Aerial Surveillance

Task Risk Assessment

for

NSW Department of Primary Industries
Emergencies and Animal Welfare Branch

Section 1 – Introduction

Aerial Surveillance Operations in support of the NSW Department of Primary Industries (NSW DPI) Emergency Management operations is a potentially hazardous activity that can impact on the reputation of NSW DPI if not conducted in accordance with the applicable rules, regulations and considerations.

In discharging its obligations under the Work Health and Safety (WHS) Act for activities conducted, the Department is committed to using risk management processes. This Risk Assessment has been conducted following procedures detailed in 'Procedure – Aviation Risk Assessment and Management Process'. A company that is either under contract, or regarded as a preferred supplier, is referred to as 'contractor' in this document. A 'contract' refers to the life of an established contract or the expected period between Department-sponsored reviews of an operation.

Risks are categorised into seven (7) elements, which may have a number of sub-elements.

A. Operator competency
B. Crew competency
C. Flight preparation
D. Aircraft preparation
E. Pre-flight discussion
F. Flight Operations
G. Accident

Section 2 - Risk assessment

Context – Aerial Surveillance is conducted using suitable helicopters and fixed wing aircraft during emergency operations for NSW DPI with landings and take-offs being conducted at licenced and non-licenced aircraft landing areas and helicopter landing sites. The purpose of aerial surveillance is to identify and record areas of interest (includes animal support tasks, pest insect targeting, and infrastructure damage assessment) in support of emergency management operations for NSW DPI. Further details describing the context of this risk assessment are:

Description of task	The task involves planned and short notice callout to at risk areas as part of emergency management. Heights flown need to be commensurate with the type of target and conditions. Landings may be required. Some tasks may require the carriage of non-Government/Operator personnel. Personnel carried shall only be those required to achieve the task objectives.
Number of and type of engines	Both fixed wing and helicopters may be utilised, either single or multi-engine. Fixed wing aircraft may have either piston or turbine engine(s). Helicopters shall be turbine powered. The fixed wing aircraft shall be high-winged and must be capable of operating normally straight level and manoeuvring safely straight and level at speeds down to 55 knots (kts).
Task profile (sequence)	• Callout • Planning include map reconnaissance for hazards • Briefing including update of hazards as shown on appropriate map, flight following procedures, weather, task objectives, target/surveillance area, communications, aerial risk assessment. Contact landowner/manager if being picked up (include briefing on appropriate clothing) • Fuelling when required • Conduct Crew Brief • Start/Taxi/Takeoff • Transit to area of operation not below 500 feet (ft) Above Obstacles (AO). • Conduct route and area of operations identification, aerial hazard survey, and pre-descent brief prior to descent below 500ft AO. • Conduct area surveillance initially not below 500ft AO. Further descent requires prior authorisation, risk assessment, hazard identification, and required to achieve the task. • Descend to low-level operations commensurate with task objectives, authorisations, and conduct further hazard/target identification if required. • Communicate with LCC or Operator (as approved) for flight following and task update. • Land at appropriate area approximately every two hours to minimise fatigue. • Transit to additional operational area at a safe transit height (> 500ft). • Conduct further hazard reconnaissance, and route identification prior to descent to conduct low level operations as above. • Transit to operating base/fuelling area. Conduct pre-landing brief. • Land / Shut Down. • Debrief and report.

Terrain description	The areas of operations will encompass all types of terrain including paddocks, hills, and urban areas. The high terrain areas can experience high density altitudes which can adversely affect aircraft performance. Also, the terrain can experience severe downdraughts and turbulence as a result of the strong winds. Cloud can roll in quickly. The lower areas can experience extensive areas of fog, mist or smog, which can limit visibility. The areas can be extensively wooded and/or populated with domestic structures in close proximity to power lines. Fences may be hidden in long vegetation.
Limitations	The inspection is conducted in day visual conditions only in low to medium turbulence at a speed commensurate with safe operations in the environmental conditions being experienced. The inspection is preceded by an appropriate risk assessment including aerial aviation hazard identification and assessment, assessment of environmental risks and an assessment of the operational impact of conducting the inspection within the conditions established by the task profile. Descent below a safe height (clear of all known and potential obstacles - generally 500 ft AO) is not to be conducted until the pilot confirms a low level of risk factoring in the route and area of operations, aircraft performance, aerial hazard and obstacle survey, environmental conditions and has conducted a low level flying pre-descent brief. This must be conducted for each descent below a safe height. Personnel working for or on behalf of NSW DPI are considered crew. Passengers should not normally be carried on this task, however where their carriage is considered essential to achieve specific task objectives, landowners/managers may be carried after having received a thorough safety briefing. All persons on board aircraft operating on behalf of NSW DPI must have a designated essential role in the performance of the aircraft task. Doors would normally be fitted to the aircraft unless a specific reason is identified for their removal and the removal is identified as essential to conduct the task and considered in the risk assessment process. Landing to liaise with landowners/managers holders should be conducted to low risk (CAAP 92-2) Helicopter Landing Site (HLS), Air Landing Ground (ALG) or aerodromes. Traversing near ground level is considered often unnecessarily risky and is normally limited to animal welfare surveys and roosting Spur Throated Locust swarm identification and is conducted **only when essential and no other technique is available**. Traversing near ground is not permitted for Australian Plague Locust swarm identification, but descent to inspect is permitted at a height commensurate to the task (generally not below 200 feet). Landings at appropriate areas should be planned approximately every two hours to minimise fatigue. Sterile Cockpit Procedures shall be implemented when the aircraft is operating below 500ft AO.

Crew composition	2 to 3 - person crew; Pilot, aviation aware air surveillance officer(s). Occasional landowner/manager passenger.
Qualification / Training of each crew member	**Pilot –** CASA licenced, medically current, appropriate approvals and experience (see EOI) **Air Surveillance Officer –** Crew Resource Management, GPS and map reading skills, medically suitable, Work Safety Around Aircraft, Fly the Wire (optional), HUET (optional). Log book to be maintained.
Role of each crew member	**Pilot** – Identify hazards and maintain hazard clearance, operate aircraft, navigation, communication, responsible for safety of the aircraft and crew/passenger, pre-flight and in-flight briefings. **Air Surveillance Officer** – Assist the pilot in hazard identification and avoidance and communication. Responsible for identifying, recording, and mapping of targets and areas of interest. Advises where to start inspection and where to end. **Landowner/manager** – Provides local knowledge aspects, hazard identification and environmentally sensitive areas.

Discussion Operator Competency:
The competency of the Operator is fundamental to safe and efficient aircraft operations. The thrust of the risk control is to ensure that the Operator has suitable culture, systems, processes and procedures to provide NSW DPI some confidence that the Operator is approaching the task appropriately and to minimise the NSW DPI risk exposure. The proposed controls are intended to address the requirements for a safety management system (SMS), Operator accident history, reporting, and senior Operator management roles.
The proposed controls identified include additional requirements in the EOI to include Operators to have an effective SMS and more comprehensive auditing and assessing requirements. This also includes a historical review of the Operator's operations and culture including a review of previous CASA audit reports.
Aerial Surveillance represents a potential safety risk to NSW DPI and the Operator as the operation requires NSW DPI and Operator personnel, landowners/managers and members of the public being airborne in aircraft at low level, particularly during landing and take-off, to achieve the task.

A.	OPERATOR COMPETENCY	1.	Operator Factors						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Lack of Operator competency leads to unsafe practices, inefficient and/or illegal operations	1. **Operator** checked by the NSW DPI to ensure that it has an Air Operating Certificate endorsed for aerial work and charter operations. 2. **Operator** audited /assessed within the last 12 months, by a competent company or authority on behalf of the NSW DPI, as being suitable to conduct aerial surveillance operations. 3. **NSW DPI** contracting requires the **Operator** to demonstrate that it has effective safety and quality management systems structured to the size & function of the Operator. 4. **Operator** has been assessed by the NSW DPI to ascertain that it has not had an accident attributable to maintenance or operational management in the previous 5 years or if it has, it can demonstrate that suitable actions have been taken to address identified deficiencies. 5. **NSW DPI** requires the operator to report all occurrences (including non-NSW DPI incidents) as part of the performance management of the contract. 6. **NSW DPI** assesses **Operator's** commitment to safety and operations by examining its' investment in the company safety and operational management systems and equipment/personnel. 7. **Operator** is checked by NSW DPI to check its senior management staff can demonstrate competent management of low-level flight training, operations and safety. 8. **NSW DPI** reviews and actions as part of the auditing/assessing process the Operator's and senior management history, operational and SMS. 9. **NSW DPI** investigates any occurrences while performing NSW DPI tasks to ascertain operator management / competency. 10. **NSW DPI** reviews prior CASA audits to establish any non-compliances /conformances that may impact aircraft safety/performance.	**1** **2** **3** **6** **8** **9**	ATSB has identified issues in the past with company culture and poor management contributing to accident causation. Historical data shows that organisational failure has been a contributor to accidents on 5 known occasions in the last 5 years indicating likelihood as *Almost certain*. Due to the multiple current controls to ensure the Operator is competent to conduct low level aircraft operations, assess the likelihood as ***Possible***	Consequence of an accident can be catastrophic due to potential for loss of life. Assessed as ***Catastrophic***	**High**	The following controls seek to establish that an operator is competent in managing aerial surveillance operations. The following controls should reduce the likelihood of an accident regardless of the environment in which the aircraft is operating. **4** **5** **7** **10**	Controls put in place to reduce the likelihood that a Contractor is not competent to conduct aerial surveillance operations and to ensure the operator is able to manage risk ***Rare***	If management controls fail then the consequence of an accident may be fatal therefore assessed as ***Catastrophic***	**Medium** **Note:** All controls to be implemented and checked through EOI and audit processes

Discussion Crew Competency:

The role of the 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 pilot's history and training as well as emphasising the role of an effective SMS, and a more comprehensive auditing and assessment protocols in checking the competence of the pilot and of the company's oversight of the pilot. Poor decision making by pilots has been identified in many accidents in all aircraft types. Although a difficult aspect to measure, controls are required to assure as far as possible that proper decision-making is conducted and poor decisions do not impact on aircraft, its' occupants or community safety.

The other members of crew that may be on-board have an important role to play in the safe operation of the aircraft including noting excursions from planned flight, highlighting warning and caution indications, operation of the equipment and acting as a member of a multi-crew environment. Consequently they should receive training related to their specialist role within the aircraft and as a member of a multi-crew environment.

Passengers should receive individual briefings each time they fly to reflect their role within the aircraft even if the role is just being purely a passenger.

The greatest risks faced by the crew as regards pilot decision-making and experience are the handling of the aircraft, ensuring adequate power margins and poor appreciation of structures and lines.

B.	CREW COMPETENCY	1.	Pilot Aspects						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Lack of pilot proficiency / experience leads to poor decision making and/or flying ability resulting in an accident	**1.** **Pilot** is properly licenced to conduct required aerial work operations by CASA. **2.** **Pilot** has sufficient experience to properly assess conditions and requirement and to conduct required aerial surveillance operations. Experience as detailed in EOI. **3.** **Pilot** has had no accidents involving poor decision-making or mishandling of the aircraft in the previous 5 years or 1000 flight hours unless adequate rectification and supervision demonstrated. **4.** **Pilot** has undergone 'fly the wire' or similar aviation safety courses. **5.** **Pilot** has undergone any aircraft-specific safety courses if available. **6.** **NSW DPI** conducts audit/assessment to assure pilot has appropriate experience and qualifications to conduct aerial work, in particular, the surveillance task. **7.** **Operator** has a robust training and checking system to ensure aircraft is handled properly, proper decision-making encouraged. **8.** **Operator** is checked by **NSW DPI** to have a functioning, effective and appropriate SMS in operation**.** **9.** **Operator** has fatigue management policies to provide support to pilots to avoid fatigue lessening the chances of poor decision-making. **10.** **Operator** has fatigue management policies for ground handling personnel to help ensure proper handling of the aircraft. **11.** **Operator** has functioning, effective drug and alcohol management policies and procedures in place for pilots and ground crew. **12.** **Operator** has a detailed manual that provides the appropriate information on such things as operations in turbulence, wind and heat and has stipulated power margins and control recovery guidance.	**1** **2** **4** **6** **7** **8** **9** **11**	Poor pilot decision-making has been identified in at least 15 industry accidents in the past 5 years. With the controls imposed, there should be some reduction from Almost Certain to ***Possible***	Consequence of poor pilot decision making is, as regards safety, often fatal and therefore considered ***Catastrophic***	**High**	**3** **5** **10** **12**	Other than removing the human from the consideration, it is almost impossible to eliminate poor decision making by pilots but the extra defences identified should lower the likelihood or at least identify those who may be prone to making poor decisions. ***Unlikely***	Consequence to pilot, crew and passenger safety is likely to be ***Catastrophic***	**High** **Note:** All proposed controls to be implemented through EOI and audit processes

B.	**CREW COMPETENCY**	**2.**	**Crew Aspects**						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Lack of crew proficiency / experience leads to poor decision making resulting in an accident	**1**. **Crew** has sufficient experience to properly assess conditions. **2. Crew** member has had no accidents involving poor decision-making in the previous 5 years or 1.000 flight hours unless adequate rectification and supervision demonstrated. **3**. **Crew** has undergone 'Crew Resource Management', 'Work Safely Around Aircraft' or similar aviation safety courses e.g. Fly The Wire). **4**. **NSW DPI** conducts audit/assessment to assure crew has appropriate experience suitable to the task. **5**. **NSW DPI** has fatigue management policies to provide support to crew to avoid fatigue lessening the chances of poor decision-making. **6**. **NSW DPI** has functioning, effective drug and alcohol management policies and procedures in place for crew.	**1** **2** **3** **4** **5** **6**	Poor crew decision-making has been identified in at least 15 industry accidents in the past 5 years. With the controls imposed, there should be some reduction from **Almost Certain to Possible**	Consequence of poor crew decision making is, as in regards safety, often fatal and therefore considered **Catastrophic**	**High**	No further controls are considered to be required based on the current risk profile	Other than removing the human from the consideration, it is almost impossible to eliminate poor decision making by crew but the extra defences identified should lower the likelihood or at least identify those who may be prone to making poor decisions. **Unlikely**	Consequence to pilot and crew safety is likely to be **Catastrophic**	**High** Note: All proposed controls to be implemented through EOI and audit processes

Discussion Flight Preparation Aspects:

PPE (personal protective equipment) is an important final control in reducing the severity of an accident. PPE should provide protection against ambient conditions (e.g. noise), impact and fire. The current controls appear sufficient to ensure that effective PPE is in place. Incorrect PPE for aircraft can affect communications and impact on hazard identification.

Environmental considerations such as noise should be addressed through wearing correct PPE.

Minimum of bare skin to be exposed, gloves, sturdy leather footwear shall be worn. Helmet with visor(s) should be worn in helicopters.

Preference for Nomex-type flying suits for aircrew operating helicopters.

C.	**FLIGHT PREPARATION**	1.	**PPE**						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Not wearing or having available appropriate PPE leads to a compromise in safety for pilot, crew and passengers exposing them to impact and noise hazards	**1.** **EOI** specifies PPE requirements for helicopter operations. **2.** **NSW DPI** procedures require the wearing of correct PPE. **3.** **Operator** has been audited/assessed within the last 12 months by a competent company or authority to ensure compliance and conformance with regulations, EOI, NSW DPI Procedures and industry practice **4.** **Operator** has procedures that requires all personnel on-board an aircraft are wearing the appropriate PPE and where required, the PPE is compatible with aircraft communication / intercom equipment **5.** **Operator** issues appropriate PPE to its crews 6. **NSW DPI** checks that **Operator** has published procedures to ensure its crews wear appropriate PPE for Department operations	**1** **2** **3** **4** **5** **6**	Lack of appropriate PPE has been identified in accidents. ***Unlikely***	Lack of appropriate PPE has been identified, as a reason for causing greater injury than would otherwise be expected. Due to the required PPE, assessed as ***Moderate***	**Medium**	No further controls considered necessary			**Medium**

Aircraft Preparation Discussion:

The proposed and current controls review the maintenance organisation's procedures, culture and standards. Historical information is also sought to establish prior practices. SMS for maintenance organisations will be relatively new and therefore the requirement may require relaxing for some time to allow a maintenance organisation to work towards developing a suitable system.

A mechanical failure can be critical due to height to fall or impact with obstacles/ground. Therefore, mechanical reliability and maintenance are essential in reducing the risk.

Expressions of Interest / Requests for Tenders and ultimately contracts should stipulate the requirements for demonstrably effective SMSs and Maintenance Procedures Manuals.

The Australian agricultural and mustering industry has experienced high accident rates and therefore any operator intending to work for NSW DPI must display the appropriate culture and management systems.

Fuelling standards are important to safe operations and can receive little review despite its importance. The proposed controls are focused at the organisation having the proper procedures in place to ensure the quality of fuel delivered to the aircraft.

An engine failure due to poor fuel could be critical especially at low height.

Several standards exist to ensure the proper quality of fuel is delivered. Aircraft also have filters to ensure as much as possible the proper quality of fuel is delivered to the engine.

D.	AIRCRAFT PREPARATION	1.	Maintenance						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Improper maintenance leads to mechanical failure of critical system(s) such as tail rotor, main rotor, controls or engine.	1. **Operator** and **Maintenance Organisation** have a functional and appropriate safety and quality management system that includes risk management, reporting, training and accountabilities. 2. **Maintenance Organisation** has appropriate CASA approvals. 3. **Operator** and **Maintenance Organisation** have a trend recording system to detect potential failures in systems before they actually occur. (Although a possible control, trend recording of parts in the agriculture industry is considered impractical at this stage) 4. **Maintenance Organisation** has an appropriate management culture that continually assesses the company and its operating procedures for continual improvement. 5. **Operator** charges appropriate charter rates to ensure company has sufficient resources to properly maintain aircraft including replacement of components. 6. **Maintenance Organisation** has an effective Maintenance Procedure/Quality Manual and complies with that manual. 7. **Operator and Maintenance Organisation** regularly audited and assessed to ensure compliance with regulations and good maintenance practices. 8. **Maintenance Organisation** is checked to ensure that only approved parts are likely to be used on the aircraft. 9. **Maintenance Organisation** is checked to ensure the major maintenance is conducted in controlled environmental conditions ie clean conditions. 10. **Maintenance Organisation** 5-year history is reviewed for prior inappropriate maintenance standards. Review should include review of CASA audits and the EOI should reflect the requirement for prior audits to be available for review.	**1** **2** **4** **6** **7** **8**	ATSB historical data indicates that the industry has had more than 5 instances of maintenance failure in aircraft in the last 5 years leading to accidents indicating that the likelihood is *Almost Certain*. It is considered that with the current controls, the likelihood will be ***Possible***	ATSB historical data indicates that the instances of maintenance failure leading to accidents were non-fatal although on at least 3 occasions, the aircraft suffered significant damage. The consequence is therefore assessed as ***Major***	**High**	**5** (to help assure parts replacement and overhaul) **9** (major maintenance including engine removal shall be done within the hangar environment – contract/EOI requirement) **10** (to assist in reviewing organisation culture and prior work) **Note:** Not all proposed controls implemented – see 3.	***Unlikely***	***Major***	**Medium** **Note:** All proposed controls except #3 to be implemented through the EOI and auditing processes.

		2.	Fuelling						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Incorrect fuel used to fuel the aircraft leading engine failure and aircraft forced landing b. Poor quality fuel is used to fuel the aircraft leading to engine failure and aircraft forced landing c. Incorrect procedures used that create a hazard during refuelling that could lead to injury, death or damage to aircraft or facilities.	1. **Operator** and **Maintenance/Fuel Supply Organisation** have operating SMSs that include risk management, reporting, training and accountabilities. 2. **Operator** and **Maintenance/Fuel Supply Organisation** have correct published procedures for the storage, security, testing and dispensing of fuel. 3. **Operator** and **Maintenance /Fuel Supply Organisation** have appropriate management cultures that continually audit and assess the operating procedures and practices for conformance and continual improvement including ensuring conformance with fuel industry standards (consider ASTM, JIG). 4. **Operator** and **Maintenance Organisation** keep proper records of fuel uplift and aircraft filter replacements to identify potential poor sources of fuel. 5. **Operator** and **Maintenance/Fuel Supply Organisation** have effective maintenance and fuel supply Procedure/Quality Manual and complies with the manual. 6. **Operator** and **Maintenance /Fuel Supply Organisation** checked to ensure that proper testing of fuel is conducted and records kept. 7. **Operator** has procedures that direct pilots to ensure correct type of fuel is used and to assure the quality of fuel. 8. **Aircraft** equipped with suitable filters and mechanisms for early detection of poor quality fuel.	**7** **8**	There have been few accidents attributed to poor quality fuel according to ATSB data although report from maintenance organisations indicate that the last line of defence (aircraft systems) have been catching issues associated with fuel indicating that the likelihood is ***Unlikely***	An engine failure or dual engine failure as a result of poor quality or incorrect fuel would likely lead to loss of aircraft with associated crew fatalities and therefore would be ***Catastrophic***	**High**	**1** (to assure proper systems in place, risk assessment and review are occurring) **2** (to assure that the fuel supply organisation has the proper procedures in place for the handling of fuel) **3** (to assure provision of quality of fuel) **4** (to assure the proper record keeping to ensure fuel can be tracked) **5** (to assure appropriate procedures in place) **6** (to assure that fuel is being correctly tested and quality maintained)	With the further controls in place, assess the likelihood of poor quality fuel being delivered is considered ***Rare***	An engine failure or dual engine failure as a result of poor quality or incorrect fuel would likely lead to loss of aircraft with associated fatalities and therefore would be ***Catastrophic***	**Medium** **Note:** All controls to be implemented and checked through EOI and audit processes

Pre-flight Discussion:
Poor planning has been cited in many occurrences but the current controls appear to be adequate in minimising the risks associated with poor planning.
Operators should demonstrate that it has the systems, practices, procedures and management oversight in place to ensure flights are well-planned.

E.	**PREFLIGHT PLANNING**	**1.**	**Planning**						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Inadequate planning information leads to task failure, aircraft being out of limits, inadequate fuel, weather-related problems and thereby placing the task or aircraft at risk of an accident. Poor planning of surveillance operations may place people in danger. Poor planning may add additional unnecessary cost.	**1.** **NSW DPI** conducts pre-flight briefing and provides written details and planning material to help assure pilot fully understands requirements and to achieve task outcomes, safely and efficiently. **2.** **NSW DPI** coordinates with **Operator** and **other organisations as required** to assure proper location and support of surveillance operations. **3.** **Operator** provides pilot with sufficient planning material and access to information to ensure the flight can be conducted safely while achieving the task objectives. **4.** **Operator** provides guidance within operational documentation to pilots on the required pre-flight planning activities including any NSW DPI required procedures. **5.** **NSW DPI** details requirement in EOI for proper planning including hazard identification to be included in Operator's documentation. **6.** **NSW DPI** audits and assesses the Operator to ensure that the required processes and procedures are in place. **7.** **Operator** has an operating SMS that includes risk management, reporting, training and accountabilities. **8.** **Operator** ensures adequate communications are in place to ensure proper briefing material is available. **9.** **Operator** has a strong fuel reserve and planning policy and associated procedures. **10.** **Operator** has a strong oversight policy and practice to ensure pilots are conforming to company requirements.	**1** **2** **3** **4** **5** **6** **7** **8** **9** **10**	Poor planning can include the failure to survey for wires, ensuring sufficient power margin and not accounting for wind correctly. As a result there have been 3 accidents in the past 5 years attributed to poor quality planning according to ATSB data indicating that the likelihood is *Likely* However due to the controls identified, lowers the likelihood to ***Rare***	Poor planning can result in the aircraft running out of fuel or striking a wire or other obstruction or other aircraft resulting in fatalities. ***Catastrophic***	**Medium**	No further controls are considered to be required based on the current risk profile			**Medium**

Discussion Flight Operations:
1. Start: Current auditing and assessing protocols should adequately address the controls. Pre-flight inspections and system checks are important to ensuring an aircraft is ready to fly.
2. Navigation: Current auditing and assessing protocols should adequately address the controls. The likelihood of poor navigation issue even in remote areas has been significantly reduced by the use of GPS.
3. Fatigue: The control requiring an SMS will assist in detecting fatigue and addressing causes before fatigue leads to an accident. Inattention and fatigue can only be controlled through administrative measures. The Operator must ensure that the pilot is fully ready for operations especially when operating low level and the pilot must be encouraged to take a break if feeling fatigued or tired when operating low level.
4. Ground impact: Inadvertent ground impact most likely the result of inattention or mishandling of the aircraft.
5. Wire and obstacle strike: Operations at low level are significantly impacted by the chances of wire strike. Any operations below 500ft AO are regarded as low flying and therefore pose the highest risk. Current procedures require pilots to climb to at least 500ft between any low flying areas. Standard high tension power line structures are up to 55m (180ft) excluding heights of the hills they may be erected on. The operation of the aircraft at low levels with the present administrative controls is assessed as a high risk. Risk is lowered to High/Medium if the aircraft operating height is raised to above likely obstacle height. Consideration should also be made of using helicopters that have demonstrated good crashworthiness capability and occupied seats should have 4 point harnesses (vice lap belts) which would lower the risk to Medium.
6 & 7. 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.
8. Power margin: For piston engine helicopters specific reference and training should be made to rotor stall conditions, entry and recovery.

F.	**FLIGHT OPERATIONS**	**1.**	**Start**						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Incorrect pre-flight, system checks or role equipment checks leads to compromise in safety	1. **Operator** has published checklists that conform to the Original Equipment Manufacturer publications. 2. **Operator** conducts training and checking to assure pilot conduct checks as published. 3. **NSW DPI conducts** audit/assessment to assure **Operator** has a robust training and checking, and SMSs, (including requirement for checks to be conducted in adequate lighting).	**1** **2** **3**	ATSB reports have not indicated poor pre-flight or starting procedures as a contributor to occurrences in the past 15 years. Assessed as ***Rare***	Incorrect prefights' or checks could lead to aircraft failure in flight leading to fatalities and is therefore rated as ***Catastrophic***	**Medium**	No further controls are considered to be required based on the current risk profile			**Medium**
		2.	**Navigation**						
a. Poor navigation leads to helicopter arriving late, not arriving at correct location or not doing the required task	1. **Operator has** training and checking to assure crew can map-read and use navigation equipment. 2. **NSW DPI** requires GPS installed (EOI). 3. **Operator provides** GPS equipment in helicopter. 4. **NSW DPI** has published procedures that ensure correct information is briefed to crews before their departure.	**1** **2** **3** **4**	No significant occurrences recorded related to aircraft becoming lost. Assessed as ***Rare***	Consequence of crew poor navigation in a helicopter is considered ***Minor*** provided the pilot decision making is sound	**Negligible**	No further controls are considered to be required based on the current risk profile			**Negligible**

			3. Fatigue							
Risk	**Possible Controls**		**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Fatigue causes the crew to be less attentive and not notice obstructions such as wires and towers.	1. **Operator** has fatigue management policies and management system to provide support to pilots to avoid fatigue 2. **Operator** has operating and effective SMS to ensure any fatigue events are captured and analysed to ensure effective remedies are put in place. 3. **Operator** has a requirement that the aircraft lands about every 2 hours (except in normal transit) to allow pilot time to have a reasonable break. 4. **Operator** ensures that adequate drinking water is carried and accessible by pilot inflight 5. **NSW DPI** conducts investigations into occurrences where fatigue may be a contributing factor 6. **NSW DPI** conducts audit/assessment of Operator to ensure proper policies, procedures and systems are in place that addresses fatigue. 7. **NSW DPI** conducts audit/assessment to ensure proper DPI policies, procedures and systems are in place that addresses fatigue.		**1 2 3 4 5 6 7**	Fatigue is suspected in several occurrences where wire strikes have occurred but with management /administrative protocols identified consider the likelihood of fatigue as ***Unlikely***	The potential consequence due to chances of wire strike or flight into terrain causing fatality is ***Catastrophic***	**High**	No further controls are considered to be required based on the current risk profile			**High**

		4. Ground Impact							
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Inadvertent ground impact made during low level operations being a significant safety hazard for the occupants	**1.** **Operator** has fatigue management policies and system to provide support to pilots to avoid fatigue. **2.** **Operator** has operating SMS to ensure any fatigue events are captured and analysed to ensure effective remedies are put in place. **3.** **Operator** has appropriate publications and guidance in place to ensure pilots are provided with the knowledge to competently conduct low level (below 500ft) surveillance. **4.** **Operator** has a strong and effective checking and training system that ensures pilots are fully competent to conduct low level (<500ft) surveillance. **5.** **NSW DPI** specifies minimum experience levels in EOI to help ensure pilot is competent to conduct surveillance. **6.** **NSW DPI** conducts investigations into occurrences to derive any organisational or human factor considerations and apply corrective actions as required. **7.** **NSW DPI** conducts audit/assessment of Operator to ensure proper policies, procedures and systems are in place that addresses flying operations and management. **8.** **Pilot and Operator** history reviewed for any occurrences in the previous 5 years that indicate poor pilot decision making or poor aircraft handling.	**1** **2** **3** **4** **5** **6** **7**	There have been 4 inadvertent ground impacts during similar types of operations in the last 5 years. Historical likelihood is assessed as *Likely* But with the current controls in place, assess the likelihood as ***Unlikely***	The consequence is assessed as ***Catastrophic*** due to result likely to be fatal	**High**	**8** (reduce the likelihood of utilising error-prone pilots)	***Rare***	Consequence is unchanged by proposed controls ***Catastrophic***	**Medium** **Note:** Control #8 to be implemented through EOI and auditing processes.

			5. Wire & Obstacle Strike							
Risk	**Possible Controls**		**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Impact with wire or obstacle causes aircraft to impact ground in uncontrolled manner impinging on the safety of occupants	**1.** **Operator** has published guidance to pilots on the avoidance of wire & obstacle strike. **2.** **Operator** trains pilots specifically in wire & obstacle avoidance including 'fly the wire' course or similar. **3.** **Pilots** have specific training & experience for low level surveillance operations. . **4.** **NSW DPI** specifies minimum experience & training levels in EOI to help ensure pilot competent. **5.** **Pilot** is to remain above 500ft AO unless descending to/departing from task, or landing/taking off. **6.** **Operator** has published procedures for descent and operations below 500ft AO. **7.** **NSW DPI** requires Operator to prepare, where practical, hazard maps for operations below 500ft AO in the designated area. **8.** **Pilot** obtains a brief from landowners & others about potential hazards, where practical. **9.** **NSW DPI** requires, where possible, property owners provide a diagram of the HLS or ALA including surrounding obstacles & wires to the LCC for on-forwarding to the pilot. **10.** **NSW DPI** requires Operator to have policies & procedures that require landings & take-offs should where possible be made at HLS & ALAs that conform to CAAP 92 more stringent requirements. **11.** **NSW DPI** requires pilot to make vertical take-offs & landings to avoid flying into unseen wires (must have sufficient power margins to do so) when operating from non-surveyed HLS. **12.** **Operator** polices & procedures require NSW DPI operations only conducted Day VMC. **13.** **NSW DPI** requires helicopters aircraft to be equipped with Wire Strike Protection System if they can be so equipped. 14. **NSW DPI** briefing includes known hazards. **15.** **NSW DPI** conducts audit/assessments Operator has proper systems and practices to avoid wire & obstacle strikes.		**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **12** **13** **14** **15**	ATSB database shows at least 6 known wire strikes by helicopters and fixed wing aircraft in the past 3 years to be a common occurrence. Historical likelihood is assessed as *Almost certain* The present controls are largely administrative controls which are the least effective controls in managing risk. However while they are the least effective, the number of controls presents a 'defence in depth' approach to the risk. With the present controls, likelihood is assessed as ***Unlikely***	ATSB records show most accidents result in fatalities. Consequence is assessed for the crew as ***Catastrophic***	**High**	**11** (vertical take-offs by helicopters to prevent departures into wires masked by environment from non-surveyed sites)	Extra control will not affect fixed wing operations so likelihood to remain ***Unlikely***	***Catastrophic***	**High** **Note:** Control #11 to be implemented and checked through EOI and audit processes

			6. Inflight Emergency							
Risk	**Possible Controls**		**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Pilot mishandles emergency or malfunction which leads to an accident	**1.** **Operator** has adequate published guidance and training to pilots on the handling of malfunctions and emergencies. **2.** **Pilots** have specific training and experience for surveillance operations (which includes the handling of malfunctions and emergencies at low level). **3.** **Pilot** has suitable number of total hours, hours on type and recency flying. **4.** **Operator** to ensure suitable and adequate records of pilot training is kept. **5.** **Pilot** history reviewed for any occurrences in the previous 5 years that indicate poor pilot decision-making or poor aircraft handling. **6.** Operations generally conducted over areas that provide the pilot with emergency landing options. While this may not be totally true for operations over floodwaters, it provides for a relatively clear area to arrive. **7.** **NSW DPI** conducts audit/assessments to assure as far as practicably possible that Operator has proper systems and practices to ensure pilot can handle emergencies. **8.** **NSW DPI** require pilot to have undergone Emergency check ride with in the month prior to commencing operations.		**1** **2** **3** **4** **6** **7**	Pilot mishandling of emergencies do not appear to have been a causal factor in any helicopter accidents in the last 10 years. Has been at 2 fixed wing accidents from emergency handling in past 5 years. Reviewer is aware of non-reported occurrences. With the current controls, assessed as ***Unlikely***	Mishandling of an emergency could lead to the aircraft impacting the ground therefore assessed for the crew as ***Catastrophic***	**High**	**5** (check history to ensure no adverse trends) **8** (ensure pilot is current in emergency training)	The additional controls provide greater assurance that the pilot is current and has a no history in poor decision-making ***Rare***	Mishandling of an emergency could lead to the aircraft impacting the ground therefore for the crew, assessed as ***Catastrophic***	**Medium** **Note:** Control #5 will be implemented through EOI and audit process. Control #8 requires consultation with industry for practicality and cost effectiveness considerations (if not implemented residual risk remains medium).

		7.	**Inflight Collision**						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Mid-air collision between aircraft on similar task or with other aircraft (e.g. low flying military aircraft on published Low Jet Routes) impinges on safety of aircraft occupants.	**1.** **Operator** installs radios to ensure pilot can communicate with other aircraft in the area. **2.** **Operator** installs TCAS to assist with potential collision identification and avoidance. **3.** **Operator** has training and checking systems and practices that ensure pilot is properly trained in communicating and identifying potential conflicting traffic. **4.** **NSW DPI** briefing informs pilot of any potential traffic in the area where this traffic may be known or planned **5.** **Pilot** checks maps, NOTAMs and/or briefing office for potential traffic **6.** **Operator** ensures aircraft **are** equipped with high-visibility markings 7. **Operator** ensures aircraft have high-intensity strobes	**1** **3** **4** **5**	ATSB historical data indicates 2 occurrences in the past 5 years which is *Likely* but with current controls, assessed as ***Possible***	Consequence of a mid-air is usually ***Catastrophic*** One of the two accidents in ATSB database within last 5 years was fatal.	**High**	**6** (fitment of high-vis markings to improve visibility) **7** (fitment of high intensity strobes to improve visibility) **Note:** Not all proposed controls implemented – see 2.	Strobe lighting and improved visibility markings should improve visibility - likelihood assessed as ***Rare***	***Catastrophic***	**Medium** **Note:** Controls 6 & 7 to be implemented through EOI and auditing processes. Control #2 is not practical to implement as would require all aircraft to operate with transponders which may not be practical or cost effective.
		8.	**Power Margin**						
a. Failure to ensure adequate power margins leads to loss of control and impinges on the safety of the aircraft occupants.	**1.** **NSW DPI** requires Operator to have policies, procedures and guidance requires that pilots assess power margin availability inflight. **2.** **NSW DPI** requires Operator to have properly operating training and checking system in place that checks that power margins are being applied in helicopters and performance assurance in fixed wing aircraft. **3.** **NSW DPI** details minimum helicopter power margin requirement in EOI. **4.** **NSW DPI** conducts audit/assessments to assure as far as practicably possible that Operator has proper systems and practices in place to ensure pilots operate with appropriate power margins.	**1** **2** **3** **4**	ATSB records indicate possible 3 occurrences in past 5 years indicating likelihood is *Likely* but with controls in place, assessed as ***Unlikely***	Consequence is assessed as ***Catastrophic*** due to potentially fatal injuries for crew	**High**	No further controls are considered to be required based on the current risk profile			**High**

		9. Landing							
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. Landing at non-surveyed areas poses a risk due to size or obstructions	**1.** **NSW DPI** requires **Operator** to operate wherever possible to areas that comply with CAAP 92-2 more stringent limitations. **2.** **NSW DPI** requires **Operator** to have published procedures that include reconnaissance requirements before making approach to HLS or ALA. **3.** **NSW DPI** provides any known information about HLS or ALA in briefing. **4.** **NSW DPI** requires **Operator** to have procedures that ensure the aircraft have adequate power margins and performance before arriving on task. **5.** **NSW DPI** requires helicopter landings to be vertical from a safe height into un-surveyed HLSs to ensure clearance from unseen obstructions and wires on the approach to previously un-surveyed HLSs. **6.** **NSW DPI** requires **Operator** to have an effective SMS to capture any issues or occurrences and to manage risk.	**1** **2** **3** **4** **6**	Historical data shows more than 5 accidents in past 10 years indicating likelihood as *Possible* With the current controls, likelihood assessed as ***Unlikely***	Due to high chance of fatality, consequence assessed as ***Catastrophic***	**High**	**5** (vertical landings and takeoffs minimise chances of helicopter hitting unseen obstructions/ wires)	Extra control will not affect fixed wing operations so likelihood to remain ***Unlikely***	Assessed as ***Catastrophic***	**High** **Note:** Control #5 to be implemented and checked through EOI and audit processes

Discussion 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 for survival.

G.	**ACCIDENT**	**1.**	**Survival**						
Risk	**Possible Controls**	**Current Control**	**Likelihood**	**Consequence**	**Current Risk**	**Proposed Controls**	**Revised Likelihood**	**Revised Consequence**	**Residual Risk**
a. If an accident occurs, survival of the occupants depends on having appropriate equipment and rapid recovery	1. **NSW DPI** requires **Operator** to carry a survival kit in its aircraft. **2. NSW DPI** requires **Operator** to carry medical kits in the aircraft. **3. NSW DPI e**nsures that full flight following is conducted to help assure rapid recovery. **4. NSW DPI** requires **Operator** to equip aircraft with Satellite tracking equipment to ensure aircraft whereabouts known at all times. **5. NSW DPI** requires **Operator** to have an effective SMS to capture any issues or occurrences and to manage risk. 6. **NSW DPI** requires carriage of ELB by pilot.	**1** **2** **3** **5**	There have been at least 5 accidents in the last 10 years where the location of aircraft following an accident was not quickly known. Likelihood based on data is *Possible* With the current controls, assess the likelihood as ***Rare***	Failure to quickly find survivors may lead to ***Catastrophic*** results for the crew	**Medium**	**4** (Satellite flight following would enable knowing precise aircraft location should an accident occur) **6** (Aircraft ELT failure rate is high and individual ELBs would enhance recovery likelihood)	Assessed as ***Rare***	With these controls, assessed as ***Major***	**Medium** **Note:** Control #4 & #6 may require consultation with industry and/or RFS before implementation.

Risk assessment summary:
Current risk for NSW DPI and the Operator is HIGH.
Risk remains at HIGH for NSW DPI and Operators as the consequence due to the safety of the pilot, crew and passengers cannot be reduced using proposed controls such as improved technology and primarily administrative controls.

Risk Assessment Prepared By:	Simon Oliver (Agricultural Protection Officer – Policy) Joanne Loughlin (Emergency Management Officer)	Mark Ogden (YTBN Services, Aviation Consultant)	2 Nov 2011
	(Name & Position)	(Name & Position)	Date:
Reviewed By:	Suzanne Robinson, Manager General Emergencies Preparedness & Response		23 Nov 2011
	(Name & Position)	(Name & Position)	Date:
Approved By:	Ross Burton – Director Emergencies & Animal Welfare		19 Dec 2011
	(Name & Position)		Date: