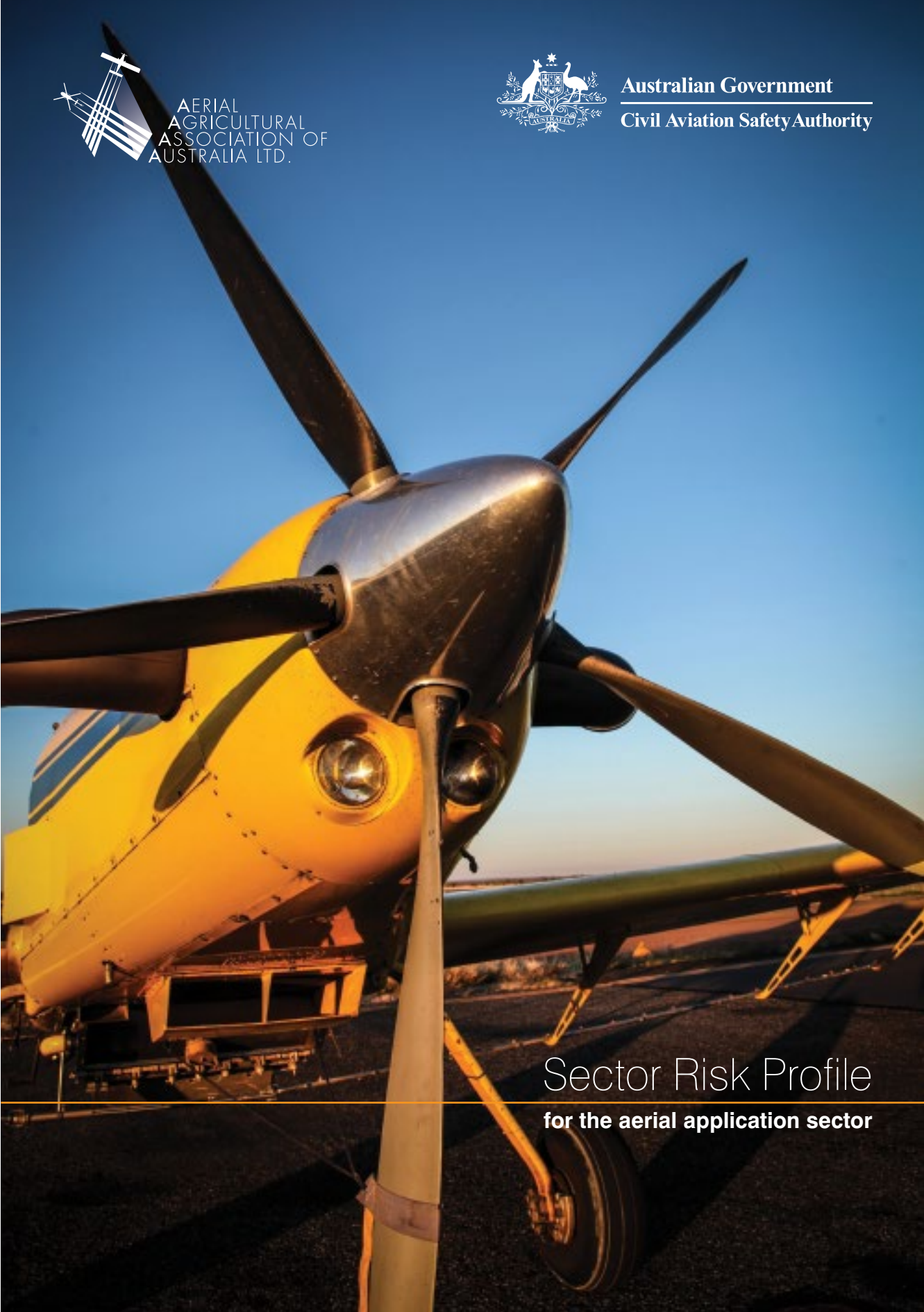
AERIAL AGRICULTURAL ASSOCIATION OF AUSTRALIA LTD.

Australian Government
Civil Aviation Safety Authority



Sector Risk Profile

for the aerial application 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 Agricultural Association of Australia

The Aerial Agricultural Association of Australia (known as the 'four As' or AAAA), represents the professional aerial application industry that provides specialist aviation services for agricultural production and emergency response. Aerial application operations include crop spraying, fertilising, sowing, locust and mouse plague control, firebombing and oil spill management.

Association members conduct over 90 per cent of all aerial application operations in Australia. The Association has been active since 1958 and provides a comprehensive mix of training, education, conference and accreditation services to its members, as well as striving to ensure the Australian Government and communities are kept up-to-date with aerial application industry issues, problems and opportunities.

The Association works closely with state and federal agencies on a range of policy issues and its Spraysafe program is recognised by all state agencies for the purpose of issuing a chemical distribution licence. The AAAA developed a comprehensive integrated management system for use by its members—the Aerial Improvement Management System (AIMS).

This program is based on **AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines** but also integrates aviation safety, environmental management and product stewardship, workplace health and safety, dangerous goods, human resources and best practice management principles. Accreditation is only achieved after an independent audit and must be renewed every three years. At the time of writing approximately half the AAAA membership was pursuing the accreditation and one quarter of the membership had already attained accreditation.

About the aerial application sector risk profile

This sector risk profile (SRP) for the aerial application sector presents a picture of the key risks facing the sector 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

The aerial application sector in Australia makes a significant contribution to the enhancement of productivity in Australian agriculture and to the delivery of emergency services.

Over the period 1993 to 2011 the aerial applications sector accident rate declined from 31.32 per 100,000 flying hours to 17.93 per 100,000 flying hours in 2011. The efforts of the AAAA to improve safety performance played a major role in achieving this performance improvement.

The AAAA represents a significant number of operators participating in the sector and has embarked on a journey of improving safety performance by developing means that would enable participants to manage their aviation related safety risks effectively and efficiently, while achieving commercial objectives.

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 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 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 use their own unique management systems, such as the AIMS program developed by the AAAA, to manage the effects of risks listed in the sector's risk register.

Following initial discussions, CASA and the AAAA determined there was mutual benefit to be gained by collaborating in the validation of CASA's methodology to produce a risk profile specific to the aerial applications sector. CASA would particularly like to thank the AAAA Board for its vision in sharing in this work which provides a methodology to further improve the safety performance of the Australian aviation industry, but in particular that of the aerial applications sector.

Mr Terry Farquharson
Acting Director of Aviation Safety

Mr Phil Hurst
Chief Executive Officer, AAAA

INTRODUCTION

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 Bureau of Infrastructure, Transport and Regional Economics (BITRE) and supplemented with surveys from air operators certificate (AOC) holders and the CASA inspectorate. This data is analysed and the results compiled into a series of outputs.

Phase 1 delivers four reports that together provide information on the state of the sector. These four reports contain the documented hazards, the associated risks, a list of data sources and a comprehensive summary. Phase 2 delivers a risk register and final report which are produced jointly by industry sector participants and CASA.

Using the sector risk profile

The purpose of the aerial application 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 the AAAA jointly developed the sector risk profile through a process in which risks were jointly identified, agreed and assessed. Following the evaluation of risks, sector-wide risk treatments were again jointly identified and agreed. When fully implemented these risk treatments should reduce the risk profile of the sector. The responsibility for coordinating the implementation of the treatment measures for which industry has accountability rests with certificate holders, operators and pilots working together with AAAA and other industry bodies and groups.

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

- The definition of aerial application sector is taken to include all stakeholders involved in aerial application operations at all levels including CASR Part 137 authorisation holders and those governed by CAO Parts 20.21and 29.3.
- The existing regulatory regime for control of chemicals while loading, spraying and disposal of agricultural spraying chemicals is not considered as these issues are the subject of comprehensive regulation by other commonwealth and state agencies and legislation.

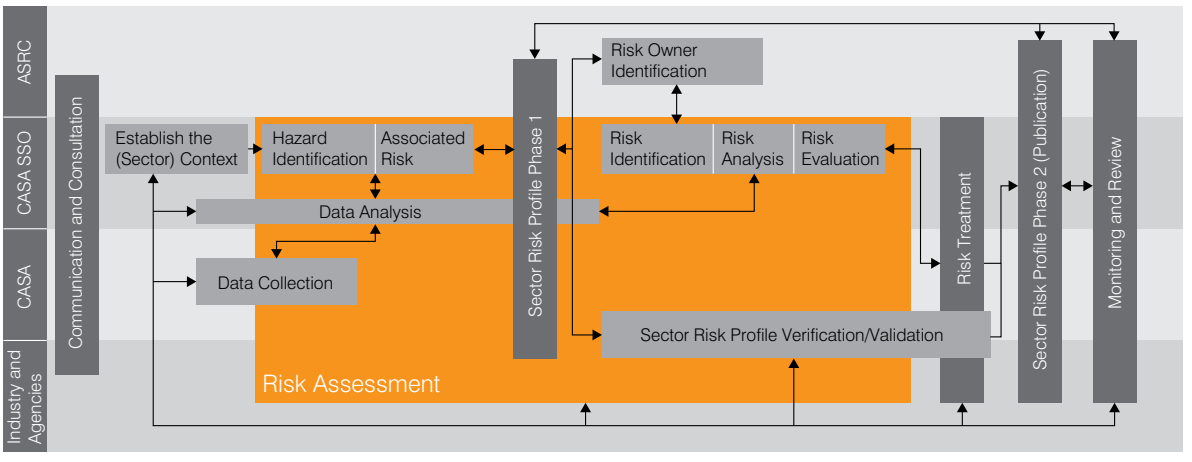
PART 1—SECTOR RISK PROFILE CONTEXT

Sector definition

The aerial application sector comprises individuals and organisations holding permissions for aerial application of chemicals, fertilisers, trace elements, seed and target specific products to enhance the production of food, fodder, fibre, forestry and bio-fuels in Australia using purpose built fixed- and rotary-wing aircraft. The current aerial application sector analysis applicable to this risk profile does not include activities such as fire bombing, oil spill control and other release activity.

(Note: these operations will be the subject of separate risk profiling activities and may result in an update of this risk profile.)

Sector risk profile process



Sector stakeholders

Short form version of the sector's risk register

Risk #	Risk Description	Risk Owner – Primary	Current Rating	Treatment Description	Treatment Owner	Residual Risk Rating	Risk Review Date
1	Loss of separation leading to a mid-air collision with other aircraft	AOC Holder	Medium	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Medium	2015
				Update AAAA operations manual (ferry procedures)	AAAA		
				RPAS/AAAA education (SEP)	CASA		
2	Collision with obstacles leads to an aircraft safety incident	AOC Holder	Medium	Power line marking AS3891	Energy Network Association	Medium	2015
				Mapping of network (register) – GPS plotting (to be advised)	Energy Network Association		
				Energy Network Association letter from CASA	CASA		
				Management of wind monitoring towers	Relevant Government authorities		
3	Loss of control leads to deviation from intended flight path	AOC Holder	Medium	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Medium	2015
4	Inappropriate landing sites not identified by inspection procedures	AOC Holder	Medium	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Medium	2015
5	Deviation from safe operation will compromise aircraft safety	AOC Holder	Medium	AIMS Initiative incorporated in AAAA AIMS to record, review and address deviations SQAT Safety Quaility Assurance Team Internal reporting systems	AAAA	Low	2015
				AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry		
				Education of government contracting agencies on aviation safety risks	CASA/AAAA/Industry		
				AIMS audit and health checks	AAAA		
				CASA review of AIMS	CASA/AAAA		
				Review Part 61/141 considering Ag application (ATO) requirements	CASA/AAAA		
				AAAA Chief Pilot Course (or industry equivalent) (setting standards and managing deviations)	AAAA		
				Incident recovery guide	AAAA		
6	Lack of awareness of safety issues (individual and/or organisational level)	AAAA CASA	Medium	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Low	2015
				Professional and industry associations membership benefits	AAAA		
				Develop arrangements to effectively share data and develop benchmarks	CASA/ATSB/Industry		
				CASA/ATSB/Industry Safety Promotion messages	CASA		
				Operations training (CASA Inspectorate understanding of aerial agriculture operations)	CASA		
7	Chemical spill inflight leading to a compromise in aircraft safety	AOC Holder	Low	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Low	2017
8	Inflight structural failure leads to a loss of control	AOC Holder	Low	AAAA Chief Pilot Course (or industry equivalent) Operator/Maintainer communication	AAAA/Industry	Low	2017
9	Inflight mechanical failure leads to an aircraft safety incident	AOC Holder	Low	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Low	2017
10	Air and ground (wildlife) strikes lead to an aircraft safety incident	AOC Holder	Low			Low	2017
11	Lack of understanding of human factors results in heightened safety risk conditions	AOC Holder	Low	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Low	2017
				FRMS reviewed for applicability to sector	CASA		
				CASA/AAAA/Industry Safety Promotion initiatives	CASA/AAAA/Industry		
12	Operating under the influence of alcohol and drugs	AOC Holder	Low	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Low	2017
				Development of an effective testing process for rural operations (exemption – micro damp)	CASA		
13	Inadequate flight planning results in a heightened safety risk and a momentary loss of the desired flight condition	AOC Holder	Low	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Low	2017
14	Loss/breach of AOC may occur leading to inability to perform aerial application functions	AOC Holder CASA	Low	AAAA Chief Pilot Course (or industry equivalent)	AAAA/Industry	Low	2017
				Effective CASA updates and communication with industry CASA review of surveillance framework	CASA		
				CASA Standards CASR Part 137 Post Implementation Review	CASA		
15	Fuel problems leads to partial or full power loss	AOC Holder	Low			Low	2017
16	A person will be harmed or experience an adverse health effect if exposed to a WHS hazard	AOC Holder	Low			Low	2017
17	Operating at night results in a heightened safety risk and a momentary loss of the desired flight condition	AOC Holder	Low			Low	2017

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 application: Sector Risk Profile Report, Civil Aviation Safety Authority, 2014'.

Sector objectives (as identified by AAAA)

- Maintain safe, efficient and innovative use of aircraft in aerial application.
- 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, over time, the reporting and analysis of incidents and accidents within the sector to inform safety responses from individuals, companies, AAAA and CASA.
- Improve the efficiency of regulation of the sector to improve responsiveness to the regulatory system, allow for innovation, permit problem solving and encourage an improved safety culture.
- Industry engagement through a risk management system that is respected and relevant to the sector.

Operating environment

As at June 2014, aerial agricultural operations in Australia were conducted by 175 authorisation holders using 311 fixed-wing and 85 rotary-wing aircraft. New South Wales has the highest number of holders closely followed by Queensland and Victoria. The average age of fixed- and rotary-wing aircraft in the national fleet was 26 years and 23 years respectively. Annual volume of activity for the sector averaged 100,000 hours in a relatively good season.

The economic performance of aerial agricultural application is affected by the prospects of the agricultural sector. The volatile nature of Australian agriculture with cycles of boom and bust, often as a result of drought and climatic changes, has a significant influence on the demand for aerial application operations. The principal crops treated for pests and diseases are cotton, rice, bananas, forestry, wheat and canola. Cotton and rice drive high usage rates for application aircraft, often in intense bursts, due to rainfall or pest pressure.

The usage rates of aircraft for aerial application services are closely related to farming activity, which in turn depends upon rainfall variation, crop seasonality, technical variation in terms of agronomy, management variation in terms of cash flow availability, and the arrival of pests. Other factors that influence aircraft usage are the outbreak of various plagues (eg mice or locusts) or the fungal disease of 'rust' in wheat. It is simply impossible to predict such outbreaks over the longer term. Most application aircraft tend to undergo inspections and heavy maintenance during the non-farming season (frequently winter) or during periods of drought.

Economic factors such as a high Australian dollar and weak global economic conditions tend to reduce primary producer income and hence demand for aerial application services. Within the sector, unsustainable pricing models by smaller operators, difficulty in obtaining funding and potential oversupply of operators have a negative impact. Major weather patterns, such as drought and floods, have a negative effect on farming income, which in turn affects the farming budget available for aerial spraying.

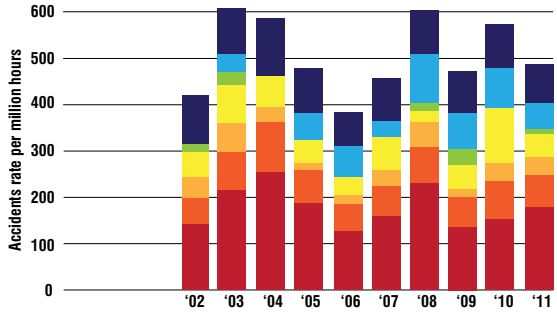
Operational

The sector is hazard rich, and as shown in Figure 1, has the highest accident rate when compared with other general aviation sectors.

This is a result of the inherent characteristics of the operation:

- very low level flying
- high workload
- negative effects from weather
- numerous obstacles in the form of:
  - powerlines
  - towers
  - trees
  - uneven terrain.
  - wind turbines

Figure 1 Accident rates in selected General Aviation Sectors

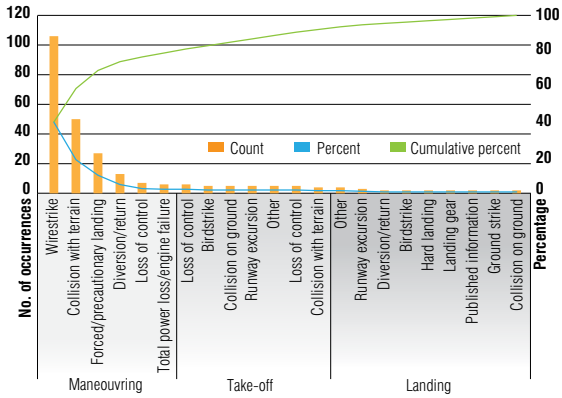


	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11
General Aviation	104.9	95.5	122.3	95.3	74.1	89.5	93.5	89.1	93.4	84.1
Survey	0	37.9	0	61.2	67	36.9	108.6	78.2	85.5	58.7
Aero-medical	14.9	29.2	0	0	0	0	13.4	36.8	0	11.3
Aerial Mustering	54.2	80.2	67.8	44.2	39	70.9	26.6	47.4	118.6	47.7
Charter	45.6	61.5	31.6	18.8	21.1	33.4	50.7	17.2	39.8	37.5
Aerial Work	56.1	86.6	109.3	70.3	55.8	65.2	81.9	67.3	81.6	70.7
Aerial Agriculture	141.3	215.1	254.5	189.5	129.6	161	230.2	136.5	154.2	179.3

Source: *ATSB Occurrence Statistics & BITRE General Aviation Activity Surveys*

As shown in Figure 2, a majority of occurrences occurred during the manoeuvring (60.27 %), take-off (9.04 %) and landing (8.49 %) phases. Wire strikes were the most common single occurrence (26.3 %), followed by collision with terrain (13.69 %). The analysis included only those occurrence types that accounted for a majority of the recorded accidents, serious incidents and incidents (over 80 %).

Figure 2 Frequency of most common occurrences during key phases of aerial application



Source: *ATSB Occurrence Data*

Due to the mission focus on the safe application of chemicals or other products, weather conditions can often lead to the deferral of an operation until appropriate weather conditions prevail. Unfavourable weather may result in a loss of productivity, client pressure on authorisation holders and, consequently, inappropriate safety trade-offs.

It is suspected that the number of occurrences in the sector is underreported, as evidenced by ATSB Report AR-2011-004. The underreporting of occurrences means that some hazards and risks may remain unidentified.

Aerial application operations have the highest occurrence rate (179 per million hours flown) and the second highest fatal accident rate (17 per million hours flown) for any type of general aviation flying. The annual cost of aerial application accidents is estimated at $11.53 million.

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. A progress report will be provided after the risk review date along with an update of the risk register.

Further reading

- Aerial application: State of Sector Report, Civil Aviation Safety Authority, 2014
- Aerial application: Sector Risk Profile Report, Civil Aviation Safety Authority, 2014 (full report)
- Aerial application: Data Sources, Civil Aviation Safety Authority, 2014
- Aerial application: Sector Risk Register, Civil Aviation Safety Authority, 2014
- Aerial Application Pilots Manual (AAPM), Edition 3
- www.aerialag.com.au

Abbreviations and terms

AAA	Australian Airports Association
AAAA	Aerial Agricultural Association of Australia
AIMS	Aerial Improvement Management System
AHSQ	AOC Holder Safety Questionnaire
AMROBA	Aviation Maintenance Repair and Overhaul Business Association
AOC	Air Operators Certificate
APVMA	Australian Pesticides and Veterinary Medicines Authority
ASRC	Aviation Safety Review Committee
ATO	Approved Testing Officer
ATSB	Australian Transport Safety Bureau
BITRE	Bureau of Infrastructure, Transport and Regional Economics
BOM	Bureau of Meteorology
CASA	Civil Aviation Safety Authority
CAO	Civil Aviation Order
CASR	Civil Aviation Safety Regulations
DIRD	Department of Infrastructure and Regional Development
ENA	Energy Networks Association
EPA	Environmental Protection Authority
FRMS	Fatigue Risk Management System
GPS	Global Positioning System
SEP	Safety Education and Promotion Division of CASA
SRP	Sector Risk Profile
SSO	Safety Systems Office
SQAT	Safety Quality Assurance Team
RPAS	Remotely Piloted Aircraft Systems
WHS	Workplace Health and Safety

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