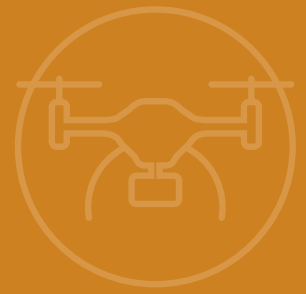


# Drone guidelines for Indigenous rangers

Book 1 – Preparing to fly



Edition 1 | 2024

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# Drone flight work flow

## Before you go

- 1 Create a flight plan and get it approved by relevant Traditional Owners
- 2 Check your equipment list
- 3 Charge all your batteries (drone and controller)
- 4 Make sure your equipment is updated and your drone is safe to fly
- 5 Create an automated flight mission (if using) and make it available offline

## After you fly (see booklet 2)

- 17 Remove the SD card
- 18 Upload your photos to a safe location
- 19 Delete photos from the SD card (if needed)
- 20 Return the SD card to the drone

## On site (see booklet 2)

- 6 Check the location is safe to fly
- 7 Set up your launch area
- 8 Do a pre-flight check of your drone
- 9 Place your drone in the take-off area
- 10 Announce your launch
- 11 Watch your drone while it flies (keep the battery above 25%)
- 12 Announce your landing
- 13 Turn off the motors
- 14 Do a post-flight check of your drone
- 15 Check your photos
- 16 Pack up your drone



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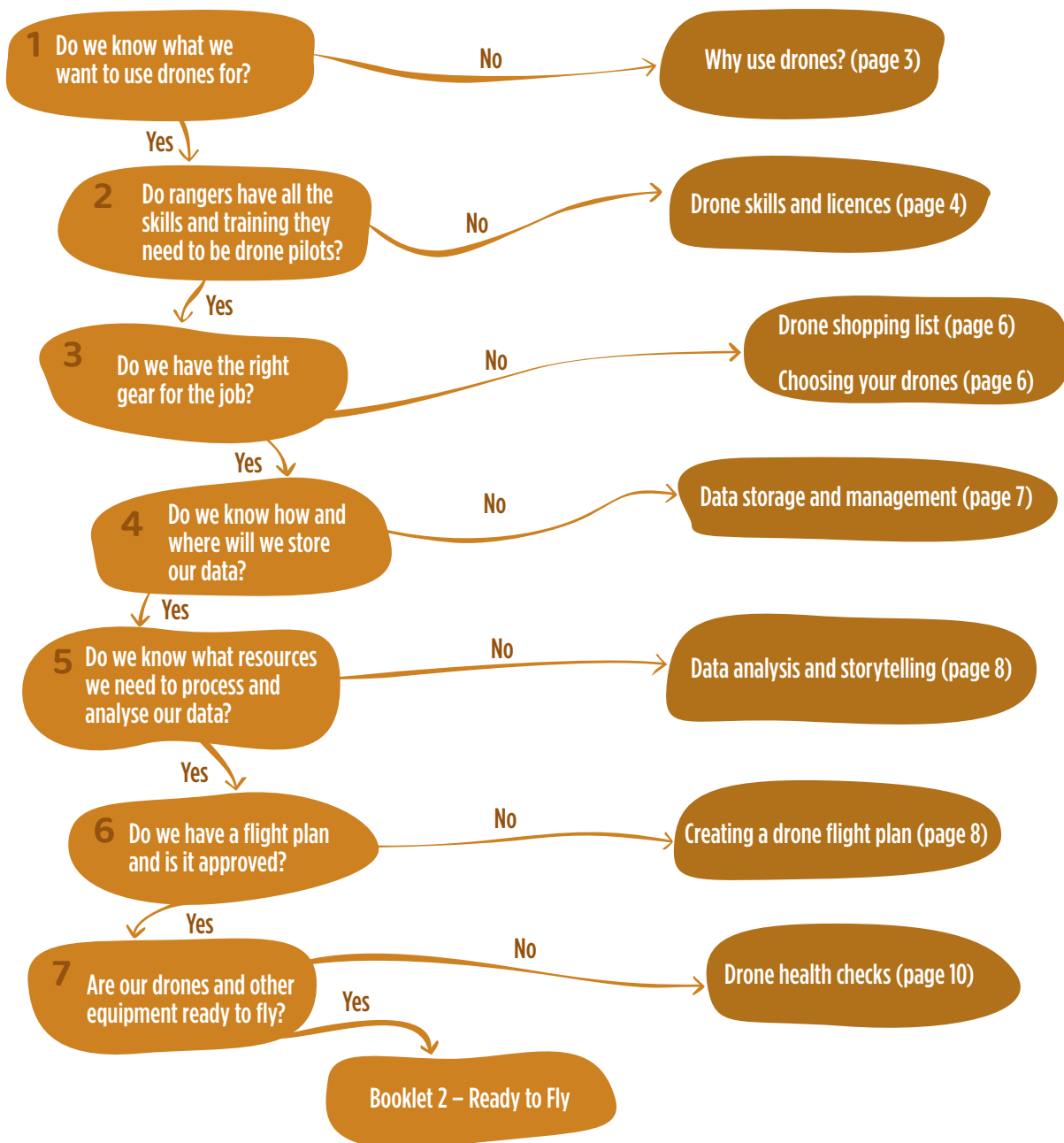
# Starting a drone monitoring program

So, you think you want to include drones in your monitoring program? Now what?

This booklet will guide you through all the steps you might need to follow to get a drone monitoring program up and running, all the way through to preparing for your first flight and each flight after that.

Every ranger group will be at a different stage of setting up a drone monitoring journey. So, you can work through the flow chart to see where you need to start.

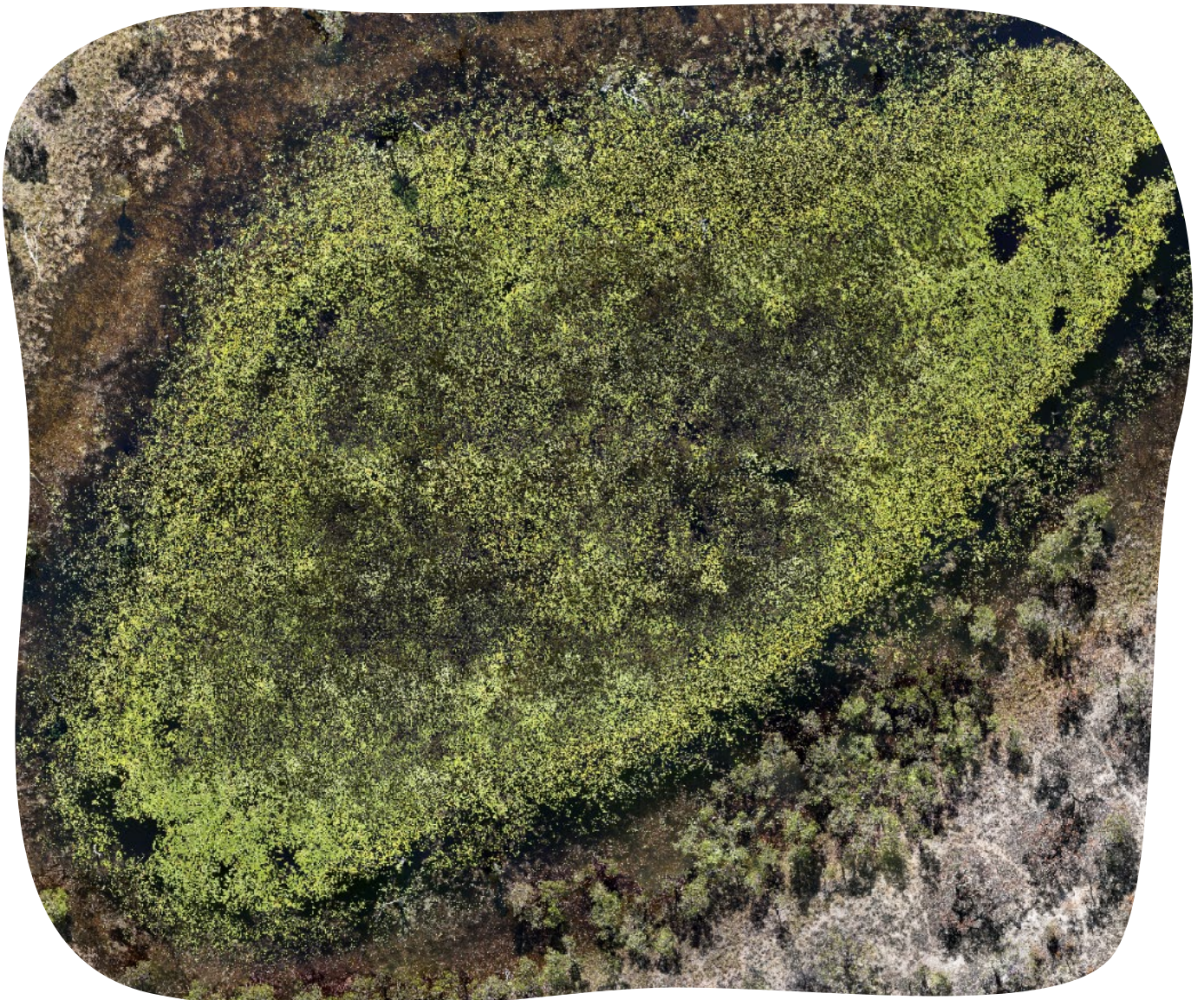
## Drone plan feasibility assessment flow chart



## Why use drones?

Drones are a great tool to 'see' Country from the sky. They are useful for looking at large areas from the sky. Indigenous rangers and their partners have used drones to map and monitor specific sites to assess changes over time, particularly before and after management actions. This includes monitoring the effectiveness of weed control, landscape burning, erosion mitigation and feral animal impacts to waterholes. For example, using a

grid (taking continuous overlapping images using a lawnmower pattern) to map the entire surface of a waterhole at set time intervals can highlight change over time. Drones have also been used to capture images of rock art, with permission from Traditional Owners, especially in areas difficult to access on foot. It is important to be clear about the purpose for using drones.



# Drone skills and licences

Monitoring Country using drones is not just about flying. There are lots of skills you might already have or might want to learn to improve how we see Country. These could include drone piloting, GIS mapping, computer skills or data analysis. There are legal requirements you should meet before flying drones for work, like having Operator Accreditation. There are also cultural responsibilities you should follow to ensure you are using drones in a culturally safe way, like working under the authority of appropriate Traditional Owners.

Before you fly a drone on Country you should feel confident that you can fly in a way that keeps you and people around you physically and culturally safe. You should also feel confident that you can monitor Country the right way. You can use the Digital Women Ranger confidence self assessment framework to help you work out how confident you are feeling about flying drones on Country.

If you aren't feeling confident yet or you want to learn more, you might want to complete the 'Site Survey Using Drones' digital badge training as part of the **Healthy Country AI and Digital Program**.

## Operator's Accreditation

Generally, if you are flying a drone for work you need to get Operator Accreditation or a Remote Pilot's Licence.

The Operator Accreditation is free, involves some online training materials and a short online quiz. It lasts for three years.

You will need to know the drone safety rules and standard operating conditions (see drone safety rules on page 5).

Having this will allow you to fly drones that weigh less than 2 kg for work.

## Remote Pilot Licence (RePL)

A Remote Pilot Licence or RePL will allow you to fly bigger drones (usually up to 7 or 25 kg) and work for a company that has a Remote Operator's Certificate (ReOC). These companies may need extra approvals to do things like fly at night.

To get an RePL you will need to complete training with a certified training provider, usually over one to two weeks. This will include passing a larger theory examination, a practical skills component and logging five hours of flight time.

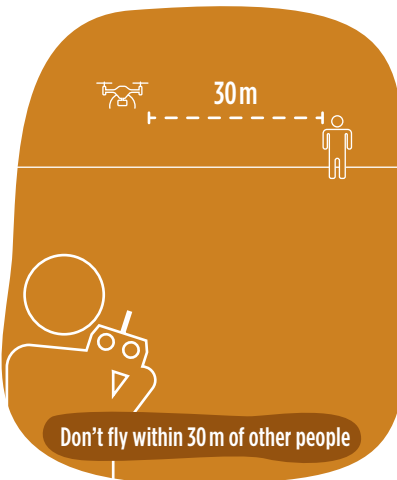
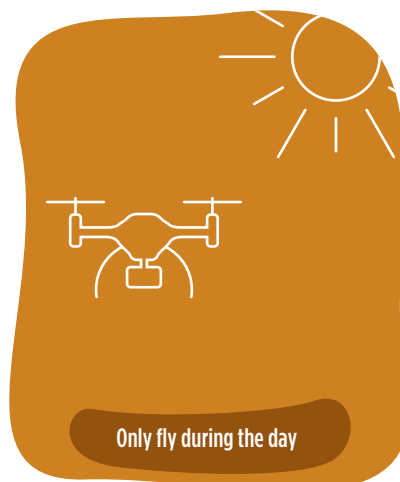
You can find out more about the accreditation and RePL in the resources section on page 12.



# Drone safety rules

Whether you are flying for fun or flying under an Operator's Accreditation you must operate under the Standard Operating Conditions. You can think of these as the Drone Safety Rules and they are regulated by the Civil Aviation

Safety Authority (CASA). We have summarised some key ones below as a helpful reminder but you should read all about them in detail at [casa.gov.au/drones/drone-rules/drone-safety-rules](https://casa.gov.au/drones/drone-rules/drone-safety-rules)



# Drone shopping list

So you have decided to go ahead, obtain some skills, and purchase your first drone to help with monitoring on Country. Here is a handy shopping list to get the items you will need.

## Essential:

- Drone and battery.
- Extra cables and propellers.
- Micro SD card and reader.
- Consent form/checklist (for TOs and photo protocols).
- Hats (to stay cool) and sunglasses (so you can see the screen).
- Drone bag/hard case.
- Computer and internet.

## Optional:

- Spare batteries (helpful when flying for longer than 20 mins and mapping exercises).
- Controller sunshade.
- Landing pads.
- Esky to keep batteries cool. Dry packs are good – don't put batteries in the fridge or on ice.
- Spare micro SD cards.
- LiPo safety bag, maybe LiPo cabinet.
- Screen wipes/cleaner.
- Software e.g., DroneDeploy, Pix4D, DJI GO fly, DJI Pilot, DJI GO 4 etc. if you want to map areas.

# Choosing your drones

Before you go out and buy a drone, or if you already have one, it is important to know what you want to use your drone for and what different drones can do.

There are a lot of drones out there and they are changing all the time. So, here are some basic guidelines or things to ask the company you are buying your drones from to make sure you get the right ones.

## Can I fly it with my certification or licence?

- Make sure the drone is less than 2 kg total weight (with cameras and attachments) to be sure you can fly it with just an Operator's Accreditation.
- If you have a Remote Pilot Licence (RePL), usually less than 7 kg or 25 kg, depending on your licence.

Some good options from the brand DJI as of July 2024



**DJI Mini 3 or 4 Pro**  
for manual surveys or individual photos only



**DJI Mavic 3 Enterprise**



**DJI Phantom 4 Pro**  
(not the Pro+)



## Does the drone have a good camera?

- Usually, 12 megapixels or higher.
- Ideally with a mechanical shutter (look for 'enterprise' drones).

## Is it compatible with mapping software?

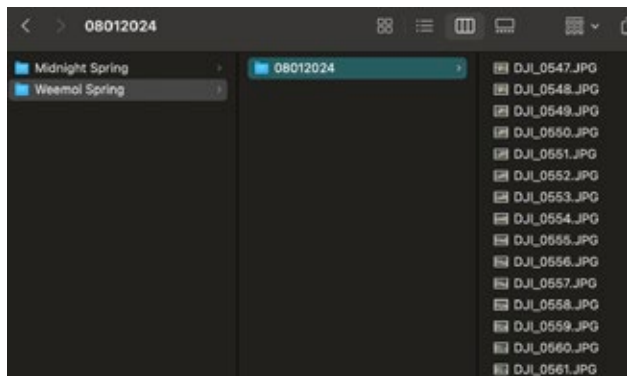
- If it is a DJI 'Enterprise' drone it should be compatible with DJI Pilot for flight planning.

- If you are planning to use DroneDeploy you can use any of the drones listed above except the DJI Mini or check the links in the resources section on page 12 for more details.
- If you are using a drone controller with your mobile phone as a screen, the mapping software will be dependent on whether you are using an iPhone or an Android.

# Data storage and management

Taking photos and video on the drone is a very useful exercise, but the size of the images and video files quickly mount up, filling SD Cards, especially if you are running automatic mapping sequences. Having a dedicated mapping folder on a computer drive is important so you can download the files off the SD card onto the computer and free up the SD card to take more images and video.

When you download the files off the SD card, make sure you put them in easily identifiable folders, such as ones named with the location, date and subject. For example, if you have flown a mapping exercise over a waterhole, you would name your folder the name of the waterhole. If you are flying the same mapping exercise over time, you would create sub-folders, each labelled under the different dates and/or times. Be aware, these folders can get quite big very quickly. It is also important to keep a backup, such as copying the folders over to an external hard drive in case something happens to the original files.



Another factor to consider is your internet connection. If you are planning to upload your data to websites like DroneDeploy or GeoNADIR for storage and processing, you will need a reliable internet connection. If your connection often drops in and out, or you regularly lose power, it may take a few tries or even overnight to upload larger datasets. Alternatively, you may need to store your images on an external hard drive and take them somewhere with a good internet connection to upload them.

## Data analysis and storytelling

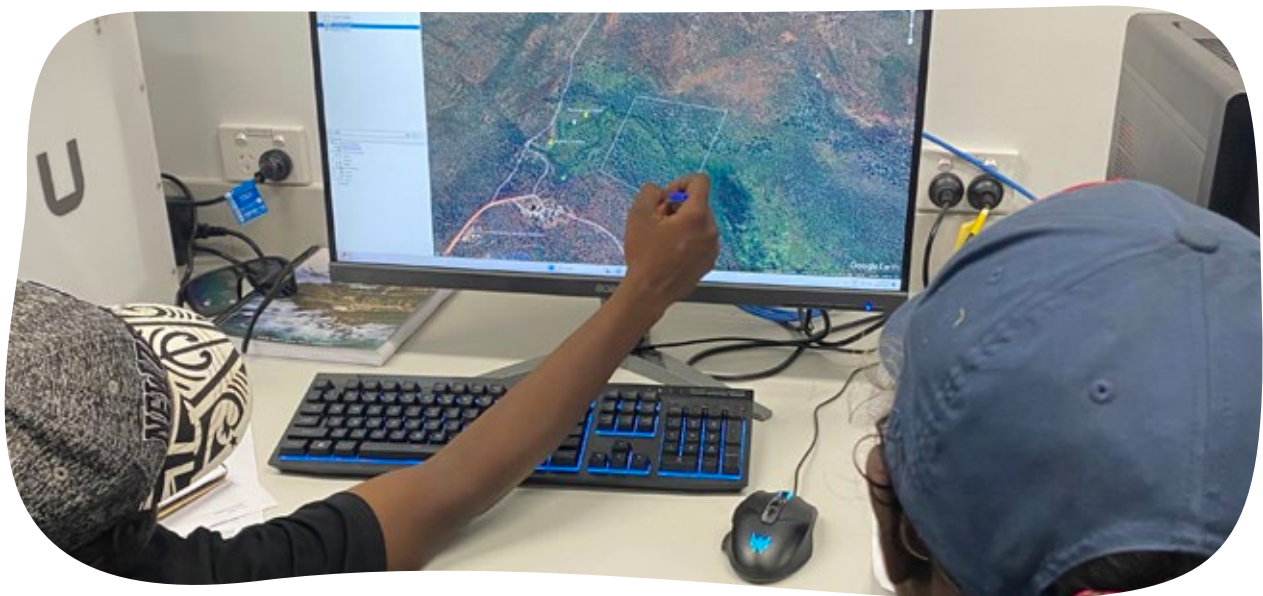
What story do you want to tell with your data? Is it to show the work you have been doing on Country? Or will the data inform your planning sessions to identify priorities for looking after Country?

If you only want to share individual pictures or videos from your drone, you just need a computer or tablet and an SD card reader. Drones are commonly used to take many hundreds of images, which are stitched together to make maps. However, if you want to create large maps or do data analysis from your drone images you will either need a high-specification computer, or a standard computer and a reliable internet connection.

If you are using your own computer to process the data you will need to check the minimum requirements for the software you are going

to use. You will need a high-specification computer to process drone images, unless you want to wait hours or even days to make a map. Some commonly used computer-based software options are Pix4Dmapper, Agisoft Metashape and WebODM (see resources on page 12).

You can also process your data online or 'in the cloud'. This means you will not need to buy an expensive high-specification computer, but you will need a reliable internet connection to upload the images in the first place. You will also usually need to purchase a software subscription or pay to process each map (which can be very expensive!). Some commonly used cloud-based software options are DroneDeploy, GeoNADIR, Pix4DCloud and WebODM (see resources on page 12).



## Creating a drone flight plan

Making a drone flight plan ensures that all of your flights are culturally safe, follow the drone safety rules, and keep yourself and your drone safe. The plan included below is just one example of a drone flight plan with descriptions of what information you might want to include or discuss when doing your

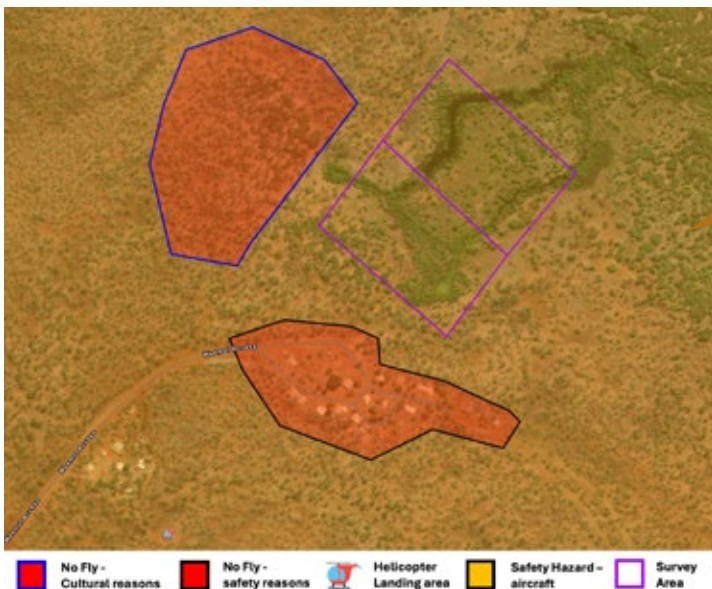
flight plans. A flight plan can be as simple as drawing a map and talking it through with the relevant Traditional Owners, your drone team and your coordinators. You should get permission to fly your drone from the relevant Traditional Owners and check if there are any places that should not be flown over.

The date and drone can help ensure that nobody else is using it.

Include anything you might need to explain to the relevant TO for approval. For example, if the camera is only facing down so it won't accidentally take photos of a sacred site.

Date of flight <i>08/01/2024</i>	Drone <i>DJI Mavic 3E</i>
Pilot Name <i>Anthea Lawrence</i>	Other drone team members <i>Danisha Riley</i>
Task summary and location <i>Survey of exclusion fence at Weemol Spring</i>	Task description <i>Fly a DJI Mavic 3E over the fenced and non-fenced areas at Weemol Spring for an automated survey. The camera will be facing down only.</i>

Sketch or map of flight area



Include:

- Your survey area or point of interest
- No Fly areas for cultural reasons (e.g. sacred sites)
- No Fly areas for safety reasons (e.g. airstrips, community areas)
- Safety hazards (e.g. helicopter landing areas, 5.5 km area around airstrips).

Check the following and address as needed. If you answer No to any of these questions you might need extra approval from your supervisor or CASA

A map of flight area has been created and we have included any known No Fly areas (cultural and safety) <i>Yes</i>	The flight is during the daytime <i>Yes</i>
Airspace checked on Ok2Fly.com.au is green or yellow. If Yellow, why? <i>Yes, uncontrolled airport</i>	The drone won't be flown higher than 120 m above the ground (including if flying over cliffs or waterfalls) <i>Yes</i>
The pilot feels confident that they can do this flight <i>Yes</i>	No-one except the drone crew will be in the area or we will land the drone if anyone comes in the area <i>Yes</i>
We have been to the site to check if the plan will work (if possible) <i>Yes</i>	There is an open area where the drone can safely take off and land <i>Yes</i>
Pilot will be able to see the drone with their own eyes <i>Yes</i>	We have consulted with the relevant Traditional Owners about any extra rules or no fly areas <i>Yes</i>
Traditional owner name/s <i>Dudley and Elizabeth Lawrence</i>	The TO has given us permission for this flight <i>Yes</i>
Comments and/or rules from TOs: <i>Do not take photos of or fly over the sacred site to the west of the spring</i>	

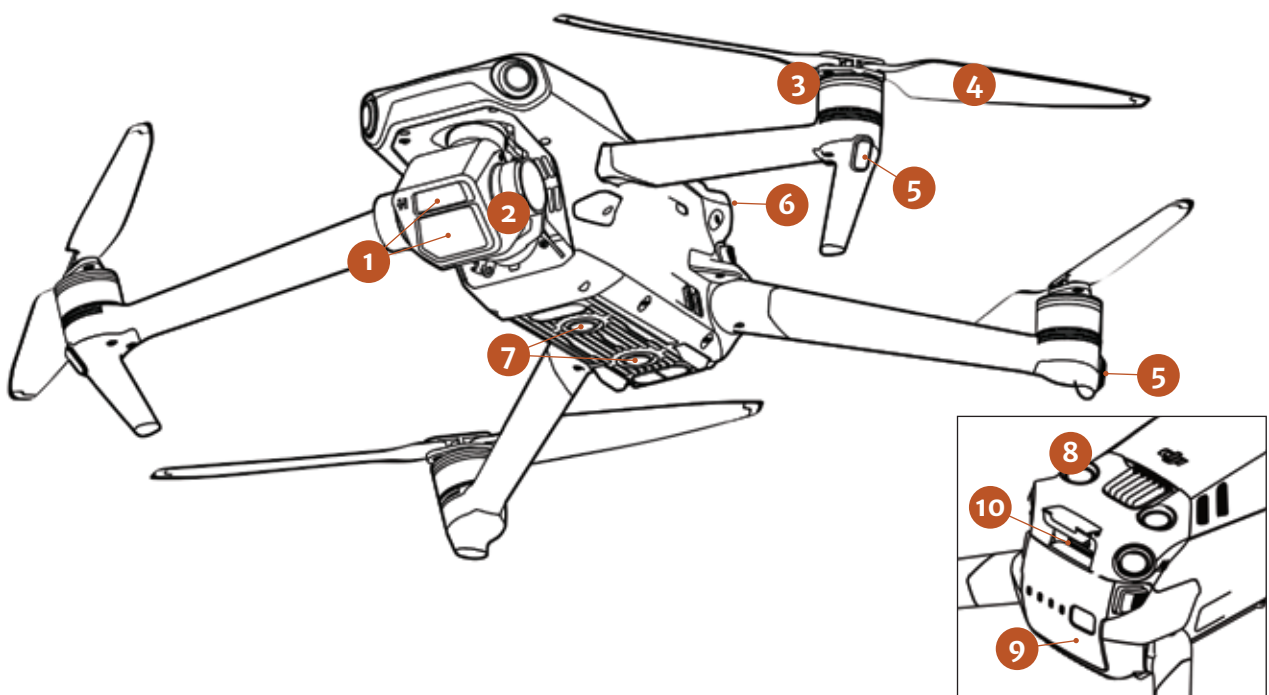
# Drone pre-flight health checks

It is always a good idea to do a basic health check of your drone the day before you go out into the field. Once you get there it may be too late to fix something and you may be too far away from the office to charge batteries or update software. You can follow the checklist below or make your own.

To complete a drone health check, you will need to know the basic parts of a drone and the controller. Many of these parts might be familiar to you, especially if you have spent a lot of time in helicopters. You can look up all the different parts of your drones in the drone's manual.

In general, a drone consists of a body that houses one or two camera/s **1**, a battery **9** and a place to put an SD card **10**. The camera is usually on a gimbal **2** so you can point in any direction. It has at least four folding arms with motors on the end **3** and propeller blades **4** attached to each motor. It also has navigational lights **5** like a plane so it can be seen in the air. Most drones these days have sensors **6 7 8** on them that are kind of the like 'eyes' of the drone.

The sensors can feel or 'see' obstacles like trees and buildings and stop the drone flying into them. Your drone might not have them or it could only have them on some sides, so it is good to check or you might fly into something by accident. This 'obstacle avoidance' can be turned on or off on your drone controller, so make sure it is turned on. The controller will show the camera view.



# Basic drone health checklist

Here is a checklist before you go out to fly the drone.

## Before turning on the drone

### 1 Propeller (props)

- Move
- No damage

### 2 Camera

- Moves
- Clean
- No cracks or scratches

### 3 Body (shell)

- No damage

### 4 Drone batteries

- Fully charged
- Spare battery/ies fully charged

### 5 Open SD card slot

- Card installed

### 6 Controller and phone/tablet (if using)

- Fully charged
- No damage

### 7 Turn on controller and phone/tablet

- Flight app downloaded

### 8 Open flight app

- Software up to date

## To turn the drone on

Move outside or remove propellers from drone for safety

### 9 Turn on drone

### 10 Open up flight app

- Drone camera showing in flight app
- SD card not full
- Software up-to-date
- No errors (except GPS errors if inside)
- Optional: Automated flight plan has been created and is set to “available offline” or downloaded on to the device (See booklet 2 for more information)

### 11 Turn off your drone

### 12 Turn off your controller

### 13 Put the propellers back on, if needed

### 14 Pack your drone back up

### 15 Your drone is ready to fly!

Go to Booklet 2 – ‘Ready to Fly’.

# Resources

## Drone law resources

### CASA Drone Operations Guide

[casa.gov.au/sites/default/files/2021-08/part-101-micro-excluded-rpa-operations-plain-english-guide.pdf](https://casa.gov.au/sites/default/files/2021-08/part-101-micro-excluded-rpa-operations-plain-english-guide.pdf)

### CASA – Know Your Drone

[casa.gov.au/knowyourdrone](https://casa.gov.au/knowyourdrone)

### Getting your Operator Accreditation

[casa.gov.au/drones/get-your-operator-credentials/operator-accreditation#Operatoraccreditationrequirements](https://casa.gov.au/drones/get-your-operator-credentials/operator-accreditation#Operatoraccreditationrequirements)

### Getting your Remote Pilot's Licence (RePL)

[casa.gov.au/drones/get-your-operator-credentials/remote-pilot-licence#GetyourRePL](https://casa.gov.au/drones/get-your-operator-credentials/remote-pilot-licence#GetyourRePL)

## DroneDeploy compatibility

### Supported and Compatible Drones

[help.dronedeploy.com/hc/en-us/articles/1500004964842-Recommended-and-Supported-Drones](https://help.dronedeploy.com/hc/en-us/articles/1500004964842-Recommended-and-Supported-Drones)

## Software to support curation of drone data

### Agisoft

[agisoft.com](https://agisoft.com)

### PIX4D

[pix4d.com](https://pix4d.com)

### GeoNADIR

[geonadir.com](https://geonadir.com)

### WebODM

[opendronemap.org/webodm](https://opendronemap.org/webodm)

### DroneDeploy

[dronedeploy.com](https://dronedeploy.com)



