



HOW TO FLY A QUADCOPTER

THE ULTIMATE GUIDE

by UAV Coach



This is the guide we wish we had when we learned how to fly a quadcopter.

Everyone goes through different struggles in the beginning. UAV flying certainly has a learning curve.

If you're having some trouble flying, you're just getting started, or you're looking to hone your skills -- don't worry.

You're in the right place.

A quadcopter is a distinct type of UAV. It uses four propellers to stay airborne and maneuver.

Each quadcopter flies differently. They come in [different sizes and weights](#), which means flying one type of quadcopter will never be exactly the same as flying another.

However, no matter your model, this guide will help you prepare for your first flight, stay safe, get airborne, and learn some basic and advanced flying techniques. You'll be able to walk through this book, step-by-step, and apply everything immediately.

Our goal is to give you a guide that will take out all of the guess work – from going through a pre-flight checklist, learning the controls, controlling your quadcopter's flight pattern, and even some advanced techniques.

This is your one-stop-shop for learning how to fly a quadcopter with confidence.

Have fun!

What You Will Learn

We know that not all aspiring pilots or hobbyists are on the same level.

So we've broken up this guide according to the following table of contents:

1. [Definitions](#).....3
2. [Quadcopter controls](#).....5
3. [Getting to know your remote control/transmitter](#).....9
4. [Overview of the main quadcopter parts](#).....11
5. [The pre-flight checklist](#).....12
6. [Choosing a place to learn how to fly a quadcopter](#).....13



7. Important safety precautions.....14
8. How to get your quadcopter off the ground.....14
9. How to hover in mid-air and land your quadcopter.....15
10. How to fly a quadcopter left/right and forwards/backwards.....16
11. How to fly a quadcopter in a square pattern.....16
12. How to fly a quadcopter in a circle.....17
13. How to rotate your quadcopter.....18
14. How to fly a quadcopter continuously.....18
15. Different milestones to pass.....19
16. Beginner's techniques.....20
17. Advanced techniques.....20
18. Next steps.....21

Definitions

General terms:

Line of site – The pilot can see their quadcopter during flight.

FPV (First Person View) -- The pilot can see where they're flying through the UAV's camera.

Parts:

Transmitter/Remote Control – The hand-held device that allows you to maneuver the quadcopter and adjust its settings.

Propellers – They spin according to the manual controls of the pilot. The intensity of the spin correlates to the intensity of the quadcopter's movement.

Camera – Many quadcopters either come with a camera or allow the pilot to attach a camera to them. This is how pilots [practice aerial videography](#) and photography.

Controls:

(Note: For simplicity's sake, this book assumes that the left stick controls yaw and throttle, and the right stick controls roll and pitch. Some transmitters allow the pilot to switch these controls based on what's most comfortable.)



Roll – Done by pushing the right stick to the left or right. Literally rolls the quadcopter, which maneuvers the quadcopter left or right.

Pitch – Done by pushing the right stick forwards or backwards. Tilts the quadcopter, which maneuvers the quadcopter forwards or backwards.

Yaw – Done by pushing the left stick to the left or to the right. Rotates the quadcopter left or right. Points the front of the copter different directions and helps with changing directions while flying.

Throttle – Engaged by pushing the left stick forwards. Disengaged by pulling the left stick backwards. This adjusts the altitude, or height, of the quadcopter.

Trim – Buttons on the remote control that help you adjust roll, pitch, yaw, and throttle if they are off balance.

The Rudder – You might hear this term thrown around, but it's the same as the left stick. However, it relates directly to controlling yaw (as opposed to the throttle).

Aileron – Same as the right stick. However, it relates directly to controlling roll (left and right movement).

The Elevator – Same as the right stick. However, it relates directly to controlling pitch (forwards and backwards movement).

Maneuvering:

Bank turn – A consistent circular turn in either the clockwise or counterclockwise direction.

Hovering – Staying in the same position while airborne. Done by controlling the throttle.

Figure 8 – Flying in a “figure 8” pattern.

Flight modes:

(Flight modes can typically be adjusted with certain buttons on your remote control/transmitter.)



Manual – Similar to flying a helicopter. Once you tilt the quadcopter (roll) it will **not** auto-level itself back to its original position. Even if you let go of the stick and it returns to the middle, the quadcopter will stay tilted.

Attitude (Auto-level) – Once the sticks are centered, the copter will level itself out.

GPS Hold – Returns the quadcopter's position once the sticks have been centered. The same as attitude mode (auto-level) but using a GPS.

Quadcopter Controls

When learning how to fly a quadcopter, the controls will become your bread and butter.

They will become second nature once you know how they act individually and how they interact together to form a complete flying experience.

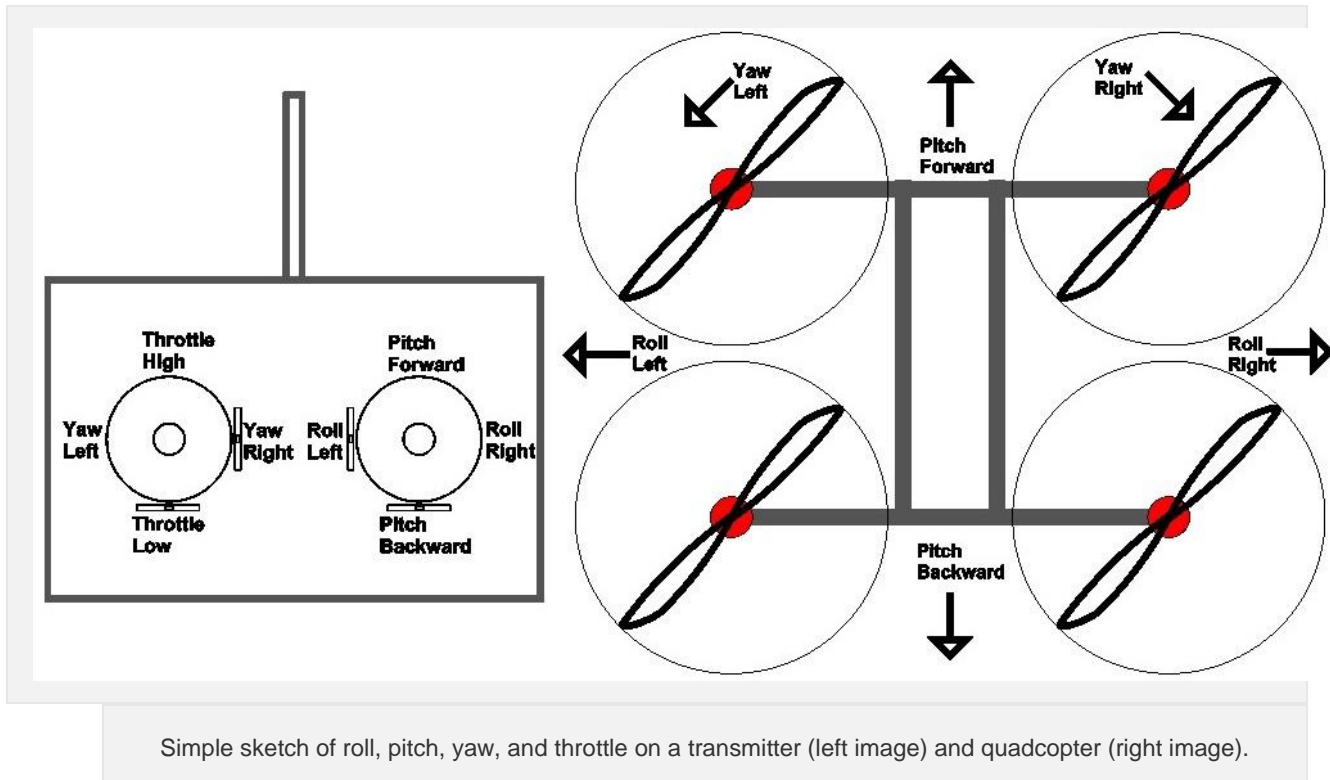
With any of these controls, the harder you push the stick, the stronger your quadcopter will move in either direction.

When you first start out, push the sticks very gently so the quadcopter performs slight movements.

As you get more comfortable, you can make sharper movements.

There are four main quadcopter controls:

- Roll
- Pitch
- Yaw
- Throttle



Simple sketch of roll, pitch, yaw, and throttle on a transmitter (left image) and quadcopter (right image).

(Image source: [Quadcopters Are Fun](#))

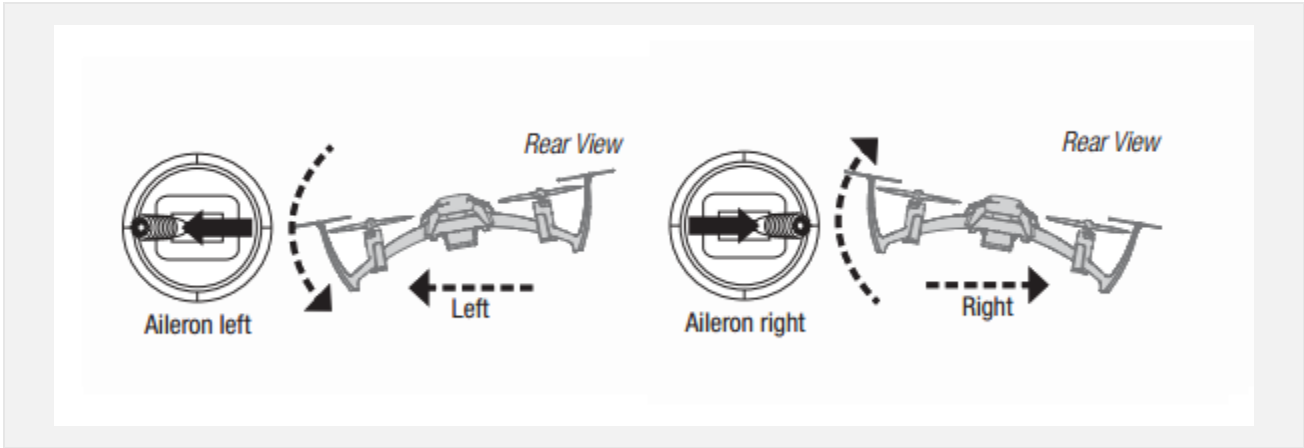
Let's go through each of them.

Roll

Roll moves your quadcopter left or right. It's done by pushing the right stick on your transmitter to the left or to the right.

It's called "roll" because it literally rolls the quadcopter.

For example, as you push the right stick to the right, the quadcopter will angle diagonally downwards to the right.



Example of a quadcopter rolling left and right. Notice the tilt of the quadcopter and the angle of the propellers.

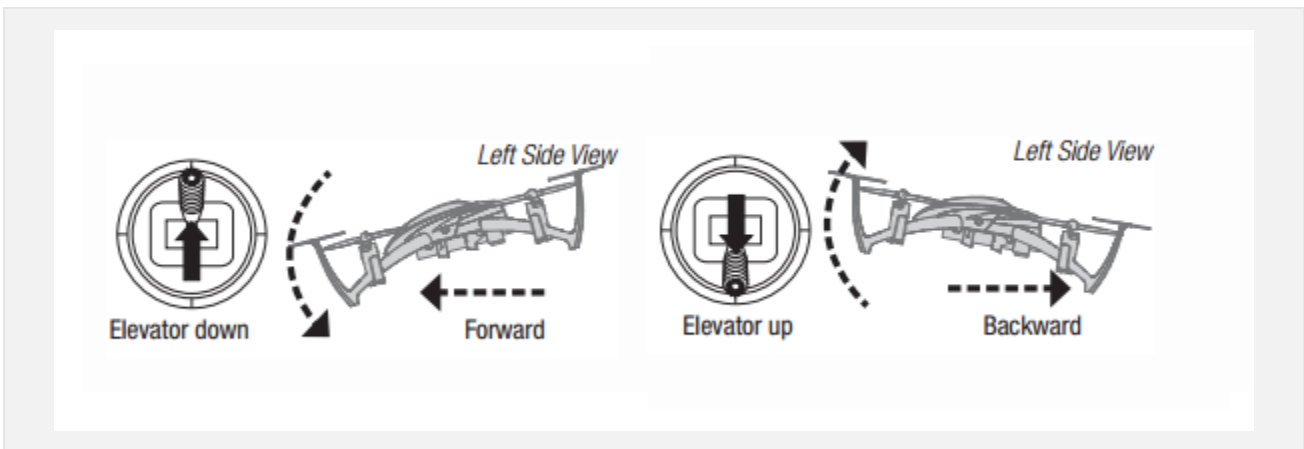
(Image source: [Best Quadcopter Spot](#))

Here, the bottom of the propellers will be facing to the left. This pushes air to the left, forcing the quadcopter to fly to the right.

The same thing happens when you push the stick to the left, except now the propellers will be pushing air to the right, forcing the copter to fly to the left.

Pitch

Pitch is done by pushing the right stick on your transmitter forwards or backwards. This will tilt the quadcopter, resulting in forwards or backwards movement.



Example of a quadcopter pitching forwards and backwards. Note that this view is from the left side.

Yaw



Yaw was a little bit confusing for me in the beginning. Essentially, it rotates the quadcopter clockwise or counterclockwise.

This is done by pushing the left stick to the left or to the right.

Check out the video below for an example.

(Watch from 3:00 to 3:40 and pay attention to how he adjusts the sticks.)

<http://youtu.be/P3E2pQnEDRI?t=3m>

Yaw is typically used at the same time as throttle during continuous flight. This allows the pilot to make circles and patterns. It also allows [videographers and photographers](#) to follow objects that might be changing directions.

Throttle

Throttle gives the propellers on your quadcopter enough power to get airborne. When flying, you will have the throttle engaged constantly.

To engage the throttle, push the left stick forwards. To disengage, pull it backwards.

Make sure not to disengage completely until you're a couple inches away from the ground. Otherwise, you might damage the quadcopter, and your training will be cut short.

Important note:

When the quadcopter is facing you (instead of facing away from you) the controls are all switched.

This makes intuitive sense...

- Pushing the right stick to the right moves the *quadcopter* to the right (roll)
- Pushing the right stick forward moves the *quadcopter* forward (pitch)
- Pushing the right stick backward moves the *quadcopter* backward (pitch)
- And so on.

So pay attention to that as you start changing directions. Always be thinking in terms of how the quadcopter will move, rather than how the

copter is oriented towards you.

Getting to Know Your Remote Control/Transmitter

A transmitter is a hand-held controller that lets you fly your quadcopter. When you make an adjustment with the sticks, it sends a signal to your copter telling it what to do next.

Check out this picture describing each part of the transmitter:



Transmitters come in different shapes and sizes. They also have different features. But there are certain parts that are universal for every transmitter.

(Image source: [Alibaba](#))

Right Stick

The right stick controls roll and pitch.

In other words, it moves your quadcopter left/right and backwards/forwards.

Left Stick

The left stick controls yaw and throttle.

In other words, it rotates your quadcopter clockwise or counterclockwise, and it adjusts the height at which you are flying.

Trim Buttons

Each control has its own trim button, as you can see from the image below.



(Image source: [Quadcopter 101](#))

When you first push your throttle to get your quadcopter off the ground, you may notice that the UAV automatically tilts and flies to one direction (or multiple).

This happens when the controls are unbalanced. To balance them out, certain controls need to be trimmed.

Check out the beginning of this video, where the pilot trims a few of his controls:

(Watch from 0:47 to 1:07)

<http://youtu.be/FPuYL8Qjhvw?t=47s>



If this happens, you can use the corresponding trim button to adjust the control's natural intensity. This will stabilize the copter when pushing the throttle.

An Overview of the Main Quadcopter Parts

When learning how to fly a quadcopter, it's important to understand the machine you're commanding.

If something goes wrong, you want to be able to diagnose and fix the issue. You also want to understand the capabilities of each part and how they play into flying a quadcopter.

Here are the main parts of a quadcopter:

- The frame
- Motors
- Electronic Speed Control (ESC)
- Flight Control Board
- Radio Transmitter and Receiver
- Propellers
- Battery and Charger

The frame connects all of the other components. For a quadcopter, it's shaped in either an X or a + shape.

If you're building your own quadcopter, you want to consider the size and weight of the frame and how it will affect your flying experience.

The motors spin the propellers. A quadcopter needs four motors, because one motor powers a single propeller.

Motors are rated in kilovolts, so the higher the kV, the faster the motor will spin.

Electric Speed Controls (ESCs) are wired components that connect the motors and the battery. They relay a signal to the motors that tells them how fast to spin.



At any one time, each of your motors could be spinning at different speeds. This is what lets you maneuver and change direction. It's all conducted by the Electronic Speed Controls, so they're very important.

The Flight Control Board is the “commander of operations”. It controls the accelerometer and gyroscopes, which control how fast each motor spins.

The radio transmitter is your remote control, and **the receiver** is the antenna on the copter that talks to the remote control. When you make an adjustment on the transmitter, the receiver is what understands that adjustment and sends it to the rest of the quadcopter system.

A quadcopter has 4 propellers, and each one helps determine which direction the quadcopter flies or whether it hovers in place.

The battery is the power source for the whole quadcopter. This needs to be charged and recharged, because without a battery, you cannot fly your quadcopter.

The charger charges your battery so you can take multiple flights.

(Pro tip: We recommend buying multiple batteries. This way, you won't have to wait for the first battery to charge in order to take more flights. You can charge the first battery while you insert the second, third, fourth one, etc.)

The Pre-Flight Checklist (Do NOT Skip This)

Going through a pre-flight checklist will keep you and your copter safe.

It will also make sure you don't waste time fixing components and getting things ready, when you could be having a blast learning how to fly your quadcopter.

Here's a checklist you can use before each flight:

- If you have a camera, check that you have your micro SD card inserted.
- Make sure the transmitter battery is charged.



- Make sure the quadcopter battery is charged.
- Insert the battery.
- Make sure the battery is inserted securely.
- Make sure each propeller is secure.
- Check that there are no loose parts on the quadcopter.
- Check for missing or loose screws.
- Turn on the transmitter.
- If your copter needs to calibrate and get satellite lock, wait until it finishes.
- Make sure there is enough room for launch and flight.
- Make sure the throttle (left stick) is all the way down.
- Turn on the transmitter.
- Back away 3 or 4 steps (or to a safe distance).
- Keep facing the quadcopter the entire time.
- Keep a direct line of site at all times when flying, so you can always see your quadcopter. You want to keep a direct line of site so you know when you're about to crash. Also, sometimes, quadcopters can fly out of the range of the transmitter's signal, which can cause your copter to fly off on its own (bye bye quadcopter). Keep the transmitter's range in mind, and don't let your quadcopter fly out of that range.

Choosing a Place to Learn How to Fly a Quadcopter

Any UAV pilot will tell you that learning to fly a quadcopter in an enclosed space is asking for something to go wrong – either with you, your belongings, or the copter itself.

As you get more experienced, and your control becomes natural, flying in tight spaces will be a cinch.

But as a beginner, choose a place that will minimize the impact any mistakes might have.

We suggest starting out in a large, open space, such as a park or a field. Many people prefer to learn on grassy ground, so if the quadcopter needs to make a crash landing, it will at least have some sort of cushion.



Next, stay away from people or animals. Any crashes could cause serious injury.

And finally, wind can be your worst enemy when learning the nuances of flying. To reduce the chance of flying in the wind, try to fly in the morning.

Important Safety Precautions

Quadcopters are basically flying lawnmowers.

They can be dangerous if not operated carefully.

Here are some quadcopter safety precautions to keep in mind:

- If you're about to crash into something, turn the throttle down to zero, so you don't potentially destroy your quadcopter, injure somebody, or injure yourself.
- Keep your fingers away from the propellers when they're moving.
- Unplug/take out the battery of the quad before doing any work on it. If it turns on accidentally and the propellers start spinning, you might have a tough time doing future flights with missing fingers.
- If you're a beginner learning to fly indoors, tie the quadcopter down or surround it by a cage.

How to Get Your Quadcopter Off the Ground

Alright! Now that you understand the controls and you've taken all of the right safety precautions, you're ready to fly.

To get your quadcopter in the air, the only control you need is the throttle.

Push the throttle (left stick) up very slowly, just to get the propellers going. Then stop.

Repeat this multiple times and until you're comfortable with the throttle's sensitivity.



Slowly push the throttle further than before, until the copter lifts off the ground. Then pull the throttle back down to zero and let the quadcopter land.

If you want to get a good visualization, check out this video from [My First Drone](#):

(Watch from 1:15 to 1:40)

<http://youtu.be/P3E2pQnEDRI?t=1m15s>

Repeat this 3-5 times. Notice whether the copter is trying to rotate left or right (yaw), move left or right (roll), or move backwards or forwards (pitch).

If you notice any movements happening without you *making* them happen, use the corresponding trim button to balance them out.

For example, if you notice the copter moving to the left when you push the throttle, adjust the “roll” trim button next to the right stick.

Keep adjusting the trims until you get a relatively stable hover off the ground by only using the throttle.

Congrats! You know how to get your quadcopter airborne.

Now, let’s learn how to hover in mid-air.

How to Hover in Mid-Air and Land Your Quadcopter

To hover, you will use the throttle to get airborne. You will then use small adjustments of the right stick to keep the quadcopter hovering in place.

You may also need to adjust the left stick (yaw) slightly, to keep it from turning.

Use the throttle to get the copter about a foot to a foot-and-a-half off the ground.

Make tiny adjustments with the right stick (and the left, if necessary) to keep the copter hovering in position.

When you’re ready to land, cut back the throttle slowly.



When the quadcopter is an inch or two off the ground, go ahead and cut the throttle completely and let the UAV drop to the ground.

Repeat this until you get comfortable hovering off the ground and landing gently.

How to Fly a Quadcopter Left/Right and Forwards/Backwards

To fly a quadcopter left, right, forwards, and backwards, you will need to hold the throttle at a steady rate to keep it airborne. You will then use the right stick to maneuver the quadcopter in the direction you want it to go.

First, bring your copter to a hover.

Push the right stick forward to fly it a couple feet forward.

Pull the right stick back to bring it back to its original position.

Now, move it further backwards a couple feet, and return it to its original position.

Push the right stick to the left to move your copter a couple feet to the left.

Move it back to its original position, then fly it a couple feet to the right.

If it starts to rotate (yaw), adjust the left stick to the left or right to keep the copter facing the same direction.

(Pro tip: When you move in either direction, you will probably notice the quadcopter dropping in altitude. To keep the copter at the same altitude, push the throttle and give it more power whenever you turn or move.)

How to Fly a Quadcopter in a Square Pattern

You've gotten off the ground, and you know how to fly a quadcopter in the four basic directions.



Now, it's time to combine these skills and start flying in patterns. This will help you get a feel for simultaneously engaging the controls.

To fly in a square pattern, keep the quadcopter facing away from you the entire time.

Push the right stick forward (pitch) and fly forward a couple feet. Then, return the right stick to the middle and hover in place.

Then push the right stick to the right (roll) and fly to the right a couple feet. Then, hover in place for a few seconds.

Pull the right stick backwards and fly backwards a couple feet. Then, hover in place for a few seconds, and push the right stick to the left and return the quadcopter to its original position.

You've just flown in a square! Keep doing this until you get comfortable with it, and then move on to our next pattern – flying in a circle.

How to Fly a Quadcopter in a Circle

This is where you will hone your simultaneous control skills.

To fly a quadcopter in a circle, you will use pitch, roll, and throttle at the same time.

As usual, use the throttle to get airborne. Then, decide whether you want to fly clockwise or counterclockwise.

For this example, we'll assume you're flying clockwise (to the right).

Keep the quadcopter facing away from you, and push the right stick diagonally up and to the right. This will engage both pitch and roll at the same time, and start moving the quadcopter in a circle to the right.

After a couple feet, start rotating the right stick more to the right, so you engage more roll. This will start maneuvering your quadcopter to the right.

After a few more feet, start rotating the right stick diagonally to the bottom right, and continue to circle the right stick around until the copter returns to its original position.



Try changing directions, and slowly rotating the right stick to fly in a circle. If you notice the quadcopter starting to rotate and face different directions, adjust the quadcopter's yaw by pushing the left stick to the left or right.

How to Rotate (Yaw) Your Quadcopter

To rotate your quadcopter, use the throttle to get airborne.

Once at a comfortable hover, push the left stick in either direction. This will rotate the quadcopter in place.

Rotate it 360 degrees. Then push the left stick in the opposite direction and rotate it 360 degrees the other way.

Keep doing this until you're comfortable with it.

How to Fly a Quadcopter Continuously

Flying a quadcopter continuously requires you to rotate and change directions simultaneously.

This will take some getting used to, because the quadcopter will be facing different angles in relation to how you're facing, so you will need to pay close attention to how each movement of the sticks will affect the quadcopter's flight.

First, take off and hover.

Rotate (yaw) your copter to a slight angle.

Use the right stick to fly it left/right and forwards/backwards. Get comfortable flying the quadcopter while it faces a different direction.

Rotate it to another angle, and use the right stick to maneuver it again.

Keep doing this until you're comfortable flying at different angles.

To fly continuously, slowly push the right stick forward.

As you're pushing the right stick forward, push the right stick slightly to the left or to the right at the same time.



Fly in different directions by pushing the right stick forward (pitch) and adjusting it left and right, and using the left stick (yaw) to change the direction the copter is facing.

Then, try adjusting the quadcopter's height by moving the left stick forward and backward (throttle).

Congrats! Now you know how to fly a quadcopter with continuous movement.

Keep practicing until you can direct your quadcopter at will. Then, move on to the next section, where we'll discuss different milestones for you to shoot for.

Different Milestones to Pass

Use these milestones to keep you organized during the learning process.

They will help you gauge where you're at and what you should be going for next.

- Learn how the four main quadcopter controls – roll, pitch, yaw, and throttle – affect a quadcopter's movement.
- Understand the parts of your quadcopter and what each of them does.
- Prepare a pre-flight checklist and go through it before each take off.
- Understand the safety precautions.
- Use the throttle to get airborne, and make any necessary adjustments using the trim buttons.
- Get comfortable hovering in mid-air and gently landing your quadcopter.
- Take off to an altitude of 3 feet and land in the same position.
- Take off to an altitude of 3 feet and spin the UAV around 180 degrees.
- Get comfortable flying your quadcopter left/right and forwards/backwards.
- Learn how to fly a quadcopter in a square pattern.
- Learn how to fly a quadcopter in a circle.
- Learn how to rotate (yaw) a quadcopter.

- Learn how to fly a quadcopter continuously.
- Do all of the above, but at an altitude of 25 feet.

Beginner's Techniques

Here are some beginner's techniques for you to master:

1. Hover in place.
2. Hover and rotate the quadcopter.
3. Rotate the quadcopter to different angles, and fly it left/right and forwards/backwards until you're comfortable flying a quadcopter without it facing the same direction as you.
4. Fly your quadcopter in a square pattern.
5. Fly your quadcopter in a circle.
6. Fly at different heights.
7. Pick two targets on the ground, and repeatedly land, fly, and land on each one.

Check out this video for an example of #7:

(Watch from 4:33 to 4:57)

<http://youtu.be/P3E2pQnEDRI?t=4m33s>

Advanced Techniques

Here are some advanced techniques for you to master:

1. Fly in a "figure 8" pattern. This will require you to fly the quadcopter with the front facing forwards the entire time.
2. Bank turns. Keep a little forward pitch for forward movement. Apply throttle, and roll the quadcopter in the direction of the turn (left or right).

Check out this video for an example of bank turns:

(Watch from 1:10 to 2:05)

<http://youtu.be/FPuYL8Qjhvw?t=1m10s>



Next Steps

Congrats on finishing our “How to Fly a Quadcopter” guide! We hope it gets you on your way to flying a quadcopter like a pro.

So, where should you go from here?

Well, if you haven’t bought a quadcopter yet, our [buying guide](#) will set you off in the right direction.

You might also want to try out a flight simulator. Here’s a cool one for you to check out: <http://rcdeskpilot.com/>.

Simulators let you experiment without any consequences to your quadcopter, and it will help you get comfortable with certain controls before diving in to the real thing.

If you enjoyed the guide, and you think other people could learn something from it, please [click here](#) to [share it on Facebook](#).

Lastly, go [like our Facebook page](#) to stay up-to-date with the latest UAV news, training, and information.

Any questions or comments? Please contact us at: support@uavcoach.com.

We love hearing from you!