



Australian Government  
Civil Aviation Safety Authority



Sector Risk Profile  
for the aerial mustering sector

## About the Civil Aviation Safety Authority

The Civil Aviation Safety Authority (CASA) was established on 6 July 1995 as an independent statutory authority under section 8 of the *Civil Aviation Act 1988* (the Act). The main objective of the Act is 'to establish a regulatory framework for maintaining, enhancing and promoting the safety of civil aviation with particular emphasis on preventing aviation accidents and incidents' (section 3A). Section 9 of the Act lists CASA's functions and safety-related functions. In particular, subsection paragraph 9(1)(g) of the Act empowers CASA to conduct regular reviews of the system of civil aviation safety in order to monitor the safety performance of the aviation industry. CASA identifies safety-related trends and risk factors and promotes the development and improvement of the system.

## About the Aerial Mustering Sector Risk Profile

This sector risk profile (SRP) for the Aerial Mustering sector presents a picture of the key risks facing the sector (specifically from helicopters) at a specific point in time. The SRP provides a definition of the sector, the context used to develop the risk profile, identification of risks, risk ratings, identification of the participants in the sector accountable for risks and proposed risk treatments, and an ongoing plan for monitoring implementation of risk treatments and evaluating their effectiveness.

## Foreword

Aerial mustering is an important activity of cattle stations in Northern and West Australia and makes a significant contribution to the enhancement of productivity of the Australian beef industry. As helicopters have the ability to move stock at their own pace, they are proving invaluable in wooded country where stock have more natural cover and are difficult to spot from the ground.

Over the period 2000 to 2012, the aerial mustering sector accident rate declined from 154.6 accidents per million hours to 53.3 accidents per million hours in 2012. Mustering, by definition involves low-level flying and is a hazard rich activity with the inherent danger of being only a few seconds away from impact in the case of an emergency or pilot distraction. The mustering sector brings safety challenges with it and the gradual withdrawal of mentorship of experienced pilots disadvantages the new and inexperienced pilot as they don't have the benefit of other people's experience.

Mustering tends to be isolated from the rest of aviation and from regulatory oversight. The low number of incidents and serious incidents reported to the ATSB in relation to the number of accidents in the mustering sector, when compared to other general aviation sectors suggests there is significant under-reporting of incidents in the sector. Under-reporting of incidents may impede the sector's ability to identify and address safety issues.

As Australia's aviation safety regulator, CASA has the function, among others, of conducting regular reviews of the system of civil aviation safety to monitor the safety performance of the aviation industry, to identify safety-related trends and risk factors and to promote the development and improvement of the system. In order to identify safety-related trends and risk factors, CASA developed a methodology that examines risk factors associated with each sector of the Australian aviation industry.

Sector risk profiling identifies sector specific risks and develops a deep understanding of the effects of risks that sector participants must address in order to maximise their aviation safety performance. Effective risk management also makes a significant contribution to an operator achieving its commercial objectives. The sector risk profiling process adopts the CASA Risk Management Framework, which is based on AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines, to identify, assess and treat the risks that must be managed by sector participants.

A sector risk profile provides the sector participants and CASA with an opportunity to understand the effects of aviation related risks on the sector and how the level of risks can be reduced and managed utilising an approach that monitors the implementation of risk treatments by sector stakeholders, including CASA, as well as evaluating the effectiveness of the risk treatments through a set of safety performance indicators. The sector risk profile also provides an opportunity for authorisation holders in a sector to manage the effects of risks listed in the sector's risk register.

The successful development of a sector risk profile relies on industry participation in identifying hazards, associated risks and developing treatments which are not only feasible but also effective in delivering safe outcomes. It is in this regard that I would like to thank the principal contributors from the aerial mustering sector namely Mr John Armstrong, Mr Craig Crumblin, Mr David Fox, Mr John Logan, Mr Dick Tully, and Mr Grant Wellington, for giving up their valuable time to attend workshops, provide commentary on documentation and demonstrating a complete dedication to building a risk profile for the sector.

Safe Flying

**Mr Mark Skidmore, AM**  
Chief Executive Officer and  
Director of Aviation Safety

## INTRODUCTION

### About the Aerial Mustering Sector

Aerial mustering is a unique Australian activity used mainly in remote areas in the north and west of the country. Over 90 per cent of aerial mustering is conducted by rotary wing aircraft and entails locating and concentrating livestock and moving them by means of aerial manoeuvring to desired locations. The sector consists of a group of authorisation holders operating as professional pilots, who in carrying out their tasks provide what has become an essential service to the rural livestock industry.

Aerial mustering, by definition, involves low level flying. Its hazards include vulnerability to wind shear, bank-angle illusions in crosswinds near the ground, and the inherent danger of being only a few seconds away from impact in case of an emergency or pilot distraction. Mustering is currently carried out under Part 61 subpart 61.Q. A pilot seeking a licence approval for aerial mustering has to meet a series of requirements before he/she can conduct aerial mustering. Apart from CASA's regulatory requirements, there is little to guide mustering pilots to be safety conscious. Unlike the aerial application industry the mustering industry does not have a professional association which could serve as a central store of knowledge and a lobby group. The absence of a professional association and control means that there is little opportunity for mustering pilots to seek support and ongoing training, education and without flight schools specialising in mustering, there is little to guide mustering pilots towards the goal of as-low-as-reasonably-practicable (ALARP).

The Robinson R22 helicopter entered the industry in the 1980s having taken over from the Bell 47 and Hiller UH-12 helicopters which pioneered the activity in 1968. Surveys by the BITRE have found that on average 62 per cent of R22 hours were flown in mustering. The next largest category was flying training, with 13 per cent.

### CASA sector risk profiling process

The CASA sector risk profiling process consists of developing a picture of sector-specific risks in two phases. In Phase 1, information is sourced from a number of databases within

the Australian Transport Safety Bureau (ATSB), CASA and the BITRE and supplemented with surveys from air operators certificate (AOC) holders and the CASA inspectorate, and workshops with CASA and industry sector participants. This data is analysed and the results compiled into a series of outputs.

Phase 1 delivers three reports that together provide information on the state of the sector, document hazards and associated risks, and a list of data sources. Phase 2 delivers a risk register and final report.

### Using the sector risk profile

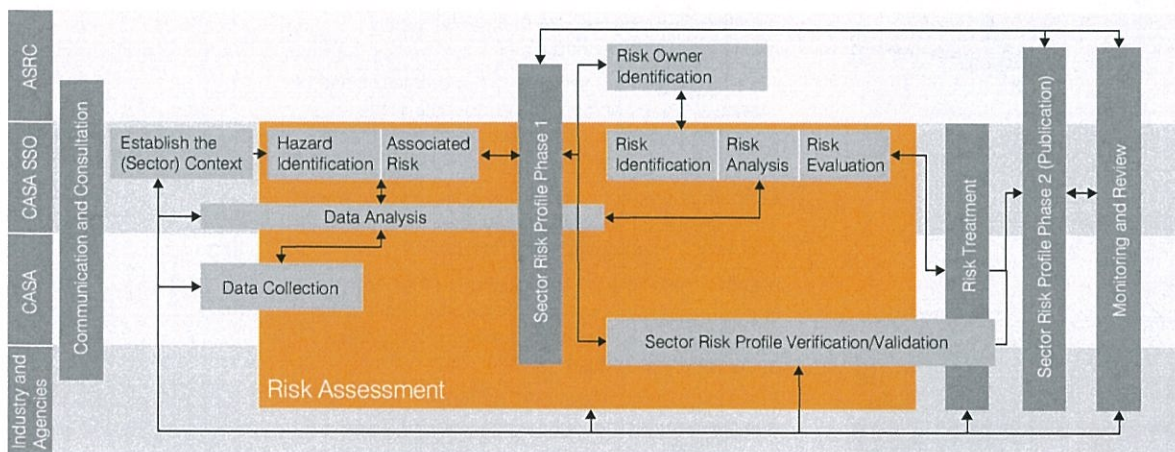
The purpose of the aerial mustering sector risk profile is to present a picture of the key risks and effects arising from the operations of the sector's fleet of aircraft at a given point in time.

CASA and selected industry sector participants developed the sector risk profile through a process in which risks were jointly identified, assessed and evaluated for treatment. When fully implemented these risk treatments should reduce the risk profile of the sector. The responsibility for implementation of the treatment measures for which industry has accountability rests with authorisation holders, operators and pilots.

The sector risk profile is dynamic and will change over time to reflect changes in the sector and the environment. The risk treatments are subject to a monitoring plan that measures change in safety performance following implementation of the risk reduction measures. An evaluation plan evaluates the effectiveness of the risk reduction measures.

### Assumptions

- » All references to aerial mustering operations exclude associated tasks such as fence surveying, feral baiting and field survey.
- » Aerial mustering operations using fixed wing aircraft, private mustering operations conducted by a pilot on their own property, and mustering operations conducted with recreational aircraft such as gyrocopters are not included in the sector risk profile.



Sector risk profile process

## PART 1—SECTOR RISK PROFILE CONTEXT

### Sector definition

The aerial mustering sector constitutes a group of individuals and organisations holding permissions to conduct aerial mustering operations for locating and concentrating stock in specific areas using a similar make and type of helicopter. Aerial mustering using a helicopter is predominantly a task specific and role related operation. The task entails locating and aggregating livestock in specific areas and driving them by means of aerial manoeuvring to specific areas. Mustering operations are conducted below 500 feet above ground level (AGL). No other person is carried in the helicopter during mustering operations unless that person is essential for the operation to be successfully carried out.

CAO 29.10 defines aerial mustering as:

“Use of aircraft to locate, direct, and concentrate livestock while aircraft is flying below 500 feet and for related training operations”

### Sector stakeholders



### Sector objectives

- » Maintain safe, efficient use of aircraft in aerial mustering (flight envelope).
- » Adopt management systems that promote the use of licensed, trained and competent people in the safe operation and regular maintenance of aircraft and associated equipment.
- » Encourage the reporting and analysis of occurrences within the sector to inform safety responses from individuals, companies, and CASA.
- » Improve the efficiency of regulation of the sector to improve the responsiveness of the regulatory system, allow for innovation, permit problem solving and encourage a safety culture.
- » Encourage, through sector engagement, the adoption of a relevant risk management system.
- » Encourage aviation safety and regulatory compliance within the sector.

## Operating environment

Aerial mustering plays an important role in the day-to-day operations of livestock industries across the country. Livestock need to be mustered for tasks such as weaning, branding, drenching, vaccinating and selling. As properties in rural Australia can be several million acres in size, aerial mustering allows for large savings in time, manpower and resources, due to an increase in overall efficiency.

Aerial mustering operations are conducted under Part 61 – Flight crew licensing subpart 61.Q Low-level ratings, CASA 524/01 - Helicopter Mustering Operations Flight Time And Duty Time and CASA 98/14 - Direction - flight time limitations for helicopter mustering operations.

As at June 2014, aerial mustering using helicopters was conducted by 134 authorisation holders. Queensland accounts for 53 per cent of the total number of operators, followed by New South Wales and Western Australia accounting for 13 per cent each, Northern Territory for 10 per cent, Victoria for 7 per cent, and South Australia and Tasmania accounting for 1 per cent each.

Demographics for the sector are shown in Table 1:

**Table 1: Sector Demographics**

Sector Demographics (2014)	
No. of Authorisation Holders	134
No. of aircraft	378
Average age of fleet	13 years
No. of pilots	981
Hours flown	113,921 hours
Accidents per million hours (2012)	53.3

The economic performance of aerial mustering operations is affected by the prospects of primary producers who in turn are affected by the meat processors and livestock exporters.

There are a number of economic factors that can have a negative impact on the primary livestock and aerial mustering sectors including low gross domestic product (GDP) growth rate, high Australian dollar, price of Avgas, high wages offered to overcome difficulties in attracting people to work in rural and remote locations, difficulty in obtaining funding despite operating in an environment of low interest rates and weak global economic conditions. Other factors such as unauthorised operators, potential oversupply of operators with 1 to 2 aircraft whose pricing models tend to promote unsustainable competition, and unsustainable pricing models by smaller operators can create additional financial pressure on the sector thereby giving rise to potential safety concerns as operators try to cut corners to compete.

Natural disasters have a negative effect on pastoral and grazing communities by directly affecting cattle production returns, which in turn affects the budget available for aerial stock mustering. As seasonal conditions are inextricably linked with aerial mustering operations, operations are conducted when weather conditions are favourable. Both periods of unfavourable weather and favourable weather can result in client pressure on authorisation holders to ramp up for more flying and such expectations may compromise safety and result in unsafe situations.

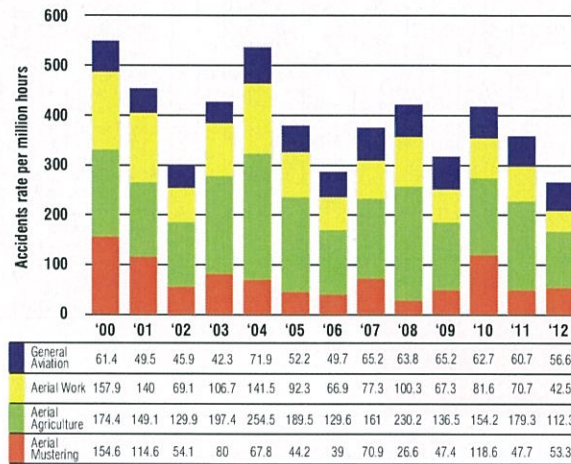
Model codes of practice for the welfare of animals prepared by the Animal Welfare Committee (AWC) within the Primary Industries Ministerial Council (PIMC) apply across all Australian states and territories. In Western Australia, the Pastoral Graziers Association (PGA) has developed a code of practice for aerial mustering.

## Operational

The aerial mustering sector is hazard rich due to the inherent characteristics of the operation, such as very low level flying, high workload, negative effects from weather, obstacles such as power lines, trees, and terrain, pilot distraction, small power margins, and extended time operating within the shaded area of the height/velocity diagram ('deadmans curve'). In some parts of Australia, military aircraft may intrude into airspace above cattle stations which could cause airborne conflict. Pilot training, supervision and mentoring play an important role in developing pilot skills to manage aerial mustering manoeuvres.

In the ten years ending 2012, there were 66 aircraft involved in commercial aerial mustering accidents, six of which involved fatalities. Over the same period, only 16 aerial mustering incidents and serious incidents were reported to the ATSB. When compared to general aviation, this suggests that there is significant under-reporting in the sector. Figure 1 compares aerial mustering accidents per million hours with related General Aviation activities. Although the accident rate for aerial mustering is declining there is still some degree of variability in the declining trend.

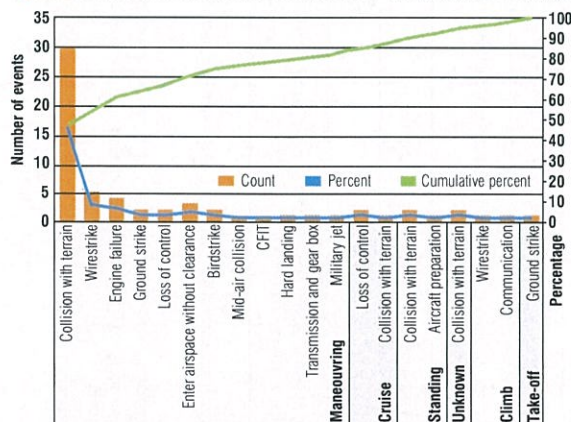
**Figure 1** Accident rates for selected General Aviation operations



Source: ATSB Occurrence Statistics & BITRE General Aviation Activity Surveys

As shown in Figure 2, the majority of occurrences (80%) happened during the manoeuvring phase of flight. The principal event during the manoeuvring phase was collision with terrain, and to a lesser extent wirestrike and engine failure.

**Figure 2** Frequency of most common occurrences during all phases of flight



Source: ATSB Occurrence Data

Hazard analysis showed that pilot distraction or lack of attention, time pressure, reduced visibility and lack of experience were the most commonly recorded causes of occurrences. These causes, identified during the hazard construction process are generally associated with organisational and human factors.

## PART 2—SECTOR RISK PROFILE

Part 2 presents a short-form version of the sector's risk register (risk cause/source, impacts, controls, stakeholders and likelihood/consequence ratings are not presented). The table provides information on the risks, current rating of risks and proposed strategies for treating the risks, treatment owner and the residual risk rating once treatments have been implemented.

### Short form version of the sector's risk register

Risk #	Risk	Risk Owner - Primary	Current Rating	Treatment Description	Treatment Owner	Residual Risk Rating	Risk Review date
1	Lack of visible CASA presence encourages entry and continued presence of unauthorised operators	CASA	High	Surveillance Sweeps	CASA	High	2016
2	Checking and testing pilots with inappropriate or inadequate operational experience conducting checks on mustering pilots	CASA / Industry	High	Improve surveillance of Flight Review Examiners Improve Mustering specific requirements in relevant CASRs	CASA CASA	High	2016
3	Inadequate provision of mentoring and supervision for pilots with low flying hours in mustering activity	Industry	High	Industry body mentoring program (Opportunity) Development of Pilot training manual/handbook Series of articles to target key messages	Industry Industry / CASA CASA	Low	2016
4	Loss of control in flight leads to deviation from intended flight path	Industry	High	Industry body mentoring program (Opportunity) Pilot Handbook/Flight Safety Australia Article	Industry CASA	High	2016
5	Loss of control on landing due to surface conditions	Industry	Medium	Industry body (Opportunity) Educating client on takeoff/landing sites Flight Safety Australia article / attachment to Mustering SRP public document	Industry CASA	Low	2016
6	Quality and frequency of advice regarding regulatory changes leads to operator uncertainty and unintentional non-compliance	CASA	Medium	Improve CASA Website (Have sector specific guides and better search feature) Communicate directly with sector Industry body (Opportunity) Provide information to industry regarding Part 138, CAO 48.1	CASA CASA CASA	Low	2016
7	Lack of understanding of limitations of human factors results in heightened safety risk conditions	Industry	Medium	Review CAO 48.1 for applicability to sector Update Human Factors for Pilots kit Industry body (Opportunity) Fatigue training opportunities	Industry / CASA CASA Industry Industry	Low	2016
8	Under-recording aircraft hours to avoid maintenance leading to airworthiness degradation of the aircraft	Industry	Medium	Regional Forums run by CASA ASAs Surveillance Sweeps (maintenance providers) Industry body (Opportunity)	CASA CASA Industry	Medium	2016
9	Collision with obstacles leads to an aircraft safety occurrence	Industry	Medium	Continue discussions with Energy Network Australia to investigate powerline marking Wirestrike avoidance seminar in regional areas Industry body mentoring program (Opportunity)	CASA CASA Industry	Medium	2016
10	Operating aircraft with suspected or known maintenance issue or physical damage	Industry	Medium	Industry body (Opportunity) Parts sharing	Industry	Medium	2016
11	Collision with birds or other wildlife	Industry	Medium	Industry body (Opportunity) Improved reporting of bird strike occurrences	Industry Industry	Medium	2016
12	Operating under the influence of alcohol and drugs	Industry	Medium	Retained - refer to full report version		Medium	2016
13	Collision with another aircraft	Industry	Medium	Education on radio frequency use Review and improve existing controls Reinforce message (existing controls) at regional forums	Industry Industry CASA	Medium	2016
14	Failure to maintain aircraft documentation leading to airworthiness degradation of the aircraft	Industry	Medium	Reinforce message (existing controls) at regional forums	CASA	Medium	2016
15	Contact with rotor blades to persons when entering/exiting aircraft	Industry	Low	Retained - refer to full report version		Low	2018
16	Use of contaminated fuel leads to an aircraft safety occurrence	Industry	Low	Flight Safety Australia article	CASA	Low	2018
	The development of an Industry body and networking between operators will have a positive effect on the ability to share knowledge and address unique issues affecting the sector	Industry		Establish industry body State based Set up initial industry workshops Promoting benefits of an Industry body CASA ASAs hold safety forums	Industry / CASA		

**Note:** This short form version of the sector's risk register does not contain risk cause/source, impacts, controls, stakeholders and likelihood/consequence ratings. For the full report version refer to 'Aerial Mustering Sector Risk Register, Civil Aviation Safety Authority, 2015'.

## PART 3—SECTOR PRACTICE STATEMENTS

As part of the risk treatments identified in the sector risk register, a set of sector practice statements will be developed jointly by CASA and a representative group of sector participants. The themes for sector practice statements will initially cover the following:

- A. Sector Mentoring and Supervision
- B. Pilot decision-making
- C. Radio frequency use
- D. Fatigue Management
- E. Establishment of Regional Forums
- F. Annual Aerial Mustering Sector Conference

A working group comprising of CASA staff and representatives from the mustering sector will be established to address the above themes.

### Principal Contributors from the Sector:

The Civil Aviation Safety Authority thanks the following sector participants in working actively with the Authority to develop a risk profile for the mustering sector:

Mr John Armstrong, Modern Aerial Mustering  
 Mr Craig Crumblin, Industry Representative  
 Mr David Fox, Fox Helicopter Services  
 Mr John Logan, Barkly Helicopters  
 Mr Dick Tully, Cloncurry Aerial Mustering  
 Mr Grant Wellington, Pearl Coast Helicopters

### Further reading

Aerial Mustering State of Sector Report, Civil Aviation Safety Authority, 2014

Aerial Mustering Sector Risk Profile Report, Civil Aviation Safety Authority, 2014 (full report)

Aerial Mustering Data Sources Report, Civil Aviation Safety Authority, 2014

Aerial Mustering Sector Risk Register, Civil Aviation Safety Authority, 2014

## Abbreviations and terms

<b>AGL</b>	Above Ground Level
<b>AHIA</b>	Australian Helicopter Industry Association
<b>ALARP</b>	As-Low-As-Reasonably-Practicable
<b>AMROBA</b>	Aviation Maintenance Repair and Overhaul Business Association
<b>AOC</b>	Air Operators Certificate
<b>AOPA</b>	Aircraft Owners and Pilots Association
<b>ATSB</b>	Australian Transport Safety Bureau
<b>AWC</b>	Animal Welfare Committee
<b>BoM</b>	Bureau of Meteorology
<b>BITRE</b>	Bureau of Infrastructure, Transport and Regional Economics
<b>CAO</b>	Civil Aviation Order
<b>CASA</b>	Civil Aviation Safety Authority
<b>CASR</b>	Civil Aviation Safety Regulations
<b>CCA</b>	Cattle Council of Australia
<b>DIRD</b>	Department of Infrastructure and Regional Development
<b>GDP</b>	Gross Domestic Product
<b>NFF</b>	National Farmers Federation
<b>PIMC</b>	Primary Industries Ministerial Council
<b>PGA</b>	Pastoral Graziers Association
<b>RAAF</b>	Royal Australian Air Force
<b>RSPCA</b>	Royal Society for the Prevention of Cruelty to Animals
<b>SCA</b>	Sheepmeat Council of Australia
<b>SRP</b>	Sector Risk Profile

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