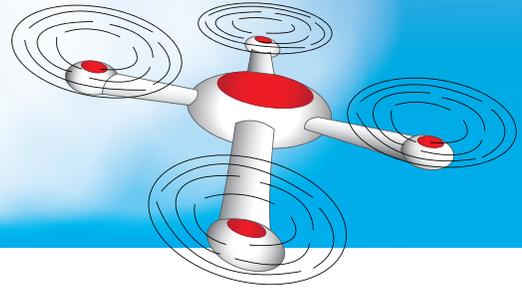


Drones Take Flight!



You Get What You Give

To get a push you have to give a push to something else. You have to throw something away. You could push the ground to run, swim by pushing water, or fly by throwing away air. The cool thing is that nothing is lost. The push you get is exactly as hard as the push you give. It's just reversed.

"To every action there is always opposed an equal reaction..."

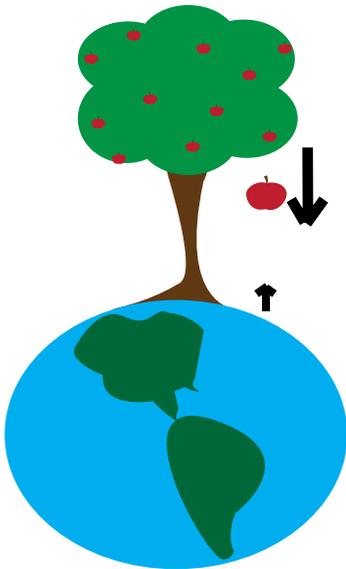
"If you press a stone with your finger, the finger is also pressed by the stone."

--Sir Isaac Newton, Philosophiae Naturalis Principia Mathematica



Get a Big Reaction, or Not

When you run, you actually move the Earth a very tiny amount. Yet it doesn't seem to go anywhere does it? That is because the Earth has a huge amount of mass compared to you. Mass is the amount of matter or substance that makes up an object. The more mass something has, the harder it is to make it move, stop, or change. You can push a shopping cart easily, but a school bus would barely move with the same amount of force.



Sometimes Easy is Hard

To swim, we push water away. Since water has a lot of mass and is harder to move, we can push pretty hard and get back a big push forward. But why does nothing happen if we try to swim in air? We need to move "lighter" stuff, like air, really fast to get the same push we can get with heavy stuff, like water, at slower speeds. This is why the propellers on helicopters, drones, and airplanes move so fast! There's an old story of Issac Newton seeing an apple fall from a tree. Here's a cool thing to think about: as the Earth pulls the apple down, the apple pulls the Earth up too!

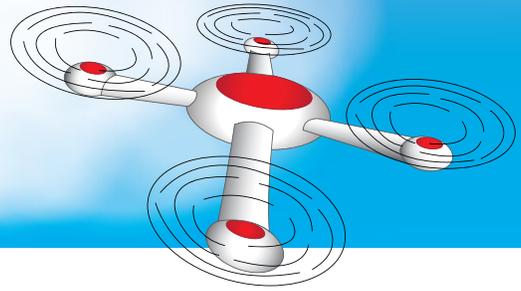
Why are Drones New(ish)?

What makes a drone work? Computers. Without computers, if a breeze blew, a drone would tip right over. Instead, when it starts to tip, a sensor tells a computer that "down" isn't in the right direction anymore. A computer on the drone speeds up and slows down motors to keep the drone flat, and make it only do what the pilot wants it to do. Computers only recently became small enough, light enough, fast enough, and cheap enough to fit into drones we can fly.

Learn more at wondergy.com/drones

To book a tour visit assemblyline.com

Drones Take Flight!

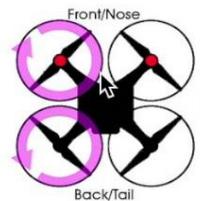


Drones Rely on Teamwork

To make a helicopter or drone fly up, it spins propellers that push the air down, really fast. But wait! If you spin and push the propellers, they will spin and push you back. So how do we keep the drone from spinning out of control? We have the drone spin a second propeller the other way. If we push two things in opposite directions, they cancel each other out.

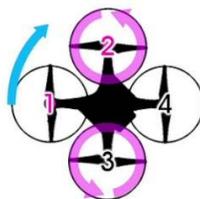
Do Amazing Drone-y Things

Want to go up? Speed up ALL of your motors, to push down harder everywhere.



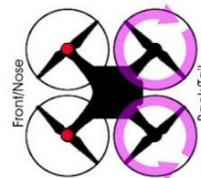
Rear View

Want to go sideways? Tip the drone a little, by speeding up the motors on the opposite sides. We call this roll.



Top View

Want to spin without going anywhere? Let one propeller spin faster than the other, and they won't cancel out anymore. They can add together. Often spinning is called rotating. In flying, pilots call it yaw.



Left Side View

Want to go forward? Tip the drone a little, by speeding up the motors in the back. We call this pitch

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