

Mega Awesome Robotics Systems is a team of high school students who are mentored by professional engineers and technicians. Visit **MARS** at www.marsbot.org to see cool videos, learn about the team, and more!

What We Do: We build robots and compete with other teams in the FIRST Robotics Competition: intense games that change each year.

What is a Robot? It is a machine that performs human-like actions. It can be programmed to do different jobs and to react to certain external events. It can sense and change what it is doing depending on the job it is designed to do and what senses it has: a camera for seeing, microphone for sound, sonar for measuring distance, etc. Unlike people, it can work 24/7!

2006 challenge: Create a robot that can play a game similar to basketball, where 3 robots put on 1 alliance play against another alliance of 3 robots. Points are scored by shooting poof balls in high and low goals, and by parking on top of an elevated platform prior to the match's end.

Our Robot "Ball-istic": Design inspiration came from professional pitching machines. The chassis/frame is aluminum tube connected by hand cut sheet metal gussets and pop rivets. 4-wheel drive provides good traction. This robot's unique feature is its **catapult arm**. A van door motor powers the arm, which has one way roller clutch bearings that allow the arm to be driven over center point, causing surgical tubing to overrun motor speed and throw balls.

What is a Catapult? : A machine that hurls an object. Generally it is understood to mean a siege weapon that uses an arm to throw a projectile a great distance. There are different types classified according to the physical concept used to store and release the energy required to propel the projectile. Some are **tensional** such as a stand-mounted crossbow, with the energy stored as tension. Others are **torsional** using a throwing arm which is connected to a twisted rope or fiber to create greater power. Another type, such as a trebuchet, uses **gravity or traction** rather than tension or torsion. A falling counterweight, or the effort of the operator, pulls down the end of the arm and a projectile is thrown from a sling attached to a rope hanging from the top end of the arm, essentially like a sling attached to a giant see-saw.

What type catapult is "Ball-istic"? : A tensional catapult. Energy is stored as tension in the surgical tubing.



Make Your Own Catapult!

Materials List:

One container with lid, one paint stick, a rubber band

Cub Scout requirements covered:

Wolves: Family Fun Achievement: 10a. Make a game... Play it with your family.

Bears: Build a Model Achievement: f. Make a model of anything.

Webelos: Engineer Activity badge: #8 Build a catapult and show how it works.

1. Stretch the rubber band around one end of the container, over the stick and then around the other end of the container.
2. Remove the container's lid and place on the end of the stick. Aim carefully away from any people.
3. Push down the end of the stick closest to the container, shooting the lid. Try shooting different weight objects, varying how hard you push down, and moving the distance the container is from the stick's end.

Make it a Game: Challenge your family. See who can shoot the furthest, highest and most accurately.

What's going on?: As the weight of your hand pushes one end of the catapult down, the other end rises in a see-saw effect. The faster this happens, the more force is applied to the lid, making it fly higher and farther.

What type of catapult is this?: You add weight on one end to shoot from the top end, so this uses power coming from the operator who is providing a counterweight. Like the trebuchet, the counterweight releases energy to propel the projectile.