



# Operation of Unmanned Aerial Vehicles

## Task-Specific Risk Assessment

for

NSW Department of Primary Industries  
Emergency Management Unit  
Biosecurity and Food Safety

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## Section 1 – Introduction

Unmanned aircraft maybe referred to as Unmanned Aerial Vehicles (UAVs), Unmanned Aerial Systems (UAS), or just simply as drones. Utilisation of UAVs in support of the NSW Department of Primary Industries (NSW DPI) Emergency Management (EM) operations is expected to increase due to their flexibility and economy but they can be hazardous to manned aircraft in the area and people on the ground. Incidents involving UAVs working for the Department may also impact on the reputation of NSW DPI if not conducted in accordance with the applicable rules, risk assessments, regulations, and considerations.

In discharging its' obligations under the Work Health and Safety (WHS) Act and Civil Aviation Safety Regulation (CASR) Part 101, for conducting UAS operations, the Department is committed to using risk management processes. This risk assessment has been conducted following procedures detailed in 'NSW DPI Aviation Management CONOPS Document'. A company that is either under contract, Standing Offer or regarded as a preferred supplier, is referred to as 'contractor' or 'operator' in this document. A 'contract' refers to the life of an established contract, Standing Offer or the expected period between Department-sponsored reviews of an operation. Remote pilot refers to the pilot operating the unmanned aircraft. Departmental Operator refers to in-house DPI operation of the UAV.

The regulations and technology involved with UAVs may evolve quickly so this risk assessment and the associated task profile should be reviewed regularly to ensure they capture any changes, and that the operation of the UAVs remains with the accepted risk profile and regulatory framework.

A way of reducing the Department's exposure (though not eliminating it) is to employ a contractor specialising in the operation of UAVs thereby removing the need for departmental personnel to be involved in the UAV's operation. Should such a contractor be used, then the contractor's operations should be reviewed and assessed to ensure that the contractor, as a minimum, conforms to the Department's requirements.

The types of UAVs more likely to be used by DPI are included in this profile and are limited to two types as prescribed in CASR Part 101: *Very Small* and *Small* drone categories. Any drone 25kgs or heavier is not included in this risk assessment.

Risks are categorised into six (6) elements, which may have a number of sub-elements.

- A. Contractor/Department Operator competency
- B. Crew competency
- C. Flight preparation
- D. Pre-flight planning
- E. Flight operations
- F. Accident considerations

## Section 2 - Risk assessment

Context – Operations of UAVs during emergency operations for NSW DPI EM involves operations to and from landing areas that may involve operations near manned aircraft and people. The UAV will always be operated within Visual Line of Sight (VLOS).

CASA has approached the use of UAVs on a risk basis. The larger the UAV, the larger the risk to other aircraft, people, animals, and property. Operating near people and aviation focal points (such as aerodromes, aerial work zones (such as an area being used during an emergency response) or low flying areas) also amplifies the risk of injury or damage as the result of a collision with a drone.

The intended or potential roles for UAV operations include:

- surveillance (such as the tracking of animals, reconnaissance of flooded areas, looking for people)
- application of chemical
- monitoring of land slippage
- mapping of structures
- delivery of supplies.

A significant mitigation to the risk involved is for the contractor to have an active Safety Management System (SMS) that includes a proactive management of safety. Contractors and departmental operators should be checked to ensure that they have the appropriate systems, culture and reporting processes and they communicate any incidents to and within the DPI.

**Contractor/Department Operator Competency:**  
**The competency of the Contractor/Department Operator (Operator) is fundamental to safe and efficient UAV operations. The risk controls are to ensure that the Operator has suitable culture, systems, processes and procedures to provide DPI some confidence that they are approaching the task appropriately and to minimise the DPI and community risk exposure. The proposed controls are intended to address the requirements for a safety management system (SMS), accident history, reporting, and management roles.**

A. OPERATOR COMPETENCY		1. Operator Factors							
Risk	Possible Controls	Current Control	Likelihood	Consequence	Current Risk	Proposed Controls	Revised Likelihood	Revised Consequence	Residual Risk
Lack of Contractor / Departmental Operator competency leads to unsafe practices, inefficient and/or illegal operations	<ol style="list-style-type: none"> <li>1. <b>Operator</b> checked by the NSW DPI to ensure that it has suitable CASA operating certificates.</li> <li>2. <b>Contractor/Department Operator</b> has Chief Remote Pilot as required under CASR Part 101</li> <li>3. <b>Contractor/Departmental Operator</b> audited /assessed within the last 12 months, by a competent company or authority on behalf of the NSW DPI, as being suitable to conduct UAV operations</li> <li>4. <b>NSW DPI</b> contracting requires the <b>Contractor/Departmental Operator</b> to demonstrate that it has effective safety and quality management systems structured to its size &amp; function.</li> <li>5. <b>Contractor/Departmental Operator</b> has been assessed by the NSW DPI to ascertain that it has not had an accident attributable to poor operating procedures in the previous 5 years or if it has, it can demonstrate that suitable actions have been taken to address identified deficiencies.</li> <li>6. <b>NSW DPI</b> requires the <b>Contractor/Departmental Operator</b> to report all occurrences (including non-NSW DPI incidents) as part of the performance management of the contract.</li> <li>7. <b>NSW DPI</b> investigates any occurrences while performing NSW DPI tasks to ascertain management / competency.</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> <li>4</li> <li>5</li> <li>6</li> <li>7</li> </ol>	<b>Rare</b>	Consequence of an accident can be catastrophic due collision or impact with a manned aircraft or people on the ground due to potential for loss of life. Assessed as <b>Catastrophic</b>	<b>Medium</b>	No further controls	<b>Rare</b>	<b>Catastrophic</b>	<b>Medium</b>

**Crew Competency:**

The role of the remote pilot in decision making, attitude and approach to safety is paramount to safe, efficient and environmentally aware NSW DPI operations. The proposed controls include a review the remote pilot’s history and training as well as auditing and assessment protocols in checking the competence of the remote pilot and of the contractor’s/department’s oversight of the pilot. Unmanned vehicle interaction with manned aircraft is becoming a significant hazard and is probably the biggest risk safety and reputation wise for the department. Any accident involving interaction with people on the ground while unlikely to cause a fatality could create significant reputational damage for the department.

The other persons assisting the remote pilot have important roles to play in the safe operation of the UAV including observing the flight path of the UAV and looking for any potential traffic conflicts. Consequently, they should be trained to fulfill their role in the operation by the Contractor/Department.

B. CREW COMPETENCY		1. Pilot Aspects							
Risk	Possible Controls	Current Control	Likelihood	Consequence	Current Risk	Proposed Controls	Revised Likelihood	Revised Consequence	Residual Risk
Lack of remote pilot proficiency / experience leads to poor decision making resulting in potential traffic conflict, ground person accident, or loss of UAV	<ol style="list-style-type: none"> <li>1. <b>Remote Pilot</b> is properly trained and licenced to conduct required by CASA and other agencies associated with the operation of the UAV.</li> <li>2. <b>Remote Pilot</b> has sufficient experience to properly assess conditions and safely operate UAV in the conditions.</li> <li>3. <b>Remote Pilot</b> has had no accidents involving poor decision-making or mishandling of the UAV in the previous 5 years.</li> <li>4. <b>Remote Pilot</b> has undergone any UAV-specific safety courses if available.</li> <li>5. <b>Remote Pilot</b> and observers have undergone specific UAV training for the task.</li> <li>6. <b>NSW DPI</b> conducts audit/assessment to assure remote pilot has appropriate experience and qualifications to conduct task.</li> <li>7. <b>Contractor/Departmental Operator</b> has a suitable training and checking system to ensure UAV is operated safely, with proper decision-making encouraged.</li> <li>8. <b>Contractor/Departmental Operator</b> has functioning, effective drug and alcohol management policies and procedures in place for remote pilots.</li> <li>9. <b>Contractor/Departmental Operator</b> has a detailed manual that provides the appropriate information on such things as operations in turbulence, wind and heat and has stipulated operating limits and control recovery guidance.</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> <li>4</li> <li>6</li> <li>7</li> <li>8</li> <li>9</li> </ol>	Rare	Consequence of an accident can be catastrophic due collision or impact with a manned aircraft or people on the ground due to potential for loss of life. Assessed as <b>Catastrophic</b>	Medium	No further controls are considered to be required based on the current risk profile	Rare	Catastrophic	Medium

B. CREW COMPETENCY		2. Observer Aspects							
Risk	Possible Controls	Current Control	Likelihood	Consequence	Current Risk	Proposed Controls	Revised Likelihood	Revised Consequence	Residual Risk
Lack of ground observer proficiency / experience / communication skills leads to remote pilot making poor decision resulting in an accident	<ol style="list-style-type: none"> <li><b>Ground Observer</b> has sufficient experience to properly assess conditions.</li> <li><b>NSW DPI</b> conducts audit/assessment to assure ground observer(s) has appropriate experience suitable to the task.</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>2</li> </ol>	<i>Rare</i>	Consequence of an accident can be catastrophic due collision or impact with a manned aircraft or people on the ground due to potential for loss of life. Assessed as <b>Catastrophic</b>	<b>Medium</b>	No further controls are considered to be required based on the current risk profile	<i>Rare</i>	<b>Catastrophic</b>	<b>Medium</b>

**Flight Preparation:**  
 The proposed and current controls review the UAV maintenance procedures, culture, and standards.  
 A mechanical failure can be critical due to height to fall or impact with obstacles and/or people on the ground. Control failure could also cause the UAV to be a threat to manned traffic. Therefore, mechanical reliability and maintenance are important in reducing the risk.

D. FLIGHT PREPARATION		1. Maintenance							
Risk	Possible Controls	Current Control	Likelihood	Consequence	Current Risk	Proposed Controls	Revised Likelihood	Revised Consequence	Residual Risk
Improper maintenance leads to failure of critical system(s) including the control system.	<ol style="list-style-type: none"> <li><b>Contractor/Department</b> have a functional and appropriate safety and quality management system that includes risk management, reporting, training, and accountabilities.</li> <li><b>Contractor/Department</b> maintenance documentation and practices comply with or exceed the requirements of CASR Part 101.</li> <li><b>Contractor/Department</b> has an effective maintenance procedure/quality manual and activities comply with that manual.</li> <li><b>Contractor/Department</b> regularly audited and assessed to ensure compliance with regulations and good maintenance practices.</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> <li>4</li> </ol>	<i>Rare</i>	Consequence of an accident can be catastrophic due collision or impact with people on the ground due to potential for loss of life. Assessed as <b>Catastrophic</b>	<b>Medium</b>	No further controls are considered to be required based on the current risk profile	<i>Rare</i>	<b>Catastrophic</b>	<b>Medium</b>

**Pre-flight planning:**

Poor planning could result in unintended interactions with other air traffic and people on the ground. Additionally, failing to plan for conditions such as the weather may result in the loss of the UAV or failure to achieve the task.

Contractors/Departmental Operator should demonstrate that it has the systems, practices, procedures, and management oversight in place to ensure flights are well-planned.

E. PRE-FLIGHT PLANNING		1. Planning							
Risk	Possible Controls	Current Control	Likelihood	Consequence	Current Risk	Proposed Controls	Revised Likelihood	Revised Consequence	Residual Risk
Inadequate planning information leads to task failure, loss of UAV or unintended interaction with other traffic or people on the ground.	<ol style="list-style-type: none"> <li>1. <b>NSW DPI</b> conducts pre-flight briefing and provides written details and planning material to help assure remote pilot and observers fully understand task requirements.</li> <li>2. <b>NSW DPI</b> coordinates with <b>Operator</b> and <b>other organisations as required</b> to assure proper location and support UAV operation.</li> <li>3. <b>Contractor/Departmental Operator</b> provide pilot with sufficient planning material and access to information to ensure the flight can be conducted safely while achieving the task objectives.</li> <li>4. <b>Contractor /Departmental Operator</b> provides guidance within operational documentation to pilots on the required pre-flight planning activities including any NSW DPI required procedures.</li> <li>5. <b>Contractor/Departmental Operator</b> audited and assessed to ensure the required processes and procedures are in place.</li> <li>6. <b>Contractor/Departmental Operator</b> ensures adequate communications are in place to ensure proper briefing material is available.</li> <li>7. <b>UAV</b> equipped or software to prevent vehicles from being operated near aerodromes.</li> <li>8. <b>UAV</b> equipped with traffic avoidance equipment such as ADS-B.</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> <li>4</li> <li>5</li> <li>6</li> <li>7</li> </ol>	<b>Rare</b>	Consequence of an accident can be catastrophic due collision or impact with a manned aircraft or people on the ground due to potential for loss of life. Assessed as <b>Catastrophic</b>	<b>Medium</b>	The fitment of ADS-B and traffic avoidance software would significantly reduce the chance of traffic conflict.	<b>Rare</b>	<b>Catastrophic</b>	<b>Medium</b>

**Flight Operations:**  
**1. Start:** Pre-flight inspections and system checks are important to ensuring a UAV is ready to fly.  
**2. Navigation:** The likelihood of poor navigation issues even in remote areas has been significantly reduced by the use of GPS and return home software.  
**3 & 4. In-flight emergency & collision:** Knowledge, practice, and assessment currency are required to ensure that a pilot is able to handle most emergencies properly. Procedures should be clearly laid down in aircraft and company documentation.

F. FLIGHT OPERATIONS		1. Start							
Risk	Possible Controls	Current Control	Likelihood	Consequence	Current Risk	Proposed Controls	Revised Likelihood	Revised Consequence	Residual Risk
Incorrect pre-flight system checks lead to compromise in safety	<ol style="list-style-type: none"> <li><b>Operator</b> has published checklists that conform to the Original Equipment Manufacturer publications.</li> <li><b>Operator</b> conducts training and checking to assure remote pilot conduct checks as published.</li> <li><b>NSW DPI conducts</b> audit/assessment to assure <b>Operator</b> has a robust training and checking.</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> </ol>	<i>Rare</i>	<i>Catastrophic</i>	<b>Medium</b>	No further controls are considered to be required based on the current risk profile	<i>Rare</i>	<i>Catastrophic</i>	<b>Medium</b>
		2. Navigation							
Poor navigation leads to UAV straying into wrong airspace, near people / obstacles (including wires) or not achieving task	<ol style="list-style-type: none"> <li><b>Operator</b> has training and checking to assure remote pilot plans and operates to a flight plan.</li> <li><b>UAV</b> has appropriate GPS-based navigation system and data transmission system installed.</li> <li><b>NSW DPI</b> has published procedures that ensure correct information is briefed to remote pilot before flight.</li> <li><b>UAV</b> equipped with obstacle avoidance sensors</li> <li><b>NSW DPI</b> requires <b>Operator</b> to prepare, where practical, hazard maps for operations below 400ft AO in the designated area.</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> <li>4</li> </ol>	<i>Rare</i>	<i>Catastrophic</i>	<b>Medium</b>	No further controls are considered to be required based on the current risk profile	<i>Rare</i>	<i>Catastrophic</i>	<b>Medium</b>



		3. Inflight Emergency							
Risk	Possible Controls	Current Control	Likelihood	Consequence	Current Risk	Proposed Controls	Revised Likelihood	Revised Consequence	Residual Risk
Pilot mishandles emergency or malfunction which leads to an accident	<ol style="list-style-type: none"> <li><b>Operator</b> has adequate published guidance and training to remote pilot on the handling of malfunctions and emergencies.</li> <li><b>Remote pilot</b> has specific training and experience for engaging emergency procedures.</li> <li><b>Operator</b> to ensure suitable and adequate records of pilot training is kept.</li> <li><b>Pilot</b> history reviewed for any occurrences in the previous 5 years that indicate poor pilot decision-making or poor aircraft handling.</li> <li>Operations generally conducted over areas that are clear of people and livestock.</li> <li><b>NSW DPI</b> conducts audit/assessments to assure as far as practicably possible that <b>Operator</b> has proper systems and practices to ensure remote pilot can handle emergencies.</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> <li>4</li> <li>5</li> <li>6</li> </ol>	<i>Rare</i>	<i>Catastrophic</i>	<b>Medium</b>	No further controls are considered to be required based on the current risk profile	<i>Rare</i>	<i>Catastrophic</i>	<b>Medium</b>

		4. Inflight Collision							
Risk	Possible Controls	Current Control	Likelihood	Consequence	Current Risk	Proposed Controls	Revised Likelihood	Revised Consequence	Residual Risk
Mid-air collision between UAV and aircraft results in hazard to people in aircraft and people on the ground.	<ol style="list-style-type: none"> <li><b>Operator</b> installs ADB-B or similar to ensure UAV can automatically avoid other aircraft in the area.</li> <li><b>Operator</b> has training and checking systems and practices that ensure remote pilot is properly trained in communicating and identifying potential conflicting traffic.</li> <li><b>NSW DPI</b> briefing informs pilot of any potential traffic in the area where this traffic may be known or planned.</li> <li><b>Remote Pilot</b> checks maps, NOTAMs and observations for potential traffic.</li> <li><b>Remote pilot</b> has authority to use radio to enable broadcast on local area frequency.</li> <li><b>Operator</b> provided radio to allow communication between remote pilot and local traffic.</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> <li>4</li> </ol>	<i>Possible</i>	<i>Catastrophic</i>	<b>High</b>	<ol style="list-style-type: none"> <li>5</li> <li>6</li> </ol>	<i>Rare</i>	<i>Catastrophic</i>	<b>Medium</b>

**Accident Considerations:**  
 The risk assessment identifies the considerations, risks, and controls in the event of an accident.  
 The quick notification, location and recovery of personnel involved in an accident is essential to minimise danger to life and departmental reputational damage.

G. ACCIDENT CONSIDERATIONS		1. Recovery							
Risk	Possible Controls	Current Control	Likelihood	Consequence	Current Risk	Proposed Controls	Revised Likelihood	Revised Consequence	Residual Risk
If an accident occurs, recovery of the occupants of an aircraft or people on the ground depends on having appropriate equipment and rapid recovery	<ol style="list-style-type: none"> <li><b>Operator</b> to have and practice an Emergency Response Plan including the crash of a UAV.</li> <li><b>Operator</b> to have an ability to quickly contact emergency services.</li> <li><b>Operator</b> requires remote pilot to carry an ELB that can be tracked by search and rescue.</li> </ol>	1	Possible	Failure to quickly find survivors or people on ground may result in loss of life. Assessed as <b>Catastrophic</b>	High	2 3	Rare	Major	Medium

Approval	Roles	Date
Risk assessment prepared by:	Emergency Management Officer Aviation Consultant	13 January 2022
Risk assessment approved by:	Manager Emergency Operations	19 January 2022