



*Note: This list is updated for winter 2016/2017. **Fly safely and responsibly, folks.** Never flown before? [Learn to fly for free over here](#). Need to get your FAA commercial drone certificate? [Start studying over here](#).*

Flying an FPV (first person view) drone is an otherworldly experience.

Before now, only in movies and video games could most people experience a bird's-eye view or race through obstacles at breakneck speeds.

Thanks to FPV quadcopters, hexacopters, and other multirotors, anyone with enough [flying skill](#) to maneuver a drone can now have this experience.

When most people think 'FPV drone system,' they think about FPV racing.

This new and rapidly growing sport is getting commercialized by organizations like the [Drone Racing League](#), [U.S. Drone Racing Association](#), and events like the [World Drone Racing Championships](#).

And rightly so. It's awesome!

Want to skip the details and go straight to our list of recommended FPV drones, goggles, cameras, and transmitters? You got it:

- [Vortex 285 Racing Quadcopter](#)
- [ARRIS FPV 250 Quadcopter](#)
- [Walkera Runner 250 Pro Quadcopter](#)
- [TBS Vendetta Quadcopter](#)
- [DYS XDR220 RTF FPV Racing Quadcopter](#)

- [DJI Phantom 4 Quadcopter](#)
- [Yuneec Typhoon H Hexacopter](#)
- [Eachine CMOS 700TVL FPV Camera + Transmitter](#)
- [FatShark 900VTL WDR CCD FPV Camera](#)
- [FatShark Dominator HD V3](#)
- [Eachine VR-D2 FPV Video Goggles](#)
- [Boscam TS351 200mW Transmitter](#)
- [Eachine 700tvl 5.8G 32Ch 200mW Transmitter](#)



FPV racing makes for an excellent spectator sport. Live attendees can either watch the drones themselves, or they can set a pair of goggles or an LCD monitor to the right channel see what the drones are seeing.

TV stations can also stream live racing events to millions of homes, bars, and restaurants.

(ESPN recently [announced a partnership](#) with the International Drone Racing Association to begin streaming races in August, 2016.)

Then there's the hobby side of FPV drones.

Pilots can have a ton of fun getting views, photos, and videos of objects and landscapes they never could have gotten before.

FPV drones can also aid search and rescue, as emergency personnel can eliminate the risk of human harm while scouting dangerous areas.

Finally, there's the ever-expanding (and lucrative) commercial side to FPV.

Professional pilots can shoot expert aerial photos and videos to be turned into marketing materials, [maps and 3D models](#), and much more.

First person view multirotor capabilities have blown the doors wide open to harness drone technology even further in society.

This guide gives drone pilots a crash course on the FPV side of drone flight.

We made sure to include what FPV drone flying is, how it works, and some of the best equipment to get started.

If you're new to the FPV world or have just started getting your feet wet, we suggest reading the entire article.

If not, go ahead and skip to the section that applies to you best:

- [Helpful Definitions](#)
- [How FPV Racing Works](#)
- [Racing Drones](#) (ready to fly)
- [FPV Quadcopters](#) for Aerial Photo/Video (ready to fly)
- [FPV Cameras](#)
- [FPV Goggles](#)
- [Transmitters](#)
- [Other FPV Options to Check Out](#)
- [Further Reading](#)

Happy flying!

Helpful Definitions

FPV (first person view): Using a screen, monitor, or goggles to view what your multirotor's camera is seeing in real time.

Line of Sight (LoS): Being able to physically see your drone as you're piloting it.

FPV racing: A rapidly growing sport in which pilots race small quadcopters around a predetermined track.

RTF (ready to fly) racing drones: Drones made for FPV racing that require no additional assembly.

DIY racing drones: A homemade do-it-yourself racing drone.

FPV camera: A special camera used for first-person-view racing, piloting, photography, or videography.

FPV goggles: A special set of goggles used to view what the multirotor's camera is seeing in real time.

Head tracking: An FPV goggle mod that allows you to adjust your camera's angle mid-flight by tilting your head.

Interpupillary distance: Internal goggle lens distance from the center of your pupils.

LCD monitor: A screen, usually attached to the controller, used to view what a multirotor's camera is seeing. Usually used instead of goggles.

Transmitter: Relays the camera's feed to the receiver.

Receiver: Accepts the camera's feed and relays it to your screen/goggles of choice.

Frequency: The radio frequency FPV equipment runs on. Can be brand-dependent. Allows for multiple channels so pilots don't interfere with each other.

FPV system: The entire drone rig, from the multirotor itself, to the connecting parts, to the controller and video display method.

On Screen Display (OSD): Gives you flight telemetry data (speed, altitude, battery life, etc) on your FPV display. See a full OSD guide [here](#).

TVL (Resolution): The camera's resolution, which helps determine video feed quality and clarity.

CCD camera type: Camera that uses a charge-coupled device (CCD) image sensor. Typically better for FPV.

CMOS camera type: Camera that uses a complementary metal-oxide-semiconductor (CMOS) image sensor. Typically cheaper than CCD cameras, but not as good for FPV.

Video Latency: Lag in what your camera sees and when it transmits it to your screen/goggles. Can lead to inaccurate flight, racing maneuvers, and aerial shots.

Jello: Vibration in your video caused by the multirotor itself.

How FPV Racing Works

FPV racing is an exhilarating sport.

These quadcopters can fly up to 50mph miles per hour (or faster) through hoops, around trees, over bars, and just about any object.

The tracks are specifically set up to challenge each pilot's skill set. Recreational tracks tend to be less complex, because the organizers usually don't have the resources for a more intricate set up.

Or the pilots' skill levels are lower.

Professional tracks can get extremely complex, causing pilots to make acrobat maneuvers to get around/through each obstacle.

The Types of FPV Drone Races

According to [FPVRacing.tv](https://fpvracing.tv), FPV pilots currently have the option of 3 race types:

1. Rotorcross

The multirotors race through a course and are ranked in the order they cross the finish line (traditional racing).

2. Drag Race

A straight-line race between 2 or more multirotors over a short distance (usually 100m). This tests acceleration and top speed.

3. Time Trial

Tests how fast each multirotor can make it through the course.

How to Find Races

Check out these five resources to find drone racing events to join:

1. [FPVRacing.tv](https://fpvracing.tv)'s [events map](#)
2. [FPVRacingEvents.com](https://fpvracingevents.com)
3. [The Drone Racing League](#)
4. [U.S. Drone Racing Association Calendar](#)
5. Google: "your location + FPV drone race"

How to Join a Drone Racing Team

Just like NASCAR and other types of racing, pilots are broken up into teams for cohesion and scoring. Each pilot on a team typically uses similar equipment.

To find teams to join, check out [this page](#).

The Different Leagues and Championships Available

The Drone Racing League – The DRL season involves different races in which pilots accumulate points. Pilots with the highest number of points qualify for the World Championship. Here are [the standings](#).

MultiGP Drone Racing League – With chapters all over the world and events and classes for all types of FPV racers, MultiGP is leading the way in FPV racing and event management.

The World Drone Racing Championship – The 2016 Drone Worlds was held in Kualoa Ranch, Hawaii. The event brought together pilots from 30 countries to compete on four courses and in six different events each day.

To find a recreational or professional drone league in your area, do a Google search for “your area + drone racing league” or “your area + recreational drone racing league.”

Ready to Fly FPV Racing Drones

The following racing quadcopters are ready to fly right out of the box. No assembly required.

Many people choose to build their own rigs to get the specifications they want.

But if you don't have the technical knowledge or the desire to build one yourself, these multirotors are more than adequate to start with.

Note: Ready to fly does not necessarily mean the quad comes with a remote control, goggles, a monitor, and other equipment. In many cases, those will need to be purchased separately.

Check out the full specs of our list of FPV drone systems below:

Note: All specs/features come from either the manufacturer or retailer.

Note #2: When checking out prices, we've included models available for sale on [Amazon](#), one of the largest and most respectable online drone retailers. We do our best to keep these listings up-to-date on a regular basis, but if you see something we missed, let us know at support@uavcoach.com.

1. Vortex 285 Racing Quad

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



The [Vortex 285 Racing Quad](#) from [ImmersionRC](#) is one of the top ready-to-fly FPV models out there.

Its 285 size is slightly bigger than the more common 250, but it's still extremely fast.

This quadcopter is foldable for easy transport, and its frame is made out of durable carbon fiber and custom injected plastic.

The camera mount is tiltable, allowing you to get the right flight angle, and it can fit either an FPV camera or an HD one (like a GoPro).

The [Vortex 285](#) also includes a full-graphic on-screen display and 5.8GHz video transmitter, making it compatible with any 5.8Ghz receiver.

This is an excellent RTF quadcopter for both beginner and intermediate racers.

Features

- Foldable design
- Tiltable camera mount

- Can hold an FPV camera or an HD one (like a GoPro)
- Includes an on-screen display

Specifications

- Size: 285
- Weight: 14.4 ounces
- Transmitter Frequency: 5.8Ghz
- Transmitter Power: 350mW



2. ARRIS FPV 250

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



The [ARRIS FPV 250](#) is one of the highest rated racing quadcopters on Amazon.

It's made of durable carbon/glass fiber composited material to help it handle crashes and accidents. The drone is also equipped with a 700TVL camera that offers zero latency between what the drone sees and what you see.

And all parts are tested by the manufacturer and ready to fly. However, you will need to buy your own remote control and battery.

If you're looking for a high-rated racing drone, check out the [ARRIS FPV 250](#).

Features

- Made of carbon/glass fiber composited material
- Comes with 700TVL camera

Specifications

- Size: 250
- Weight: 13.6 ounces



3. Walkera Runner 250 Pro

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



The [Walkera Runner 250](#) is one of the most popular ready-to-fly FPV drones on the market.

This quadcopter features a carbon fiber frame that's ultra-durable and crash resistant.

The Walkera 250 Pro is also simple to disassemble and reassemble. This allows pilots to customize its features and tune the rig.

This drone reaches speeds of up to 21-25 miles per hour, and the [Runner 250](#) is equipped with an 800TVL HD camera for live FPV streaming.

If you're looking to get into drone FPV racing, the Walkera Runner 250 is a solid start at a modest price.

Features

- Carbon fiber frame
- Simple to assemble and disassemble
- Reaches speeds up to 21-25 mph
- Comes with 800TVL camera

Specifications

- Size: 250
- Weight: 18.7 ounces (w/ battery)



4. TBS Vendetta

SEE LATEST PRICE & OPTIONS AT [AMAZON.COM](https://www.amazon.com)



Team Black Sheep (TBS) has created an excellent RTF FPV racer, the [Vendetta](#).

This 240-sized quadcopter is made with a full carbon fiber frame and quick swap arms. It's also one of the only FPV drones that does not require soldering to make repairs.

This is especially helpful for racers, because crashes are inevitable. Making repairs at the event is much easier with this quadcopter.

All parts are made by TBS and tested by professional tuning experts before going on sale.

Because this drone is in such high demand, availability is low right now. But you can backorder it [from GetFPV here](#).

Features

- Carbon fiber frame
- Quick swap arms
- No soldering required

Specifications

- Size: 240
- Weight: 14.4 ounces



5. XDR220 RTF FPV Racing Drone

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



Force 1's XDR220 comes with a light, extra durable, and bend-resistant carbon fiber frame, and was clearly designed with racing in mind.

The XDR220 fits every level of racing, as it can be tuned and modified overtime as you become a better pilot. It is available as an RTF package, or you can get the kit separately and customize your own XDR220.

Features

- Ready-to-fly with modular design for quick crash recovery builds
- Carbon fiber frame
- Powerful brushless motors
- Balance charger increases battery life
- Fits every level of FPV racing

Specifications

- 9-CH 2.4GHz CONTROLLER
- PREMIUM 5.8GHz FIRST PERSON VIEW (FPV) Remote Controller: FrSky Taranis X9D Plus (RTF Only)

Ready to Fly FPV Quadcopters for Aerial Photo/Video

First person view is not only for racing.

It's also one of the best ways to get accurate aerial photos and videos. (Check out [these aerial videography training tips](#).)

The following quadcopters are two of the top aerial videography and photography rigs with native FPV capability.

1. DJI Phantom 4

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



DJI has made more than a few excellent drones, but the [Phantom 4](#) stands out among the rest.

First off, the quadcopter has an obstacle avoidance system. If you're about to run into something, the drone senses its distance and automatically bumps itself away.

This drone also comes with multiple autonomous flight modes, like ActiveTrack, which allows you to click a subject on the screen and tell the [Phantom 4](#) to follow it.

To fly in first person view with the Phantom 4, you can use your tablet or smartphone through the [DJI GO](#) app. You can then attach your device to your controller, which allows you to have it in front of you at all times.

You can also use [FPV goggles](#) (discussed later). To do this, you need to attach [an adapter](#) to your controller. Then, attach the HDMI cord from your goggles to the adapter.

Features

- Auto takeoff and auto return home
- Obstacle avoidance system
- FPV capability
- Capture 4K ultra HD video at 30 fps and 12MP stills

Specifications

- Frequency: 2.4G
- Gyro: 6 axis
- Size: 12.8 x 8.66 x 14.96 in
- Weight: 3.3 pounds
- Flying time: about 28 minutes
- Speed: Up to 45 mph



2. Yuneec Typhoon H

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



The [Yuneec Typhoon H](#) is one of the most advanced [aerial videography drones](#) on the market. Most rigs of this quality cost \$4,000-\$10,000 or more.

The Typhoon H sits at a reachable \$1,499 (similar to the Phantom 4).

This hexacopter features obstacle avoidance and a CGO3+ 4K UHD camera that gives you a full 360-degree view of the world around your drone.

It also offers Team Mode, which allows you to bind one controller to the hexacopter and one to the camera for dual-operator control.

Also, flying in FPV with [the Typhoon H](#) is super easy. Either use the 7-inch screen built into the controller, or simply connect your goggle's HDMI cord to the controller's HDMI port.

Features

- CGO3+ 4K UHD camera (360-degree view)
- Team mode
- Easy FPV capability
- Capture 4K ultra HD video at 30 fps and 12MP stills

Specifications

- Frequency: 2.4G
- Gyro: 6 axis
- Size: 520 x 457 x 294 mm
- Weight: 4.1 pounds
- Flying time: about 25 minutes



Drone FPV Cameras

Many cameras that can be mounted on drones can also be used for FPV.

But there's a certain type that are best for FPV racing, reducing latency, and maximizing the FPV experience.

If your racing drone doesn't come with a camera or you're building your own (DIY), check out these cameras:

1. Eachine CMOS 700TVL FPV Camera + Transmitter

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



This is one of the highest rated FPV cameras on Amazon. And for what you get, the price is nearly unbeatable.

It comes with a 5.8GHz transmitter (make sure your receiver is also 5.8GHz), and the FPV camera features low power consumption and lightweight design, making it great for 250-sized quadcopters.

It is a CMOS camera, so it's not as good for FPV as CCD ones. And you may need to solder the connections. But for less than \$50, this camera is a great starter.

Specifications

- Frequency: 5.8Ghz
- Weight: .42 ounces
- Type: CMOS
- Resolution: 700TVL

2. FatShark 900VTL WDR CCD FPV Camera

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



If you've read anything about FPV systems before, you've probably heard of [Fat Shark](#).

Their [900VTL camera](#) is on the pricier side, but it delivers high quality video.

At .3 ounces, it's extremely lightweight and great for FPV racing. But you will need to couple it with a transmitter, receiver, and goggles or a monitor if you don't have those items already.

(This is the case with most FPV cameras available.)

Specifications

- Frequency: 5.8Ghz

- Weight: .2 ounces
- Type: CMOS
- Resolution: 900TVL
- Mechanical: 25 X 27 X 12(lens) mm, 13.5g (plastic cased) + 5g/9g cable.
- Resolution: 900 TVL*
- Low light (0.08Lux/F1.2)

Drone FPV Goggles

Many people prefer flying with goggles rather than a monitor. Goggles can provide a more immersive experience and minimize distractions.

They can be pricey, but totally worth it if you're serious about improving your skills.

Here's what you're looking for in a pair of goggles:

- Is the resolution high enough? You want your image to be as clear as possible (within your budget).
- Can you adjust the IPD ([interpupillary distance](#))? This allows you to make sure your pupils are centered in each goggle — similar to adjusting binoculars.
- Does it come with a receiver? And is it in the right frequency? (Remember that your receiver and transmitter need to be in the same frequency.)
- Head tracking: Can you control the camera's tilt by tilting your head? (Awesome feature)
- Does the price fit your budget?

To cater to most people's needs, I've reviewed goggles that have adequate resolution and can fit most people's budgets:

1. FatShark Dominator HD3 V3

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



Fat Shark's [Dominator HD3 V3](#) goggles come fully-featured with adjustable IPD, a modular design (allowing you to customize parts and add-ons), and high quality 800×600 resolution.

You can also attach the [Trinity Head Tracker](#) to allow you to adjust your camera's angle mid-flight by tilting your head. Simply insert the module into a slot on the side of the goggles.

Features

- Compared to the Dominator HD2, it has reduced field of view to help with image sharpness.
- HD3 ships with new lower profile Velcro backed (removable) faceplate foam for a more accommodating fit.

- 4:3 in Analog signal; 16:9 in HD signal.

Specifications

- Resolution: 800×600 WVGA
- High definition media interface
- 720p Support

2. Eachine VR-D2 FPV Video Goggles

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



Eachine's [VR-D2](#) is an excellent pair of goggles, and a good fit for new pilots or pilots who are on a budget.

It's resolution is solid at 800 x 480, and it features a full 5-inch screen to view your quadcopter's flight, and a built-in DVR function for recording your flight.

It has got a built-in 5.8Ghz receiver (the antenna is 5.8Ghz as well), and it comes with padding for added comfort.

These goggles are worth a look if you're on a budget or want a starter pair to try out.

Features

- 5-inch screen
- Built-in 5.8Ghz receiver

Specifications

- Resolution: 800×480 WVGA

Transmitters

Transmitters run pretty cheap compared to other drone FPV gear.

But they're also one of the most important pieces. The transmitter determines your goggle's and camera's connection quality, how well it can handle distance, and how well it can handle objects coming in its way.

Transmitters and receivers come in different radio frequencies. The most common right now is 5.8Ghz. That's probably the route you'll want to take, because it's legal to use in most countries (but make sure to look up the laws in your country).

Look up the power limitations in your country as well.

Here are a couple transmitters to check out:

1. Boscam TS351 32Ch 5.8 Ghz 200mW Transmitter

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



It runs on 5.8Ghz frequency, offers 32 channels, and is rated 600mW in power.

The 5.8Ghz frequency will make your connection a little jumpy if there are obstacles (like trees or buildings) in the way, but 600mW should be enough to make up for some of that.

For less than \$30, this transmitter will at least get you up and running.

Specifications

- Frequency: 5.8Ghz
- Power: 600mW
- Weight: .7 ounces

2. Eachine 700tvl 5.8G 32Ch 200mW Transmitter

[SEE LATEST PRICE & OPTIONS AT AMAZON.COM](#)



This [Eachine transmitter](#) is similar to the one above (5.8Ghz, 32 channel, etc) except the power voltage is lower.

What this transmitter lacks in power it makes up for in weight. If you're concerned about minimizing weight to maximize

speed, Eachine's transmitter is a solid buy.

Specifications

- Frequency: 5.8Ghz
- Power: 200mW
- Weight: .2 ounces (w/o antenna) and .53 ounces (w/ antenna)

Other FPV Options to Check Out

Here are a few other FPV options to check out:

The Hubsan H107L – If your pilot skills aren't ready for a full-fledged FPV quadcopter yet, the Hubsan H107D is an excellent training drone. It's small, can be flown indoors or outdoors, it's cheap, and it has first-person-view capability.

The Blade FPV Nano QX—This is one of the few quadcopters than comes with an FPV camera, transmitter, receiver, and goggles. It's an EXCELLENT buy for practicing your skills and learning FPV.

Racing Quadcopter Kits – If you'd like to assemble your own quadcopter, check out [this kit](#) and [this kit](#). Some kits can be half the price of an RTF drone.

Build your own racing drone from scratch – Check out this awesome video:



FPV Racing Simulators – I've been using [this simulator](#) for a few months now. It's really fun and it's a good excuse to bust out my Xbox controller. You can also check out [DroneSimPro](#) and the [FPV Freerider app](#).

Further Reading

If you'd like to deepen your FPV knowledge, check out these articles:

- [The Beginners Guide to FPV Racing](#)
- [The Ultimate Guide to FPV Systems](#)

- [How To Get Into Hobby RC: Starter FPV Quadcopters](#)
 - [FPV Guide for Multicopters | First Person View Bible](#)
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Over to You

Flying first-person-view multirotors can be fun, exciting, and it can improve your pilot skills dramatically.

If you have any questions about this aspect of drone flight, leave a comment below and I'll do my best to help you out.

Fly safe!

Do you have any questions? Email us at support@uavcoach.com.
