

NEW_021 Use of Unmanned Aerial Vehicles (UAVs)

I. OBJECTIVE

To provide a standard procedure for UQ-affiliated animal researchers and teachers when planning to use Unmanned Aerial Vehicles (UAVs) in association with animal use for “scientific purposes”.

II. INTRODUCTION

Unmanned Aerial Vehicles (UAVs), often simply referred to as “aerial drones”, can be valuable research tools, particularly in relation to wildlife studies. They enable the capture of accurate, high value data that is often not feasibly obtainable by any other means. Although published literature exploring the impacts of UAV operation on animals is limited, there is evidence to indicate that they can elicit considerable behavioural as well and physiological responses. UAVs should always be operated in such a way that aims to cause as little disturbance to animals and the environment as possible – this includes structuring the flight plan to be least invasive, and being generally mindful of disruptions that your presence may be causing (e.g. when the ground control team is travelling and camping in national parks).

III. DEFINITIONS

Categories of UAV use -

Survey: the UAV is piloted following a preestablished path, which is not altered (unless failure to alter course would present an unexpected hazard to people, animals, or environment). Generally, the recorded data is then analysed, relative to animal sightings, after the survey-flight is complete.

Observation: the UAV is piloted to a location which enables observation of target animal(s); the UAV is left stationary for a period of observation before being returned or moved to the next point of observation. Should the target animal(s) move away, the UAV is not piloted in pursuit.

Pursuit and track: the UAV is piloted to a location which enables observation of target animal(s); should the target animal(s) move away from the UAV, the UAV may be piloted in pursuit for the purpose of continued observation. The purpose of pursuit is not to “chase” the animal(s) away.

Behaviour manipulation: the UAV is piloted with the aim of disturbing the target animal(s) (i.e. the intent is to manipulate their behaviour). For example, livestock that are mustered with UAVs, and birds that are intentionally roused to take flight.

Competent - “the consistent application of knowledge and skill to the standard of performance required regarding the care and use of animals. It embodies the ability to transfer and apply knowledge and skill to new situations and environments.” (NHMRC, 2013)

Scientific Purposes – “an animal is used for a scientific purpose if it is used in an activity or in connection with an activity performed to acquire, demonstrate or develop knowledge or techniques in a scientific discipline (for example, diagnosis, environmental studies, field trials, producing biological products, product testing, research (including the creation and breeding of a new animal line where the impact on animal wellbeing is unknown or uncertain), or teaching)” (UQ, 2021)

Conditions:

- Investigators named in an animal ethics application, relative to this SOP, must be competent to implement the SOP
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IV. COMMENTS / RECOMMENDATIONS

- Relative to animal ethics applications, when using this SOP, the following must be described in the individual ethics application: an overview of your proposed flight plan (see V. AEC REVIEW, below), and any intended variation to this SOP.
- When using animals for scientific purposes all personnel must be competent in the procedures they perform or be under the direct supervision of a person who is competent to perform the procedure – this includes knowledge and experience to understand relevant animal behaviours (see VIII. Animal Considerations, below).
- It is critically important that the pilot has adequate control of the UAV at all times and sufficient skill to be able to react quickly to changes in the environment (e.g. if a large group of galahs begin to move through the flight vicinity the UAV will need to be landed immediately). This means that the pilot should have committed to prior practise if they are unfamiliar with the specific UAV to be used.

V. AEC REVIEW

An overview of your proposed flight plan must be detailed within the relevant animal ethics application (if a written flight plan exists this may be included as an attachment to support your application). This information is likely to be pertinent to the AEC's consideration of potential impacts to animal wellbeing. This information should include:

- an indication of the most applicable UAV use "category" (see III. Definitions),
- your flight path, pattern, speed etc., and the relative scientific rationale (e.g. how will you approach the animals, and why in that specific manner?),
- flight schedule (e.g. frequency of flights, duration of associated animal disturbance, time of day or night, time of year with respect to breeding seasons etc),
- expected impacts to animals (both target and non-target species), and any specific animal-related considerations (e.g. minimum radius of proximity to animals, any species you aim to avoid completely, potential collision with bats or nocturnal birds of prey if operating at night, proximity to known nesting sites or rookeries),
- UAV type and any relevant specifications (e.g. weight, size, noise-level produced, maximum flight time etc),
- any relevant environmental factors (e.g. location, topography, nearby buildings).
- specific personnel requirements (e.g. will a "spotter" be available?).

The AEC judges whether an activity is considered ethically acceptable based on the information provided in the application that demonstrates "respect for animals" (including application of the 3Rs), and balance whether the potential effects on wellbeing of the animals involved is justified by the potential benefits of the work.

VI. PERMITS AND COMPLIANCE

Users hold individual responsibility to ensure compliance under the relevant frameworks they are operating. The AEC expect you to attain all relevant permits and licenses, and to provide a copy of those that specifically relate to the use of animals for scientific purposes to Research Ethics and Integrity <animal.ethics@research.uq.com.au>, once they have been attained and before commencing the work. For guidance relative to "those that specifically relate to the use of animals for scientific purposes" see table 2.

The following is presented as a general guide to the permits and licenses that may be required, and should be considered a non-exhaustive list:

- **Civil Aviation Safety Authority (CASA)** – national regulator of UAV use.
Check the [CASA webpage](#), in context of UQ's operational document (referred to below).

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- **Local governance**

Ensure you have obtained any relevant permission from local government and or traditional landowner.

- **Wildlife / environmental authorities**

State permits may be required, common Queensland government examples include:

- Scientific Purposes Permit (SPP), issued by Department of Environment and Science (DES),
- (Marine Park) Permits under the *Marine Parks Act 2004*, issued by Department of Environment and Science (DES)

National permits may be required, common examples include:

- (Marine Parks) Permits, issued by Great Barrier Reef Marine Park Authority (GBRMPA)
- Cetacean Permits, issued by Department of Environment and Energy (DEE)

- **Animal Ethics Committee (AEC) approval requirements**

If using animals for scientific purposes (this includes research and teaching activities) you will require [animal ethics](#) approval. If unsure about the nature of your animal ethics obligations, contact the animal ethics team for advice animal.ethics@research.uq.edu.au

- **Human Research Ethics approval requirements**

If unsure about the nature of your [human ethics](#) obligations, contact the human ethics team for advice <https://research.uq.edu.au/contact>

- **Export trade controls**

If unsure about the nature of your [Sanctions/Export Controls](#) obligations, always contact exportcontrols@uq.edu.au (for example, under most circumstances it is illegal to export a UAV).

- **UQ operational requirements**

At the time of writing this guideline, UQ Research Infrastructure was undergoing development of an operational documents for UAV use. Please contact Director, Infrastructure Research director-infrastructure@research.uq.edu.au (this includes queries regarding CASA licencing, relative to UQ)

If you plan to operate a UAV on a UQ campus, prior approval is required. Please refer to the [Flying Drones on Campuses](#) webpage location.

VII. UAV SPECIFICATIONS

The type of UAV selected for use should be the least disruptive option available that is able to achieve the desired scientific outcomes (i.e. the UAV that is able to be the smallest, quietest, and furthest away from the animals). The desired image resolution is often an important consideration in this regard (e.g. do you require 1cm/pixel or 0.5cm/pixel?). This is because image resolution is dependent on the imaging equipment (i.e. how heavy is your imaging equipment) and distance from the image target (i.e. how close do you need to get to the animals). Generally, heavier UAVs can carry heavier, more highly powered imaging equipment. Table 1 below is for general guidance only; it highlights the main pros and cons of using very small (250g - 2kg), compared to heavier, UAV options.

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Table 1 | Summary pros and cons of “very small UAVs” (i.e. 250g - 2kg), compared to heavier UAVs (i.e. >2kg).

Please note, at the time of publication CASA categorises UAVs relative to take-off weight.

| Pros | Cons |
|--|---|
| <ul style="list-style-type: none"> ▪ Less disruptive to animals (i.e. smaller, quieter and less air turbulence) ▪ Cheaper ▪ Reduced CASA licencing requirements (when <2kg) ▪ Potentially increased flight time | <ul style="list-style-type: none"> ▪ Unable to carry heavy equipment (e.g. high resolution or specialised cameras) ▪ Must be flown closer to the image target (usually) because the camera is less powerful |

Generally, the UAV specifications required (e.g. weight), relative to desired image resolution, can be determined via simple desk-top calculations. Following this, if trials of the equipment are required to ensure/validate image quality, this should be done in preparation of animal work, using inanimate objects (so that animals are not needlessly disturbed).

VIII. ANIMAL CONSIDERATIONS

UAV operators must be familiar with normal and abnormal behaviours (including stress responses) of the animals that they may encounter during operation. This needs to be considerate of the species as well as individual animal differences relative to age, sex, class etc.

Further to this, users should review current literature and consult with academic peers to identify expected animal behaviours / responses. For example, Rebolo-Ifrán *et al.* (2019), provides a valuable summary of documented animal responses to UAV activities, and textbox 1 was developed from consultation with various UQ-based academics.

If the planned UAV operations has an unknown potential for disruption of normal behaviours a pilot study should be performed. This pilot should be used to assess the impacts of the UAVs operations and establish acceptable operational parameters accordingly – this is exemplified in textbox 2.

Textbox 1 | From consultation with academic users the following general guidance has been identified.

- Livestock species require a period of habituation to UAVs, especially if the purpose is to use the UAV to interact with the animals, or to muster them. After this habituation period their responses become predictable and routine.
- If you intend to survey birds, when using very small drones, the initial launches should commence >100m from the target birds. Larger drones require greater initial launch distances (because they are very loud and disruptive). Following this the approach distance may be adjusted according to the birds’ response.
- Marine terns, when scavenging around fishing trawlers should not be approached with UAVs. They may attack the UAVs out of what is presumably territorial behaviour.
- Birds of prey need to be monitored closely. If the bird is in the immediate flight vicinity or if it appears to show any interest in the UAV (e.g. turning towards the UAV), the UAV must be landed immediately. Birds of prey have been reported to attack UAVs (injuring themselves and the UAV).
- Large groups of birds must be avoided (such as flocks of galahs or budgerigars). If these appear in the immediate flight vicinity, the UAV must be landed immediately to avoid collisions.
- It is difficult to identify if marine animals such as cetaceans and turtles have much of a behavioural or physiological response to proximate UAVs. Government permits generally provide direction relative to operation around these species.

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Textbox 2 | Wallabies: UAV pilot study, within an experimental study.

When studying macropods (e.g. kangaroos & wallabies) in the wild it is possible that animals will respond to the UAV by hopping away. Macropods can perform a slow hop and a fast hop. It is imperative that the UAV does not induce a fast hop since it presents a significant risk that females will eject their pouch young. Therefore, it is important that you perform a pilot study using escalating approach distances and speed to establish safe parameters of operation.

IX. PREPARATION

The specifics of equipment and procedures (i.e. flight plan) required is often strictly dependent upon the following items, many of which are covered in this document (sections IV-VII, above). These include:

- your scientific aims (and thus the optimal flight path/pattern)
- animal specific parameters (e.g. minimum radius of proximity to animals)
- operational documents, licenses and permits (eluded to within IV. Permits & Compliance)
- logistic limitations (e.g. battery life/ maximum flight time),
- environmental factors, such as topography and wind speed (e.g. very small UAVs are poorly controlled in winds >15 knots)

X. EQUIPMENT

As a minimum, equipment should include:

- The UAV,
- An operator (i.e. the pilot),
- A spotter, if required to maintain direct visual contact with the UAV at all times, and monitor for local hazards (e.g. if the operator is expected to require periods of uninterrupted focus on the remote-camera video display, thus, losing direct visual contact with the UAV)
- Animal use records (e.g. project specific observational record, lab book entry etc)

XI. PROCEDURES

1. Obtain all permits and licences (including ethics approval), relevant to your proposed work.
Note: depending on their conditions, you may need to hold some of these permits and licences on hand at the time of operation (especially if operating in a public space).
2. Once obtained, provide a copy of those external permits and licenses (that relate to the scientific use of animals) to Research Ethics and Integrity animal.ethics@research.uq.com.au, see table 2 for guidance.
Note: The AEC may approve a project in principle, under the proviso that relevant external permits are obtained and a copy of these are sent to the above address before work commences.
3. Ensure you have an established flight plan.
Note: Your flight plan needs to be established in line with the relevant permits and licences. This is because many of the permits will dictate how you can operate the UAV (e.g. a Cetacean Permits may stipulate a minimum 50m radius from any cetaceans). Further to this, the AEC may require consideration of amendments to the flight plan to safeguard animal wellbeing.
A flight plan does not have to be a formal document; however, it must be well communicated and understood within your operational team, and it must be outlined in your animal ethics application (see above, V. AEC REVIEW, for guidance)

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4. Execute operations, as per your established flight plan.
5. Record data and report on observations, as appropriate.
When performing field work, ensure these data enable reporting on observations and interaction with expected animals as well as any unexpected animals (i.e. by-catch). From these data an assessment should also be made as to the level of impact/disturbance caused (especially if there were there any unintended negative consequences). These features should then be communicated to the AEC via [mandatory annual reports](#), or [unexpected adverse event](#) reporting, as applicable. This is important, and of particular interest to the AEC, so that they may develop a more complete understanding of the potential impacts associated with UAV operations.

XII. REFERENCE INFORMATION

Table 2 | The AEC requires that copies of only those permits and licencing arrangements that specifically relate to the use of animals for scientific purposes be sent to Research Ethics and Integrity animal.ethics@research.uq.com.au, once they have been obtained, and before commencing work. This table aims to guide which permits and licencing arrangements usually have specific reference to the use of animals for scientific purposes. NB: this table is a guide only - for specific case advice contact animal.ethics@research.uq.com.au

| Permit/licencing type | What needs to be sent to Research Ethics and Integrity? |
|--|---|
| Wildlife / environmental authorities | Copies of permits/licenses are generally always required. These permits will often detail operational specifics, such as the maximum number of animals permitted for use, as well as operational limitations relative to ecosystem disturbance. |
| Local governance | Copies of permits/licenses are often required as they often contain specific details or information relative to your interactions with animals. |
| Any other permit/licencing arrangement, not named in this table | Copies of permits/licenses may be required if they contain specific details or information relative to your interactions with animals. |
| Civil Aviation Safety Authority (CASA) | Copies of associated permits/licenses are not required, however, written confirmation that you will comply with the relevant regulation, following UQ operational procedures is expected in the application. |
| UQ operational requirements (e.g. permit to fly a drone on campus) | Copies of associated permits/licenses are not required, however, written confirmation that you will comply with UQ operational procedures is expected in the application. |
| Human Research Ethics approval requirements | Copies of associated permits/licenses are not required, however, written confirmation that you will comply with relevant regulation, following UQ operational procedures is expected in the application. |
| Export trade controls | If applicable - copies of associated permits/licenses are not required, however, written confirmation of compliance with relevant regulation, following UQ operational procedures is expected in the application. |

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| Version # | Reviewing AEC (note: all other relevant AECs ratify the approval) | AEC Review Date | Approval To Date |
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