

## REMOTELY PILOTED DRONE

### 1. Purpose

To ensure pilotless drone e.g. Drones, are managed safely and non-intrusively on Geothermal Steamfield and Station sites, and compliant with aviation regulations.

### 2. Background

Remotely Piloted Drone Systems (RPAS), also known as Unmanned Aerial Vehicles (UAV) or Drones, present an opportunity for Contact Energy to remove data collectors from potentially hazardous situations and to gather information more efficiently.

Potential applications of RPAS include:

- Visual inspection of asset,
- Videography,
- Vegetation monitoring,
- Thermal infrared surveying.

These applications can be broken into three classes:

- Line of Sight (LOS) operations,
- Beyond Line of Sight (BLOS) operations and,
- Night time operations.

For Contact Energy to establish a reputation as a responsible RPAS user, specific attention **MUST** be given to mission planning, risk management, and stakeholder communications. The following document has been prepared to guide service providers in their operation of RPAS to build, and protect this reputation.

### 3. Regulatory Requirements

Civil Aviation rules regulate the use of RPAS both within unaided visual Line of Sight and < 25kg (Part 101) and Beyond Line of Sight or > 25kg (Part 102).

#### 3.1. Within Line of Sight and < 25kg

Operators **MUST** comply and be CAA-Part 101 certified. Part 101 of the Civil Aviation rules prescribe the operating rules for persons operating drone of less than 25kg within line of sight.

When operating under Part 101 you **MUST** consider the following 12 key points:

1. Drone **MUST** not be flown higher than 121 metres (400 feet) above ground.
2. The pilot **MUST** be able to see the drone with their own eyes at all times (e.g. not through binoculars or a monitor) to ensure separation from other drone or property.

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3. You **MUST** notify the landowner or person in charge of the area you want to fly above before flying.
4. You **MUST** gain the consent of any person you intend to fly above.
5. You **MUST** only operate an drone less than 25 kg and always ensure that it is safe to operate.
  - a. If your drone weighs between 15 and 25 kg you **MUST** obtain approval from a CAA (Civil Aviation Authority) approved organisation.
  - b. If your drone weighs less than 15kg then no approval is required.
6. At all times take all practicable steps to minimize hazards to persons, property, and other drone.
7. Fly only in daylight (general rule - not applicable to Contact sites)
8. Give way to all crewed drone.
9. Have knowledge of airspace restrictions that apply in the area you want to operate.
10. Do not fly closer than four kilometres from any aerodrome (unless certain conditions are met).
11. When flying in controlled airspace, obtain an air traffic control clearance issued by airways (via airshare My Flights).
12. Do not fly in special use airspace without the permission of the controlling authority of the area (e.g. military operating areas or restricted areas).

### 3.2. Beyond Line of Sight or > 25kg

Operating a RPAS in a way that does not conform to Part 101 requires certification under Part 102.

This document relates specifically to drone operating under Part 101. Operations under Part 102

Will be considered at a later date.

### 3.3. Night operations

Civil Aviation Rule Part 101 includes that you **MUST** not operate at night unless indoors or as a "shielded operation", which means within 100m of a structure and below the top of the structure.

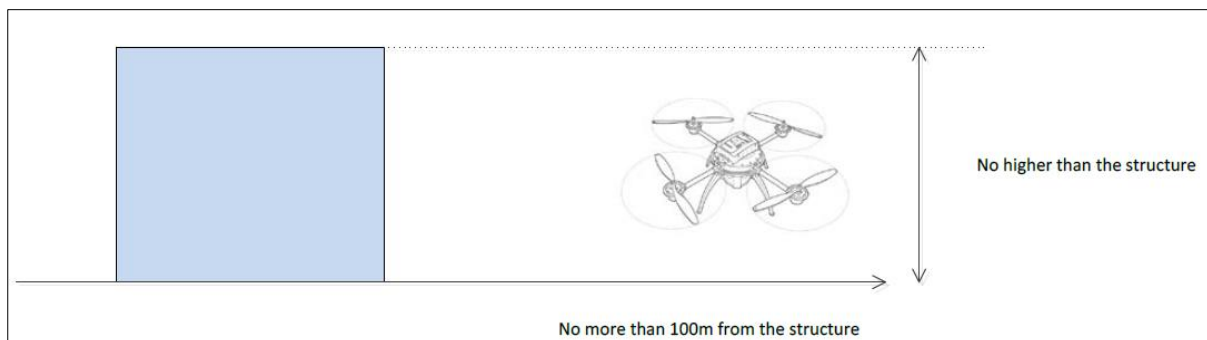


Figure 1. Shielded operation

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For further guidance regarding the regulatory requirements of operating RPAS under Part 101 and Part 102, refer to:

- <https://www.aviation.govt.nz/>
- [https://www.caa.govt.nz/rules/Part\\_101\\_Brief.htm](https://www.caa.govt.nz/rules/Part_101_Brief.htm)
- [https://www.caa.govt.nz/rules/Part\\_102\\_Brief.htm](https://www.caa.govt.nz/rules/Part_102_Brief.htm)

## 4. Contact Energy Flying Rules

Although the regulations stipulated in Part 101 provide users with baseline requirements for the use of RPAS under general circumstances, The use of RPAS around Contact Energy operational sites raises additional concerns that **MUST** be addressed as a part of effective mission planning.

### 4.1. Drone Specification and tools

Service providers wishing to employ RPAS in jobs for Contact Energy will need to be able to demonstrate that their Drone complies with the following standards:

Item	Description
Auto airtime logging	Air time logger inbuilt into the flight controller.
GPS and mode lights	Inbuilt GPS logger and indicator light for the flight mode.
In use battery monitor	External or via real time display
Return to home feature	Manually and fail safe mode return
Real time RPAS telemetry	Telemetry to provide real time flight information and drone status.

### 4.2. Personnel/ Organisation requirements

All missions **MUST** include at least:

- One dedicated pilot in command,
- One separate field assistant or,
- One Contact Energy staff member.

The pilot will have at least **10 hours** of machine logged experience on the system to be used.

**Note that staff member can also be the field assistant, provided they have been given an induction provided by the RPAS contractor.**

### 4.3. Documentation

The service provider will be able to provide:

Pre-flight:

- Mission plan (including a flight plan and safety plan outlining hazard handling),
- Contingency plan,
- Incident reporting documents.

Post flight:

- Summary of task performed,

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- Incident reports required.
- Identify any changes to the plan with justification

## 4.4. Stakeholder communication

All stakeholders and landowners needs to be advised of the task and provided any information relevant.

Communication	Condition
Landowner	All landowners with property under or within 50m (Urban) or 150m (Rural) of planned flights path
Airshare flight plan notification	All flights
Local Distribution Network	If flying over distribution lines
Road Controlling Authority	If traffic management plan required
Aerodromes, airports, aero clubs, gliding clubs, etc	If operations within 4km plus others as identified by Contact Energy.

## 4.5. Internal Stakeholders!

Contact Energy supervisor is responsible for alerting the steamfield manager and teams working near the area of aerial data capture for any flights scheduled.

## 4.6. Area Flying Restrictions Geothermal Sites

### 4.6.1. HV Power Lines (<66kV) and structures – Contact owned

When conducting aerial surveillance of lines minimum vertical and horizontal distances from conductors and poles **MUST** be maintained at no less than 1 metre.

### 4.6.2. HV Structures – Contact owned

Flying over 220kV structures is prohibited unless instructed by Contact Engineer. Structures <66kV surveillance is permitted if accompanied by a **CE Electrical Supervisor or Engineer where distances MUST** be maintained at no less than 1 metre from any part of structure or conductor

### 4.6.3. HV Lines and structures –Transpower owned

Refer to TP Document Issue 1.12 Jan 2016 still in draft but outline of recommendations are:

<u>Item of concern</u>	<u>Description of control</u>
Altitude	Less than 121m (400ft)
Wind	Less than 40kph or drone capability (whichever is lower)
Rain	As per RPAS capabilities
Visibility distance	Unaided line of sight to max fly distance or 2 spans, whichever is greater.
Flight Path	Above and to the side of line
Proximity to line	Greater than 12m, less than 150m
Hours of flight	Within daylight hours as defined by Part 1 of the Civil Aviation Rules
Line crossing	Above structures only, at least 12m clearance

### 4.6.4. Buildings - Outside

Reasonable distance from buildings **MUST** be maintained at all times especially around doorways and access areas. Craft **MUST** be visible during all times during flying

### 4.6.5. Buildings - Inside

Distance from equipment and personnel **MUST** be maintained at all times especially around doorways and access areas. Craft **MUST** be visible during all times during flying

### 4.6.6. High Power Microwave Areas

Flying in the path of **Microwave beams is to be avoided due to high energy levels transmitted i.e. frequencies are very close to that of craft receivers which could be detrimental to craft control**

### 4.6.7. High Wind Considerations

Maximum 40kph wind speed for flying conditions. Less depending on craft specifications

### 4.6.8. People Considerations

Flying in the vicinity of personnel is prohibited

### 4.6.9. Hazardous Areas

Flying in close proximity of **Hazardous Area plant** is prohibited due possible emissions of an explosive gas. A minimum distance of 6 metres **MUST** be maintained at all times



[Date]  
[First name][Last name]  
[Job title]  
[Organisation]  
[Address]  
[City]

Dear [First name]

## **Aerial Survey by Remotely Piloted Drone System**

As part of the consent requirements, Contact Energy Ltd is required to carry out regular monitoring of the geothermal environment. This will involve a remotely piloted drone flying at low altitude.

Because the work requires crossing the airspace above your property, we want to ensure that you are fully aware of this and the process we are undertaking.

Details of when this work is proposed to take place and what you can expect are outlined below:

Timing and duration	We intend to operate a remotely piloted drone over your land, above and adjacent to the [SITE], from time to time between [OPERATING HOURS] during the week beginning [DATE]. The work is weather dependent, and we will inform you of any change.
Contact	Please contact [First name] on [phone number] or [mobile number] for any further information on this work.

If you have any special requests regarding the timing and effect of this work, please contact us as soon as possible and we will try to accommodate your needs into how we do this work.

Yours sincerely

[First name] [Last name]

[Job Title], Service Provider Name

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## Line of Sight RPAS Mission Plan

**REMINDER:**

- Visual contact **MUST** be maintained with the drone at all times during flight.
- The drone **MUST** remain below 121m (400ft) above ground level at all times.
- You **MUST** have notified a landowner before flying over their property.

For more information see [www.airshare.co.nz](http://www.airshare.co.nz)

### 1. Job information

Job description			
Nearest Address/Site			
Date		contingency date	
Time		contingency time	

	Name	Company	Email	Mobile
Pilot				
Observer				

### 2. Stakeholder communications

Communication Documents (only if communications done by the contractor)	
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### 3. Flight Planning

<b>RPAS and Ground Station</b>		
RPAS Make and Model		
UAV Data and Comms		
<b>Airspace</b>		
Nearby restricted airspace identified		
All necessary airspace clearances obtained (n/a if none are required)		
Flight logged on airshare.co.nz		
<b>Communication (frequency)</b>		
Airspace Comms RX		
Mission / Work Area Comms TX / RX		
Meteorological Constraints	Forecast	Actual
Wind (kph)		
Moisture / rain		

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## 4. Mission Plan

Mission Profile

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## 5. Site Safety

Use Contact Energy Hazard ID Form (DMS Document 10000005067)

## 6. Contingency

Event	Result	Procedure
Loss of signal		
Battery depletes		
Loss of direct visual sight of RPAS		

## 7 Emergency Contacts

Name:	Phone:
Pilot:	





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## Appendix C: Pre-flight Checklist

### RPAS Pre-flight Checklist

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For more information see [www.airshare.co.nz](http://www.airshare.co.nz)

#### 1. Before mission date

Enter ✓

1	All landowners within 50m (urban) or 150m (rural) of flight path have been notified	
2	Stakeholder communications completed	
3	Restricted airspace identified	
4	Necessary airspace clearances acquired	
5	Flight logged on airshare.co.nz	
6	Mission Plan filed	
7	Batteries charged	
8	Contingency plan evaluated for mission, location, expected conditions	
9	Measurement instruments within calibration	

#### 2. Area and Environment

Enter ✓

1	Wind speed	
2	Visibility acceptable	
3	Temperature acceptable	
4	Precipitation acceptable	
5	GPS Constellation minima	
6	Hazards identified	
7	Flight plan checked for visual obstruction	
8	Structures and cables identified	
9	Alternative / emergency landing zones identified	
10	People / bystanders identified	
11	People / bystander permission gained	
12	First aid kit stocked, accessible, and visible	

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## 3. RPAS

Enter ✓

1	Pilot In Control Camera lens inspected for obstruction	
2	Return to Base behaviour defined	
3	Return to base path checked for obstructions	
4	Props checked for damage	
5	Batteries sufficient for all flights	
6	Batteries charged	
7	Inspection camera settings correct	
8	RPAS clearly marked with identification	
9	RPAS strobe light functioning	
10	RPAS navigation lights (Red and Green) functioning and correct	

## 4. Ground Control

Enter ✓

1	Correct model selected in Transmitter	
2	Transmitter batteries fully charged	
3	Pilot In Control video displaying (if applicable)	
4	GPS reporting correct position in ground control software	
5	IMU recording correct movement in ground control software	
6	All transmitter controls move freely in all directions	
7	All transmitter trims in neutral position	
8	All transmitter switches in correct position	
9	Transmitter throttle to zero	
10	Ensure LED indicators and audible tones functioning and correct	
11	Flight timer visible	
12	Pre-mission 20 second hover test passed	

## 5. Flight Approval

Contact Energy Designated Approver	Title	Date