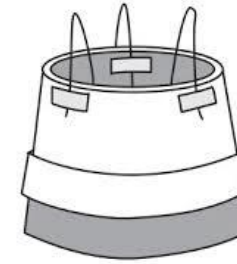




DIY Air Force Activities:

Robotic Arm End Effector



Materials:

- 2 paper or styrofoam cups
- scissors
- masking tape
- 3 pieces of string, each 2 cm long
- pencil

Robots still inspire thoughts of Science Fiction and space adventures, but they are becoming increasingly common as technology advances. Robots are being used regularly in manufacturing, often doing jobs that would endanger human lives. Space is no longer a fantasy, and robotics do play a large part in the work done among the stars. For example, the Canadarm project was a joint venture between the governments of the United States and Canada to supply the NASA Space Shuttle program with a robotic arm. This arm is used for the deployment/retrieval of space hardware from the payload bay of the orbiter. One important part of a robotic arm is the end effector. This is the tool, gripper, or hand at the end of the arm that does the work. Following the directions below you will build your own model of the end effector used in the Canadarm.

Directions: (**adult supervision is suggested)

1. Trace a circle around the outside of the bottom of one of the cups using the pencil.
2. Stack the two cups and cut through both cups using the scissors following the traced line.
3. Tape one end of each of the three strings to the inside of the inner cup. Make sure they are equally spaced.
4. Lightly tape the other ends of the strings to the outside of the outer cup, again, equally spaced.
5. Rotate the outer cup until the strings are lined across the cups. Gently pull on the outside ends of the strings so that the intersection is taught. Secure tape and trim excess string.

Challenge: Twist the cups to open and close your robotic “hand.” What can your end effector lift?



Air Force Associations:

The Airmen of the U.S. Air Force are some of the most highly trained specialists in the world. But there are places even they can't go—yet. With the development of robotics that can work independently (autonomous), soon even the most hazardous areas will be accessible. Today, work is underway to develop these aerial and ground robots so that we may eventually be able to enter dangerous environments without putting human lives at risk. For example, recently a company, RE2 Robotics, won a \$2.9 million dollar Air Force research grant to develop a drop-in robotic kit to help the Air Force use existing ground vehicles as robotic vehicles during cleanup efforts after an airfield strike.



