

CREATIVE CONTENT

SPECIAL DRONE EDITION

Jan 2025

Which Drone to Buy?

Tips on Flying

QuickShots and MasterShots

Drone Accessories



Rules and Regulations
Flying Professionally
Drone Maintenance

- **All About SD Cards**
- **Filters - When to Use Them**
- **Drone Controller Types**
- **Drones and Batteries on Aeroplanes**
- **Drone Clubs**





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"I hope you find something of interest inside these pages, and even better, hope you get the urge to 'join the family' and fly with us!"

FROM THE EDITOR

Ten years ago, we probably could not have conceived that drones would become a consumer item. Now, you can buy one that is not of the "toy" variety for under \$300

I have been flying drones for around 8 years now and this e-magazine is aimed to help you choose a drone, walk you through what to look out for when buying a drone, the rules and regulations you need to abide by and a quick primer on how to advance your drone training using certification.

The most common drone from the consumer point of view is one that has a built-in camera to shoot photos and video, but other models are designed for racing, mapping, agricultural spraying, search and rescue, surveillance and sadly of course, they are also used in combat.

In this e-magazine I am only concentrating on consumer level drones. If you have an interest in any of the other types, I suggest that getting in touch with Melbourne based company CR Kennedy would be your best course of action as they specialise in this market area.

I hope you find something of interest inside these pages, and even better, hope you get the urge to 'join the family' and fly with us!

If you have any questions that you can't find the answer to, feel free to drop me a line at the email address shown on the page opposite, and also please visit my website to see all the latest news, reviews and tutorials on drones as well as videography and photography.

THE ANATOMY OF A STANDARD DRONE SYSTEM

Drones are also known as UAVs which stands for unmanned aerial vehicle, and are occasionally called quadcopters because of the four arms. Some industrial drones have six arms and are called hexacopters accordingly.

Whatever you call them, drones are basically a chassis with these attached arms each containing a motor and

propeller and red and green LEDs depicting port (red) and starboard (green) sides.

Commonly, the arms are hinged enabling the drone to be folded for easier transport.

POWER

Drones are powered by rechargeable batteries that in consumer drones are

generally good for between 20- and 40-minutes flying time and a range of up to 20Km.

CAMERA

They also commonly have an inbuilt camera system for taking both still images and video and that camera is on a gimbal system letting you pan and tilt the camera whilst in flight.

Commonly, you can shoot up to 4K video and around 12MP photos although higher spec'd drones can go up to 48K still images. Higher end drones such as the Mavic 3 Pro have multiple cameras with differing focal length lenses.

STORAGE

Storage for your images and photos is usually to a removable SD card, but some drones also have inbuilt storage as well, whilst other such as the DJI Neo only have inbuilt storage of around 48GB.

Most drones also have a standard USB-C port letting you connect your drone to a computer for downloading images. Sometimes this port can also double up as a charging port for the battery.

Controlling your drone while flying is via a controller and



viewing system that displays the image the camera in the drone is seeing. At the lowest level, your smartphone is used with an app giving on-screen controls, but it is also common to have a combination of the smartphone, the app and a physical controller containing joysticks.

The next level is a dedicated controller with a built in screen, and there are different versions of these depending on the screen resolution and brightness.

FPV

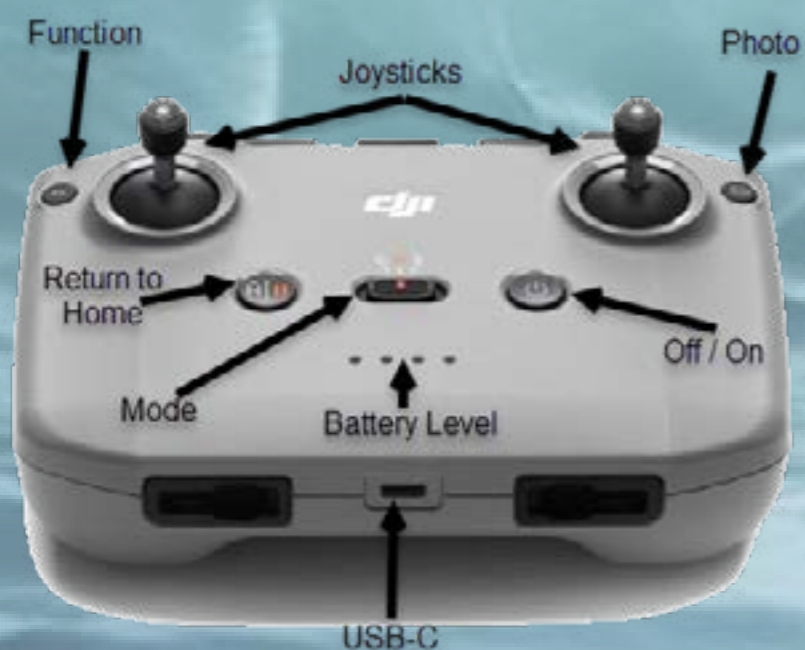
Finally, some drones called FPV (first person view), and usually used for drone racing, use a combination of goggles letting you see what the drone sees including a heads up display, and a motion

controller akin to an aircraft's joystick.

The standard controller in conjunction with a smartphone and app as shown is the most common form in use, and has joysticks for controlling the drone's direction and height as well as switches to change the type of flight, to start and stop camera shooting / recording, pan and tilt the camera, a Return To Home button if something untoward happens and various other controls depending on the drone and controller type.

PRICING

Finally, the price of a consumer drone (ignoring any "toy" type units) starts at between AUD\$299 up to just under AUD\$7000 and price varies according to the built in feature set, camera type, resolution, range and other factors.





WHICH DRONE FOR FUN, SERIOUS PHOTO OR VIDEO IMAGING?

If you have been checking the different types of drones available with a view to buying one, then the sheer number of models might have left you a little confused.

There are a number of features to look out for when buying a drone. Some of them are obvious and some not. For example, an \$80 drone from one of the tech stores or toy shops will most likely not be able to hover by itself – meaning you are bound to crash it in the early days until you master that skill.

And the cheaper toy drones, while having cameras, have imagery of a very low resolution. And of course, there is no obstacle avoidance or other safety measures.

Ignoring the cheapies (under \$150 or so) as these are primarily toys that won't last the distance, in Australia you are pretty much at this stage bound by a single brand – DJI.

In the past there have been other brands available, notably Parrot, but whilst a number of others have attempted to start up in Australia such as Autel, they have never really gained any traction.

There was talk about Hong Kong company HoverAir having a crack at the end of 2024, but I have heard nothing since.

Consequently, at this stage I'll concentrate just on DJI drones.

In each of the model ranges except for the Neo, there are various models – for example in the Mini, Mini 2 and Mini.

There are the Mini SE, Mini 2SE Mini 3 Pro, Mini 4 Pro, Mini 3, Mini 4K and more. I haven't covered every single model in each range as there simply far too many. I have instead covered the models in each range I have personally reviewed. Lesser models come with less functionality and features obviously, and I'd suggest checking the DJI website for comparisons.

JUST FOR FUN

This is a no brainer. The recently released DJI Neo wins this category hands down. It is primarily designed simply for fun, but DJI has been very clever in the way the Neo can be configured allowing it to lend itself to some serious possibilities too.

In its basic form at AUD\$299, you simply get the drone. The Neo is small and lightweight at 12cm by 12cm and approximately 140g. It is controlled simply by using voice commands or via an app on a smartphone. Alternatively, you can also buy it with the DJI RC-3 controller (or get this as an accessory later) which gives you better control and also increases the range of the Neo quite dramatically to 10km – a moot point in the real world as in Australia you MUST keep you drone within line of sight at all times if you are not appropriately licenced. DJI call this configuration the DJI Neo Fly More Combo and will set you back AUD\$539.

If you want to go a step further, you can pair the Neo with DJI goggles for point of view (POV) flying and use the DJI Motion Controller which is akin to a joystick. This version of the DJI Neo sells for AUD\$839.

So what can the Neo do?

Well, it shoots still images of course and also video at 4K, and importantly the video is super stabilised. There are a number of built in flying modes such as Circle, Rocket and Spotlight. If you are using the RC 3 controller, these are further expanded. There is also a very clever AI mode letting the Neo follow you during activities such as walking or running, and even when say skateboarding.



The Neo is billed as the ideal vlogging tool for capturing everyday life, leisure, family activities and pets.

FOR THE MORE SERIOUS FLYER

If you want something a little more serious, then have a look at the DJI Mini 4K. This comes in at AUD\$499 and is still under the magic 250g weight (which is explained in the Rules and Regulations section in detail and why it might be important to you.)

It is a small factor unit that folds up for portability when travelling

The Mini 4 comes with a controller and you view the imagery from the drone via your smartphone and the DJI Fly app and you'll get around 30 minutes of flight time from a single battery.

This drone can shoot 4K / 30 frames per second or 3.7K / 60 frames per second video and takes 12 megapixel still images using a 24mm f/2.8 fixed lens on a 3-way axis gimbal. It even has a 4x zoom facility (digital not optical) and can shoot panorama shots that are either spherical, 180° or wide angle.

Like the Neo, QuickShots functionality giving you flying manoeuvres such as drone, circle, rocket and helix are available.

A Fly More Combo version is also available giving you batteries and a charging hub as well as a shoulder bag for an extra AUD\$200.

STEPPING UP ANOTHER NOTCH

If you want to get really serious but still

be under the 250g weight in a small form factor model, then the DJI Mini 4 Pro is what you are after.

The two major things that set the Mini Pro 4 from the Mini 4K is more advanced imaging capability and importantly, omni-directional obstacle sensing to minimising the danger of crashing into something.

On the imaging side, it has a more powerful sensor supporting D-Log M and HLG recording as well as HDR and better lens system letting you shoot 4K up to 100 frames / second. Additionally, there is a Night Shot system employed to improve low light shooting (bearing in mind that recreational flyers are not allowed to fly at night).

For lovers of vertical shooting, the gimbal can twist 90°, and the ActiveTrack system supports subject tracking and pathfinding simultaneously.

Of course, similar to the Neo and the Mini 4K QuickShots are available as is a Hyperlapse option.

Another useful function is Waypoints where you can pre-plan your flight before you take off.

The basic Mini 4 Pro unit is AUD\$1119 and there is again a Fly More Combo which as in the Mini 4K gives you extra batteries, a charging hub and carry bag. This costs AUD\$1699.

BEST ALL ROUNDER

I have had an Air2S for a few years now and considered it the best all -round drone until the new updated Air3S was released later last year.

If the imaging side of things is just as important as the flying, and you want a stable platform with a long flying time and distance capability, then this is the right model for you.

The Air3S on a single battery is rated up to 45 minutes flight time and has a range of 32Km.

Camera wise, it is a ripper with twin cameras – one with a wide angle and the other a medium telephoto giving up to 14 stops of dynamic range and shooting in 10 bit D-Log M and HLG video.



Between them they can shoot a variety of formats right up to 4K at 120 frames per second and 48 megapixel still images. The Air3S has 42GB of on-board memory for video and still image storage.

It has a beefed-up transmission system too, with the Air3S capable of transmitting video up to 20Km.

For safety, a full omnidirectional binocular sensing system plus forward facing LiDar and infra sensors just about ensure you will never have a collision even at night.

At AUD\$1699 it is excellent value too. The Fly More Combo version also adds a screen to the controller, extra intelligent batteries and a charging hub plus an ND filter kit for an extra AUD\$430.

PROFESSIONAL LEVEL

The Mavic 3 Pro is the flagship of the range at this stage and is designed for the video professional. Starting at AUD\$2789 (currently), the camera system, is the heart of the Mavic 3 Pro. With a triple camera system designed by arguably the world's best camera maker, Hasselblad, are a 4/3rds camera, a 70mm medium tele camera and a 7x zoom camera capable of shooting up to 5.1K 50frames per second or 4K 120 frames per second or 48 megapixel stills.

The Mavic 3 Pro has a maximum flight time of 43 minutes per battery and a stunning top speed of 74 kph.

Intelligent creative features include ActiveTrack, MasterShots, QuickShots

and Hyperlapse plus there is Waypoint flying with Cruise Control and an auto return to home function. The O3 transmission system allows the broadcast of footage up to 15Km.

Of course, a full omnidirectional sensor system is built in and this includes an advance system to map a flight to ensure an obstacle free flight back to the home point.

The Mavic 3 Pro is versatile too in that you can use any of the controllers including the Motion 2 (joystick-like) and the DJI goggles for POV flying.

The basic model has 8GB of internal storage, but the Cine version has a whopping 1TB on board! This model also has Apple ProRes Recording and the top of the range RC Pro Controller and consequently has a hefty price tag of AUD\$6249...

NEED FOR SPEED

Classified as an FPV or First Person View drone, the Avata 2 is primarily designed for one thing – speed and acrobatics.

Controlled by a Motion Controller and using goggles, you get a whole new perspective on drone flying.

The first time I tried it was with the original DJI FPV, and I have to confess it was both breathtaking and scary at the same time! It is HIGHLY recommended you put in a LOT of practice on the DJI simulator.

The Avata is slightly bigger than the Neo but has a much bigger battery payload giving it a flight time of 23 minutes. It sports a 4K / 60 fps HDR camera with 10 bit D-Log M recording and utilises RockSteady and HorizonSteady algorithms for image stability. There is 46GB of onboard storage.

The aerodynamic design lets the Avata fly up to 97 kilometres per hour with the right controller!

Built in aerobatics include flips, rolls and drift and if the Avata happens to go belly up, a new "turtle mode" will automatically right it.



DRONE CONTROLLERS

Lower cost drones use your smartphone as a view port. This shows you the imagery from the camera as well as drone statistics such as height, speed, location maps and menus to change different aspects of the drone characteristics and functions. It is usually connected via a USB-C cable to a controller containing a pair of joysticks to control flight direction and speed, buttons to start and stop recording, change camera direction, return to home and more.

The downside is that in bright sunlight, the phone screen is very hard to see, and I find them

to be a little unwieldy as well, taking a bit of time to set up.

DEDICATED CONTROLLER

This is by far my preferred method. The controller containing the joysticks and associated other controls, also has a built-in screen. This is brighter in direct sunlight – technically it has a higher NIT rating.

Another major advantage is that there is no setup time; turn it on and it connects automatically to your drone in a few seconds, and you are good to go.

MOTION CONTROLLER

This is a little like a joystick as used in computer simulations such as Flight SIM

By using various movements of the controller, you can control the flight of the drone, viewing the imagery and on screen information via a pair of VR goggles.

Normally, these are only used for acrobat / speed drones such as the AVATA, although standard drones can sometimes be used with a motion controller. It takes a lot of practice and use of a simulator to train is highly recommended.

TIPS ON FLYING

Whilst most of the new drones are very easy to fly, there are a number of things you should be aware of that may not be immediately obvious.

TERMINOLOGY

The joysticks control various aspects of your drone and use terms that may not be immediately familiar to you. Words such as speed, and altitude and familiar to many, but are you aware of what pitch, yaw and roll are? It is important to understand these terms when flying a drone.

Pitch is rotation of the drone around a side to side axis. Think of it as the drone nodding up and down.

Yaw on the other hand, is the rotation around an imaginary vertical line through the centre of the drone. In simple terms, it is effectively changing compass direction.

Roll as the name suggests is rotation around a line horizontally through the centre of the drone. It can be thought of as spinning. Generally, consumer drones cannot perform this action, but some of the acro drones are capable of “flipping”

Waypoint. Some of the advanced drones allow you to fly a route and save the details of the journey. You can set points on the route and these are called waypoints. These allows you fly exactly the same path again by recalling that journey and flying from waypoint to waypoint.

SIMULATOR

For training purposes, especially if you are looking at or have already bought an Avata

or other FPV drone. With these especially, practice, practice, practice should be your mantra, but even if you have one of the other brands or models, then a simulator will help you sharpen your skills.

DJI used to make a couple of simulators for both Apple and Windows computers as well as for iPhone and Android smartphones but have since discontinued them. You can still download them at time of writing, but bear in mind there is no support any more.

If you go to the DJI website and its Download Centre, the Windows version is still available.

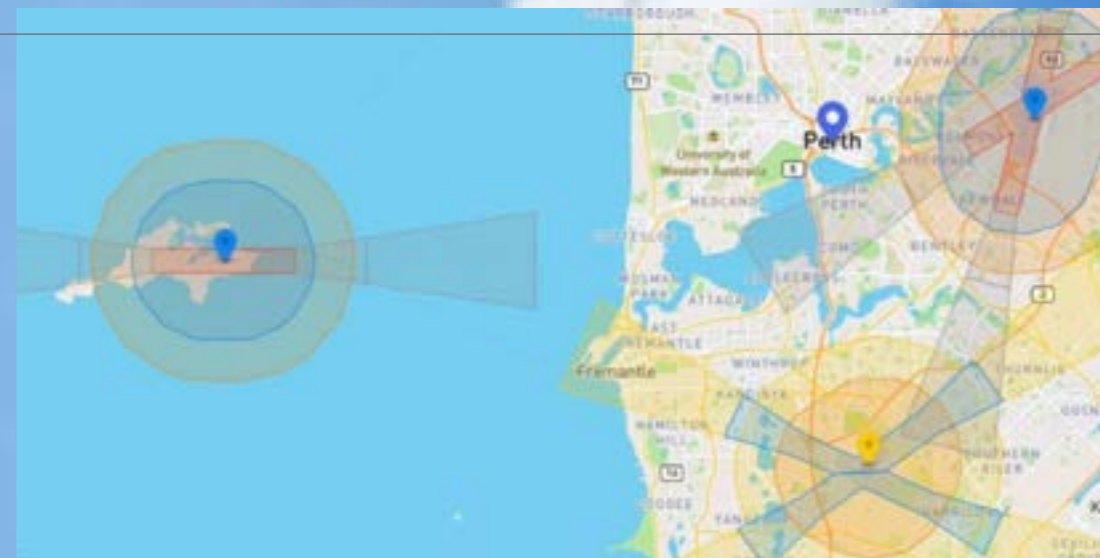
There are plenty of 3rd party simulators, however. I haven't used any of them personally and therefore cannot vouch for how good (or bad) each one may be. There is a comparison website at <https://oscarliang.com/fpv-simulator/> and this may give you an indication.

OVER WATER

Flying over water can be daunting. I am especially wary of it having lost a GoPro Karma drone in Hervey Bay a few years back. (To be fair to myself, it wasn't my fault as early Karma drones had a faulty battery level sensor giving a false sense of security as to how much life was left in the battery.)

One thing you should be aware of though. If your drone has sensors to detect objects, then flying to close to water has been known to cause instability. In fact DJI themselves suggest turning off the downward positioning system if possible when flying over water and make sure you keep at least 2 metres height above any water.

Another suggestion is you are flying from a boat to turn of the Return to Home (RTH) feature. As the RTH will send the drone back to



the point it took off from, the boat may have moved and the drone will end up potentially in the drink!

When the RTH is turned off, the drone will instead hover in position letting you navigate to its position before landing.

Another potential cause of disaster is putting the drone into a steep dive over water. There have been a number of people who have lost their drone this way by underestimating how much time and distance it needs to pull the drone up and therefore – kersplash!

SET RTH

Speaking of Return to Home, it is good practice when taking off to let the drone hover for a few moments until you get the advice the RTH has been reset. This timer is necessary for the drone to pick up the needed amount of GPS satellites in order to get a fix on its position. Until that has been established, the drone may be unstable in flight.

SET HEIGHT AND RANGE

I also suggest, especially early in your flying experience to dive into the settings menu and set the maximum height and range your drone will fly at. For example, if you are practicing in a local park, set the range at the approximate distance to the perimeters of the

park so you cannot stray out of that zone. By setting the maximum height to 120 metres it means you will also stay legal.

MAP / COMPASS

A feature that seems to be overlooked – and I have been guilty of this – is the mapping and compass feature built in both DJI Fly and the dedicated controllers.

Ordinarily, the display shows you the view from the drone's camera, but you also have the option of seeing a top down map so you can located the drone.

It is common when the drone is at a distance for you to lose track of which way it is facing. The map and compass lets you instantly be able to reorientate yourself as to the drones exact location and heading. You can then flick back to the camera view.

Of course when in absolute doubt, you can also simply press the RTH button to get the drone to return to the take off point. Be aware though the drone will first rise to a predetermined height (you can change this is settings) and then return to home using the least amount of resources available to maximise battery use. As a consequent, it might take longer than you think to fly by to the origin point.

quickshots and mastershots

Many drones have a built-in capability for specific flying manoeuvres and these are called QuickShots by DJI. These are especially useful when shooting video as you can set the drone up to create exactly the right cinematic sequence you want.

For example, the British police series *Midsomer Murders* is especially fond of a shot either zooming into or out of a forest scene, and for this you might use the "Dronie" Quickshot.

For all the DJI models that support Quickshots, the way access them is identical. In either the DJI Fly app or on the controller screen is using one, first you tap the shooting mode icon and swipe down to select Quickshots and choose the mode you want. Next you select the target by dragging a rectangle around it with your

finger than tap Start.

To exit Quickshots mode, press the Flight Pause/RTH button of the remote controller once or tap "X" in DJI Fly. The aircraft will brake and hover in place.

Here is a quick description of each of the Quickshots types.

DRONIE

The aircraft flies back-



ward and ascends, with the camera locked on the subject, and records a video. The distance the drone flies from the subject whilst recording varies from drone model to drone model ranging from 10 metres for the Neo to 30 metres to a maximum user setting of 120 metres on the Air3 series

and Mini 3 and 4 series.

CIRCLE

The aircraft circles around the subject. The distance cannot be set separately, but the flight direction can.

ROCKET

The aircraft ascends with the camera pointing downward. The distance the drone flies from the subject whilst recording varies from drone model to drone model ranging from 10 metres for the Neo to 30 metres to a maximum user setting of 80 metres on the Air3 series and Mini 3 and 4 series.

BOOMERANG

The aircraft flies around the subject in an oval path. As it flies it ascends away from its starting point and descends as it flies back. The aircraft's starting point forms one end of the oval's long axis, while the other end is

at the subject's opposite side from the starting point.

For DJI drones you need to allow a radius of at least 30m around the aircraft and at least 10 m above the drone. The flight direction can be set.

HELIX

The drone ascends and spirals around the subject. The distance the drone flies from the subject whilst recording varies from drone model to drone model ranging from 20 metres for the Neo to 30 metres to a maximum user setting of 120 metres on the Air3 series and Mini 3 and 4 series.

The direction the drone flies can also be determined by the operator.

ASTEROID

The drone flies backward and upward, takes

several photos, and then returns to the starting point.

The video starts with a panorama of the highest position and then shows the descent.

You need to allow at least 40m behind and 50 m above the drone. The flight direction and distance cannot be set.



MASTER-SHOTS

Many DJI drones also support MasterShots, which uses photography as against video.

Depending on the type and distance of a selected target, the drone automatically selects from Proximity, Landscape,

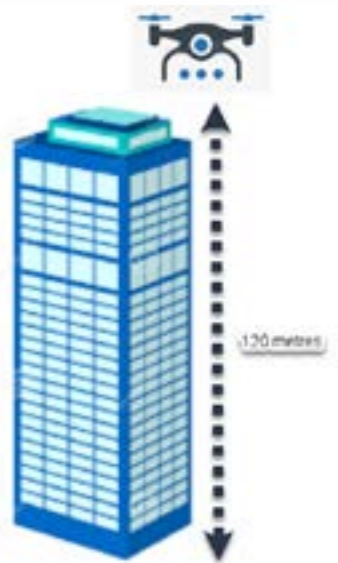
and Portrait flight routes and creates a cinematic sequence of shots. After shooting is complete, the aircraft automatically edits the footage. There are a number of templates that can be used to create videos with a single tap!

After you have selected the MasterShots option and selecting a target, you can also adjust the width, length and height of the shooting area.

The actual sequence of shots depends on the type of MasterShot chosen. For example, if you have chosen Portrait mode, this will be Zoom In/Out - Circle (Medium) - Circle (Close) - Dronie - Circle (Far) - Tilt up + Fly Forward - Rocket - Camera Down + Circle - Camera Straight + Descend - Camera Down + Descend.

After shooting, the aircraft will return to its initial position.

DRONE FLYING RULES FOR AUSTRALIA



YOU MUST NOT FLY YOUR DRONE HIGHER THAN 120 METRES ABOVE GROUND LEVEL

The most common question asked about this rule is an attempt to qualify what is "ground level".

This is not defined as "sea level", but the ground at which the drone will be taking off from.

For example, if you are out in the bush and at sea level, then it means you can fly to a height of 120 metres.

If however you are on a hillside and the height above sea level at the point of takeoff is 60 metres, you can fly to a height of 180 metres ABOVE SEA LEVEL but only 120 metres higher than where you are taking off from.

The altitude of your drone should be prominently display on your controller / smartphone.



YOUR DRONE MUST ALWAYS BE MORE THAN 30 METRES FROM OTHER PEOPLE

This is pretty straight forward.

It means that your drone must always be 30 metres away from another person both laterally (horizontally) and vertically (above them).

This obviously does not include the drone operator.

Drones that allow the use of goggles for a point of view (POV) of what the drone sees, in some countries must, as well as the operator, have a spotter who can see the drone in line of sight.

However, technically these type of drones (such as the [DJI Avata](#)) are not allowed to be flown in open air in Australia.



YOUR DRONE MUST ALWAYS BE WITHIN LINE OF SIGHT

Maximum distance to drone manufacturers is a bit like the old wars between camera manufacturers about who had the biggest number of megapixels or digital zoom.

However, whilst your drone might be rated as having a range of 15Km or even more, you are not allowed to fly it out of line of sight without the proper certification.

In other words, in Australia at least, you must be able to see your drone with the naked eye at all times whilst flying.



YOU MUST NOT FLY OVER OR ABOVE PEOPLE OR IN A POPULATION AREA EG BEACHES, PARKS SPORTING EVENTS

This rule ties in with the 30 metre rule, but adds the proviso of where you can fly.

It may be tempting to send your drone over the top of your youngster's soccer match to shoot the action below or fly over a motor racing track to get some high speed footage,, but in both these cases, you would be breaking the rules.

The reasoning is quite simple; if your drone fails, even a 250g model falling from a height would seriously hurt someone.

Additionally, if you send your drone over an event such as a motor race, it is more than possible there are helicopters there filming for television and so you place additional danger on the helicopter crew and anyone on the ground.



IF THE DRONE WEIGHS MORE 250G YOU MUST FLY AT LEAST 5.5KM FROM A CONTROLLED AIRPORT

Even a small drone hitting an aircraft could cause catastrophic circumstances.

The better drones such as those from DJI have both geofencing built in that should stop you taking off too near an airport, as well as aircraft detection to warn you if an aircraft is approaching (using transponder technology).

But like all the rules, this is mostly common sense.

If in any doubt, simply don't fly. And if you hear or see an aircraft in the immediate vicinity, land as soon as possible or at worst, get down to a low height to minimise any collision.



YOU MUST ONLY FLY DURING THE DAY AND NOT IN CLOUD OR FOG

This is pretty straight forward and is linked to the line of sight rule.

In order to fly at night you need special certification and permission (at this stage).

And while it is obvious that in cloud or fog, you'd also not be able to see your drone within line of sight with the naked eye, another consideration is that the moisture contained in the clouds or fog could affect your drone's operation causing it to crash.

At best, this would be an expensive exercise, and at worse, cause major property damage or even hit someone.

DRONES AND FLYING ON PLANES

One of the most common questions asked in drone forums goes something like this: "Next week I am travelling to [insert exotic place name and country] on [insert airline name]. Can I take my [insert drone brand and model] on the plane?"

So, in the interests of saving a lot of time and trouble for others to answer, I did some research to see what the go is. And across the board, it is remarkable similar. Here is a list of the requirements to carry (drone) batteries on Australian airlines, plus British Airways as a starter..

QANTAS – All batteries must be carried as hand luggage and will not be accepted in checked in bags. Up to 20 batteries less than 100watt-hours can be carried, and there is a maximum of 2 for batteries >100Wh and < 160Wh. It is recommended batteries be kept in separate containers away from each other (eg plastic bags) with terminals covered by insulation to prevent shorting.

VIRGIN – Up to 15 100Wh or less batteries can be carried as hand luggage in a device. Up to 20 batteries < 100watt-hours can be carried as spares and must be in hand luggage. Batteries >100Wh and <160 Wh in a device can be either hand luggage or in checked baggage.

There is a maximum of 2 for extras batteries >100Wh and < 160Wh and these must be in hand luggage. . It is recommended batteries be kept in separate containers away from each other (eg plastic bags) with terminals covered by insulation to prevent shorting.

REX – Batteries with a maximum 100Wh must be kept in cabin luggage and up to 20 / passenger. A maximum of 2 Batteries > 100Wh < 160Wh is allowed, are to be carried as hand luggage only and MUST be declared. Batteries >160Wh will only be carried as freight.

Skywest – Batteries are carried as per the rules of its partner airlines Delta, United, American Airlines and Alaska Air.

British Airways – Batteries <100Wh can be carried as hand luggage in the device only with up to 4 spares in original packaging or insulated from metal contact. Batteries kept in the device and switched off (ie not sleep mode) can be checked in. Spare batteries in checked luggage is forbidden.

Batteries >100Wh and < 160Wh can be carried in devices (max 2. Up to 2 spares can be carried kept in original packaging or insulated. Spare batteries in checked luggage is forbidden.

*To calculate Watt Hours, it is equal to battery voltage multiplied by its Amp Hours and divided by 1000.

Wh = (V*Ah)/1000.

MAINTAINING YOUR DRONE

Like any piece of precision equipment, you should regularly perform routine maintenance on your drone. The biggest enemies are of course water and dust / grit and any traces of either of these should be removed as soon as possible after flying.

Maintenance will also add to the lifespan and safety of the drone, and of course, also mean you don't need to spend money on repairs if something goes wrong.

MAIN BODY

Carefully check the main body for any cracks, and especially make sure the arms, hinges and any other joints are working correctly with no damage.

Wipe the drone down to remove any dirt, and if the drone has been subject to water via a rain shower for example, pack it in silicate bags to absorb any moisture.

Finally, make sure all the wiring is properly connected and there are no frays or bare sections.

PROPELLERS

Regularly check the propellers for any cracks, chipping or any other irregularities. If there is any damage, a propeller should be replaced immediately. Also check they are spinning freely and the locking mechanism and screws are all in place. Losing a prop mid flight is a sure fire way to disaster.

GIMBAL

The gimbal should have its protective shroud in place whenever you are not flying as this is probably the most delicate piece of equipment on the unit. Make sure it has no obstructions and is free to move on all, the axes.

CAMERA

Use proper camera lens cleaning fluid and cloths to make sure the lens has no dirt or

smears on it. Remove any SD cards in the drone, copy the data off and reformat the card before returning it to the drone and testing to make sure the camera will write to the card.

CALIBRATION

Check the manual for your particular drone as to the process, but all drones should routinely re-calibrated making sure all of the on board instrumentation and sensors are in proper working order.

BATTERIES

When storing the drone, make sure the battery is removed. DJI batteries are "smart" and will automatically discharge for safety when not used so it is vital to recharge them before a flight. The battery also has a set of indicators that will tell you what level of charge is available.

Never let a battery discharge to zero and leave it like that for an extended period as this can permanently damage the battery. And don't forget to make sure the charger is in proper working order too.

SOFTWARE AND FIRMWARE

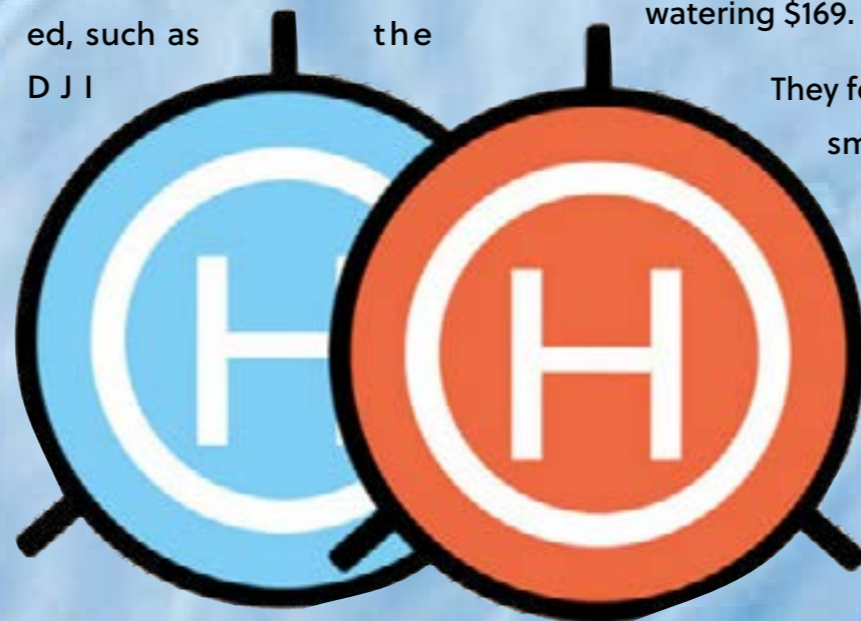
DJI and other drone companies are constantly updated and improving their products, and many share common software and firmware bases. Because of this, it is important to make sure your software (eg DJI Fly) and drones firmware are always up to date.



There is a strong after market accessories selection for drones. Some make flying easier, some make it safer, and another category just adds to the fun of it. Please note that the online prices I quote are all in USD\$ unless I state otherwise.

MAT

Unless you have a drone that is designed to be hand launched and landed, such as the DJI



This can be avoided by the use of a landing mat. I got mine from JB HiFi for about AUD\$30, but you get them online for less than that. There are some super heavy duty ones too that range from \$99 to an eye watering \$169.

They fold up quite small making them easier to stash in the carry case and be available whenever you need it.

LANDING GEAR EXTENDERS

If you have a tendency to fly from uneven ground for example, you can get extenders that clip on to raise the height of the drone body from the ground. A few places online carry them; I think I'd avoid the Temu \$10 ones

Neo, or you are far braver than I, it is common for people to land and take off from the ground. Often this can be a dusty or sandy surface, and if so, you run the risk of dirt and grit getting into the mechanics of your drone, especially the gimbal and prop motors.



myself and go for the CamGo \$29.95 units

I don't think I'd risk it personally, but there are also flotation devices letting you land and take off from water. The risk here of course is spray lifted up by the spinning props dragging water into the electrics of your drone.

Float landing gear I saw online ranges from around \$20 at Temu (definitely no thanks!) \$229 from UAV ME. CamGo has what looks like a usable set for \$79.95, but as I say, I for one wouldn't risk it as tempting as it may be!

FILTERS

POLARIZING

As the name suggests, a polarizing filter is used to polarize the light hitting the camera sensor. They are used to darken skies, manage reflection and suppress glare

from water surfaces. They are very specific to a particular drone model because of the shape and size of the camera lens, so make sure when you order you get the right one.

If in doubt, I'd go to something like a local Camera House store and order it through them. Expect to pay around \$35-\$40.

ND

If you know a little about photography you'll know how useful ND filters are. If you have no idea what an ND filter is or does, in simple terms, it allows you to keep the shutter open longer without over-exposing the

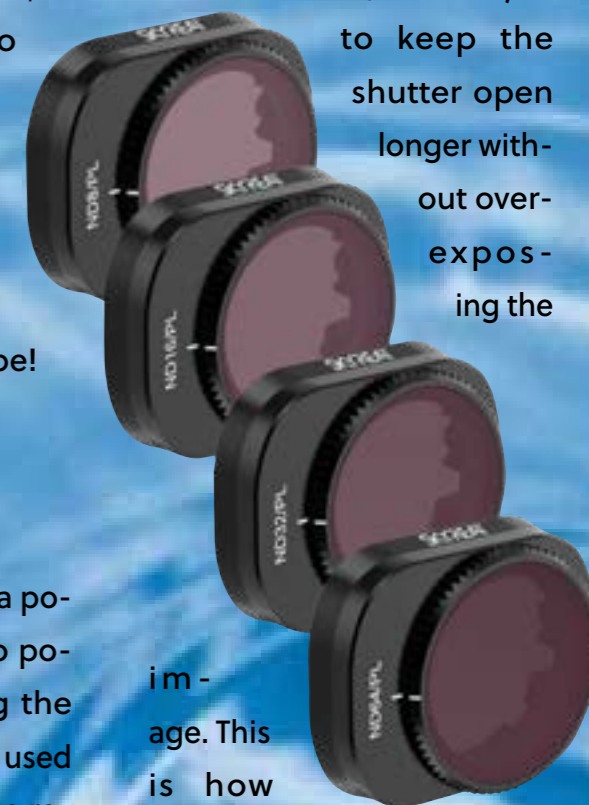


image. This is how they get those photos of waterfalls

“What accessories do I need?”

where the water has that dreamy look as against a frozen image.

ND filters come with a numerical rating as to how "strong" they are. So an ND filter with a rating of 4 will let in more light than one with as rating of 32 for example.

ND filters usually come in a set of 4 or more. A good brand is someone like Freewell, and expect a price tag of around \$70 for a basic set of 4 ND filters.

STROBE

Whilst the CASA rules state you must keep a drone in line of sight, sometimes due to conditions it can be very hard to physically see your drone. And when you start out, I can al-

giving you a high intensity flashing light on the drone. You can either get a single white strobe for around \$25 (or more), or a set of white, red and green strobes for AUD\$100.

PROP GUARDS

Propeller guards are useful to minimise personal damage caused by the drone's props – they are bloody sharp and sport a scar on my left arm from an encounter with an original GoPro Karma drone – as well as stopping damage to the props if you happen to hit a tree or other obstacle.

Like filters, they are very drone model specific so if you decide to invest in a set, make sure they are available for your model and you order the right ones.

They seem to average about \$30 for the smaller DJI models.

ANTENNA BOOSTER

In theory, having an antenna booster will allow you to fly further. This is a bit of a moot point as recreational drone

flyers have to stay within line of sight. It is also a bit of a fallacy as whilst boosting



the controller will make the controller signal go further, the drone will

still transmit a video signal at the same power unless you attach a booster to the drone too, so you'll need a bigger antenna in order to reach further.

I haven't looked too much into this as it is generally out of the sphere of my readership, but apparently in order to do this, you'll need to hack the drone electronics to tweak

something, so probably for the majority of people it is not worth the effort for the gains you'll get but cannot legally use.

I assume hacking your drone would also void any warranty.

CONTROLLER SCREENS

The lower specification drones like the DJI Mini series tend to use a smartphone allied with the DJI Fly app.

The phone acts as a viewport for the drone camera, and on-screen controls interact with the controller via USB-C which then send them to the drone for direction or height changes, camera control, navigation and so on.

The problem here is that most smartphones cannot be seen in bright sunlight – the screen gets washed out to make it unusable.

There are three options; find a really shady place or one protected from the sun glare, get a cover for the controller / phone combination or



actually fly. This makes the third option the most satisfactory.

It is not an inexpensive option I'll grant, but does make a world of difference. The DJI drones that can use the base level AUD\$399 DJI RC controller are the Mini 2, Mini 3 and Mini 3 Pro, Air2S and the Mavic 3 series.



LICENCING & FLYING PROFESSIONALLY

Whilst it is not mandatory in this country as yet, unless your drone is over 2Kg in weight I'd always advise recreational users get registered with the regulatory authority CASA.

This is a simple process and available from its website at <https://www.casa.gov.au/drones/drone-registration/register-your-drone#Relatedcontent>.

There are a number of benefits including;

1. It makes you aware of the safety rules and keeps you up to date with any changes. The rules that are in place are there for very good reason – despite a small cohort of recreational users choosing to ignore them.
2. If you do lose your drone, then being registered means that if someone else finds it, they can pass the serial number to CASA who can then trace you.
3. It gives you credibility if you can show official registration if any the general public question your motives when flying.
4. Importantly, if your drone is under 2Kg it allows you to

monetise your investment by selling photographs or video etc, as long as you stay within the regulatory boundaries of course.

To further elaborate on point one, whilst nothing thankfully untoward did happen, there is footage around of a recreational user flying over the MCG Stadium in Melbourne when an Ed Sheeran concert was in full swing.

If that drone had lost a propeller or otherwise failed, apart from the obvious danger to people in the crowd below, the costs to the operator would have been catastrophic from a legal point of view. A defence was put up that the promoter also had drones up and filming, but these would have had fail safe systems AND insurance.

THE NEXT STEP

So knowing all that, if you want to take the next step and say, wish to fly further than the "line of sight" rule, or at night say, what certification and training do you need to be able to this?

Firstly CASA deems you need to either be a fully licenced operator in the same way

QANTAS or smaller commercial operators such as say crop duster or joy flight companies are. Alternatively, you can fly under the auspices and control of such a company.

To be an operator, there is a special certificate called a Remotely Piloted Aircraft Operator's Certificate (ReOC) and this allows you to operate as a drone service provider for hire.

Note the key phrase here is "operate as". It does not mean you can physically fly, just gives you the licence to fly commercially, and hire other pilots.

To actually fly, you must also have a Remote Pilot's Licence (RePL). This allows you to go beyond the stage of a recreational flyer by flying bigger drones, but there are still restrictions in the licence by itself. For example, a farmer who has an RePL can fly over his / her own land for the purposes of crop or livestock inspections, land surveying or even carrying cargo if the drone allows it.

But to allow you go that extra mile you need to fly under the control of a ReOC holder

as mentioned. This means you can fly outside of your own property, with a drone over 2Kg, and for reward.

But even then, there are restrictions. If you wish to be able to fly out of line of sight for example, you will need another certification called an AROC or Aeronautical Radio Operators Certification. And to fly at night you MUST get CASA approval for each flight.

So in summary, to answer the original question, in order to be fly out of line of sight and at night you need:

- To have a ReOC (Remotely Piloted Aircraft Operator's Certificate) or operate under someone who has.
- To have an RePL (Remote Pilot's Licence)
- To have an AROC (Aeronautical Radio Operators Certification)
- CASA approval for a flight at night.



COURSES AND PRICING

If we start with the RePL first, these courses are run by certified RePL trainers such as Global Drone Solutions. In their case, the course can either be taken in-house or online, and can also contain a component to get your AROC.

If done in-house, they are taken over 5 days and include theory and practical assessments.

On the other hand, if you choose to take the course online, this of course can be done in your own time but must also include 2 days virtual classroom training via Zoom.

If you choose to do the RePL by itself, the price is AUD\$1,495 when done online, and AUD\$2,795 if done in-house. If you want to do the RePL AND the AROC together these prices are AUD\$1,695 and AUD\$2,995.

The ReOC is a bit more complicated as you have to already have the RePL, and involves you also get training as a Chief Remote Pilot before being briefed and trained on an in-depth CASA interview.

Global Drone Solutions can be contacted via its website at <https://gdronesolutions.com/>



DON'T RISK IT BY USING CHEAP SD CARDS

One of the most common questions I get asked is which size SD card to use in a drone / GoPro / camera / camcorder. And which card to use.

- Check your device's documentation to see what SD (or microSD) card rating is recommended. While the fastest read / write card may seem to be obvious, some devices simply cannot take advantage of these speeds and therefore you are wasting money paying for the ability.

Some may not work at all. If you are shooting 4K video (or higher), go as fast as you can to make sure there are no dropped frames.

- I talk from experience here, but I'd suggest ALWAYS purchase brand name SD cards. I use and recommend [Verbatim](#) as to date I have never had a failure with a [Verbatim](#) card. Conversely, cards I have purchased in an emergency that are either unbranded or a name I have never heard of (ie cheap) usually give read / write errors after the first or second re-format.
- Make sure you format the card according to its capacity eg FAT32, NTFS.
- Again, from personal experience, transfer the data from an SD card to a more permanent device as soon as you can. For

travelling, I use a [Verbatim VX500 SSD](#) that has 120GB of storage which is more than enough and can be bought for less than \$100.

- Rather than use a single humungous capacity SD card in your drone or camera, I prefer to use a number of smaller capacity cards. That way, if one does get lost or corrupted, at least not all the shots or video are gone.

Refer to my [Hervey Bay whale story](#) for an example where using multiple cards saved the day in a TV shoot.

- Before you go out on a shoot (of any sort), check the SD cards are working OK, and always carry at least one or two spares. There is nothing worse than starting the shoot and finding the card(s) are duds. (The same applies to batteries as it turns out).
- Store cards properly. I use a small case that has plastic inserts to hold both SD and microSD cards. You can get them from Officeworks for \$10 or so.

Remember, all those little electrons that make up your images no matter it be still photos or footage are on those cards. Once they are gone, they are to all intents and purposes, gone forever. So, treat them nicely!

filters explained

Over the last few months, I have seen a lot of posts in Facebook Groups asking about filters on cameras. Questions included when to use a red filter, what rating ND filters to use, what is a CPL and others.

So here is a breakdown of the basic types and when to use them (and when not for that matter).

But first, what is a filter and how are they used.

Generally, filters are screwed onto the lens at the front of the camera. If you look closely, most cameras have a thread in the lens of a specific value, and you get filters that match this thread size. Another type, such as



marketed by Cokin, have a filter holder that screws

into the lens and allows a number of filters to be added at once.

Others, like GoPros, need you to buy a special filter adaptor (usually containing a UV filter) and then other filters can be screwed into this.

COLOURED FILTERS

The easiest to explain is coloured filters such as red, blue or yellow. A red filter is used for underwater video and photography as they can increase visibility in hazy or cloudy water. In

landscape photography, red filters turn a sky almost black making clouds pop out.

A blue filter on the hand can INCREASE haze or fog adding to the mood of a shot. It will also lighten blues and darken yellows, oranges and reds given colour separation in scenes with a mix of colours.

A yellow filter is used to bring out clouds by darkening a blue sky.



EFFECTS FILTERS

Effects filters such as the star filters I mentioned earlier are purely to add a special effect to a shot and like special effects in video, should be used sparingly. As well as star filters, you can get ones that break up the image into triangles or pentagons (and more), ones that "fog" the edges of an image and much more. For inspiration, look at a [Hoya](#) or [Cokin](#) catalogue.

UV FILTER

Whilst a UV filter is useful in film photography (as against digital) as by stopping UV rays reaching the



film and causing discoloration, the primary use these days of a UV filter is as a lens protector, stopping dirt and grit and even fingerprints on to the valuable 'glass'.

POLARIZER LENS

If you are shooting anywhere near water or glass, a polarizer is extremely advantageous

as it will help remove any reflections, when for example, shooting through a window. In effect, they work exactly the same way as polarizer sunglasses.

Now you may see reference to linear and circular polarizers. It is best to go for circular ones, also called CPLs, as these have an extra quarter wave-plane element that helps convert the light back into a form that is suitable for modern autofocus and auto-exposure systems.

ND FILTER

These are the trickiest to explain in a few words, so much so I did an entire article on them a while back you can read here.

There are varying values of ND filter – 4, 8, 16, 32 and so on – and these allow you to

vary the exposure time by reducing the amount of light reaching the sensor. This is best explained by way of an example.

Say you have a waterfall you are shooting, and its bright sunlight. You might need to shoot at f22 and 1/60th of a second to get a still shot, that is not overexposed, but this will 'freeze' the water in the shot.

By adding an ND filter, you will reduce the light getting to the sensor and allow you to slow down the shutter speed to maybe 2 seconds (depending on the filter you use) or even more, and therefore get one of those blurry water shots.

A master exponent of this art in nature shots is [Jim Picôt](#) with his drone images, and my great mate [Ross Gibb](#) with his nature footage.

It takes trial and error with a learning curve to master ND filters, but in the long run they are worth it.

CONCLUSION

This was a very quick primer on filters and I hope it helps. If you have any questions, feel free to contact me at da-vid@creativecontent.au.



DRONE FLYING CLUBS

There are a number of drone clubs throughout Australia and joining one is a great way to mix with like minded enthusiasts who are usually happy to pass on tips from their own experiences.

Many of these clubs are dedicated to drone racing using specialised FPV drones, many hand built, so if you are interested in this side of drone flying, a club is definitely the way to go.

Many of the clubs run regular training sessions too, and this is a useful and inexpensive way of gaining skills before graduating possibly into the area of licencing that will let you make money from your hobby.

A list of Australian drone clubs can be found at <https://aufpv.org.au/clubs/>

For more generalised model flying including drones, additionally there is the Model Aeronautical Association of (MAAA) which also covers model planes, helicopters, and drones. Its website can be found at <https://www.maaa.asn.au/>

CLUBS IN CAPITAL CITIES

SYDNEY DRONE CLUB

Menai Indoor Sports Centre, 98-150 Allison Cres, Menai NSW 2234

Contact: james@sydneydroneclub.com

EASTSIDE FPV

Llewellyn Park, Llewellyn Park Drive, Wantirna Sth VIC 3152

Contact: eastsidefpv@gmail.com

FPV REBELS

Whites Hill Reserve Play Park, 258 Boundary Road, Camp Hill QLD 4152

Contact: info@fpvrebels.com

ADELAIDE FPV RACING

Woodville Hockey Club Park Ave & Northgate St, Adelaide SA 5012

Contact: secretary@adelaidefpvracing.com.au

ROTORCROSS

35 Weston Road, Pickering Brook WA 6076

Contact: rotorcrossaustralia@gmail.com

CANBERRA MULTIROTOR RACING CLUB

Weston Valley Archery Club, Dixon Drive & Streeton Drive, Weston Creek ACT 2611

Contact: president@cmrc.asn.au