

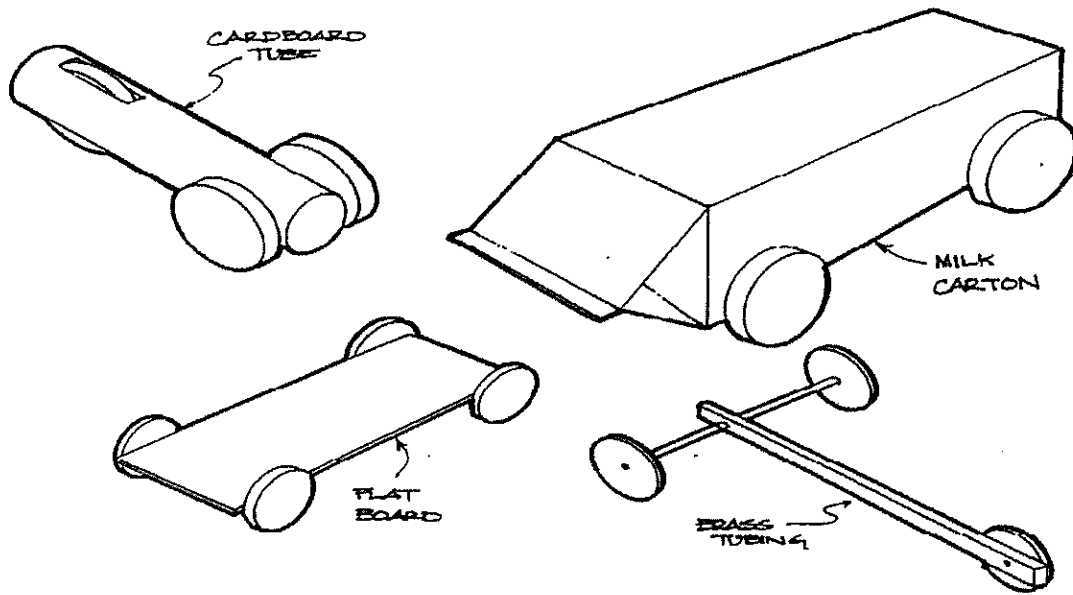
## Chassis

### Purpose

The car's chassis is its frame. It holds all of its main parts together.

### Ideas

Some possible ideas for a solar car chassis are below. Try different ideas! Try different materials!



### Concepts: Weight and Stiffness

One thing you will discover when you build your solar car is that designing and building involves tradeoffs. There is no one ideal design. This is true with the chassis of your car.

One obvious consideration is that you don't want your car too heavy. It is easier for your motor to push a light car than a big, heavy one. In solar cars, efficiency is very important, and you don't want to waste energy.

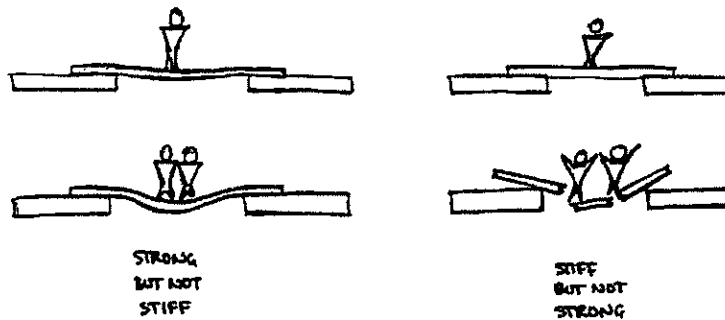


But something you must also keep in mind is that a light car can be pushed easily by the wind, too. Even if the wind does not blow the car over, it may make it harder to go in a straight line. (This depends not only on the weight, but on where the weight is, and the shape of the body, too – we will talk a little about the body and aerodynamics in a later section.)

## Materials

In most cases it is more difficult to make the car light enough (you can always add a little ballast anyway) so in this section we will emphasize lightweight materials and construction. The first step to a lightweight chassis is choosing the right materials. Balsa wood, for example, is a commonly chosen material because it is lightweight. But more importantly, is fairly stiff for its weight.

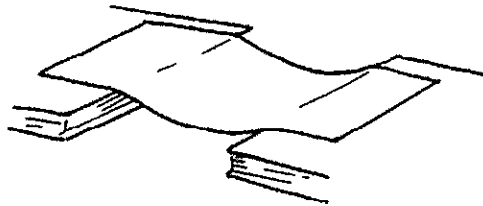
What is the difference between strong and stiff? Strong means it will not break easily. Stiff means it will not bend easily.



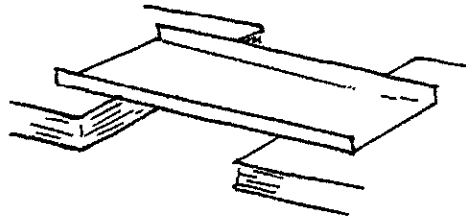
For the solar car, stiffness is very important. Stiff, light materials include Styrofoam, foam core, balsa wood, corrugated cardboard, and some plastics

## Shape

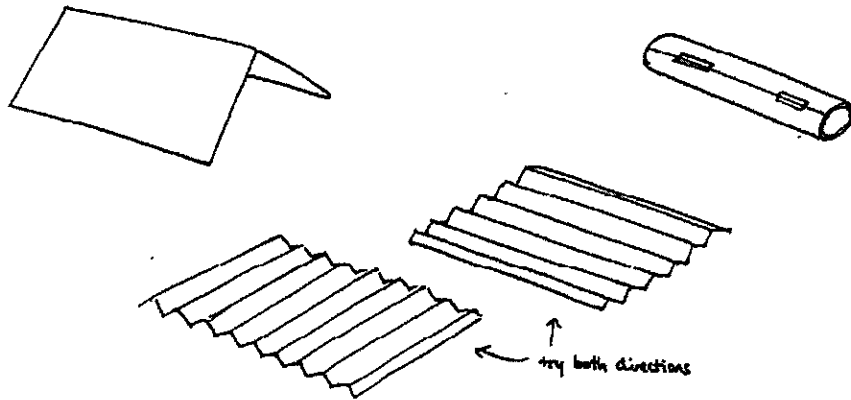
Some heavier materials are also appropriate if they are constructed correctly. Let's try an experiment. Place two books side-by-side, about 6 inches apart. Now place a piece of paper across the two books. What happens?



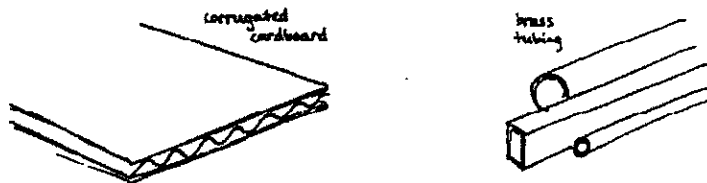
The paper is not stiff, so it bends in the middle. Now, fold the same piece of paper in thirds, like a "u" (see drawing) and put it back across the books. Now what happens?



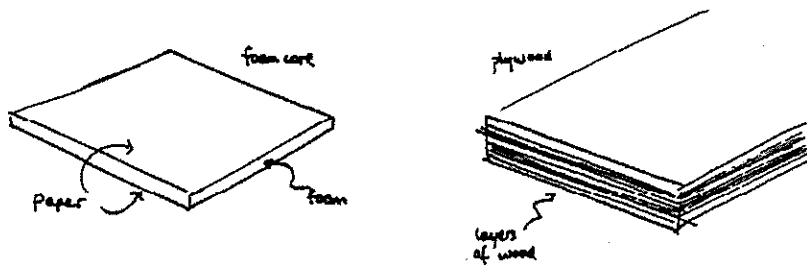
The paper is not any heavier, but it is much stiffer now because of its shape. Try other shapes and see how stiff they are:



So in this way engineers can stiffen flexible materials – or use less of a heavier material – with just a change of shape! Look at a cardboard box. Why is the inside “corrugated”?

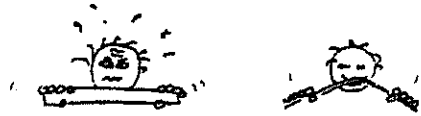


Other materials are made stiffer or stronger by sandwiching them between other materials.



## Orientation

As you saw with the folded pieces of paper, orientation is also very important in determining stiffness. Take an ordinary wood or plastic ruler. Try to bend it both directions:

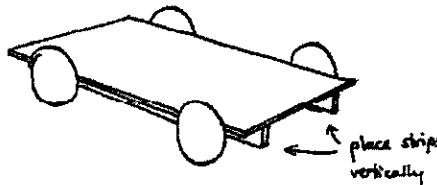


It is easier to bend it the thin way, of course.

Imagine you wish to stiffen your chassis by adding ribs. You glue two strips of material to the bottom of the chassis like this:



Unfortunately, that didn't seem to do the trick – the chassis still sags. Your partner insists that adding more strips of material will help, but you know that this is not necessary. You have a better idea! What is your idea?



Well, if you turn the strips sideways (remember which way the ruler was stiffer), your chassis will be much stiffer . . . without adding material!

So, as you can see, if you are smart about your material selection – and you remember the importance of shape and orientation of materials – you will have much more control over the weight of your solar car.

## Materials

Any material that is light and stiff would be appropriate. Some hollow and tube-like pieces are very stiff for their weight. Arts and crafts stores and hobby stores are good sources. Some stores have scrap materials like cardboard. Or, look around your house for scraps. Some materials we found that are useful are:

- Stiff insulating foam (large hardware store or home improvement center)
- Foam core (like the back of your solar panel – try arts and crafts stores)
- Balsa wood (arts and crafts or hobby stores)
- Brass tubing (arts and crafts or hobby stores)
- Cardboard tube (scrap from arts and crafts store)
- Shoe box
- Soda bottle
- Rigid plastic
- Corrugated cardboard (scrap from boxes)