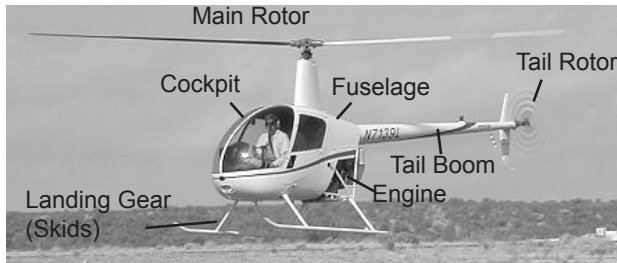


# About Helicopters

## What are the main parts of a helicopter?

The body of a helicopter is called the *fuselage*. This includes the cockpit, where the pilot sits during the flight.



Helicopters have a *main rotor* with two or more *rotor blades* to lift them up into the sky and move them in any direction. Each main rotor blade is like a wing. As the main rotor spins, each blade moves through the air. Together, the spinning blades are sometimes called a *rotor disk*.

Most helicopters also have a *tail rotor* at the end of the *tail boom*. The tail rotor prevents the helicopter from spinning around in a circle when the main rotor is spinning. It also lets the pilot turn the helicopter left or right.

The helicopter's *engine* provides the power to turn both the main rotor and the tail rotor.

## What does the inside of a typical helicopter cockpit look like?

The pilot sits inside the helicopter in what is known as the *cockpit*. There are many instruments and switches to operate things like radios and lights. Most helicopters have big windows so the pilot can see all around — even what's below.



The pilot controls the helicopter by using four different controls:

- The **cyclic** is a control stick that tilts the rotor disk in any direction — forward, backward (or *aft*), left, or right. The helicopter moves in the direction that the pilot pushes the cyclic. The pilot holds the cyclic in his or her right hand. The cyclic is very sensitive and the pilot usually cannot let go of it during flight.
- The **collective** is a control stick that changes the angle of the main rotor blades. Pulling the collective up increases the angle of attack, which increases lift and moves

## What would happen if the engine stalled during flight?

Lots of people think that if a helicopter's engine stalled, the helicopter would drop out of the sky like a brick. But that just isn't true.

A helicopter stores energy in its rotor blades. If the engine quits and the pilot reacts properly by quickly lowering the collective, the helicopter can glide safely to the ground. The landing might be a little hard, but it's a lot softer than the landing a dropped brick would make! This emergency procedure is called *autorotation* and all helicopter pilots must learn it.

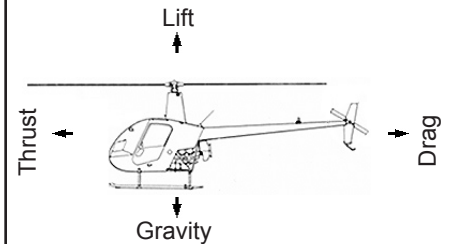
the helicopter up. The collective is beside the pilot's seat and the pilot holds it in his or her left hand.

- The **throttle** controls the amount of power that the engine produces. It is a twistable handle that is on the end of the collective, where the pilot holds it. As the pilot pulls up the collective, he or she usually has to increase the throttle. In many helicopters, this is done automatically for the pilot, but the pilot can adjust it if he or she needs to.
- The **antitorque pedals** control the amount of thrust the tail rotor produces. If there was no tail rotor, a helicopter with only one main rotor would spin in the direction opposite the main rotor blades. The tail rotor prevents this from happening by pushing the helicopter's tail. By using the pedals, the pilot can control the rotation of the helicopter to the left or right. The pedals are on the floor and the pilot controls them with his or her feet.

As you might imagine, flying a helicopter takes a lot of coordination because the pilot has to work controls with both hands and feet.

## Four basic forces of flight

There are four forces that affect a helicopter in flight: Gravity, Lift, Thrust, and Drag.



- **Gravity** is the force that keeps all objects on earth. If we pick up a ball and let it go, it will drop quickly to the ground because of gravity.
- **Lift** is a force that a helicopter must create to overcome the force of gravity. A helicopter does this by making lift with its main rotor blades as they spin. Because a helicopter doesn't need to move forward to produce lift, it can do something an airplane can't do: it can *hover*.
- A helicopter's horizontal movement is produced by thrust. **Thrust** is created by tilting the main rotor disk in the direction the pilot wants to fly. Unlike an airplane, thrust can move a helicopter in any direction — forward, backwards, or to either side.
- Just as lift overcomes the force of gravity during flight, thrust must overcome the force known as **drag**, which resists movement of an object — in this case, a helicopter!

## Helicopter Safety Rules

- Stay with your pilot or ground crew at all times.
- Listen carefully for instructions on entering and exiting the helicopter.
- Do not touch any part of the helicopter without the pilot's permission.
- When the helicopter is running, be sure to stand where the pilot can see you. Stay away from the back of the helicopter and its tail rotor.