Name: _____ Date: _____

Four Blades Up

Reading level 8 (4th grade) · 877 words

A small drone sits in the grass. It has four blades and a camera. Nobody rides inside, and Ana steps back with the controller. She pushes one stick up. The blades spin up. The machine lifts off the ground and hangs in the air, almost still. What is holding it up?

This machine is a quadcopter. It has four rotors. A rotor is a spinning blade. Each one pushes air down. When the air goes down, the machine goes up. NASA says lift works like this: air is turned one way, and lift pushes the other way. That is action and reaction.

Lift needs air. With no air, or no movement between the blades and the air, there is no lift. So they must spin. To climb, Ana pushes the stick, and all four speed up. To come down, they slow, and to stay still, they spin at just the right speed.

A spinning blade does more than push air. It also twists the machine the other way. If all four turned the same way, it would try to spin around. So two turn clockwise and two turn the other way. The twists cancel out.

To fly forward, the two blades at the back spin a bit faster than the two in front. The machine tips forward and moves off. To go left or right, the two blades on one side spin faster than the two on the other. Only the speed of each blade steers it.

To turn without tipping, it speeds up one pair, the two that spin the same way. Now the twists do not cancel. The machine turns on the spot. Ana uses this to point the camera at the far trees. Then the four spin evenly again.

Who tells each blade how fast to spin? A small computer called the flight controller. It checks sensors all the time. A gyroscope feels when the machine starts to turn. An accelerometer feels when it speeds up or tips. A pressure sensor tracks height, because air pressure falls as you go up. Your phone has these tiny sensors too.

Wind pushes the machine sideways. The controller notices and speeds up the right blades to push back. It does this again and again, hundreds of times each second. So it can hover almost still, even in a breeze. If the settings are wrong, it twitches in the air instead.

Many camera drones also use GPS. GPS tells them where they are. A phone's GPS can be right to about sixteen feet in the open. It does worse near tall buildings and trees. When Ana picks return home, the machine climbs first. Then it flies in a straight line back to the place where it took off.

The camera hangs in a frame called a gimbal. The frame can tip and turn in three ways, with a motor for each. That keeps the picture level while the machine leans. Some send live pictures to a screen. Then the pilot sees what the drone sees. This is called FPV, short for first-person

view.

All that spinning runs on a battery, and a battery runs down. One maker lists thirty-four minutes in the air for one small drone. That came from a test with no wind. In 2013, an early one was listed at about fifteen minutes. That is less than half as long.

The battery is a lithium battery. The FAA warns that such batteries can overheat and catch fire. This can happen with no warning if one is damaged, wet or overcharged. A fire department adds two plain rules. Use only the charger that came with it. Stop using a battery that smells odd or has changed color. Ana follows both.

In the United States, a drone is an aircraft, and the FAA makes the rules. These are the rules in fall 2026, and they can change. A drone that weighs 250 grams or more, a bit over half a pound, must be registered by someone who is 13 or older. Anyone flying for fun must also pass a free test called TRUST.

Where can you fly? The rules start from one fact: other aircraft can fly low in many places, not just near airports. So keep your drone in sight, and stay at or below 400 feet in open airspace. Near an airport you must ask the FAA first. Never fly over a wildfire or a rescue. A service called B4UFLY shows where flying is allowed.

Ana's drone is registered, so it also sends out a Remote ID. Think of it as a name tag in the air. It tells who it is and where it is. The FAA and the police can use it to find the person flying when a drone goes where it should not. A drone under 250 grams, used just for fun, does not have to register.

Ana lands the drone and switches it off. The blades slow, then stop. Drones need air to push on, and some places have less. On April 19, 2021, a small NASA helicopter named Ingenuity took off from the ground on Mars. The air there is less than a hundredth as thick as the air at home. It went up anyway. It flew seventy-two times.

Questions

1. Why do two of the blades turn one way and two the other way?

A. So the twists cancel out
B. So the drone is louder
C. So the camera shakes less

2. What does the flight controller do?

A. It charges the battery
B. It decides how fast each blade spins
C. It takes the pictures

3. What does a gimbal do for the camera?

A. It makes the drone fly higher
B. It sends live video
C. It keeps the camera level

4. The FAA warns that a battery can "overheat." What does overheat mean?

A. Get too hot
B. Get too heavy
C. Get too loud

5. Why does the controller speed up certain blades when wind pushes the machine?

A. To save battery
B. To push back and stay in place
C. To make it louder

6. How thick is Mars air compared with air at home?

A. About the same
B. Twice as thick
C. Less than a hundredth as thick

Words to know

rotor: spinning blade
gyroscope: turn sensor
gimbal: tipping frame
register: sign up
FPV: pilot's-eye view

Answer key: Four Blades Up

1. A. So the twists cancel out
2. B. It decides how fast each blade spins
3. C. It keeps the camera level
4. A. Get too hot
5. B. To push back and stay in place
6. C. Less than a hundredth as thick