Next:
Materials and Explanations

Then:
Step-by-Step Photo Sequence
HEAVY NEWSPAPER

Demonstrate the incredible properties of air and air pressure using a sheet of newspaper, a piece of wood, and some karate-chopping power.

Materials
- Several pieces of pine wood or wood paneling
  (1" wide x 36" long x 1/4" thick)
- Several large sheets of newspaper
- Work gloves
- Table

EXPERIMENT
1. Place the piece of wood on a table and let one end hang over the edge about 4 inches. Ask the spectators, "What will happen if I hit the piece of wood that is hanging over the edge of the table?" Make sure everyone is out of harm's way as you karate-chop the stick. Of course, the stick goes flying end over end just as expected.
2. Return the stick to the table allowing about 4 to 10 inches of the stick to hang over the edge. "Let's use a piece of newspaper to help secure the stick in place." Show a single sheet of newspaper and fold it in half 3 or 4 times. Place the folded newspaper over the end of the stick that is lying on the table. Again, make sure everyone is standing away from the table as you hit the end of the stick that is hanging over the edge of the table. What happened? Did the newspaper help to hold the stick in place? Of course, the answer is "NO."
3. Finally, show the spectators a new sheet of newspaper and use it to cover the portion of the stick that is lying on the table. Make sure that the newspaper is flush with the edge of the table. "What do you think will happen now if I hit the stick with the unfolded newspaper covering the stick?" You might anticipate an answer like, "The newspaper will go flying...or the sheet of newspaper will tear apart." Smooth down the newspaper with your hands so that there are no pockets of air under the sheet of paper. Put on your karate-chopping glove to protect your hand. Strike the protruding edge of the stick with your hands with a sudden sharp hit. To everyone's amazement, the stick breaks. Remind the audience that the weight of flat newspaper is exactly the same as the folded newspaper, yet the flat newspaper stayed in place and held the stick in place. That's amazing... but how does it work?

HOW DOES IT WORK?
The results of the experiment prove that the newspaper is more difficult to lift when it is spread out over a large area, yet the weight of the folded and flat newspaper remain the same. What other force is exerted on the newspaper that could account for these differences? The answer is as simple as the air we breathe. It is the pressure of the air pushing downward on the newspaper that prevents the paper from rising.

It might be useful to picture a giant column of air resting on top of the newspaper. This column of air is 250 miles (402 km) tall! This column of air above the newspaper pushes down with a force of 14.7 pounds of pressure per square inch (this is at sea level). In other words, each square inch of the newspaper has 14.7 pounds pushing down on it. So, if you know the area of the newspaper, you can calculate the total amount of pressure pushing downward on the paper. Let's say that the newspaper dimensions measure 20 inches by 30 inches. The total area is 20 inches X 30 inches = 600 square inches. If each square inch has a force of 14.7 pounds pushing on it, then 600 square inches X 14.7 pounds per square inch = 8,820 pounds! That's the equivalent weight of two large automobiles. It's no wonder that the newspaper stayed in place at the moment when you hit the stick. Smoothing down the newspaper with your hands prior to hitting the stick is a crucially important step. You want to make certain that there is no air under the newspaper that might help it to lift up when you strike the stick.
Heavy Newspaper

Here is what you need

Newspaper
A yard stick
Gloves
1. Balance the yardstick with half hanging off the edge of the table.

2. Lay one section of the newspaper over the yardstick.
USE A GLOVE TO KARATE CHOP THE YARDSTICK
What is the least number of sheets of paper you can use to break the yardstick?

If you have a thin yardstick try using one sheet.