Electricity Engineers' Association

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Safe Use of Drones in and around Electricity Assets Guide

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HEALTH + SAFETY
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Safe Use of Drones in and around Electricity Assets Guide

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This guide is recommended as good practice by electricity supply industry representatives, but it is not a substitute for legislative or other regulatory requirements. If there is uncertainty on what guidelines or legislative requirements should apply in any particular situation, specialist advice, including legal advice, should be sought.

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This guide has been prepared on the basis that the user will be appropriately trained, qualified, authorised, and competent.

Status of Examples and Case Studies

Examples, including sample processes, or case studies in this guide are included to assist with consideration of health and safety issues. The examples or case studies are not a comprehensive statement of matters to be considered, nor steps to be taken, to comply with any statutory obligations pertaining to the subject matter of this guide.

Acknowledgements

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Preface

Suggestions for improving the content of this guide should be sent to: Electricity Engineers' Association (EEA), PO Box 5324, Wellington, New Zealand. Email admin@eea.co.nz

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Purpose and Scope

This suite of guides *"Safe use of Drones around Electricity Assets"* and the *"Starting your drone programme, A good practice guide"* sets out good practice standards and operational protocols for the use of Unmanned Aircraft (UA) in proximity to electricity assets. Its primary audience includes operators, contractors, and any organisations engaged in work near or on electricity infrastructure.

The core purpose is to provide an enabling framework: if an organisation does not currently have internal processes or policies related to drone use, these guides offer a comprehensive overview of UA applications and essential criteria to consider when drafting companies own operational procedures.

This guide *Safe Use of Drones in and around Electricity Assets* encourages alignment with industry standards, fostering consistency, safety, and innovation across the sector.

Key objectives include:

- Promoting safe and efficient drone operations that support asset inspections, fault finding, and risk mitigation. Particularly in challenging terrain where UA can significantly reduce worker exposure to hazards.
- Outlining regulatory compliance, including adherence to Civil Aviation Rules (CAR), all relevant health and safety legislation such as the Health and Safety at Work Act 2015, and Privacy Act 2020.
- Clarifying the operational boundaries for organisations, including weight limits, licensing requirements (or lack thereof under CAR 101), and the importance of pilot competency and training, even where formal certification may not be mandated.
- Highlighting the diverse use cases of UA in the electricity industry, such as real-time data collection, asset inspections using advanced sensors, asset mapping, and automated reporting, all of which contribute to improved accuracy, safety, and operational agility.

By articulating these standards, the guide empowers organisations to tailor their own internal policies and procedures to their specific operational environments. Adopting the recommended practices can help ensure regulatory compliance, protect worker well-being, and leverage the full spectrum of UA capabilities, ultimately supporting both safety and innovation in electricity infrastructure management.

Definitions

The definitions of CAR Part 101 apply to this document unless specifically called out in the table below:

AIP	Aeronautical Information Publication
AGL	Above Ground Level
ATC	Air Traffic Control
BVLOS	Beyond Visual Line of Sight
CAA	Civil Aviation Authority
CAR	Civil Aviation Rule(s)
EVLOS	Extended Visual Line of Sight
IFIS	Internet Flight Information Service
LiDAR	Light Detection and Ranging
MTOW	Maximum Take Off Weight
NOTAM	Notice to Airmen
RPAS	Remotely Piloted Aircraft System
UA	Unmanned Aircraft
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
UV	Ultraviolet, i.e. ultraviolet light
VNC	Visual Navigation Chart
VTOL	Vertical Take Off and Landing

1. Regulatory Compliance

In New Zealand, *CAR Part 101* applies to all UA operators, both recreational users and commercial. It sets out the basic rules for operating UA and is designed to ensure safety for people, property, and other airspace users.

Key points under Part 101:

- Certification or qualification is not always required to operate under CAR Part 101.
- Applies to anyone flying a UA, regardless of purpose.
- Operators must follow rules such as:
    - Fly only during daylight hours unless the flight is a shielded operation.
    - Stay below 120 metres (400 feet) AGL.
    - Obtain consent before flying over people or private property.
    - Stay at least 4 km away from uncontrolled aerodromes unless there is agreement with aerodrome operator, and other requirements are met.
    - Stay at least 4 km away from controlled aerodromes unless operated in accordance with an authorisation from the relevant ATC unit, and other requirements are met.
    - Unless the operation is a shielded operation, do not operate a UA within controlled airspace unless approved by ATC.
    - Do not operate within restricted airspace unless approved by the administering authority.

If a UA operator cannot meet these conditions, such as flying at night, beyond visual line of sight, or over crowds. They should apply for CAR Part 102 certification, which allows for more complex or higher-risk operations.

CAR 101.215 (b) says a person must not operate a remotely piloted aircraft with a gross mass of between 15 kg and 25 kg unless the aircraft, and any modification made to it, is—

- constructed under the authority of, or inspected and approved by, an approved person or organisation; and
- operated under the authority of an approved person or organisation
- CAR 101.202 defines approved person or organisation.

If your UA exceeds 25 kg:

- You must operate only under Part 102, which requires certification/approval from the CAA.

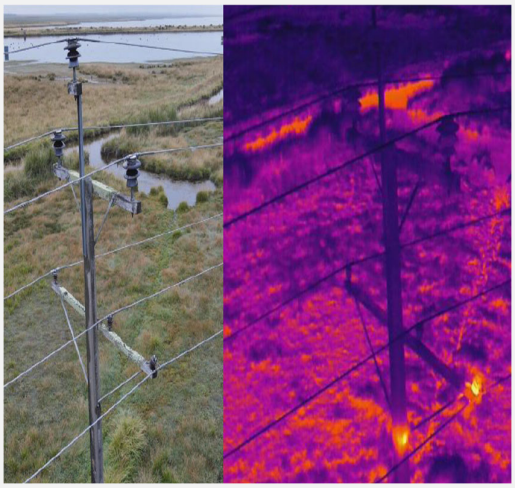
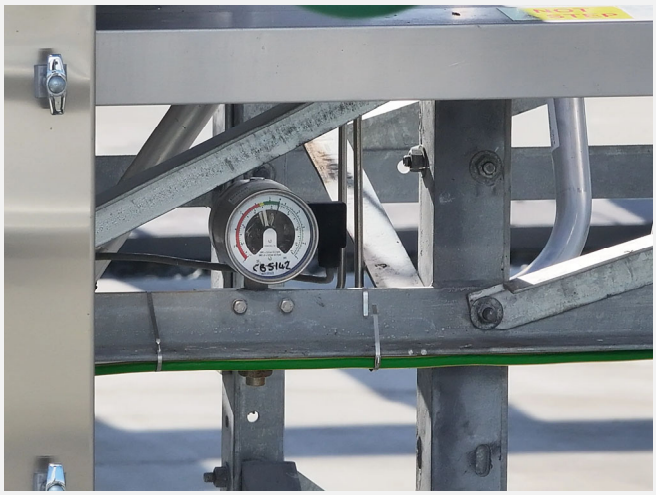
Nothing in this guide relieves operators of their obligations under the Civil Aviation Act and Civil Aviation Rules. Where conflict exists, CAR Part 101 or Part 102 prevails

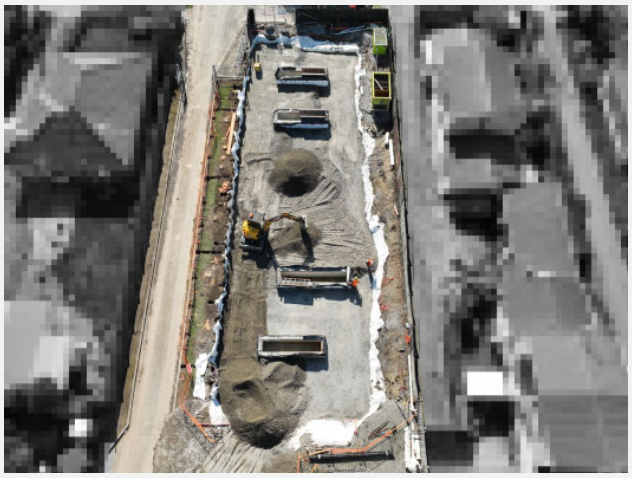
2. Use Case Scenarios

UA support the electricity industry by offering a wide range of applications that enhance efficiency, safety, and accuracy. These versatile tools are employed for various inspection tasks, including line fault inspection, field inspection, and thermal fault inspection. UA can provide live streaming and real-time data, capture high-density LiDAR data, and raw imagery for detailed analysis.

Utilisation of machine learning can be added real-time or post-capture to detect specific components, calculate pole locations, measure pole heights, and analyse pole inventories.

USE CASE	
Line Fault Inspection – Detailed identification of faults – Clear view and record of faults/damage	
Field / Asset Inspection – Detailed identification of faults – Clear view and record of faults/damage – Inspection of high-risk assets on network	

USE CASE	
Thermal Fault Inspection – Fault location for sensitive earth (or similar heat signature faults) – Reduced discovery times – Circuit loading checks	
Live Streaming and Real-Time Data – Real time fault ID – Collaborative environment for fault recognition, risk management and restoration planning	
Remote Asset Monitoring – Site security inspections – Switched breaker status – Bunding inspections – Property inspections	

USE CASE	
Vegetation Management – Overview of hard to access areas with hazardous terrain – Standard imagery for overview, recon, etc – LiDAR for detailed analysis	
Construction Monitoring	

3. Types of UA

UAV Type	Image	Benefits	Limitations
Single Rotor		Compared to Multirotor - Longer endurance - Larger payload capacity	- Harder to fly - Higher cost - Complex maintenance
Multi-Rotor		- Excellent manoeuvrability - Ideal for close-up inspections - Easy to deploy and operate	- Limited flight time (20–40 mins) - Smaller payload capacity
Fixed-Wing		- Long-range coverage - Longer endurance (often above 2 hrs) - Suitable for large area surveys	- Requires runway or launcher - Less manoeuvrable in tight spaces
VTOL		- Combines benefits of fixed-wing and multirotor - Can hover and cover long distances - Ideal for hybrid missions	- More complex and expensive - Heavier and requires more maintenance
Drone-in-a-Box or Dock Systems		- Can be fully autonomous - Ideal for routine inspections - Some can operate 24/7 with robotic battery swap	- High initial cost - Requires infrastructure setup - Requires extensive operational procedures

4. Types of Sensors and Payloads

UAV Type	Data Type	Use Case
Standard RGB	Photo / Video	General visual inspection, asset identification, condition assessment, documentation, and mapping.
Thermal / IR	Thermal / Radiometric Photo / Video	Detection of hotspots, electrical faults, overheating components, wildlife presence, and night inspections.
LiDAR	Point Cloud	High-precision 3D mapping, vegetation encroachment analysis, clearance measurement, and terrain modelling.
Stereoscopic RGB	3D Imagery	Generation of structure-from-motion, volumetric or other analysis that requires depth information from a single capture.
Laser Range Finder	Distance Data	Accurate distance measurement to assets or vegetation, clearance verification.
Corona	UV Imaging	Detection of electrical corona discharge, insulation breakdown, and early fault identification on live lines.

5. Operator Competency

A comprehensive approach to training is essential for UA pilots to ensure safe, compliant, and effective operations. The following recommendations outline the core elements of pilot preparation:

- Complete a safety induction and become familiar with company UA procedures, safety policies, and relevant site-specific hazards and emergency actions.
- Obtain formal training on the specific UA to be operated and comply with all CAR Part 101 rules, including airspace restrictions, altitude limits, and visual line-of-sight requirements.
- Gain supervised flight experience until company competency is achieved; additional endorsements and logged flight hours are required for specialist or high-risk operations.
- Maintain documented evidence of all training, competency assessments, and regulatory compliance.
- Stay informed of airspace designations and restrictions before every flight or operate under the direct supervision of an operator who is.
- For specialist tasks (e.g., close work near high-voltage assets), obtain specific endorsements and additional training as required.
- IMSAFE Checklist: *https://www.aviation.govt.nz/assets/publications/posters/im-safe-poster.pdf*

6. Pre-Flight Planning and Permissions

Identify the asset owner and obtain all necessary permissions before operating near electricity assets. Use official application forms where required.

Notify relevant authorities, including the asset owner's control room.

Flights within controlled airspace may require ATC approval which can be obtained with a flight request on *https://airshare.co.nz*.

Conduct a thorough risk assessment and pre-flight briefing, identifying all hazards.

7. Landowner Consent / Liaison

Risks to landowners include:

- Stock injuries (e.g., scaring livestock, which could cause them to run into fences)
- Damage to property
- Mistaken identification of drones as being used for criminal activity
- General disturbance or privacy concerns

Operations over people or private/third-party property:

- For operations under CAR Part 101, consent is required to fly over people or property.
- For operations under CAR Part 102, consent is often replaced with notification. It is considered best practice to provide notification at least 24 hours prior to operating.

Continuous GPS logging is recommended to confirm or deny the validity of any public complaints about drone activity. GPS logs should be retained for a minimum of 28 days

Department of Conservation (DoC) land**:** No aircraft may land or take off from conservation areas without a DoC concession, except in emergencies. Hovering is considered “landing” under the Conservation Act 1987.

Individual Councils may have differing and additional requirements, it is recommended to contact your local authorities to determine what these may be for the area you operate in and include these in you company’s policies and procedures.

The above may also apply to other large commercial organisations and sensitive areas, for example take extra care near schools, childcare centres, ports and sensitive stock (e.g., horses, pigs)

8. Safe Operating Distances and Practices

The requirements of ECP34 should be applied in relation to flying drones near electricity assets. ECP34 states a minimum of 4 meters from overhead electric lines however this may be reduced with written consent from the asset owner.

Some asset owners may have other specific requirements, as an example Transpower require the following be applied:

Distance from Transmission Assets	Requirements/Actions
Less than 4 metres	No drone flying allowed.
4–12 metres	Only Transpower service providers may operate, and must meet strict requirements for drone specifications and pilot qualifications.
12–25 metres or above the lines	Contact Transpower to discuss the planned flight and obtain approval.
25 metres or more (and not crossing above)	Permitted, but operators are encouraged to contact Transpower if they have questions.
Within 25 metres horizontally	Contact Transpower before flying.

Other safe operating distances and protocols are established in CAA Part 101 and Part 102

9. Emergency and Incident Procedures

9.1 Emergency Response

All operators must be briefed on emergency procedures, including power line contact, fire, injury, or loss of control. Never attempt to retrieve a drone from live assets, contact the asset owner immediately.

9.2 Incident Reporting

Report all incidents, near misses, and accidents to both the asset owner and the CAA as required. Maintain records in accordance with company and regulatory requirements

Reportable events include accidents, serious incidents, loss of control, fly-aways, motor failures, incidents involving manned aircraft, airspace incursions, and damage to third-party property.

If the incident poses an urgent risk to public safety, contact the Police immediately, otherwise, submit your report using the CA005RPAS form or the CAA's online reporting tool.

10. Post-Flight and Documentation

After each flight, operators should inspect the UA, complete flight and maintenance logs, report any incidents or damage, and retain all documentation (including checklists, stakeholder records, and regulatory approvals) in accordance with company and regulatory requirements

11. Continuous Improvement

Regularly review and update procedures in line with changes to legislation, technology, and industry best practice.

Participate in ongoing training and competency assessments.

Develop company training and competency levels.

- Night Ratings
- EVLOS / BVLOS
- Above 400ft
- Above 15kg MTOW
- External Load

12. Resources

CAR Part 1: Definitions and Abbreviations	https://www.aviation.govt.nz/rules/rule-part/part-1/
CAR Part 12: Accidents, Incidents, and Statistics	https://www.aviation.govt.nz/rules/rule-part/part-12/
CAR Part 101: Operating Rules	https://www.aviation.govt.nz/rules/rule-part/part-101/
CAR Part 102: Operator Certification	https://www.aviation.govt.nz/rules/rule-part/part-102/
Aeronautical Information Publication New Zealand: Aerodrome Charts / Contact Details - Airspace Supplements	https://www.aip.net.nz/
AirShare: Airspace Maps - Flight Logging and ATC Approval	https://airshare.co.nz/
FlightAdvisor: Airspace Maps (VNC Layer) - Airspace Advisories	https://flightadvisornz.io/
Transpower: Guidance Material	https://www.transpower.co.nz/our-work/industry/our-grid/drones-our-network
Internet Flight Information Service: NOTAM source	https://www.ifis.airways.co.nz/
GAP – Airspace: (Good Aviation Practice)	https://www.aviation.govt.nz/safety/safety-education-and-advice/education/good-aviation-practice-booklets/airspace/ https://www.aviation.govt.nz/assets/publications/gaps/caa-gap-new-zealand-airspace.pdf

13. Appendix

Placeholder for link to supporting guide *"Starting your Drone programme; A good practice guide"*