Australian Government
Civil Aviation Safety Authority

SUMMARY OF SURVEY

BVLOS drone operations in regional Australia

March 2024

Acknowledgement of Country

The Civil Aviation Safety Authority (CASA) respectfully acknowledges the Traditional Custodians of the lands on which our offices are located and their continuing connection to land, water and community, and pays respect to Elders past, present and emerging.

Inside front cover artwork: James Baban.

Overview

Australia's open economy, large rural areas and low population density creates opportunities to get more benefits from using remotely piloted aircraft (RPA), also known as drones.

As drone technology continues to improve it has the potential to:

- boost delivery and transport services
- achieve greater efficiencies in agricultural industries
- increase agricultural yields in regional areas.

Drones are already in use in agriculture, including:

- planting
- livestock management
- crop spraying
- mapping.

Drones in agriculture can:

- outperform traditional methods by enabling operators to control them from a distance
- automate tasks, saving time and money on labour or machinery hire
- deliver faster and more accurate results.

Drones are a key tool for modern farming techniques. They offer inexpensive 3D mapping and aerial images of farms. This helps farmers customise how they apply soil and chemicals across their crops, ensuring each part of the farm gets exactly what it needs for optimal growth.

An estimated 10% of Australian agricultural business use drones for their operations. By 2040, this number is expected to rise, leading to big cost savings and better productivity in farming.

The Civil Aviation Safety Authority (CASA) is supporting the uptake of drone technologies across all industries through regulating, educating the public and managing its impact while keeping the skies safe for all airspace users.

Contents

1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this document are listed in the table below.

Table 1. Acronyms

Acronym	Description
BVLOS	beyond visual line of sight
CASA	Civil Aviation Safety Authority
CASR	*Civil Aviation Safety Regulations 1998*
EVLOS	extended visual line of sight
MOS	Manual of Standards
ReOC	remotely piloted aircraft operator's certificate
RePL	remote pilot licence
RPA	remotely piloted aircraft
RPAS	remotely piloted aircraft system

1.2 Definitions

Terms that have specific meaning within this document are defined in the table below. Where definitions from the civil aviation legislation have been reproduced for ease of reference, these are identified by 'grey shading'. Should there be a discrepancy between a definition given in this document and the civil aviation legislation, the definition in the legislation prevails.

Table 2. Definitions

Term	Definition
drone	a remotely piloted aircraft or RPA
remote pilot	the person who manipulates the flight controls of a remotely piloted aircraft, or who initiates and monitors the flight, and is responsible for its safe conduct during flight time.
remotely piloted	an aircraft is remotely piloted when controlled from a pilot station that is not on board the aircraft.
RPA	An RPA, other than a balloon, a kite, or model aircraft.
BVLOS	the drone pilot cannot see the drone with their own eyes and relies on cameras on board the drone or other location-based information directly from the drone to orient and fly.
EVLOS	the drone pilot cannot see the drone with their own eyes and a trained observer (or observers) maintains awareness and visual line of sight of the drone.

1.3 References

Legislation

Legislation is available on the Federal Register of Legislation website https://www.legislation.gov.au/

Table 3. Legislation references

Document	Title
Part 101 of CASR	Part 101 of the Civil Aviation Safety Regulations 1998, as published on the Rules page on the CASA website.
Part 101 MOS	Part 101 (Unmanned Aircraft and Rockets) Manual of Standards 2019 (as amended) published on the Rules page on the CASA website.

2 Background

CASA continues to support the safe operation and growth of the remotely piloted aircraft industry.

We are reviewing regulations for non-complex beyond visual line of sight (BVLOS) operations.

BVLOS operations mean the drone pilot can't see the drone themselves. Instead, they use cameras or location-based data from the drone to navigate and control it.

In extended visual line of sight (EVLOS) operations, the drone pilot can't see the drone directly. Instead, they rely on one or more visual observers to keep an eye on the airspace and ground area for safety.

As part of this review, CASA surveyed the RPA sector, which includes those currently operating drones or intending to do so, with a focus on BVLOS operations.

The objectives of this survey were to:

- collect information on the use of, or intended use of drones for BVLOS operations
- review demographic and geographic information of BVLOS activities
- identify key benefits from, and challenges to, increased BVLOS drone operations
- identify areas where regulatory improvements may be applied for non-complex BVLOS operations.

We sought input from the agricultural sector who may benefit from BVLOS drone operations in tasks like:

- spray management
- mustering
- farm and land management.

The survey results have given CASA a clearer picture of current and future BVLOS drone use in Australia. This information will help us improve the regulatory framework and streamline operational approvals.

Please note that as respondents could select more than response to each question, the percentage column may add up to be more than 100%.

2.1 Current regulations

Currently, the following requirements apply to a person operating a drone for commercial, or commercial-like, purposes (not recreational).

Table 4. RPAS regulations

Drone weight	Requirements
250 g or less (micro) More than 250 g, but not more than 2 kg (very small)	• operator accreditation • register drone (annually) • operate within the drone safety rules (standard operating conditions) at all times
More than 2 kg, but not more than 25 kg (small) that are only operated over land owned or leased by the drone owner	• operator accreditation • register drone (annually) • operate within the drone safety rules (standard operating conditions) at all times • keep the required records of your operations • not accept any type of payment for the services
More than 25 kg, but not more than 150 kg (medium) that are only operated over land owned or leased by the drone owner	• RePL for the type of drone you plan to operate • register drone (annually)

Drone weight	Requirements
	• operate within the drone safety rules (standard operating conditions) at all times • keep the required records of your operations • not accept any type of payment for the services

The drone safety rules (standard operating conditions) apply to all drone operators. CASA has published an easy to read guide that explains the standard operating conditions.

Provided agricultural operations can be conducted in accordance with the standard operating conditions, operators don't need any further approvals or permissions from CASA.

Training and flight authorisations are required for complex operations (see below for details).

Table 5. RPAS flight authorisation requirements

RPA Operation	Requirements
Extended visual line-of-sight (EVLOS)	• RePL • register drone (annually) • ReOC, or operate under an individual or business that holds a current ReOC • create EVLOS procedures • seek CASA approval to fly EVLOS
Beyond visual line-of-sight (BVLOS)	• RePL • register drone (annually) • ReOC, or operate under an individual or business that holds a current ReOC • pass the required examination or operate under a supervising remote pilot who has • seek CASA approval to fly BVLOS in the planned area
Swarm operations – one to many	• remote pilot licence (RePL) • register drone (annually) • remotely piloted aircraft operator's certificate (ReOC), or operate under an individual or business that holds a current ReOC • seek CASA approval to operate more than one drone at a time

3 Survey respondents

3.1 Operator profiles

We received 443 responses to the survey.

Respondents hold the following licence type or accreditation:

Table 6. License type / accreditation

License type / accreditation	Percentage
Commercial drone pilot	25.06%
Commercial drone operator	58.69%
Drone manufacturer/repairer	1.13%
Recreational drone flyer (model aircraft)	7.00%
Remote pilot licence training organisation	1.35%
Other	6.77%

The following sectors were represented in responses:

Table 7. Operational sectors

Sector	Percentage
Crop management	5.42%
Education and/or research organisation	9.03%
Emergency services	7.90%
Farmer agriculture (owner/operator)	9.03%
Infrastructure management	9.93%
Land management	5.42%
Livestock management	3.61%
Mining	11.29%
National parks and forestry	4.97%
Other	33.41%

3.2 RPA types and categories

Respondents provided feedback on the type and category of RPA they operate.

Table 8. RPA type

RPA Type	Percentage
Micro RPA	27.54%
Very small RPA	67.27%
Small RPA	56.21%
Medium RPA	13.09%
Large RPA	1.58%

Table 9. RPA category

RPA Category	Percentage
Aeroplane	9.26%
Drone in a box	5.19%
Helicopter (single rotor)	1.81%
Multirotor	94.81%
Powered lift	11.29%

3.3 Operations

Locations

We asked for feedback on the State or Territory where respondents primarily carry out, or propose to carry out, BVLOS operations.

Geographically, BVLOS operations exhibited the following geographical spread across the country:

Table 10. Geographical spread of RPAS operations

State / Territory	Percentage
New South Wales	40.41%
Queensland	39.95%
Western Australia	26.86%
Victoria	24.60%
South Australia	16.48%
Northern Territory	14.22%

State / Territory	Percentage
Tasmania	11.29%
Australian Capital Territory	8.58%
Australian Antarctic Territory	1.58%

In terms of specific future operations, several survey respondents submitted state-wide polygons, which are not practical for air risk assessment due to their large size and computational demands.

However, many others offered specific operational areas of various shapes and sizes from different regions across the country.

This data will assist CASA in refining and testing its risk model with de-identified operational areas.

Some examples of operating areas in New South Wales include:

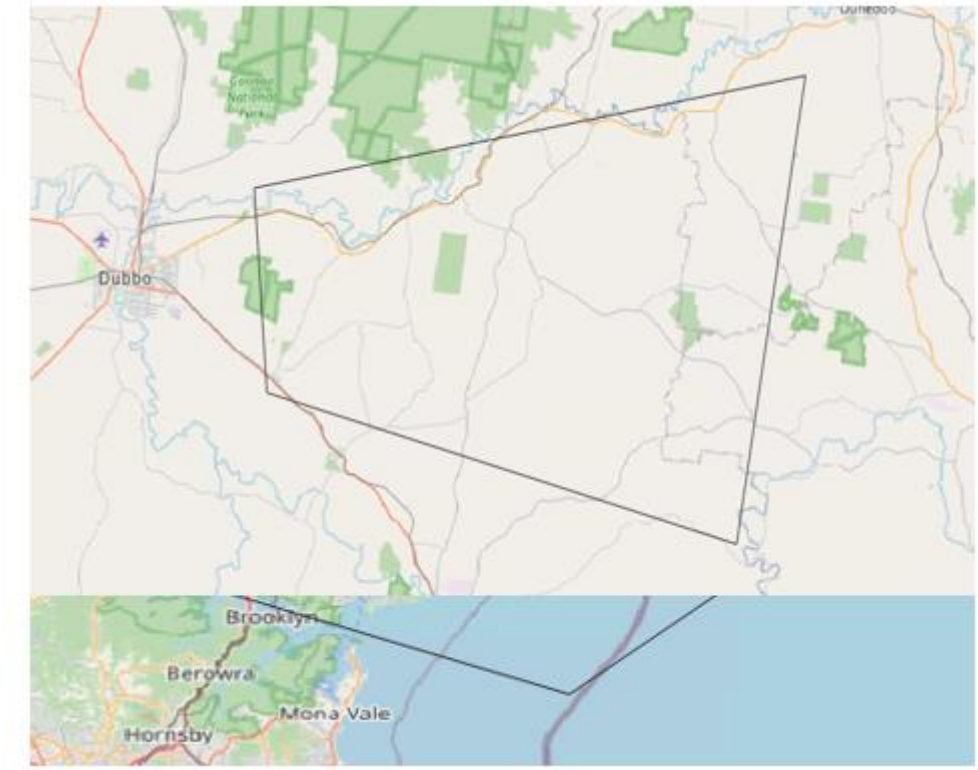

Figure 1. RPAS operational area in New South Wales

Figure 2. RPAS operational area in New South Wales

Type of land and in airspace for operations

Most respondents identified that their operations occurred mostly over land that they did not own or occupy, and overwhelmingly in non-controlled airspace.

Table 11. Land type

Land Type	Percentage
I fly drones over land owned or occupied by someone else	64.56%
I only operate drones over land owned or occupied by me/my organisation	35.44%

Table 12. Airspace type

Airspace Type	Percentage
Non-controlled airspace	91.20%
Controlled airspace	25.96%

Altitude of operations

Respondents also identified their usual operating altitudes when conducting BVLOS operations.

Table 13. Operational altitudes

Altitude	Percentage
1 – 30 m (up to 100 ft)	46.28%

Altitude	Percentage
31 – 60 m (up to 200 ft)	46.95%
61 – 90 m (up to 300 ft)	45.60%
91 – 120m (up to 400 ft)	67.49%
More than 120 m (over 400 ft)	6.77%
I don't currently operate a drone	3.61%

Types and purpose of operations

Respondents identified the following operational profiles and activities as being the most the most applicable to them.

Table 14. Type of operations

Type of Operations	Percentage
Beyond visual line of sight – drone less than 3 km from drone pilot	15.12%
Beyond visual line of sight – drone more than 3 km from drone pilot	7.45%
Extended visual line of sight – Class 1	24.83%
Extended visual line of sight – Class 2	16.25%
Night operations within visual line of sight	29.12%

Table 15. Type of activities

Activities	Percentage
Aerial spotting	39.05%
Inspections	52.82%
Mustering	8.35%
Photography/filming	69.75%
Seeding or spraying	11.06%
Search and rescue	15.35%
Surveying	49.44%
I don't currently operate a drone	3.84%
Other	14.90%

4 Feedback

Respondents were asked to rate statements about their views on the current regulatory environment.

Regarding the statement "CASA's regulations are clear and understandable for drone users in my sector," 56.23% of respondents agreed or strongly agreed with this statement, while 25.06% remained neutral.

Similarly, positive support was observed for the statement "the use cases or activities described in the RPAS and AAM Strategic Regulatory Roadmap reflect the future needs of drone users in my sector adequately". Amongst the responses received, 30.7% agreed or strongly agreed, while 47.63% were neutral.

In contrast, a less favourable sentiment was expressed for the statement "CASA's regulations consider the current needs and requirements of drone users in my sector adequately". In this case, most respondents either disagreed or strongly disagreed (33.86%), or remained neutral (31.15%), with only 22.8% agreeing or strongly agreeing.

Respondents then identified the following barriers to operations:

Table 16. Barriers to operations

Barriers	Percentage
Complex regulations	64.56%
Not enough time to apply for a flight authorisation	29.12%
Too expensive to apply for a flight authorisation	27.99%
Too expensive to obtain a RePL or ReOC	16.03%
There are no barriers to my future operations	11.06%
Not enough time to obtain a RePL or ReOC	6.32%
Other	13.09%
Not applicable	4.74%

4.1 Themes

4.1.1 Approval of agricultural and remote area BVLOS operations

Feedback received from respondents underscores the challenge of receiving BVLOS approvals for operations in:

- agriculture
- remote and regional areas of Australia.

The approval process for BVLOS operations in agriculture was criticised as:

- excessively expensive and
- time-consuming for routine farming tasks.

Concerns were raised about the need for farmers to obtain a ReOC due to the perceived low risk of some agricultural operations below 400 feet.

One respondent stated that the regulations do not factor in the limitations of the current size and weight of drones. Drones used for agricultural tasks are often restricted to low altitudes (below 30 ft and within 2 km of the operator) due to battery life and range.

Regulations for night operations with spray drones in contained paddocks was also criticised. One respondent reported that demonstrating proficiency and documenting procedures should be enough.

Maintaining VLOS in regional areas can also be challenging. For instance, one person said the rules for flying drones VLOS over unpopulated forested areas were prohibitive. In such cases, multiple take-off points are needed, while also needing to ensure the drone can still be seen.

Monitoring activities pose significant challenges as well. For instance, one respondent highlighted the difficulties encountered in conducting surveillance in regions where drones rapidly vanish from direct view due to environmental factors like twists and turns in creek beds and other geographical constraints. Further, it's impractical to position observers in dense forested areas or locations characterised by rugged terrain and water reservoirs.

RPA training opportunities in regional Australia, including accessibility and affordability were also highlighted. The requirement for face-to-face test flights were deemed excessive, especially when drones largely operate autonomously.

The feedback highlighted the need for low-altitude BVLOS operations, pointing out that the difficulty in maintaining VLOS isn't always about how far the drone is, but also about the landscape. There were several examples, where seeking approval for BVLOS operations was seen as impractical. This could result in operators not following regulations due to time and cost pressures, especially for time critical tasks like accurately spraying crops at low altitudes.

4.1.2 BVLOS in emergency situations

Emergency situations are dynamic, and BVLOS operations can help to adapt, locate threats, and assist with public safety.

Respondents to the survey voiced concerns about the time it takes to get permission for BVLOS operations in an emergency, where immediate action is crucial, and flights might last less than 30 mins.

Emergency services, like the police, use BVLOS operations for tasks such as search and rescue and flood surveys. However according to respondents who identified as themselves as being part of emergency services stated that the approval process during an emergency isn't practical.

Increased flexibility in operating drones BVLOS under an approved ReOC or exempting emergency services from some regulations are seen as necessary for quick responses to emergencies.

4.1.3 Approval timeframes do not meet business needs

Respondents reported that long lead times (minimum 28 days, or more for complex operations) for BVLOS approvals is a significant barrier to timely and cost effective operations. Many expressed a desire for quicker approval times. Getting approval in a timely manner impacts operations for example:

- unpredictable weather - approval is needed when the weather is optimal
- workload in agriculture - approval is needed during peak times to offset staff shortages or increased yields.

Respondents highlighted the challenges associated with short notice approval requests (<1 week) for BVLOS operations. Approval timeframes are impractical for operations like livestock spotting and mustering due to a short planning window. The impracticality of getting a CASA approval for every BVLOS operation or location in regional and remote Australia was also raised.

One proposed solution was to have a company's ReOC approved for BVLOS operations if pilots have the required qualifications.

Another concern raised by respondents was the increased response time to queries, attributed to the introduction of a designated CASA approval contact. This change was seen as causing delays compared to the previous process of directly emailing the business area for enquiries.

Respondents noted that the time and associated cost of applying for a BVLOS approval are seen as prohibitive, rendering services economically unfeasible.

Delays in approvals for complex operations and the necessity for designated areas and test ranges for drone testing and development were also noted, particularly for rural operations.

4.1.4 BVLOS applications are complex and expensive

Respondents expressed frustration with the:

- lengthy and complex process of obtaining BVLOS approvals
- need to get approvals for each location
- significant time and resource burdens.

There was a clear desire for more streamlined options, such as:

- area permits
- simplified process to get BVLOS approvals on short notice.

In remote areas, getting instruments of approval for BVLOS operations was identified as a challenge. Approvals for each location are also considered impractical due to time and cost constraints, especially for operations like incendiary deployment with shorter notice periods than application and approval times.

Respondents expressed concern about the perceived high cost of exemptions and BVLOS applications, for operations in:

- non-controlled airspace
- rural locations.

They noted that costs can sometimes surpass operational budgets, raising worries about wasted funds if an operation cannot proceed as planned. CASA does not refund application fees if an approved operation does not proceed.

Criticism was directed at legislative requirements for BVLOS operations, which are seen as excessive to the perceived risk level. There are calls for more reasonable proficiency demonstrations and documentation to better align with the risks involved.

There's a call for CASA to review its regulations for lower-risk BVLOS operations. This includes operations at low altitudes over uninhabited areas, closer to the remote pilot. The suggestion is that regulations should evolve to support the increasing use of drones in these situations.

4.2 Suggestions for improvement

Respondents made the following suggestions in their responses of how to reduce barriers for BVLOS operations in regional Australia and in the agricultural sector:

Create specific BVLOS regulations for agriculture

- Develop and implement regulations tailored to the unique needs and characteristics of BVLOS operations in the agricultural sector.

Establish a more efficient BVLOS approval process

- Streamline the approval process for BVLOS operations, including emergencies, ensuring efficiency, transparency, and consideration of operational requirements.

Define low-risk BVLOS criteria

- Clearly outline criteria for low-risk BVLOS operations in agriculture, allowing for simpler and faster approvals for operations meeting specific safety standards.

Introduce Area Approvals for routine operations:

- Implement area approvals instead of location-specific ones for routine BVLOS operations in designated regional and rural areas, reducing the need for individual approvals.

Use technology for monitoring and compliance

- Promote the use of technology like real-time monitoring and geofencing to enhance safety and compliance with BVLOS regulations. This includes electronic reporting tools and automated systems.

Implement a risk-based approach

- Adopt a risk-based approach to BVLOS approvals, considering the agricultural operation nature and the potential benefits of expanded drone usage in terms of efficiency, productivity, and environmental impact.

Review and revise existing regulations

- Regularly review and update regulations to align with technological advancements and evolving

agricultural drone industry needs.

Educate and raise awareness

- Conduct awareness campaigns and educational initiatives to inform agricultural operators, drone pilots, and stakeholders about BVLOS regulations, benefits, and safety considerations.

Facilitate pilot programs and demonstrations

- Organise pilot programs and demonstrations to showcase the safety and effectiveness of BVLOS operations in agriculture, fostering broader acceptance and understanding.

5 Future direction

CASA extends its sincere gratitude to all respondents for their invaluable contributions and insightful perspectives. Your feedback has played a crucial role in shedding light on the challenges faced by operators within the agriculture sector and in rural and regional areas of Australia, particularly in BVLOS operations.

CASA recognises the pivotal role that RPAS play in various industries, particularly in agriculture and regional enterprises. In recent years, CASA has been dedicated to fostering safe and responsible RPAS operations in these areas, acknowledging the unique needs and circumstances of regional Australia.

Our ongoing efforts involve working closely with stakeholders in regional communities to develop tailored regulatory frameworks that balance safety requirements with the operational needs of RPAS operators. This collaborative approach ensures that regulations are pragmatic, relevant, and conducive to the sustainable growth of RPAS activities in rural and regional Australia.

CASA is committed to providing guidance and support to RPAS operators in regional areas, offering resources and training opportunities to enhance their understanding of safety best practices and regulatory compliance. By empowering operators with the necessary knowledge and skills, we aim to promote a culture of safety and professionalism within the RPAS community.

Furthermore, CASA continues to engage with industry stakeholders and local authorities to address specific challenges faced by RPAS operators in regional Australia, such as airspace access and infrastructure limitations. Through dialogue and collaboration, we strive to identify innovative solutions that facilitate safe and efficient RPAS operations in these environments.

Your input serves as a cornerstone in our commitment to ensuring safety and efficiency in RPAS operations across regional Australia. Every comment and suggestion received through this survey will be thoroughly reviewed and carefully considered by CASA, further informing our ongoing efforts to support the RPAS community in regional areas.

Once again, we express our gratitude for your active participation and meaningful contributions to the advancement of RPAS safety and regulation in regional Australia.