the present context.