

What you will need:

- Scissors
- Paper Helicopter Template
- Paper clips
- Stopwatch



Engineering Design Method

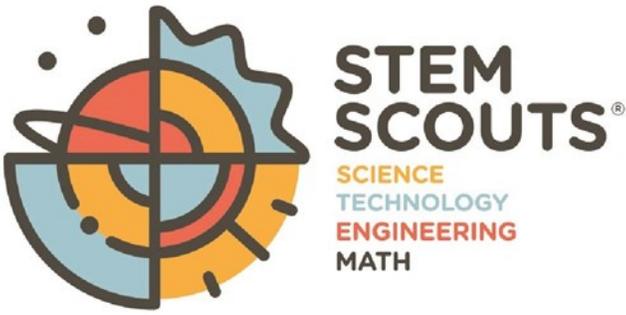
Instructions

- *Think* about a challenge for your helicopter. For example, design a helicopter to maximize airtime or landing accuracy.
- *Do*. With adult supervision, cut out the helicopter along the solid lines, folding the rotors along the dotted lines. Place one paper clip at the bottom, like the picture.
- *Test*. Time to test your helicopter, place a piece of paper on the floor to serve as your target. Use a stop watch to track the airtime each test. Or measure the distance from the target each test. Use this data to help you improve your design as you continue.
- After the first test, return to the think stage to figure out how to improve your paper helicopter.
- Once you have an idea, do the changes your design. You can add or remove paper clips, changing the rotors, or anything else you want to try.
- Keep testing! Continue to *think*, *do*, and *test* until you are your helicopter is designed how you like!

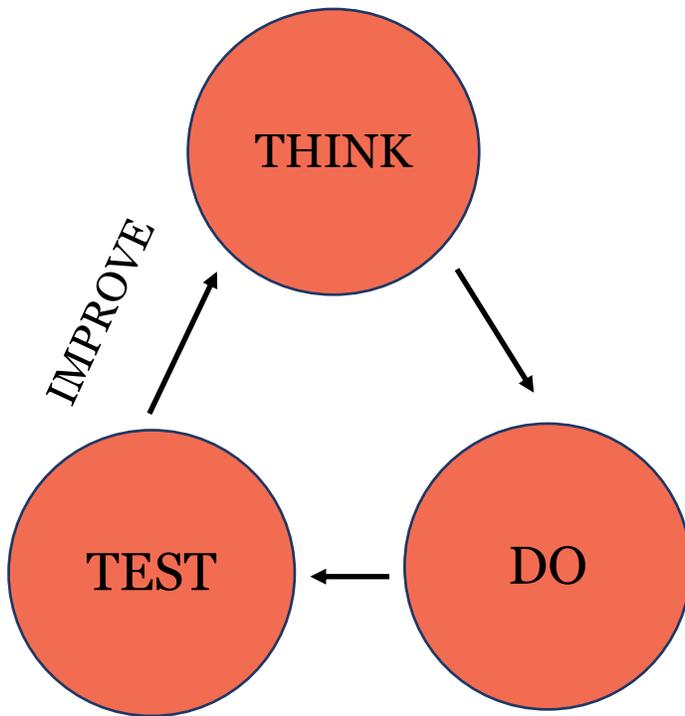


How it works:

Paper helicopters operate using two forces: gravity and air resistance. When the paper helicopter falls towards the ground, it's being pulled down by gravity. The paper clips that you might have decided to add to the bottom will have helped with that. However, it doesn't fall straight to the ground like any random object. The paper helicopter's rotors allow for air resistance to keep the copter up for longer than a regular falling object. As the helicopter falls, it encounters air (which has mass!) and the rotors push the air out of the way when they come in contact. This slows the helicopter down from falling. However, not only do the rotors simply catch air to slow the helicopter, they also spin the helicopter around. This is because the force of air resistance is happening on both rotors, and the same amount of air is being pushed on either side. That gives the helicopter its spin, and a faster spin slows the helicopter down even more.



Engineering Design Method



Engineering Design Method:

Much like how scientists use the scientific method to help them discover new things, engineers use the engineering design process to help solve problems.

There are four basic components to the engineering design process: Think, Do, Test, and Improve. Think involves looking at how to solve a problem, coming up with ideas. Do is the application of your ideas, where you build or design something. Test is taking your design and trying it out. The final step is Improve, where you start the whole process over again, tackling the problems that came up during your first try.

The engineering design process is an important way for engineers to make sure their solutions are the best they can be, which is always important since their designs almost always affect the real world. The process is much more like a cycle, and real-world engineers will go through many different improvements, or iterations, before they're done.

Summarizing Questions

1. What are the two forces that affect the paper helicopter during its flight?
2. Does a paper helicopter fall faster or slower if it spins more during flight? Why or why not?
3. What do engineers do, and how do they affect everyday life?
4. Why is the design process important for engineers?
5. Explain what you would do at the think stage after you've tested your design