

Hydraulic Systems

Have you ever seen a car lifted into the air at an auto repair shop? Have you ever wondered how an elevator can lift a load of people up into the air? Often, *hydraulic systems* are used to lift heavy objects and perform work. Like the word hydro suggests, hydraulic systems use a liquid to transmit force.

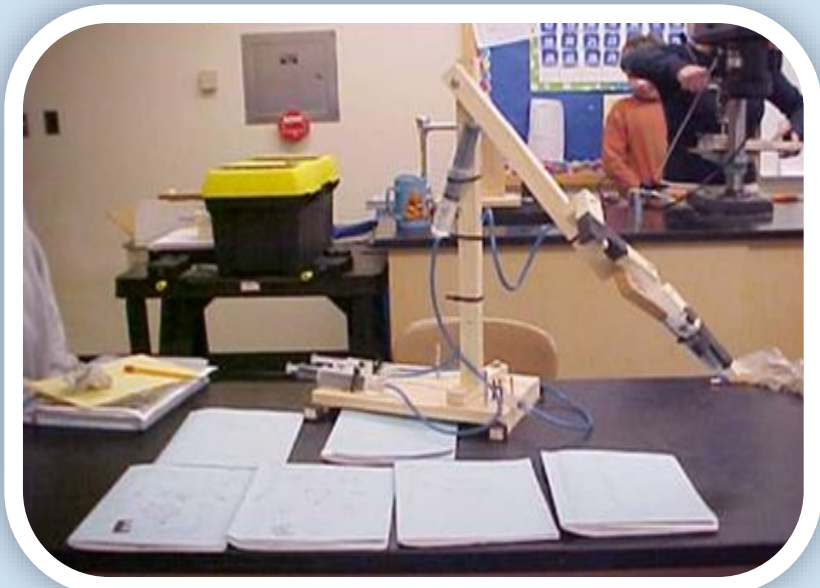
Engineering Challenge!

Using assorted materials, as well as plastic syringes filled with water, can you design and build a hydraulic machine that can pick up an empty aluminum can and lift it 12 inches?

- To get started, you will need to create a hydraulic system with two syringes of equal volume.
- Push the plastic tube over the tip of one syringe with the plunger down.
- Submerge the tip of the second syringe in water and pull out the plunger, completely filling the syringe with water. Make sure that there are no air bubbles in the water.
- Now connect the other end of the plastic tube to the tip of the second syringe.
- Test your system by pressing the plunger of the water-filled syringe down. This should move the water to the empty syringe, raising its plunger.
- Repeat these steps for each hydraulic system you intend to use.

Materials

- 2-6, 10ml syringes
- Thin plastic tubing
- Water
- Empty aluminum can
- Assorted building materials, like cardboard, craft sticks, rubber bands, glue, tape etc.



How does it work?

Hydraulic systems work according to *Pascal's Law*. Developed by French mathematician Blaise Pascal, Pascal's Law says that that when there is an increase in pressure at any point in a confined fluid, there is an equal increase at every other point in the container.

Here's a formula! $\text{Pressure} = \text{Force} / \text{Area}$