MAKING WORK POSSIBLE AND EASIER---THE SIMPLE MACHINES

By Richard Sorokin

In your daily life you are using simple machines. Door handles, hammers, can openers, wheels, bicycles, wheel barrows, screws, pliers, plies, and so on. The list can go on and on. But what do these devices do for us? Basically they do is to make work easier and possible. They do this not by reducing the work {force X distance}, they do it by increasing the distance the input force travels thus reducing the force necessary. Yes it will take longer but it will be possible and easier.

The amount of work equals the force multiplied by the distance it travels. With big machines we can increase the force and reduce the distance, with humans doing the work it's best to increase the distance thus reducing the force necessary to do the job.

Let's take a simple situation. You want to lift a 100 pound block say two feet. Total work done will equals 200 foot-pounds. Force times the distance it moves equals the work done ... Now to make it easier we will put the block on an incline plane. The plane is 10 feet long and rises the two feet that we want the block to reach. Since we know that work equals force times distance we can say the block will travel 10 feet, the ten feet times the force required will equal the work done. Therefore 10 times what equals the 200 foot-pounds? The answer is 20 pounds. By just exerting 20 pounds pressure on the block we can raise it the two feet required. We are not considering friction in these problems.

What all simple machines do is to spread the work out over a distance thus requiring less effort. The handles of a pair of pliers moves a greater distance than the teeth end. On a wheel you move the outer wheel a greater distance than the inner wheel. In a screw you have to go around and round to go up the shaft a short distance. In a lever, one end is longer than the other. Therefore it will move a greater distance than the shorter end. The end that goes the greater distance will be easier to move.

On boats we have levers such as steering wheels, tillers and rudders and especially on sail boats we have pulleys. Pulleys not only change the direction of the forces but can magnify the force you can exert. By increasing the number of lines that are shortened by the pulley system, the greater is the force multiplier. A pulley system that has six lines going back and forth between the pulleys will generate six times the force you apply to the last line.

Levers are big helper. Your pliers, crowbar and hammer are all levers. You move the handles a larger distance than the jaws move giving you the mechanical advantage.

The basic simple machines are the inclined plane, the wedge, the screw, the lever, the wheel and gears.

Archimedes, a famous Greek mathematician, physicist, engineer, inventor, and astronomer of the ancient world, once said “Give me a lever long enough and I can move the world:.