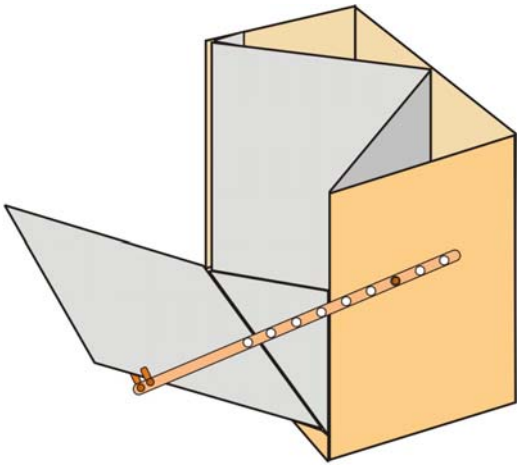
Constructing an open panel solar cooker with two reflectors inside a box

The open panel cooker was improved in 1994 by **Roger Bernard**. He proposed a more advanced design ("reflective open box", ROB), with two reflectors of the solar cooker fixed inside a main box, which is used as base forming the cooking space. This construction is still easy to build, light and portable, in a way, but simultaneously it appears to be a more concrete and stable design.

Materials



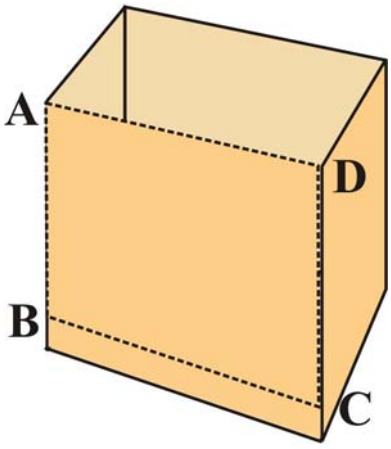
- ✓ one rather tall cardboard box (indicative dimensions: length 45-55 cm, width 35-45 cm and height 40-50 cm)
- ✓ a long piece of cardboard cut out of a large box to be folded in the middle to form the reflectors inside the base box
- ✓ a piece of wood to be used as a prop for the front reflector, or a piece of thick wire to be used for the same purpose
- ✓ 3-4 wood dowel pins for the construction of the prop
- ✓ aluminium foil, white glue and a paint brush
- ✓ scissors, cutter
- ✓ ruler, pen or pencil

Let's put it together

1 Cut out the top flaps of the cardboard box, but keep them aside because you can still use the carton for insulation.

In one of the broad sides of the box draw a line BC, approximately 5-6 cm from the bottom. Make sure that you mark *not* to cut along or further down that line.

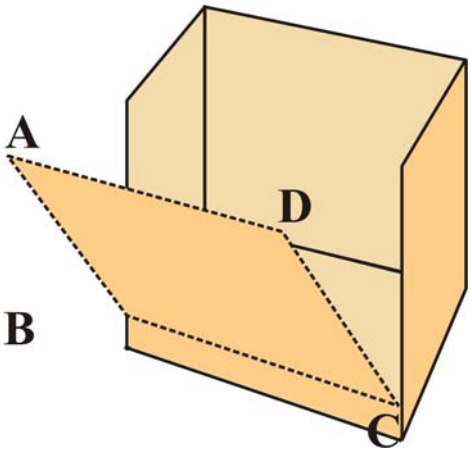
Mark lines AB and CD perpendicular to the bottom of the cardboard box (*see drawing aside*).



2 Cut along the seams AB and CD up to points B and C respectively. Use a long ruler to help you bend the front panel ABCD using BC as a hinge (*see drawing*).

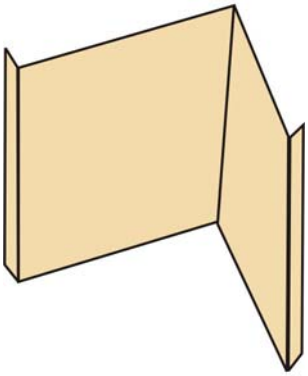
This is a good time to glue a few rectangular pieces of cardboard to the bottom of the box to raise it a bit and to achieve better insulation with the ground contact.

After you finish that, you may glue a rectangular piece of aluminium foil to the bottom of the box with its shiny side facing outwards.



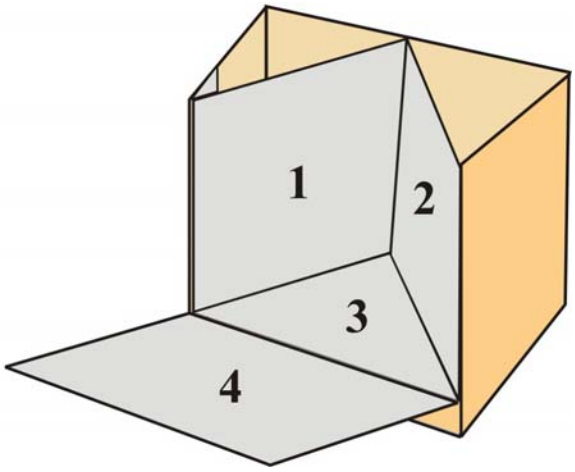
3 Cut and fold another piece of cardboard to be used as reflectors inside the box.

A useful hint is to measure with a piece of string the distance of the "**V**" shaped reflectors inside the box to make sure you cut them in the right dimensions. Do not forget to add approximately 5 cm at each side of the reflectors in order to create two long stripes of cardboard in each side to be glued at the sides of the box (*see drawing*).



4 Glue aluminium foil, with its shiny side facing outwards, on all reflectors and the base if you have not done that already (*panels 1-4*).

Adjust and glue the reflectors inside the box (*panels 1 & 2*). Any angle between 60° and 90° appears to be a good compromise and works fine. Smaller angles concentrate the Sun more, but require frequent adjustments to follow its path.

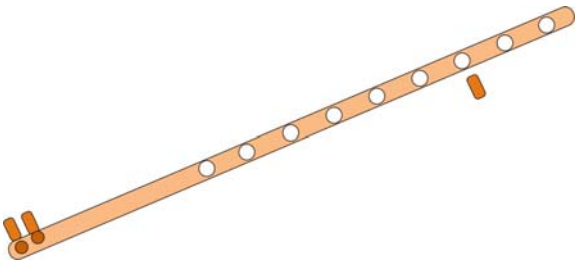


5 Use a piece of wood to construct a prop to hold and adjust the front reflector.

Ask an expert adult to drill two holes at the one end of the piece of wood close to each other and in a rather slanting arrangement with one another. These holes should have same diameter of the wooden dowel pins (usually 5-6 mm) in order to be glued inside them.

Then drill a few more holes along the piece of wood with the same diameter as the first two holes (*see drawing aside*)

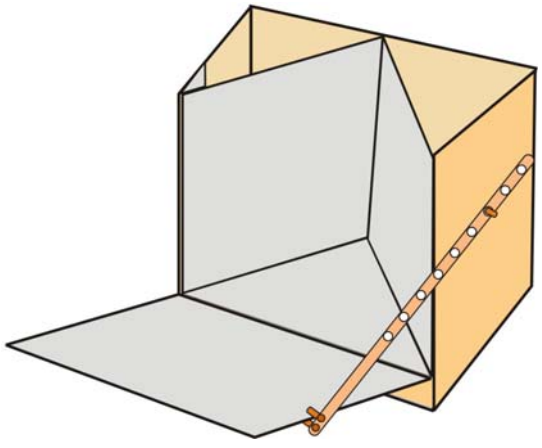
Get another dowel pin, make a hole at one of the box sides and glue it steadily with half of it sticking out of the box.



6 Grip the front reflector of the solar cooker in between the two dowel pins glued in the front part of the piece of wood. Then adjust it by inserting the other dowel pin, the one sticking out of the side of box, into one of the holes of the piece of wood (*see drawing aside*).

Now the front reflector can move up and down and be stabilized at the desired position with this wooden prop.

Alternatively, you can still glue a wooden dowel pin at one side of the box and use it to support a prop made out of a piece of thick wire.

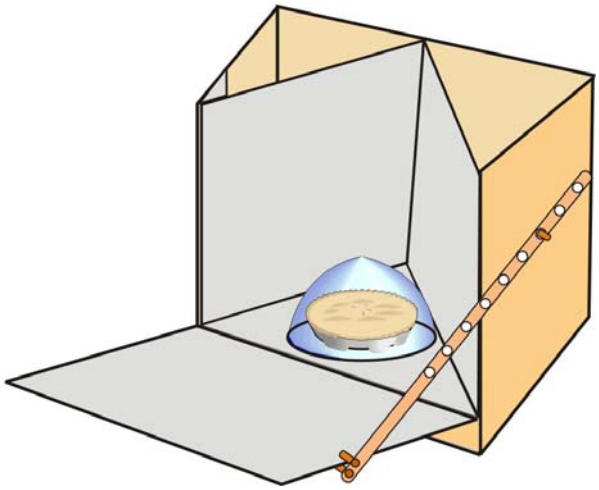


7 The open panel solar cooker with two reflectors inside a box is now ready!!

You have to adjust the orientation of the solar cooker, fix the front reflector and start cooking.

For instance, you may bake a cake using a baking pan, which fits inside the cooking space of the solar cooker and under a reversed glass salad bowl (*see drawing*). The salad bowl has to rest firmly on the base of the solar cooker.

A *useful hint* is to raise the pan slightly off the solar cooker base, by using a flatted stone or a kitchen metal grid, in order to assist hot air circulation under the pan, inside the reversed salad bowl space.



Some more tips for solar cooking …

As Bernerd (1994) claims the *"salad bowls and oven bags share the following disadvantages: they hamper access to the food, and they retain the moisture coming from the heated food and need periodic drying. These drawbacks can be avoided if we put only the lower part of the cooking pot inside of a glazing [see figure above], instead of the whole pot with its lid. This can be done by placing the dark pot into a glass dish whose diameter is slightly larger than that of the pot. Obviously the advantages of such a system are partially offset by extra heat loss from the uninsulated lid. By raising the pot off the ground a further gain is achieved. In fact, my experiments have shown that cooking times with this new system are no longer than with the original design with a salad bowl up-turned over the pot"*.

The "reflective open box" solar cooker will be more stable against a strong wind if we put some stones inside the tall triangular spaces that are formed behind the two reflectors inside the box, where they appear to be not only functional, but also "invisible".

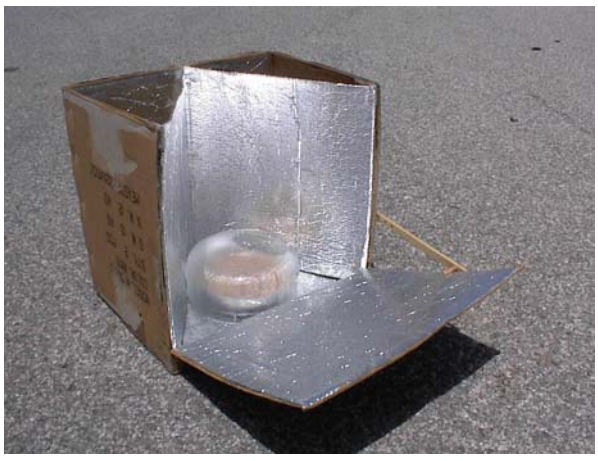


Photo 1: The first "reflective open box" solar cooker we constructed out of a cardboard box and two reflectors. The front reflector is adjusted for the early morning Sun.

Photo 2: A side view of the solar cooker at the school yard, with the front reflector adjusted for the noon Sun.

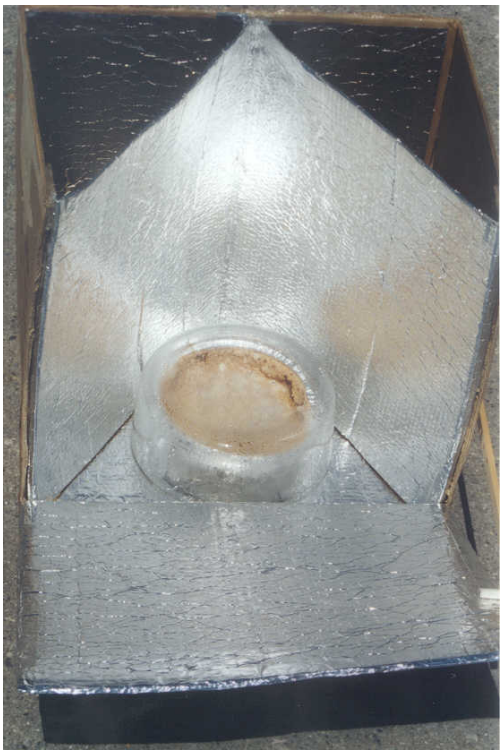


Photo 3: Testing the solar cooker by cooking a pie, inside an aluminium pot raised slightly with a kitchen grid, all under a reversed salad bowl.

Photo 4: Two pupils testing the solar cooker by cooking croissants, which look ready to be eaten.

Photo 5: A "reflective open box" solar cooker presented in one of the school science fairs. The outer sides of the cardboard box have been painted for decorative purposes.

Photo 6: Another "reflective open box" solar cooker presented in a school science fair. Notice the piece of wood used as a prop to hold and adjust the front reflector.

References & Resources

Anderson, L. & Palkovic, R. (2006) *Cooking with Sunshine – The complete guide to solar cuisine with 150 easy sun cooked recipes*. New York: Malone & Company.

Bernard, R. (1999). *La Cuisson Solaire Facile*. Editions Jouvence.

Bernard, R. (1994). The Reflective Open Box Solar Cooker. Paper available at URL: < http://solarcooking.org/plans/newpanel.htm >.

Halacy, B. & Halacy, D. (1992). *Cooking with the sun: How to build and use solar cookers*. Lafayette: Morning Sun Press.

Kaufman, A. (1989). *Exploring Solar Energy: Principles and Projects*. Prakken Publications, Inc.

Kerr, B.P. (1991). *The expanding world of solar box cookers*. ISBN: 096326740X. Available at URL: < http://www.solarcooking.org/kerr.htm >.

Kofalk, H. (1995). *Solar Cooking*. Summertown: Book Publishing Company.

Narayanaswamy, S. (2001). *Making the Most of Sunshine: A Handbook of Solar Energy for the Common Man*. New Delhi: Vikas.

The Solar Cooking Archive (*sponsored by the "Solar Cookers International"*). The ultimate website for solar cookers. Available at URL: < http://solarcooking.org/ >.