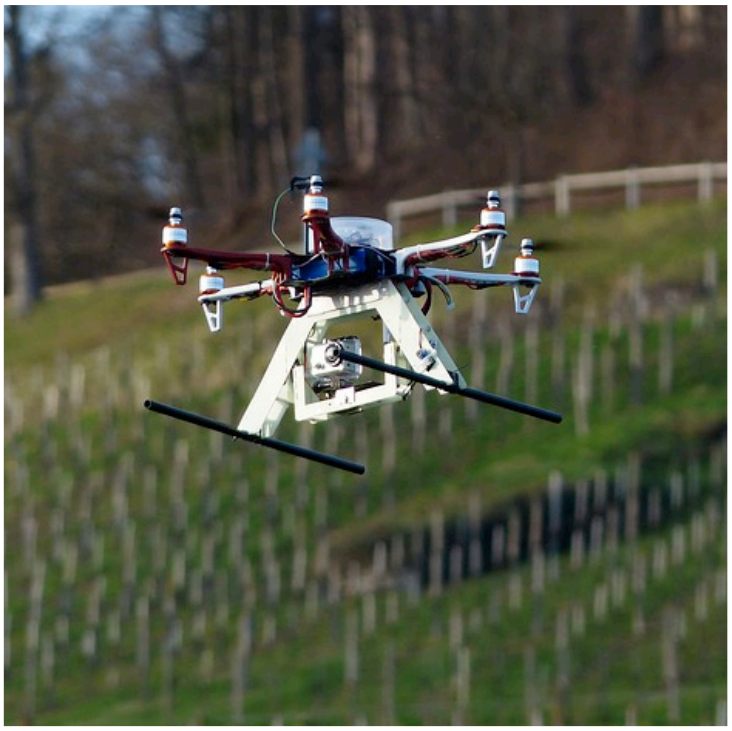
STEM Sims™

Dronopter



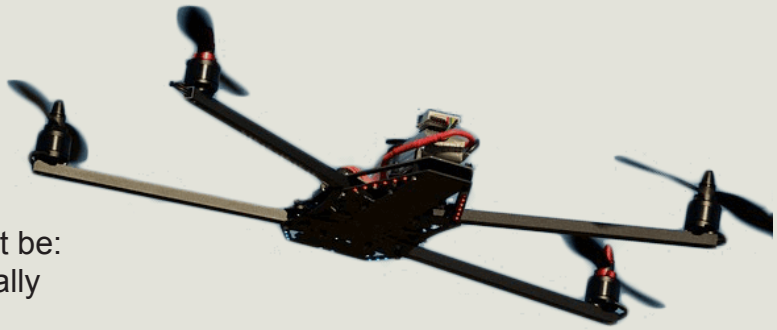
STEM Sims™

Dronopter

Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.

Start learning right now about how quadcopter and drone technology can be used in a variety of applications. Take the following brief quiz to see how much you already know about quadcopters. See the bottom of page 4 to check your answers.

1. Which term describes the rotation along the axis perpendicular to the ground, assuming your aerial craft is parallel to the ground?
   a. roll
   b. pitch
   c. yaw
   d. acceleration



2. The propellers on a quadcopter must be:
   a. symmetrically pitched diagonally
   b. clockwise pitched
   c. counterclockwise pitched
   d. mirror pitched (left two clockwise, right two counterclockwise)

3. In order to adjust pitch or roll, a quadcopter applies:
   a. equal thrust to all four rotors.
   b. more thrust to one rotor and less thrust to the opposite rotor.
   c. more thrust to rotors rotating in the direction it wants to go in.
   d. more thrust to rotors rotating in the opposite direction it wants to go in.

4. When was the first powered unmanned aerial vehicle flight attempted?
   a. 1916
   b. 1935
   c. 1959
   d. 1964

5. Which U.S. shuttle launch site is now also a drone base?
   a. Cape Canaveral Air Force Station
   b. Vandenberg Air Force Base
   c. Wallops Island Flight Facility
   d. Regan Test Site, Kwajalein Atoll

Rubber Band Helicopter

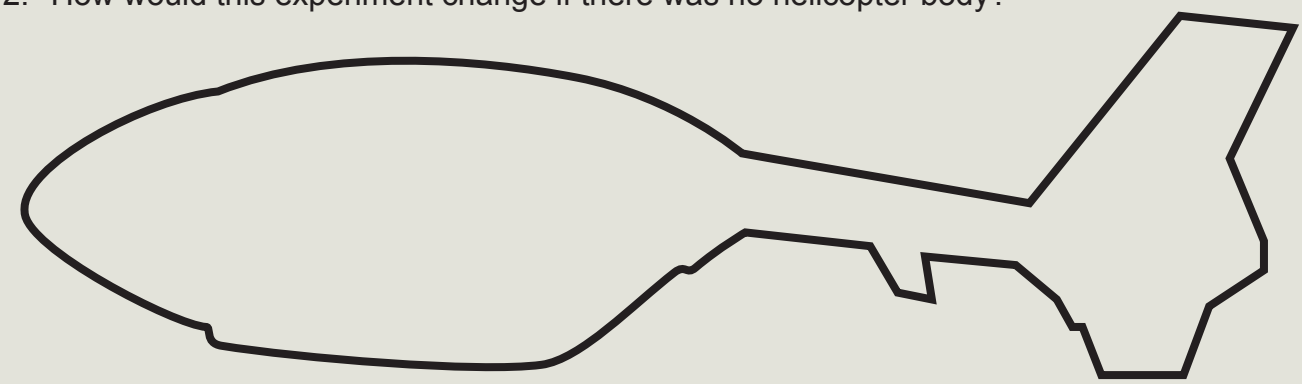
Learn the properties of flight by building your own rubber band helicopter! Follow the instructions below to get your chopper moving!

Materials
scissors
a craft stick
a paperclip
masking tape
a medium rubber band
A 6” hook nose propeller
construction paper or carton cardboard (e.g., cereal or pasta boxes)

Procedure
1. Open up your paperclip to ninety degrees.
2. Tape the paperclip to the craft stick by wrapping the masking tape around the base several times.
3. Fit the propeller to the other end of the craft stick.
4. Trace and cut out the helicopter shape below out of a sturdy material like carton board or construction paper. (Decorate your helicopter before moving on to the next step.)
5. Tape your shape to the opposite side of the craft stick from where the half of the paperclip is sticking out.
6. Stretch the rubber band from the propeller hook to the paperclip.
7. Go outside and wind up the rubber band by spinning the propeller clockwise at least sixty turns.
8. Hold the top and the base. First let go of the top, then let go of the base.
9. Watch your helicopter fly up high in the air.

Questions
1. At step 7, is the rubber band storing potential or kinetic energy?

2. How would this experiment change if there was no helicopter body?



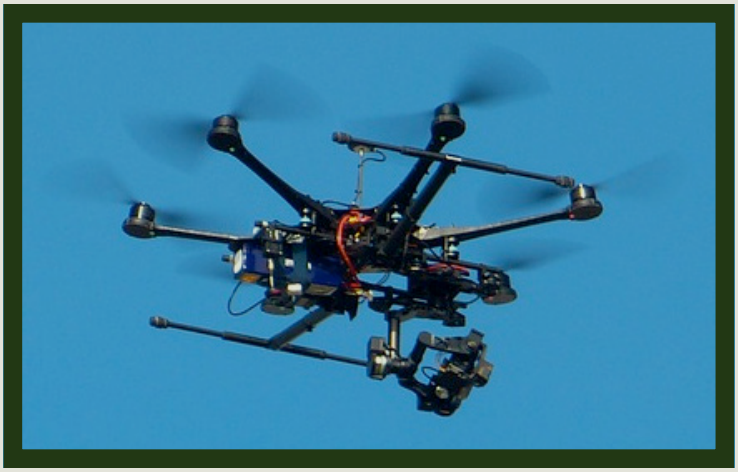
Dronopter

Drones to the Rescue

The term dronopter is a portmanteau of “drone” and “quadcopter.” Drone is a blanket term for unmanned aerial vehicles, though the term is often associated with military contexts. Quadcopters are versions of helicopters that use four equal propellers.

Quadcopters are incredible at precision flying due to their balancing abilities. Like all other flight vehicles, there are two sets of opposing forces that create flight: thrust vs. drag and lift vs. weight. Thrust is provided by the motors spinning the propellers and drag is the opposite force from air resistance. Lift is a force perpendicular to the direction of flow while the weight is a force perpendicular to the ground due to gravity. In order for quadcopters to hover, they must constantly recalculate and balance these forces. Quadcopters therefore rely on multiple sensors to detect altitude, direction along three axes, and positioning information (such as from GPS). In the last few years, an explosion of different uses for quadcopters has arisen as the prices have become more reasonable for individuals.

Drones can be used in multiple ways for ecological preservation. For example, drones are being used to monitor fires encroaching on orangutan habitats. Researchers at the University of Florida are using thermal imaging tools on drones to detect the invasive Burmese pythons in the Florida Everglades. Drones are even being used to detect the health of Oregon-grown potatoes.



And quadcopters are becoming more and more pervasive in classrooms. Students in the Engineering & Manufacturing Institute of Technology (EMIT) magnet program at Forest High School have developed their own quadcopters that they hope will be able to assess damage from natural disaster areas and be used in other productive ways for the county.

Please visit our site for more helpful information:
STEMsims.com

Answers: Page 2 Answers: 1) c. 2) a. 3) b. 4) a. 5) d. **Page 3 Answers:** 1) potential energy. 2) It would not fly so well, as the body creates drag, much like the rear rotor on an actual helicopter

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