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STATISTICAL REPORT

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Aviation

General aviation study

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Contact us

Bureau of Infrastructure, Transport and Regional Economics (BITRE)
Department of Infrastructure and Regional Development
GPO Box 501
Canberra ACT 2601
Australia

Email: bitre@infrastructure.gov.au
Website: www.bitre.gov.au

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Executive summary

General aviation (GA) is a diverse sector playing an important role in Australian aviation including in serving regional communities. The industry covers all flying activity, manned or unmanned, other than commercial transport operations. GA includes flying training, mustering, firefighting and emergency service operations, search and rescue, aerial surveying and photography, towing, and private flying.

Since 2010, total manned general aviation activity in Australia has been decreasing, but not all parts of GA have been affected. Several GA sectors, including private flying and flight training activities have experienced significant decreases since 2010, but this has been partially offset by increases in other areas, such as aerial mustering and search and rescue activity. GA activity internationally, from available data covering the USA, UK, Canada and New Zealand, also has been declining or is static.

Parts of the Australian aircraft fleet have been ageing over recent decades and the composition of Australian GA has been undergoing significant change with strong growth in ultralight flying up to 2010 and more recently, strong growth in remotely piloted aircraft systems (RPAS).

Within sectors the results are mixed. Some aviation businesses have been able to adapt to changing circumstances and grow, while others have not. Some GA businesses appear to have been created more as a way of funding the operator's passion for flying, rather than as a profit generating enterprise.

There are currently no robust economic datasets compiled for the GA sector, restricting analysis of the impact of the various cost pressures facing GA or the contribution GA makes to the economy. There are no measures of the contribution of ultralight aircraft to activities other than pleasure flying, that are traditionally undertaken by VH- registered aircraft. Nor are there complete datasets on RPAS operations, particularly those operating under the excluded category.

Experimental estimates of overall income and expenses for general aviation were compiled for this study. They suggest that the average GA business operates with a very narrow profit margin.

The key issues identified by this GA Study were:

- An aging aircraft fleet,
- Changes to operating arrangements at some airports and the effects on small aircraft operators of airports being upgraded to cater for larger aircraft,
- Aviation safety regulation, and
- Changing flying training pathways.

The average age of the most popular group of VH- registered aircraft in GA operations (small single engine aeroplanes) is 36.4 years. While they are very robust aircraft, many are beginning to develop age-related faults such as corrosion and metal fatigue, which are very expensive to repair. Most still require leaded fuel (aviation gasoline or avgas), which is becoming increasingly harder to source and more expensive, with production likely to cease over the next decade.

Changes to airport operating arrangements at some airports were raised by aircraft operators, given concerns over the impact on charging and lease arrangements. These concerns are heightened where airport operators strengthen runways to meet the needs of the largest aircraft expected to use the airport. Airport infrastructure needs regular maintenance, regardless of the amount of traffic that uses it; and runway maintenance can be very expensive. Operators of small aircraft that do not need strengthened runways may find it cheaper to relocate to smaller airports nearby.

GA sector representatives have clearly expressed concerns that aviation safety regulatory changes are having an unnecessary adverse impact on the GA sector, an issue that has been raised in previous studies of GA.

Some concerns expressed about regulatory changes include:

- the cost of some changes is too high (including where CASA has subsequently changed the nature and timing of compliance at the request of industry);
- some changes are not supported by adequate justification or reasoning;
- a "one size fits all" approach to regulation with some changes brought in for all aircraft not appropriate for smaller GA aircraft; and
- regulations should be aligned with a particular regulatory regime overseas - an issue examined in the Aviation Safety Regulation Review (ASSR) Report in 2014 but not included in the list of recommendations.

Some of the key challenges facing the GA industry adapting to changes in the economic, demographic and regulatory environment include:

- fluctuations in the cost and availability of avgas fuel;
- the maintenance of an ageing, fixed wing VH-registered aircraft fleet;
- transitioning to the increased commercial use of RPAS, with these activities replacing some traditional VH- operations;
- increased use of ultralight aircraft in aerial work activities on a self-fly basis;
- cost of pilot and maintenance training and attracting/retaining staff;
- airport leases and charges;
- the impact of regulatory changes including the outcome of a number of current CASA reviews of aviation safety regulations that apply to GA operations;
- GA business access to foreign markets; and
- lack of robust data on the GA industry and its economic and community contribution.

Some key opportunities for the industry and Government to respond to these challenges include:

- fleet renewal and use of engines with fuel requirements other than avgas, including turbine fuels and biofuels;
- industry continuing to work with CASA on ageing aircraft policies, including adoption of aircraft manufacturer manuals incorporating extended life maintenance and inspections;
- targeted measures for enhanced training and retention - pilots and maintenance staff;
- CASA progressing the outcomes of current relevant GA-related safety regulatory reviews - including fatigue management, pilot medical requirements, safety regulatory requirements for self-administering organisations (e.g. RAAus) and remotely piloted aircraft systems.

- CASA to continue to seek opportunities for harmonization of safety regulations or mutual recognition of Australian aviation industry services and products by other countries to enhance export opportunities for GA.
- examination of aviation safety regulatory fees including a review of the number of hourly rates used by CASA relative to the number of fixed fees and possible removal/reduction of certain fees for GA;
- better engagement between airport and aircraft operators on future airport planning;
- harnessing the benefits of potential multiple commercial applications of RPAS, noting that increased integration of RPAS will only occur where safety standards are maintained; and
- Government and the GA sector establishing a means of collecting comprehensive data on GA, including the sector's economic contribution, to better inform future policy development.

In conclusion, the GA industry in Australia has experienced a number of challenges, particularly since 2010, due to a combination of economic, demographic and regulatory factors. Many of these challenges are also evident in the level of GA activity overseas.

Some parts of the industry have done well over the period while others have struggled to respond to the evolving business environment.

The GA industry will need to continue to adapt to the changing nature and structure of the aviation environment to ensure its continuing safe and sustainable operation.

Introduction

General aviation is an important part of the Australian economy, supporting large-scale agriculture and emergency services, providing personal and business connection to areas not serviced by airlines, training pilots and providing a source of recreation for many amateur pilots.

However, some members of the GA community have voiced concerns over a number of years about the sustainability and viability of general aviation in Australia.

On 28 October 2016, the Minister for Infrastructure and Transport, the Hon. Darren Chester MP announced the Government's commitment to this study into general aviation in Australia.

As outlined in the Study's *Terms of Reference*, the "purpose of this study is to examine the General Aviation (GA) industry in Australia, and outline the challenges facing the GA industry and opportunities to respond to those challenges". The specific Terms of Reference for this study are to:

- Define the scope, and provide an overview of, the GA industry;
- Profile significant sectors of the GA industry, including case studies of particular GA businesses;
- Examine trends in GA activity over the past decade including amongst different types of GA operations;
- Identify the key economic, demographic and regulatory factors behind these trends;
- Undertake a comparison of the Australian GA industry with comparable aviation nations (e.g. USA, Canada, NZ);
- Outline the key challenges facing the GA industry; and
- Outline opportunities for the GA industry and Government to respond to these challenges.

This report provides the key findings of the GA Study in accordance with these Terms of Reference.

This report presents statistics on the various forms of flying activity undertaken by GA in Australia. However, comprehensive statistics on the economic health of GA were not available. To better understand the key economic, demographic and regulatory factors, a series of interviews were conducted across a wide range of GA stakeholders, across a wide range of locations.

A number of case studies are provided to illustrate the issues and in some cases, how operators are responding to the challenges.

Chapter 1: Scope and overview of the General Aviation industry

1.1 What is General Aviation (GA)?

The term 'general aviation' means different things to different people. For some, it means private flying in small CASA-regulated aircraft, while for others it includes broader aerial activities as well. All agree that it excludes commercial airline activity.

This Study uses the definition of general aviation described in International Civil Aviation Organization's (ICAO) Classification of Civil Aviation Activity (Figure 1.1). This classification was published in the ICAO Reference Manual for Aviation Statistics in 2013 (ICAO 2013).

It makes no distinction regarding aircraft size, business type, what safety regulatory regime applies, or even whether the aircraft is manned. While ICAO defines general aviation as purely a flying activity, this study has examined some non-flying activities where they provide vital support functions to GA.

A key difference between the traditional view of GA and the new ICAO classification is the treatment of air transport charter activity. Previously, small transport charter operations were considered to be part of GA. However, the new ICAO definition explicitly excludes them.

The Bureau of Infrastructure, Transport and Regional Economics (BITRE), in consultation with key aviation agencies, developed additional detail for ICAO's classification to better meet Australian requirements (Figure 1.2). This new classification was introduced for BITRE's 2014 General Aviation Survey, with the first results published in *Australian Aircraft Activity, 2014* (BITRE, 2017). For the majority of data series, there were no changes in the definitions used. However, the availability of more detailed options and comprehensive instructions appears to have led some operators to change how they report their activity. Analysis of the changes in reporting patterns is provided for each flying activity in *Chapter 2: Trends in GA Activity*, below.

Figure 1.1 ICAO's classification of civil aviation activities

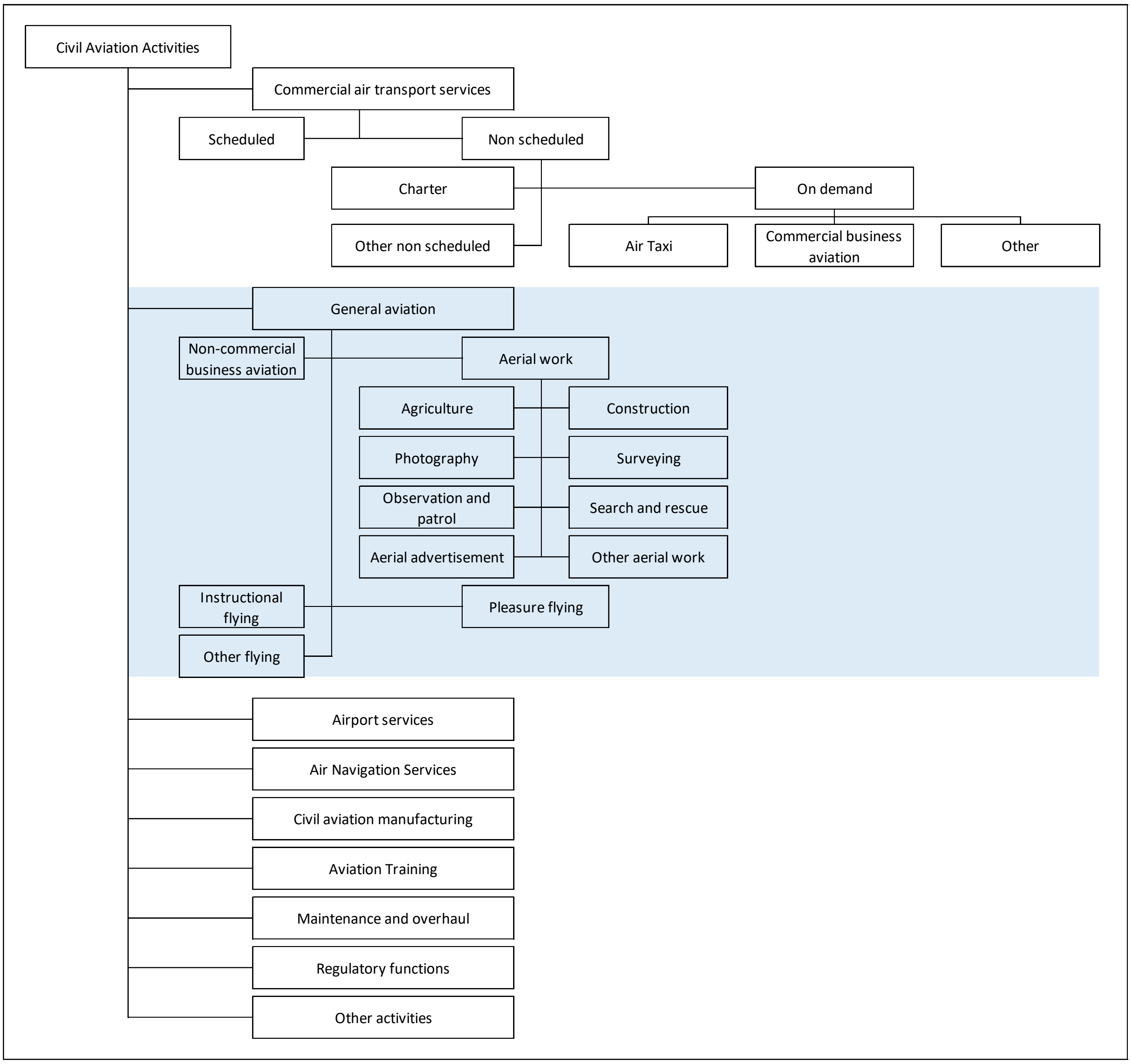
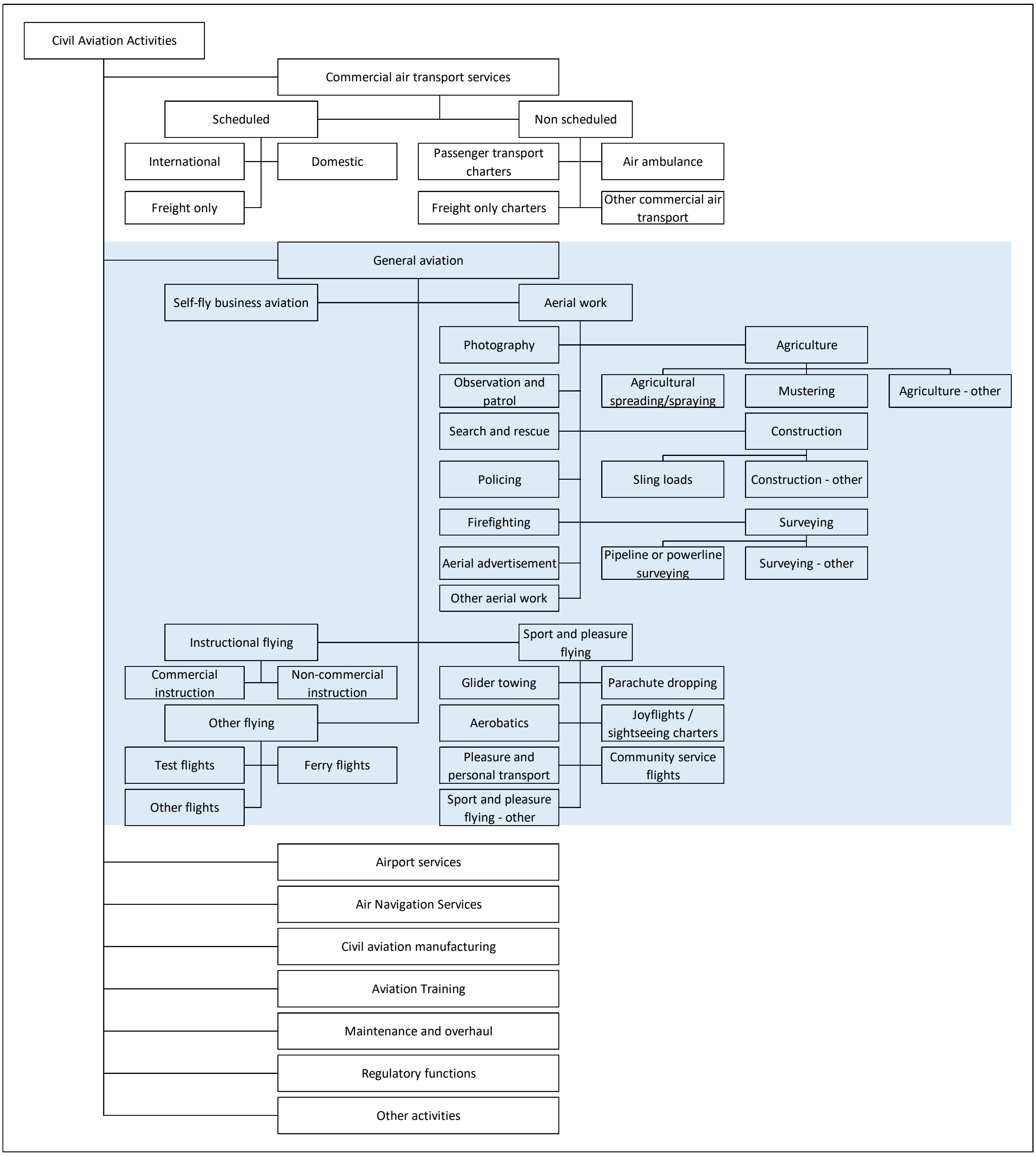


Figure 1.2 Australian classification of civil aviation activities



BITRE has taken a literal interpretation of the term ‘commercial air transport’ which only includes those flights conducted on a hire-and-reward basis that transport passengers or cargo from one location to another. Sightseeing and joy-flights that start and finish at the same location are not considered to be transport. Some smaller tourism operators that provide both transport and non-transport flights are considered to be participating in both commercial air transport and GA.

1.2 An overview of Australia's GA sector

While the quality of information on the GA sector varies greatly, the statistics presented in this report have been examined to ensure they are, as far as is practicable:

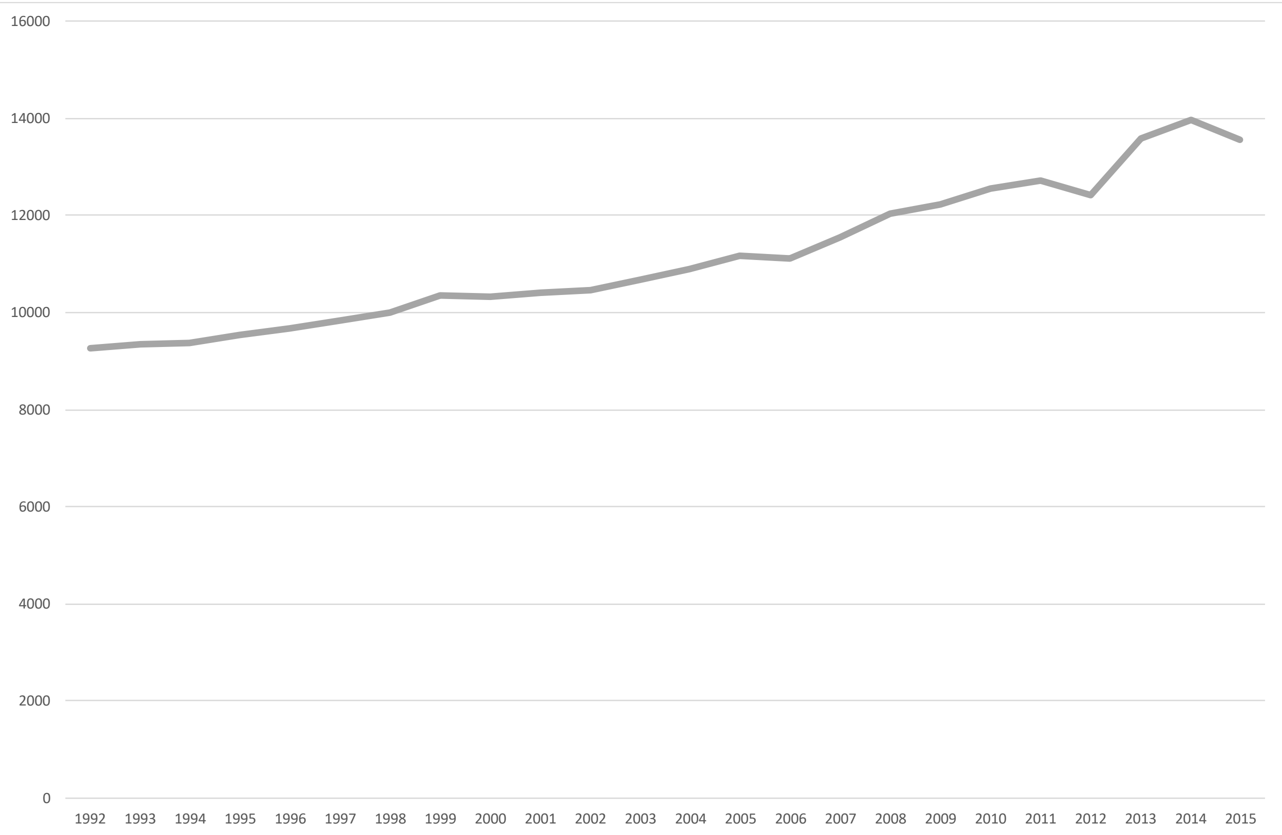
- Comprehensive - they cover a wide range of fields in GA, so that different activities can be compared on a similar basis.
- Complete - all relevant operators are included in the statistical process.
- Robust - statistical activity is conducted to the highest professional standard and response rates are at least 75 per cent of the complete population.

This overview looks at the two key elements unique to aviation; the aircraft fleet and the population of pilots.

1.2.1 The Australian aircraft fleet

The Australian aircraft fleet includes all aircraft, manned or unmanned, operated in Australia. In practical terms, this includes all aircraft registered with CASA (VH- registered) as well as all aircraft registered with Self-Administering Associations, most notably Recreational Aviation Australia Inc (RAAus). Notionally, it also includes commercial and recreational remotely piloted aircraft (RPA or 'drones'). While there is little doubt about the recent surge in popularity of RPA, both for commercial and private applications, there are currently no comprehensive statistical datasets for these aircraft and this is an area for further consideration.

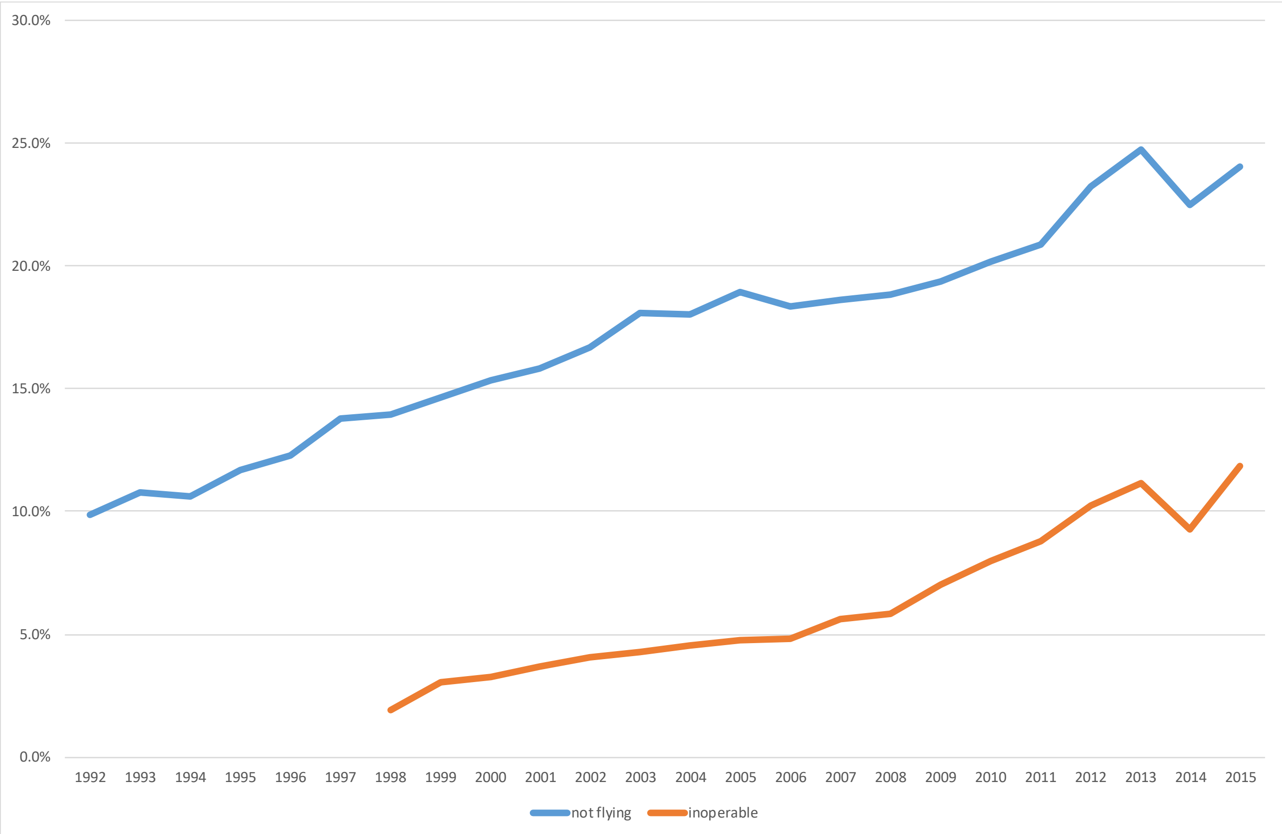
Figure 1.3 Number of Australian VH- registered aircraft



Source: CASA 2017b, Civil Aircraft Register

The number of VH- registered GA aircraft has increased steadily for many years (Figure 1.3). At first glance, this may suggest a growing GA sector, however the proportion of GA aircraft not flying has also been increasing steadily (Figure 1.4) and in 2015 was 24 per cent (2,923 aircraft) of all aircraft listed on the VH- register other than major airliners. Of the aircraft that did not fly at any time in 2015, 7 per cent were unserviceable or not airworthy, while another 42 per cent were undergoing repair, maintenance or restoration.

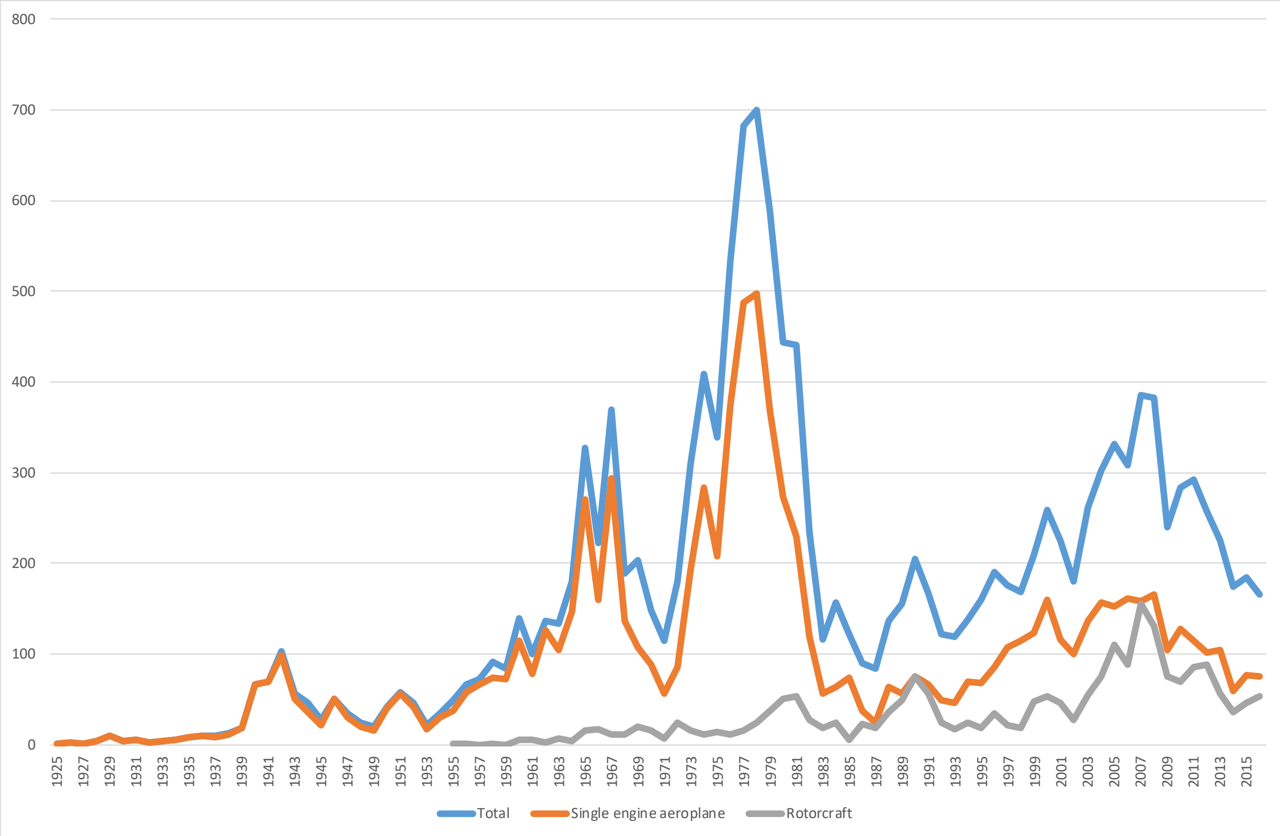
Figure 1.4 Proportion of Australian VH- registered aircraft that did not fly



Source: BITRE 2017, Australian Aircraft Activity 2015

An examination of the age profile of the VH- registered fleet as at 30 June 2017 shows the average age of the fleet at 32.3 years. Single engine aeroplanes dominate the older categories, with an average age of 36.4 years. Cessna, the most popular single engine aeroplane manufacturer on the VH- register, represents 35.6 per cent of the total, with an average age of 39.8 years. Helicopters tend to be much younger than single engine aeroplanes, with an average age of 19.3 years.

Figure 1.5 Age profile of the Australian VH- registered aircraft fleet



Source: CASA 2017b, Civil Aircraft Register

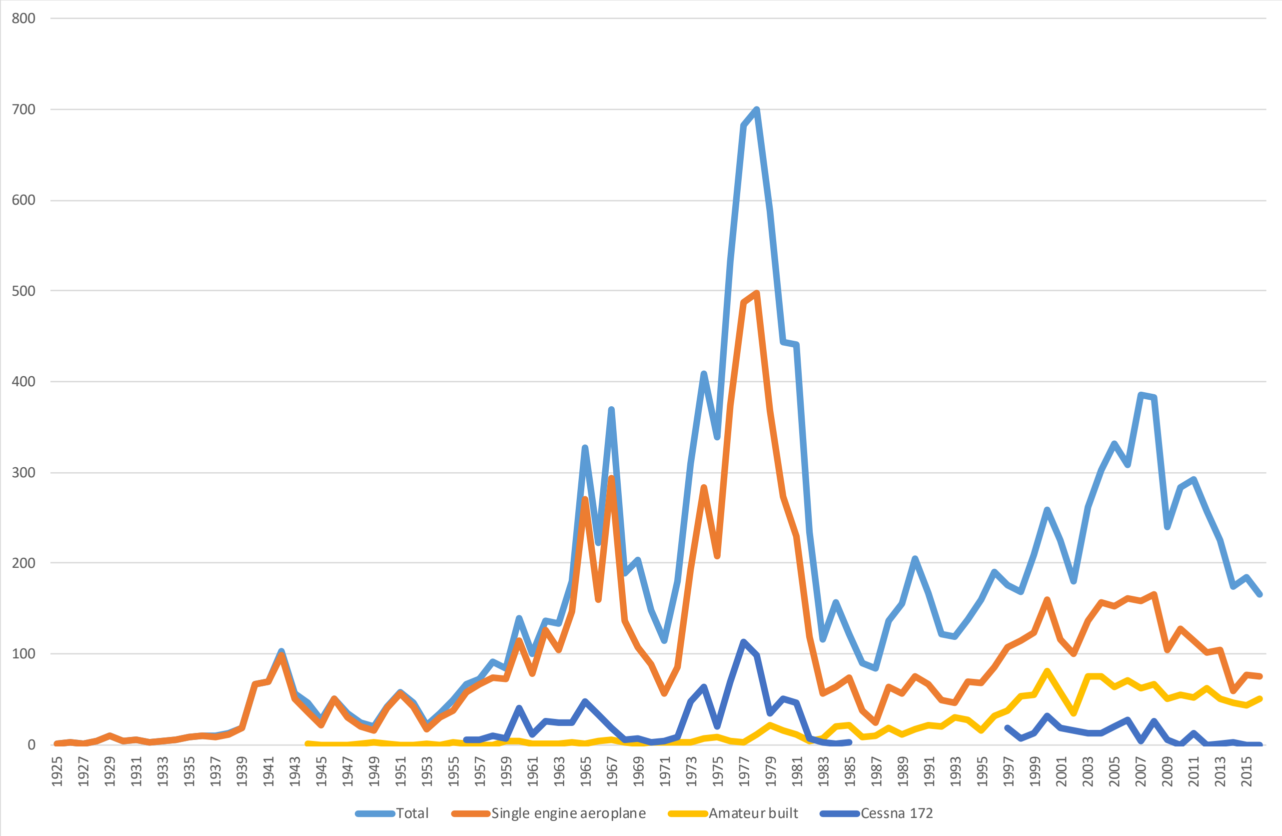
The Cessna 172 is the most popular model of aircraft on the VH- register today, with the majority of aircraft on the register manufactured at least 40 years ago.

The original type certification of the Cessna 172 took place more than 60 years ago, a little over 50 years after the first powered heavier-than-air flight. The fact that so many of these aircraft are still operating today shows that they are very robust aircraft. However, the number of recently manufactured Cessna 172s on the VH- register has declined, with the number of recently built amateur built aircraft now higher (Figure 1.6).

This ageing of the GA fleet is not restricted to Australia and is not new. By the mid-1980s light aircraft were found to be lasting longer than expected and remained operational at a much greater age than motor vehicles and even commercial airliners.

This led to a fall in the demand for new aircraft. At the same time, the increasing use of strict liability in USA courts saw manufacturers' product liability costs rising. In 1986, Cessna ceased production of piston engine light aircraft (including the Cessna 172, see Figure 1.6). Production of light aircraft resumed in the mid-1990s following the introduction of the General Aviation Revitalization Act in USA, which limited prolonged product liability on general aviation aircraft.

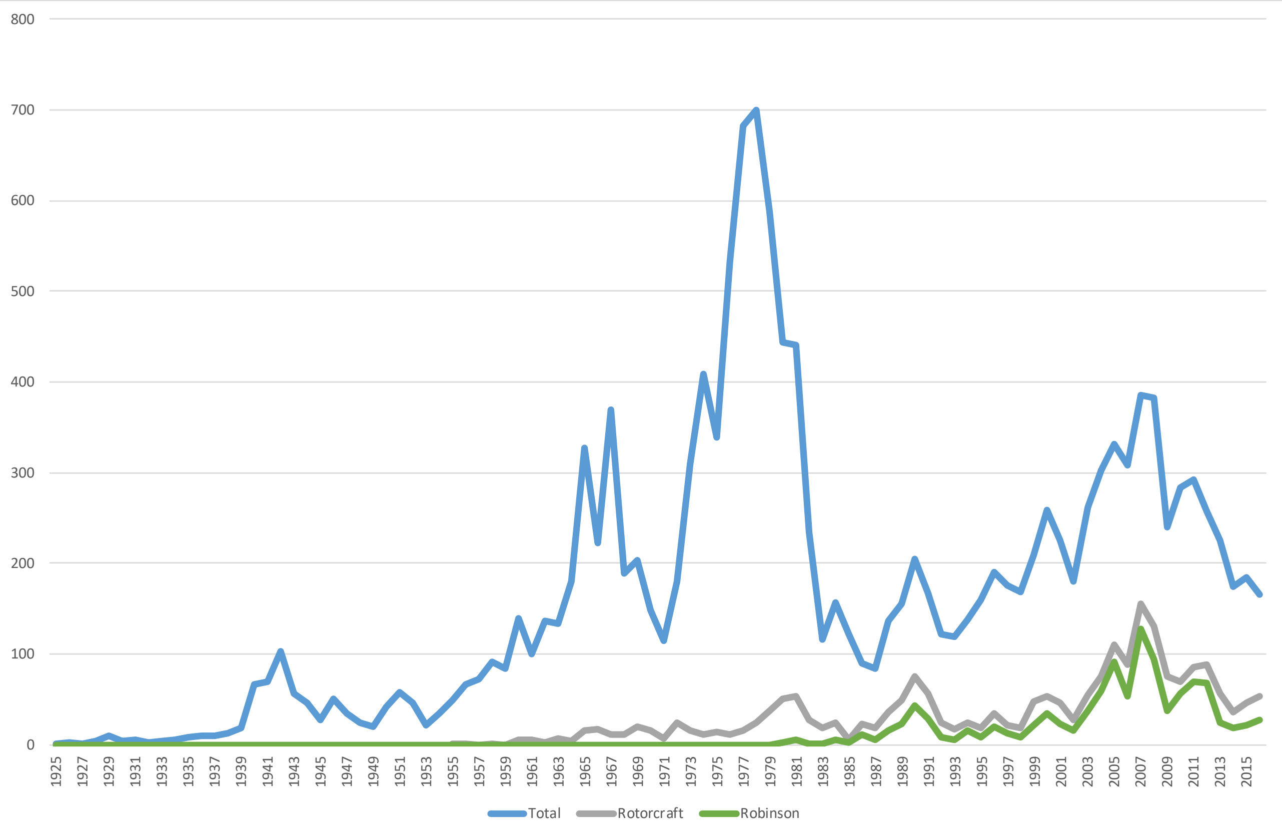
Figure 1.6 Age profile of Australian VH- registered single engine aeroplanes



Source: CASA 2017b, Civil Aircraft Register

When Cessna resumed production of their light aeroplanes Australian sales did not recover to the levels of the 1960s and 1970s. In contrast, the amateur construction of aeroplanes increased significantly, as did the popularity of helicopters.

Figure 1.7 Age profile of Australian VH- registered rotorcraft



Source: CASA 2017b, Civil Aircraft Register

For recent years, helicopters are almost as popular as single engine aeroplanes. This is clearly influenced by the popularity of Robinson Helicopters (Figure 1.7), which dominate the rotorcraft sector of the VH- register. The average age of Robinson Helicopters on the VH- register is 12.8 years.

1.2.2 Australian pilots

For manned aircraft, there is a sequence of licences and certificates that correspond to broad areas of aviation activity, reflecting the relative skill sets required. This sequence of licences provides a pathway for pilots' progression to larger and more complex aircraft. A table summarising these licences is outlined below.

Table 1.1 Overview of the licencing of Australian pilots of manned aircraft

Licence type		Summary
RPC	Recreational Pilot Certificate	RPCs are usually issued by RAAus and permit the holder to fly ultralight aircraft registered with RAAus. Medical requirements are equivalent to a normal driver's licence. Pilots are permitted to fly aircraft with a maximum of one passenger and a maximum take off weight (MTOW) of 600kg. RPC holders are not permitted to fly in controlled airspace.
RPL	Recreational Pilot Licence	RPLs are issued by CASA and permit the holder to fly aircraft up to 1,500 MTOW that are registered with CASA. Medical requirements are equivalent to a normal driver's licence (with some modifications for aviation purposes) and pilots are permitted to carry 1 passenger, although pilots with a Class 2 medical certificate are permitted to fly above 10,000 feet and carry more than one passenger. RPL holders may hold endorsements on their licence to fly in controlled airspace.
PPL	Private Pilot Licence	PPLs are issued by CASA and permit the holder to fly a wide range of aircraft, subject to them holding the appropriate aircraft class or type rating. Pilots must hold either a full Class 2 medical certificate or a Basic Class 2 (limited to flying piston engine powered aircraft carrying up to five non-fare paying passengers under visual flight rules) and are permitted to fly in controlled airspace. PPL holders are permitted to fly private operations and must not fly for hire or reward.
CPL	Commercial Pilot Licence	CPLs are issued by CASA and permit the holder to fly a wide range of aircraft, subject to them holding the appropriate aircraft class or type rating. Pilots must hold a Class 1 medical certificate for operations carrying passengers or a Class 2 medical certificate for non-passenger carrying commercial operations. CPL holders are permitted to fly in controlled airspace and are permitted to fly for hire or reward. CPL holders with a Class 1 medical certificate may fly RPT or charter operations where the aircraft is under 5,700kg MTOW (piston engine) or 3,500kg for turbojet aircraft.
ATPL	Air Transport Pilot Licence	ATPLs are issued by CASA and permit the holder to fly a wide range of aircraft, subject to them holding the appropriate aircraft class or type rating. Pilots must hold a Class 1 medical certificate and are permitted to fly passenger transport operations.

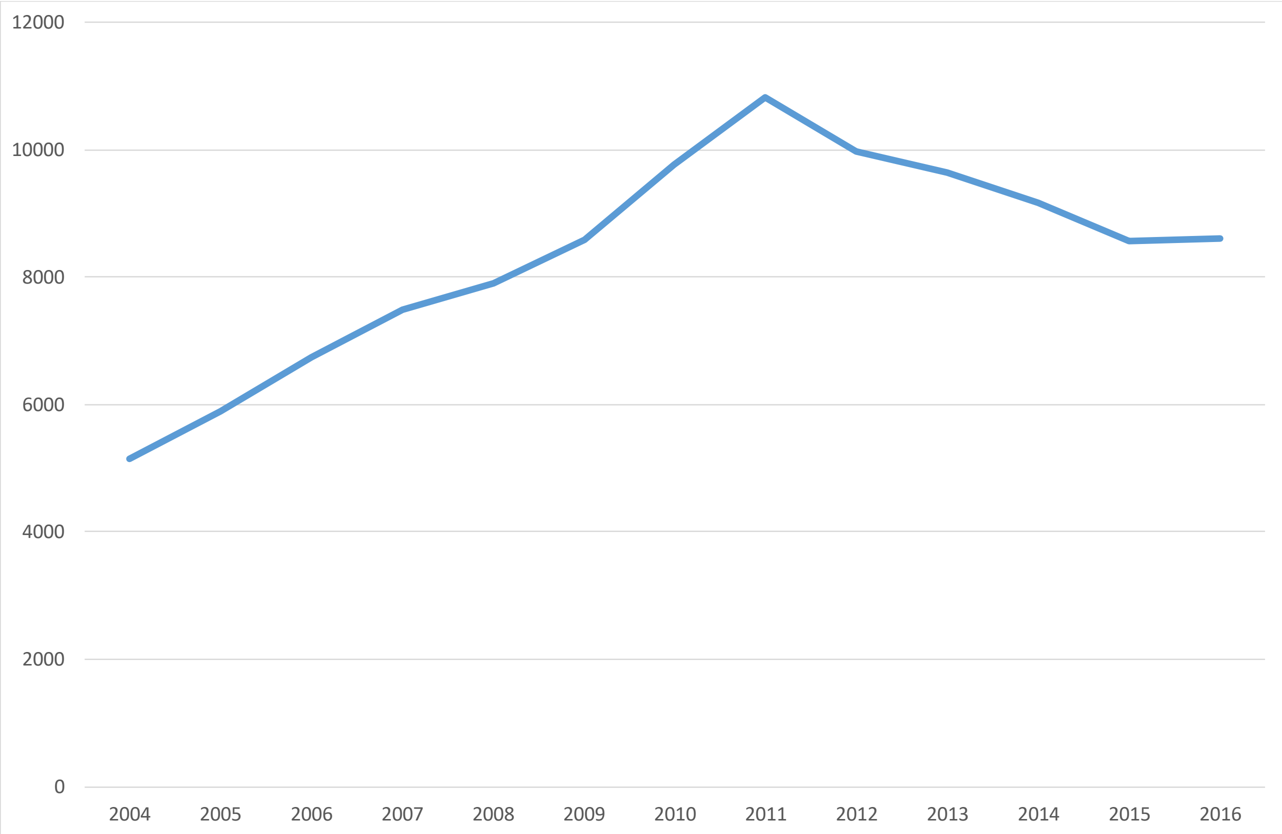
Information on Remote Pilot Licences is provided on page 19.

The most basic is the Recreational Pilot Certificate (RPC), issued by self-administering organisations such as RAAus, under an exemption to the Civil Aviation Safety Regulations. This exemption permits approved organisations to administer ultralight, recreational and other sport aircraft operations under the oversight of the Civil Aviation Safety Authority (CASA).

An RPC holder is permitted to fly a light sport aircraft in unrestricted airspace (away from congested airspace, such as the area around a busy airport or over built up areas). RPC pilots are generally not permitted to fly beyond 25 nm from their take off point, however a navigation endorsement is available that permits cross country flying.

For RAAus registered aircraft there is a limit to the maximum take off weight (MTOW) of 600kg in most cases and a maximum of 2 seats. Pilots are only permitted to fly in daylight and under visual flight conditions. The medical requirements for a RPC are roughly equivalent to the requirements for a normal driver’s licence.

Figure 1.8 Recreational pilot certificate holders



Source: CASA 2017, Custom dataset

As can be seen in Figure 1.8, the popularity of RPCs increased significantly through to a peak in 2011 and has since stabilised. There are now almost 9,000 pilots holding RPCs in Australia.

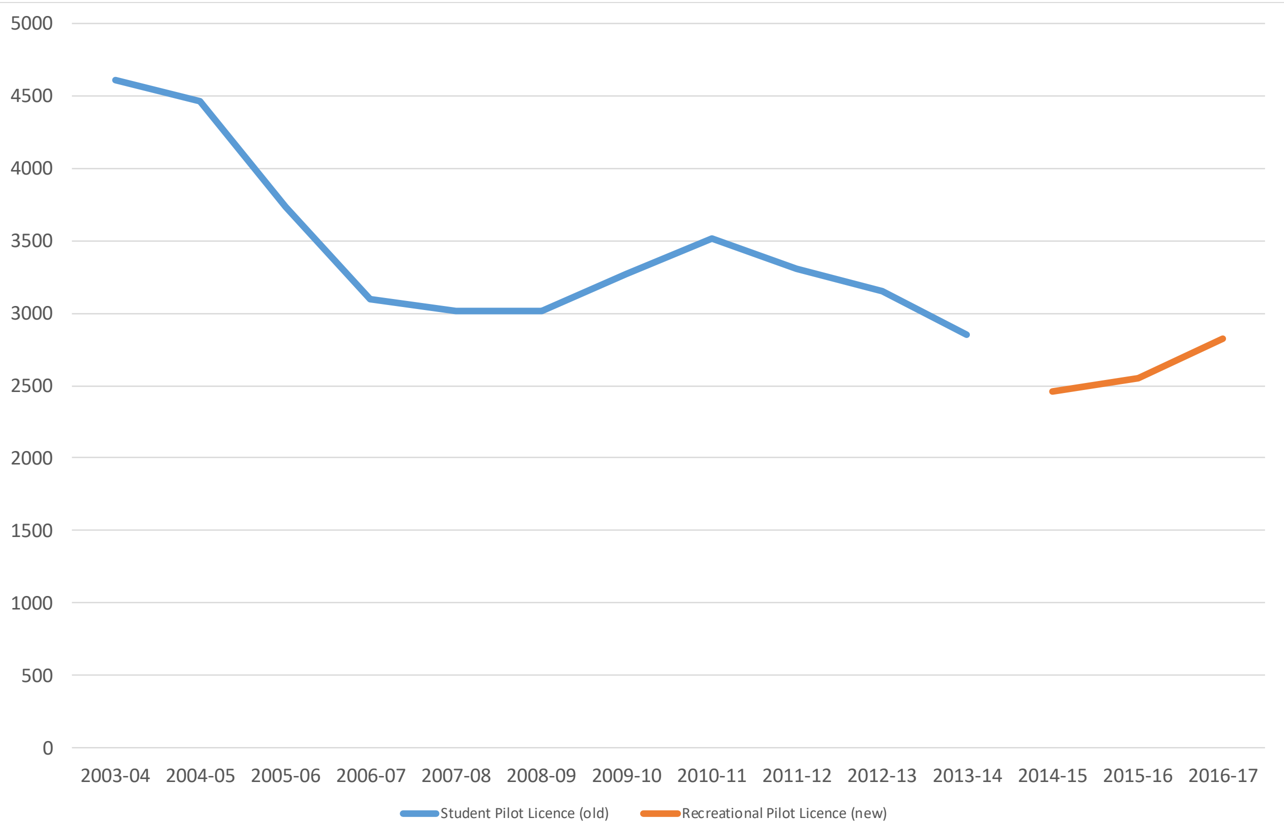
An RPC issued by RAAus is considered roughly equivalent to a Recreational Pilot Licence (RPL) issued by CASA. RPC holders seeking a RPL need only complete an application form and undertake a flight review to be granted an RPL. Pilots will automatically be granted a navigation endorsement if their RPC included authorisation to conduct cross-country flights.

RPLs are issued by CASA under Part 61 of the Civil Aviation Safety Regulations. While a RPL holder is permitted to fly light, single engine aircraft (up to 1500kg), the number of passengers carried and airspace available to the pilot will depend on the standard of their medical clearance.

Pilots with a Class 2 medical certificate are permitted to fly above 10,000 ft., and carry more than one passenger, while pilots with a Recreational Aviation Medical Practitioner's Certificate (which is roughly equivalent to an unconditional driver's licence) may only carry one passenger.

RPL holders may seek additional endorsements on their licence to permit them to fly in controlled airspace, to controlled aerodromes, use flight radio and with a navigation endorsement, fly cross-country. A pilot with a RPL is only permitted to fly in daylight hours and under visual flight conditions.

Figure 1.9 Recreational pilot licence holders

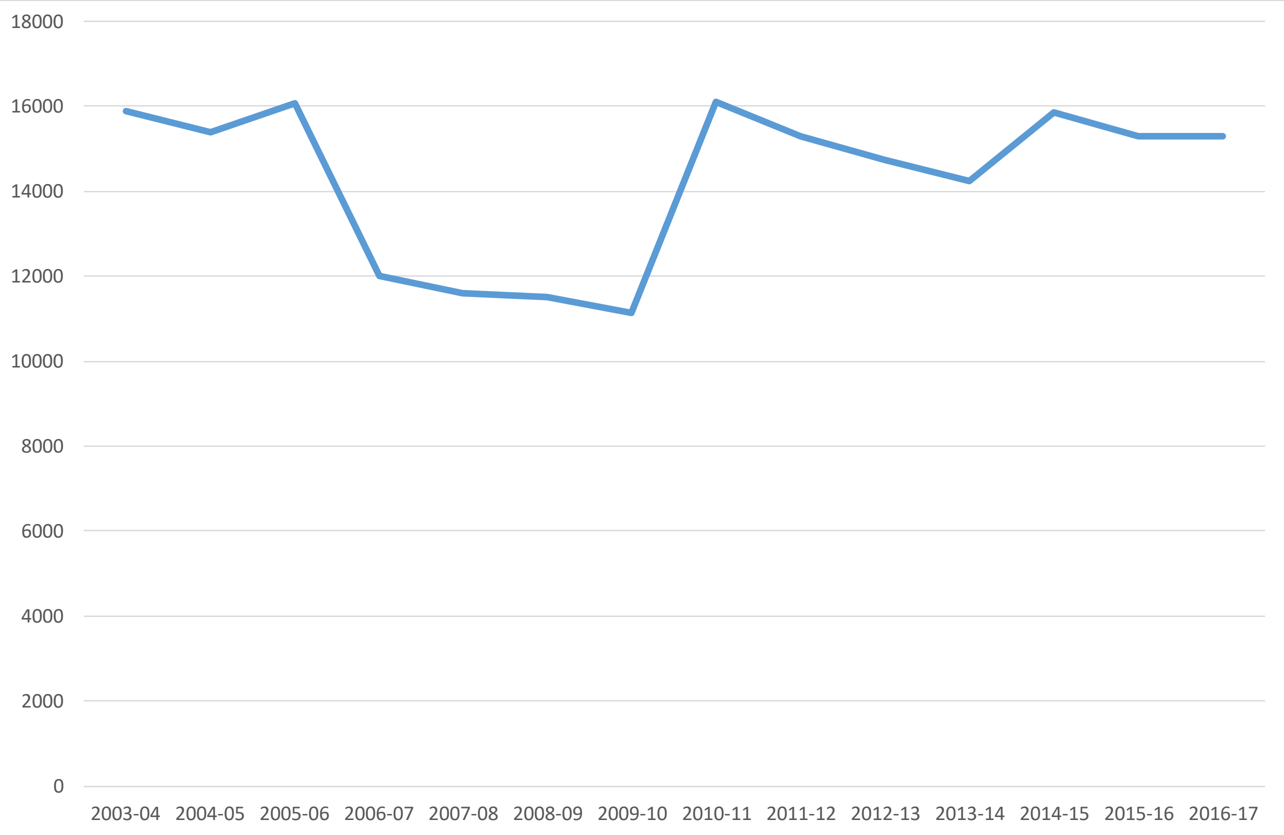


Source: CASA 2017a, Annual Report 2017

RPLs were first introduced in September 2014, replacing the old student pilot licence (with general flying progress test), which had been declining in popularity (Figure 1.9).

Private pilot licences (PPL) are issued by CASA under Part 61 of the Civil Aviation Safety Regulations. While a PPL provides pilots with the potential to fly a much wider range of aircraft, PPL holders must have the appropriate class or type rating for the aircraft they wish to fly. PPL holders are only licenced to fly private operations and must not undertake commercial activity. PPL holders with only a basic Class 2 medical certificate are permitted to carry up to 5 non-fare paying passengers.

Figure 1.10 Private pilot licence holders



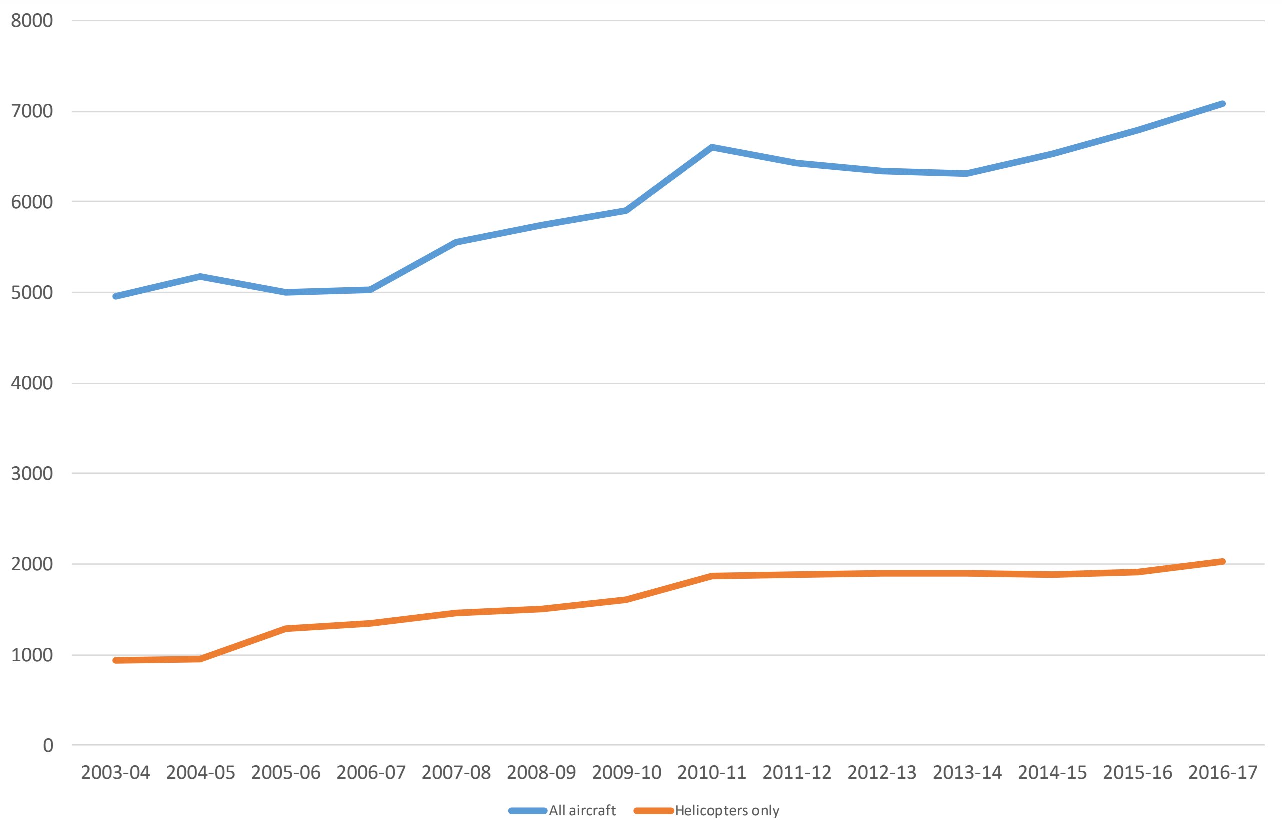
Source: CASA 2017a, Annual Report 2017

The number of PPL holders has been in gradual decline since 2010 (Figure 1.10).

Commercial pilot licences (CPL) are also issued by CASA. Pilots may conduct private and commercial operations in a range of aircraft, so long as they have the appropriate aircraft category on their CPL and class and type rating.

CPL holders are generally not permitted to fly commercial air transport operations (multi-crew aircraft in charter or regular public transport operations, single-pilot RPT operations with a MTOW of more than 5,700kg, or turbojet aircraft with MTOW of over 3,500kg). CPL holders with only a Class 2 medical certificate are not permitted to carry fare-paying passengers.

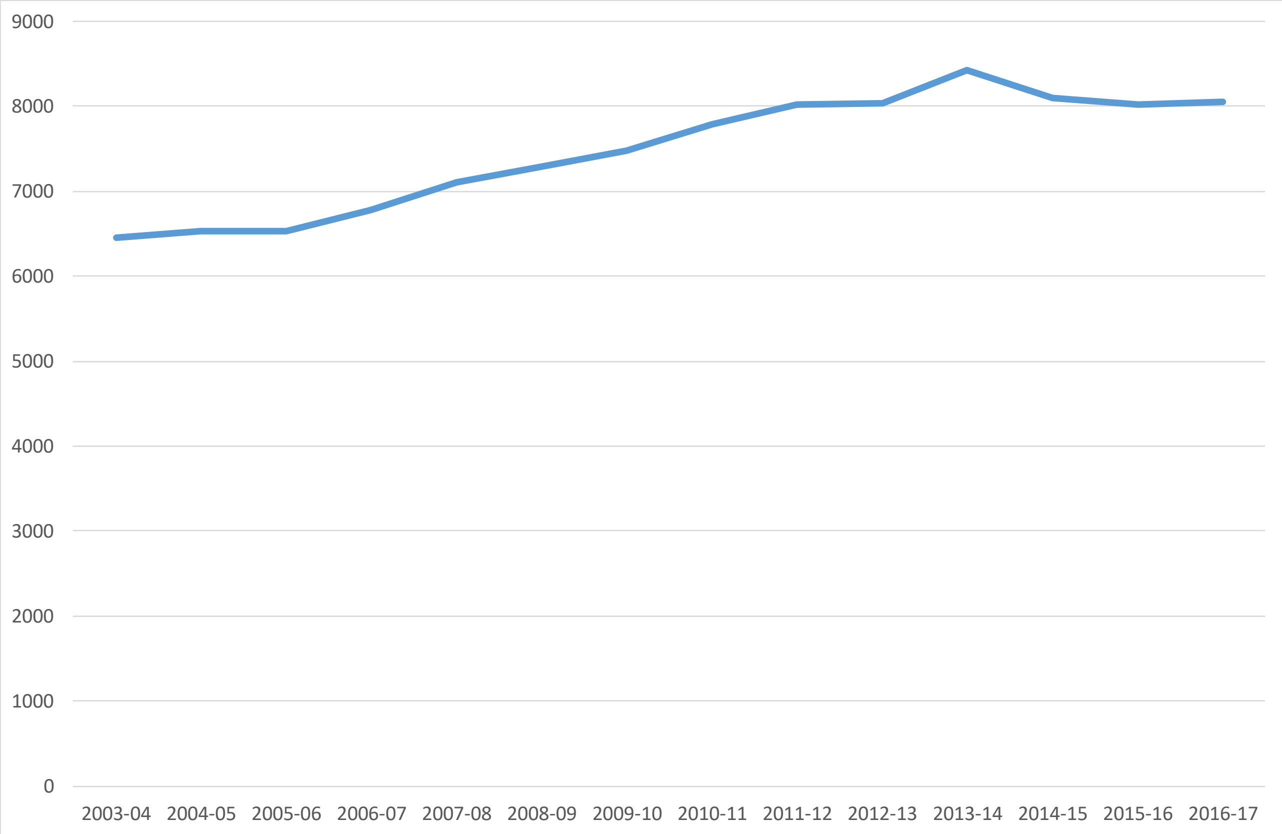
Figure 1.11 Commercial pilot licence holders



Source: CASA 2017a, Annual Report 2017

In similar fashion to the RPC holder numbers, the number of CPL numbers increased steadily through to 2011, however for CPLs the number has remained relatively static since 2011 (Figure 1.11). Commercial helicopter licences represent more than a quarter of all CPLs issued in Australia.

Figure 1.12 Air transport pilot licence holders



Source: CASA 2017a, Annual Report 2017

The number of ATPL holders in Australia grew steadily through to 2013-14 (Figure 1.12).

Having a CPL or ATPL is no guarantee of work as a pilot. Noting that some CPL or ATPL licence holders work more as managers than pilots, discussions with GA operators also suggest that many aspiring pilots fail to convert a licence into a job as a pilot.

Table 1.2 shows that on recent Census nights, around two-thirds of people holding an airplane CPL or ATPL considered their occupation was aeroplane pilot, while less than half of people holding a helicopter CPL or ATPL considered their occupation was helicopter pilot.

Table 1.2 Employed persons in aviation occupations on Census night

Occupation	2001	2006	2011	2016
Air Transport Professionals, nfd	122	135	138	167
Aircraft pilot	7449	7357	9151	9103
Aeroplane pilot		6532	8071	8000
Helicopter pilot		825	1080	1103
Air Traffic Controller	1477	1496	1568	1720
Flying instructor	602	740	852	872
Flight Service Officer	168			
Flight engineer	262			
Air Transport Professionals, nec	880	1207	1113	1152
Total	10960	10932	12821	13005
Number of current CPL and ATPL licences				
Aeroplane Pilot	10852	9736	11763	11991
Helicopter Pilot	2192	1782	2528	2730
Working rate	per cent			
Aircraft pilot	57.1	63.9	64.0	61.8
Aeroplane Pilot		67.1	68.6	66.7
Helicopter Pilot		46.3	42.7	40.4

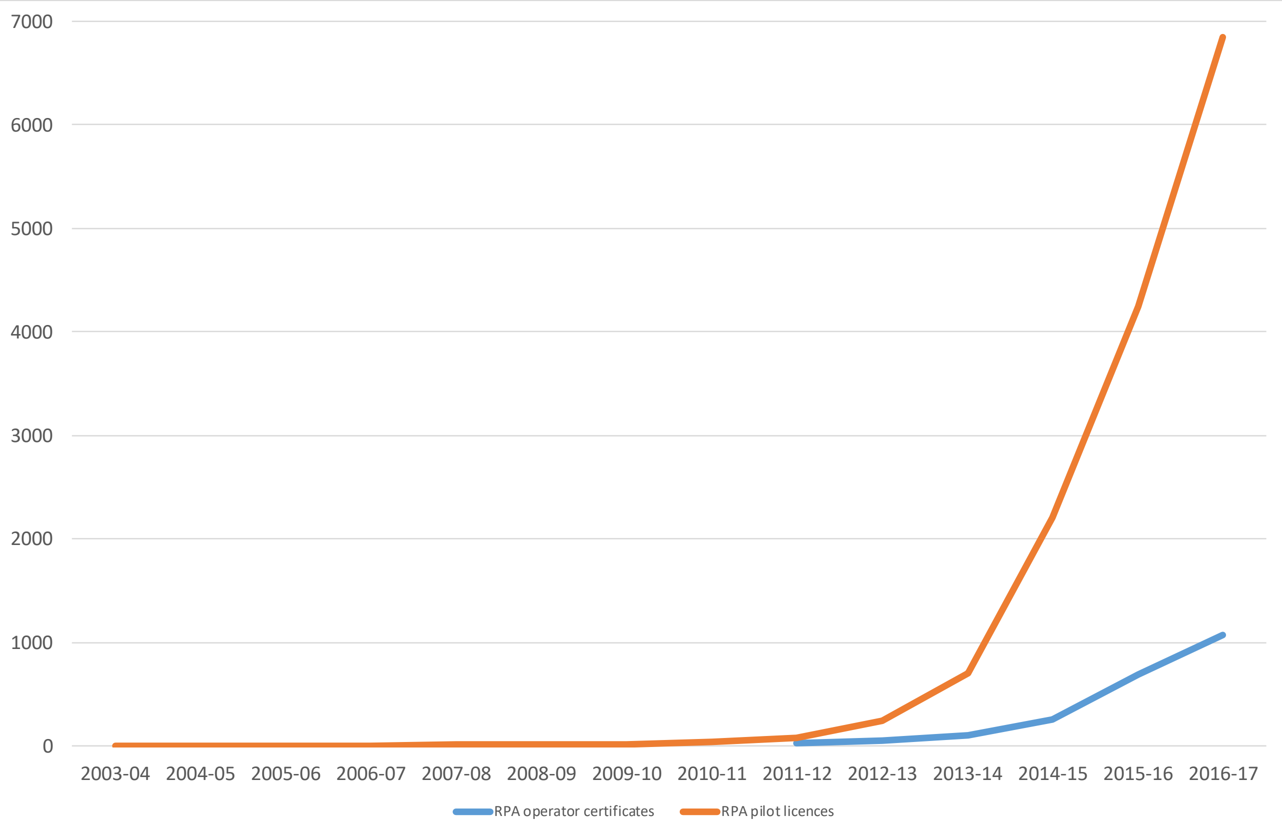
nfd: not further defined

nec: not elsewhere classified

Source: Australian Bureau of Statistics, CASA 2017a, Annual Report

Commercial operators using remotely piloted aircraft (RPA) over 2kg (or under 2kg if engaged in complex operations) are required to hold a RPA operator's certificate (ReOC) issued by CASA (Figure 1.13). There are no limits on the number of RPA pilots a ReOC may employ, but each must have a remote pilot licence if operating RPA over 2kg or in complex operations. ReOCs were introduced in 2013 (largely replacing unmanned operator's certificates, which commenced in 2002), with the number on issue experiencing strong growth in subsequent years. While it is too soon to discuss long term trends, Figure 1.13 shows the rapid take-up of RPA pilot licences (RePL) and ReOCs in the four years since their introduction.

Figure 1.13 RPA pilots and operators



Source: CASA 2017a, Annual Report 2017, custom dataset

CASA undertook the first census of commercial remotely piloted aircraft systems (RPAS) in early 2017. Results are scheduled to be released in late 2017 and means for further data gathering on RPAS operations will be important in the future.

Chapter 2: Trends in GA activity

2.1 Classification of GA operations

Statistics on the hours flown and number of landings by Australian aircraft are available in BITRE's annual Australian Aircraft Activity report. However, as outlined above in *1.1 What is General Aviation*, the classification used in BITRE surveys was updated for the 2014 survey. Detailed activity information provided below is based on the old classification to provide continuity.

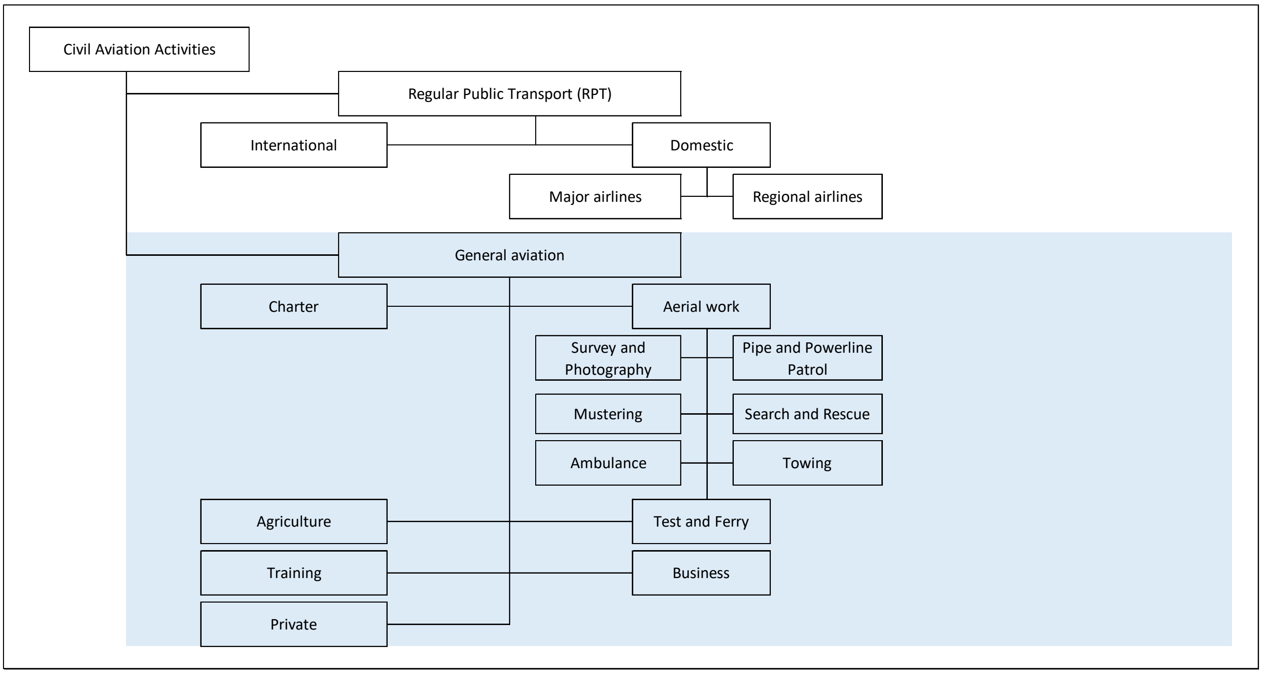
While the new classification provided more detailed options without changing the definitions used, the clearer classification structure and comprehensive instructions appear to have led to some changes in how operators report their activity.

The principle differences between the classification used prior to 2014 (Figure 2.1) and the new classification (Figure 1.2) are:

- Aerial Agriculture was not considered to be part of Aerial Work prior to the 2014 survey,
- The classification used prior to the 2014 survey had less than half the Aerial Work categories than the new classification, leading to a higher use of the other aerial work category in the old surveys.
- The new classification changed the title of the old business flying category to self-fly business aviation.

Changes in response between the 2013 and 2014 surveys were analysed. Where patterns were identified, they have been included below.

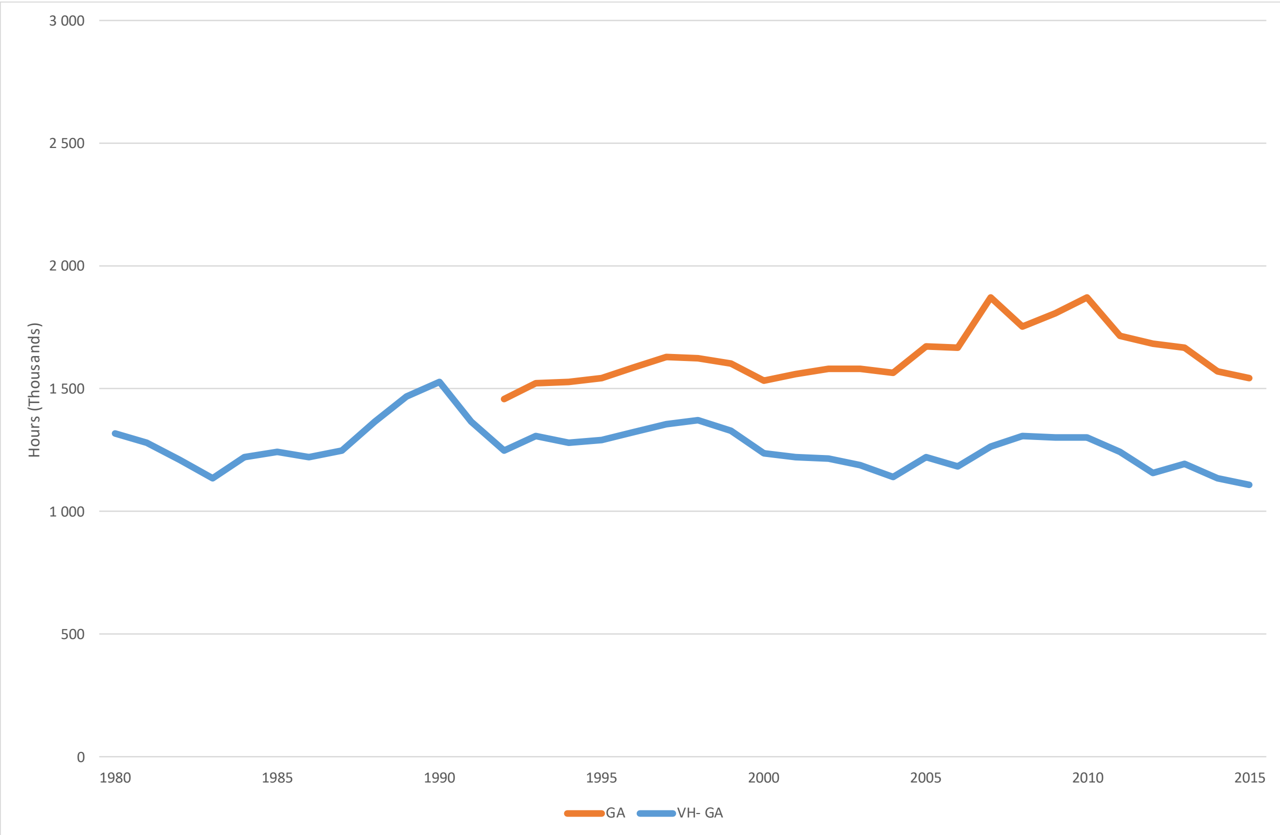
Figure 2.1 Australian classification of civil aviation pre-2014



2.2 Overview

Overall, GA flying activity in Australia has steadily increased between the early 1990s and 2010, but has since decreased (Figure 2.2). However, flying activity by VH- registered aircraft has experienced a marginally downward trend for an extended period of time.

Figure 2.2 General Aviation flying hours



Source: BITRE 2017, Australian Aircraft Activity 2015

2.3 Private flying

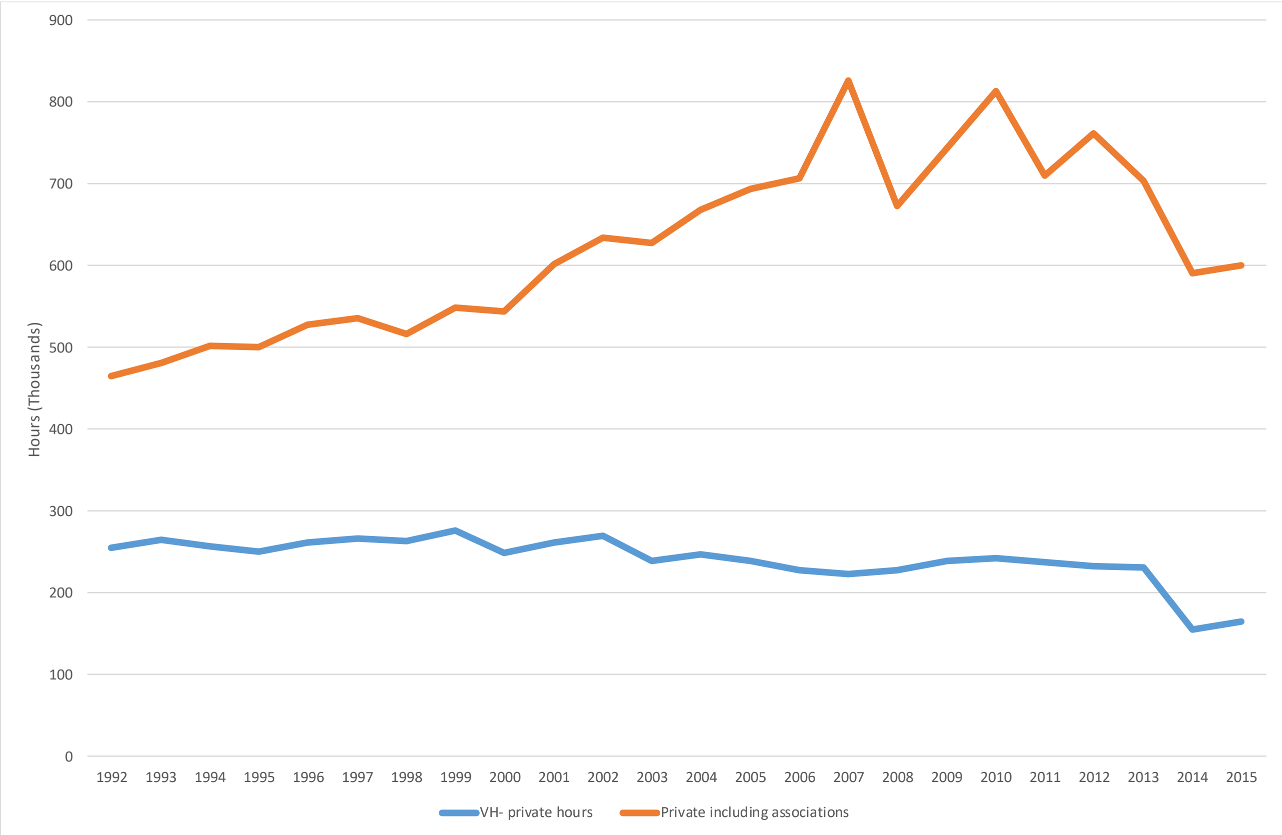
It is a CASA requirement that aircraft registered with self-administering associations only be used for non-commercial activities (excluding a small number of specific activities, including flight training, warbird adventure flights, etc.). To simplify statistical compilation, BITRE currently treats all flying activity in aircraft registered with self-administering associations as though it is private flying. In reality, in addition to commercial flight training and adventure flights, these aircraft are also used in non-commercial activities, such as self-fly business aviation, aerial mustering by property owners and glider towing.

BITRE statistics show there was a marked divergence between the private flying activity of aircraft registered with self-administering organisations and aircraft on the VH- register (Figure 2.3). Overall private flying hours experienced a strong increase between the early 1990s and 2012, while private hours flown in VH-registered aircraft gradually, but consistently, fell.

While some of the decrease in private hours flown reported in the 2014 survey may be due to improvements in the survey, it is clear that there was a significant decrease in private flying hours by VH- registered aircraft in 2014.

Self-administering organisations reported that hours flown by their members also decreased significantly in 2014, however these figures are subject to significant revision in the two years following their initial compilation.

Figure 2.3 Private flying hours flown

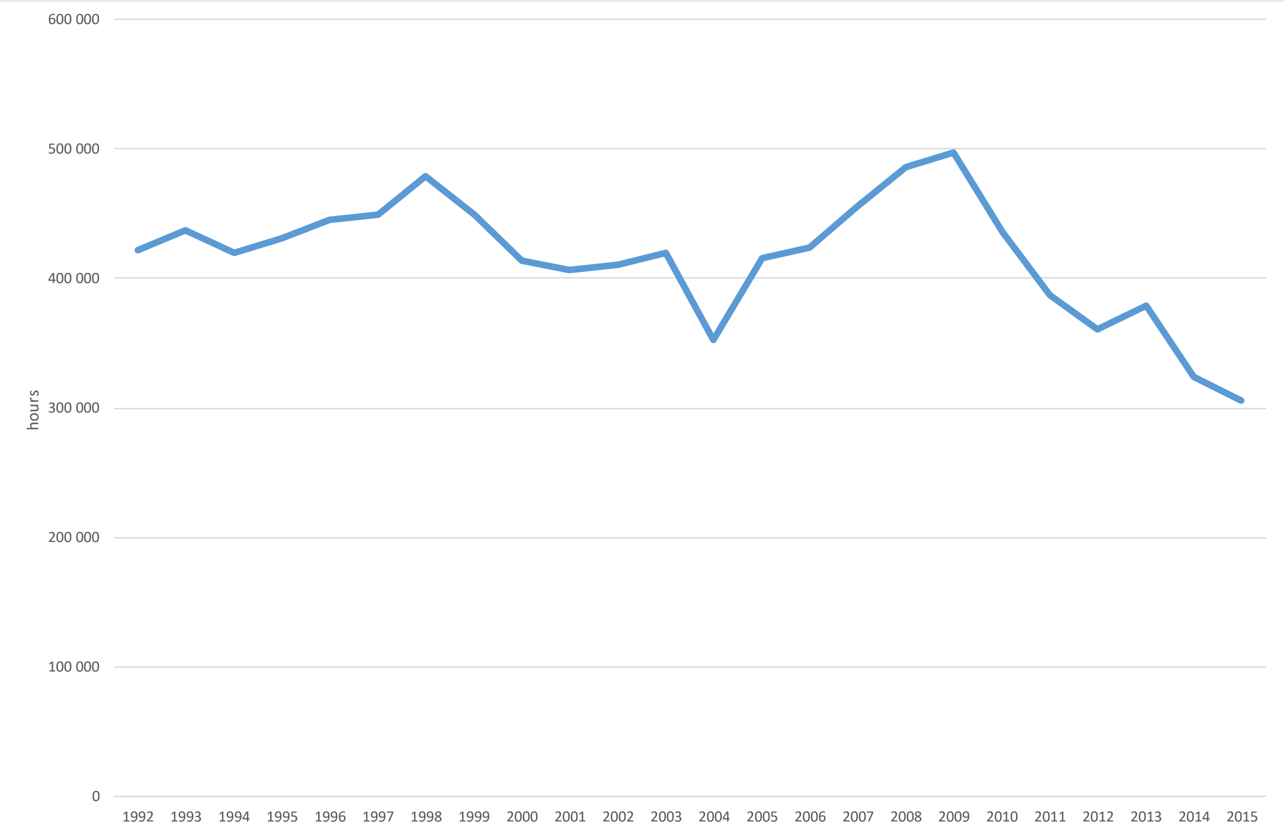


Source: BITRE 2017, Australian Aircraft Activity 2015

2.4 Training flights

Flight training hours flown by VH- registered aircraft have been falling since 2009. While several participants in this study have suggested that the introduction of new regulations for flight schools may have contributed to this decline, the regulations were introduced in late 2013, well after training hours started to fall.

Figure 2.4 Flight training hours flown (VH- registered aircraft Only)



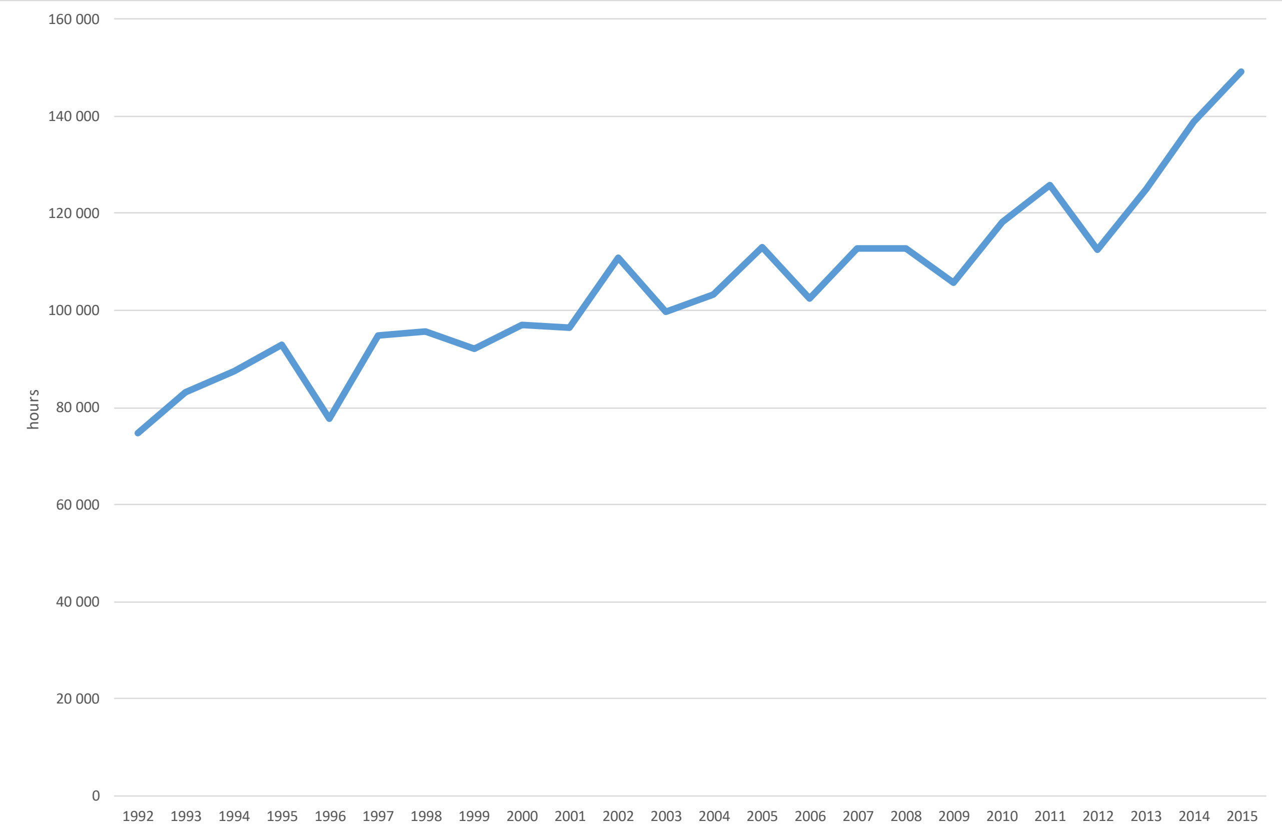
Source: BITRE 2017, Australian Aircraft Activity 2015

2.5 Aerial mustering activity

Aerial mustering activity, despite some seasonal variation, shows consistent growth since the early 1990s and strong growth over the last 3 years (Figure 2.5). In recent years, there has been little change in the number of aircraft undertaking aerial mustering, rather the average hours of each aircraft performing aerial mustering have increased.

Aerial mustering estimates presented in Figure 2.5 include mustering activity undertaken on both a hire-and-reward basis and a self-fly (non-commercial) basis by VH-registered aircraft. Figure 2.5 does not include estimates of mustering activity undertaken by ultralight aircraft registered with RAAus, gyrocopters or by RPAS operations. With several ultralight aircraft manufacturers providing mustering or 'utility' versions of their aircraft, it is likely that Figure 2.5 underestimates total aerial mustering activity and that this underestimate will increase over time.

Figure 2.5 Aerial mustering activity (VH- registered aircraft only)



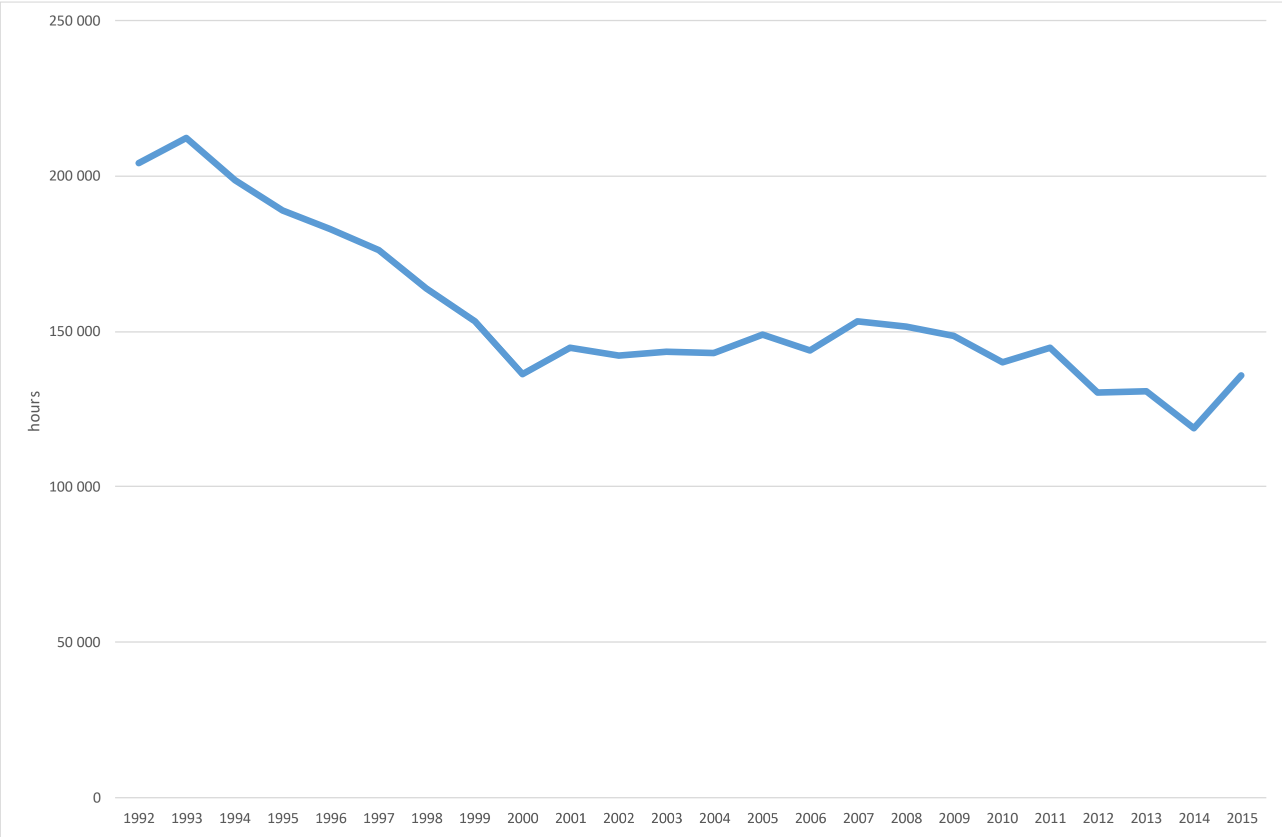
Source: BITRE 2017, Australian Aircraft Activity 2015

2.6 Business flying

There was a significant decrease in self-fly business hours flown in the 1990s that coincided with changes in the taxation treatment of aircraft depreciation (Figure 2.6). More recently, there has been a gradual decrease in business hours flown since 2009.

The flying activity presented in Figure 2.6 does not include hours flown by aircraft registered with RAAus. While there are currently no measures of the business hours flown by aircraft registered with RAAus, it is clear that this activity takes place.

Figure 2.6 Self-fly business hours flown (VH- registered aircraft only)



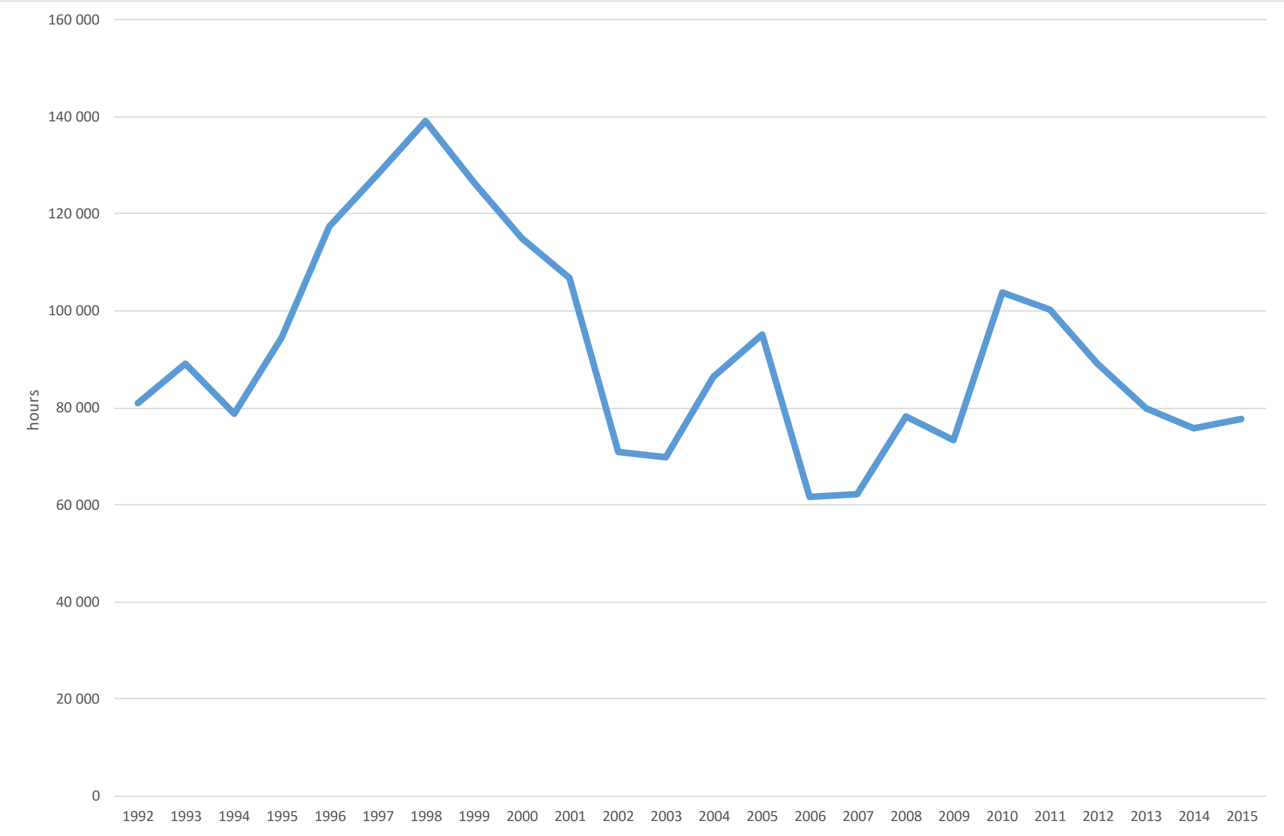
Source: BITRE 2017, Australian Aircraft Activity 2015

2.7 Aerial agriculture

Aircraft performing aerial agriculture flying show large seasonal variations in the hours flown from year to year (Figure 2.7). While in the long run, the number of hours flown appears to be decreasing, discussions with industry suggest that this is largely due to advances in chemicals and efficiencies in timing and frequency of application. In addition, the average capacity of aircraft has increased significantly in recent years, reducing the flying times required.

In many cases, aircraft used in crop spraying activity are also used to spray chemicals in firefighting campaigns alongside specialised firefighting aircraft. A separate category was introduced to the GA Survey in 2014 for firefighting. In time, aerial firefighting statistics will be an important input to analysis of the aerial application industry.

Figure 2.7 Aerial agriculture hours flown (VH- registered aircraft only)

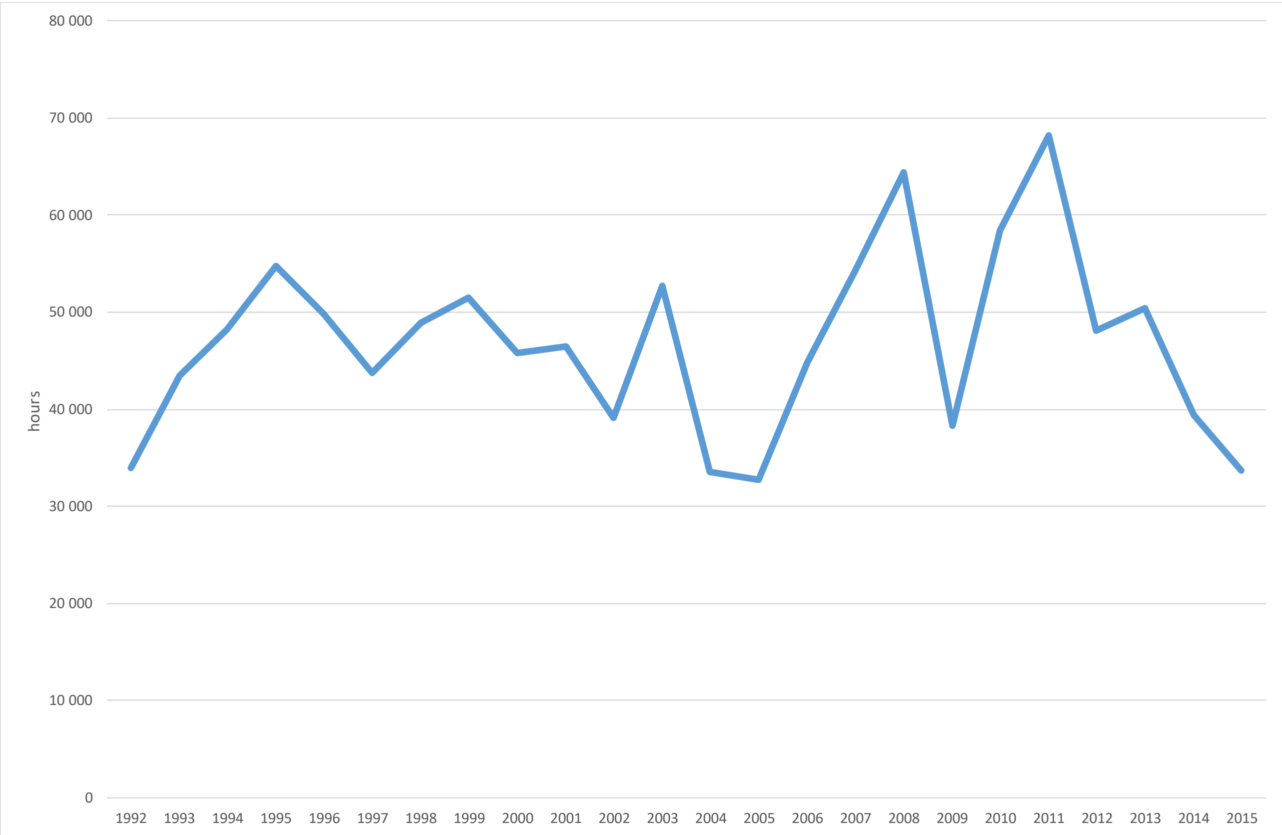


Source: BITRE 2017, Australian Aircraft Activity 2015

2.8 Survey and photography flights

Hours flown in survey and photography flights are highly variable from year to year (Figure 2.8). In recent years, significant aerial photography activity has been undertaken by RPAs, which is not included in Figure 2.8. While it is not clear if RPA activity is in addition to manned activity or a substitute for manned activity, it is clear that there has been a rapid increase in the number of commercial RPAs operators (see Figure 1.13).

Figure 2.8 Survey and photography hours flown (VH- registered aircraft only)

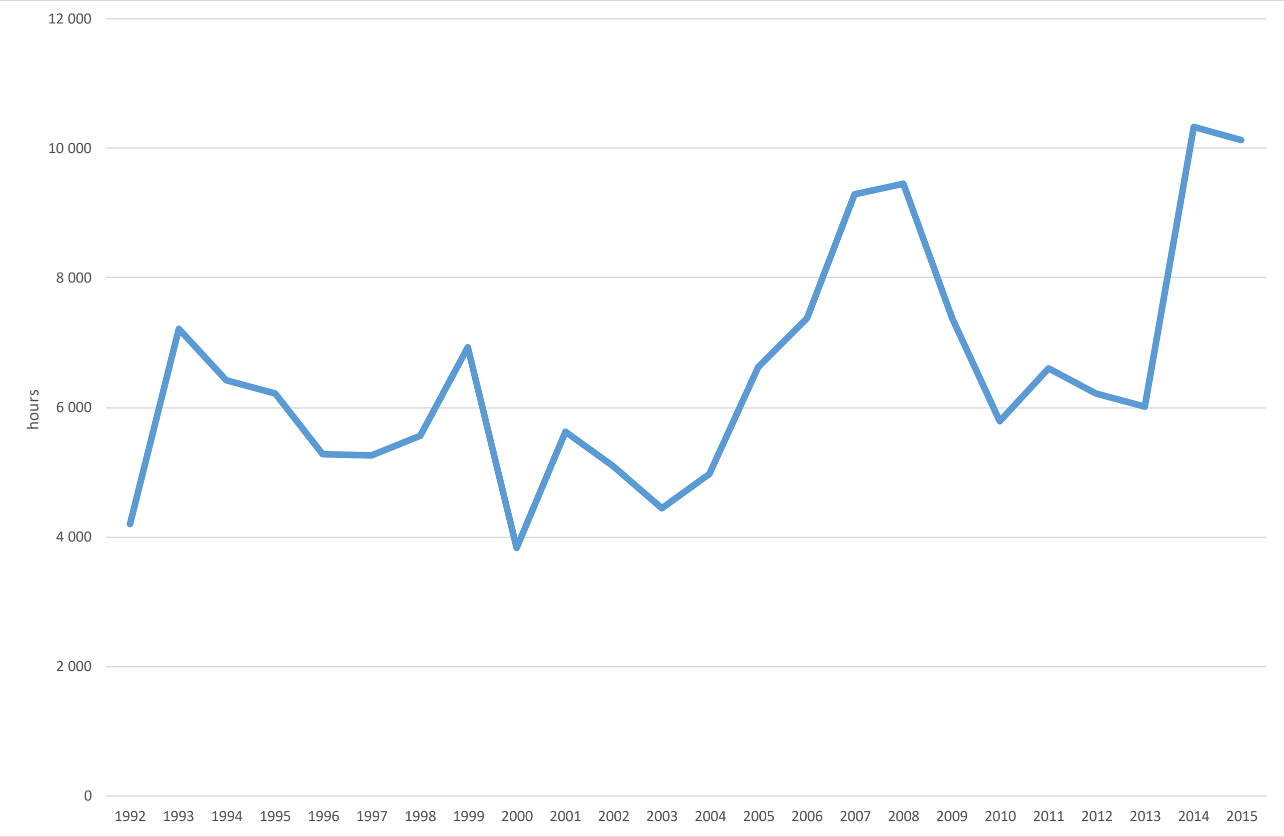


Source: BITRE 2017, Australian Aircraft Activity 2015

2.9 Search and rescue activity

While varying significantly from year to year, hours flown on search and rescue operations have been trending upwards since the early 1990s (Figure 2.9). Study participants reported an increasing number of search and rescue aircraft based at major secondary airports near urban centres, where the airport infrastructure meets the needs of the larger aircraft.

Figure 2.9 Search and rescue hours flown (VH- registered aircraft only)

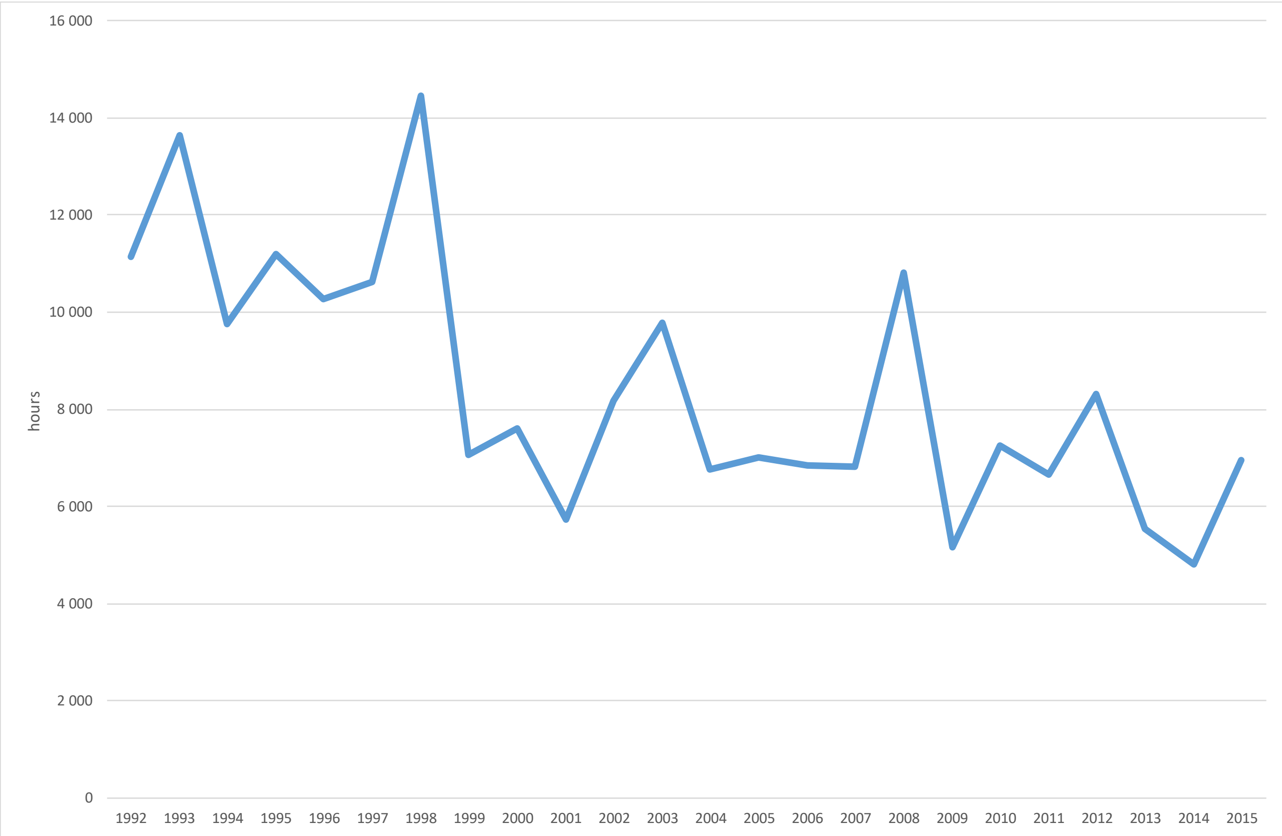


Source: BITRE 2017, Australian Aircraft Activity 2015

2.10 Towing

The amount of hours flown while towing varies significantly from year to year, however towing has shown a generally decreasing trend since the early 1990s (Figure 2.10). Interviews with glider pilots suggest that a significant proportion of glider towing activity is now being undertaken by ultralight aircraft registered with RAAus. With activity data for RAAus registered aircraft not included in Figure 2.10, it is possible that recent decreases in aerial towing activity reflect a shift from VH- registered tow aircraft to RAAus aircraft, rather than a general decline in towing activity.

Figure 2.10 Aerial towing hours flown (VH- registered aircraft only)



Source: BITRE 2017, Australian Aircraft Activity 2015

Chapter 3: Key economic, demographic and regulatory factors

3.1 Economic factors

There are currently no robust, comprehensive economic measures of GA in Australia.

Most Australian economic statistics that provide industry detail use the Australian and New Zealand Standard Industry Classification (ANZSIC) – a modified version of the International Standard Industry Classification. The ANZSIC provides an "Air and Space Transport" category (analogous to ICAO's "commercial air transport" category) within the "Transport and Storage Division", however GA is scattered over a number of ANZSIC industry classes, including "Services to Agriculture", "Surveying and Mapping Services", "Fire Protection and Other Emergency Services", etc.

To help inform this study, two data collection exercises were conducted to develop an insight into the economics of GA.

In the first exercise, a small number of GA businesses provided a percentage breakdown of the operational expenses their businesses face:

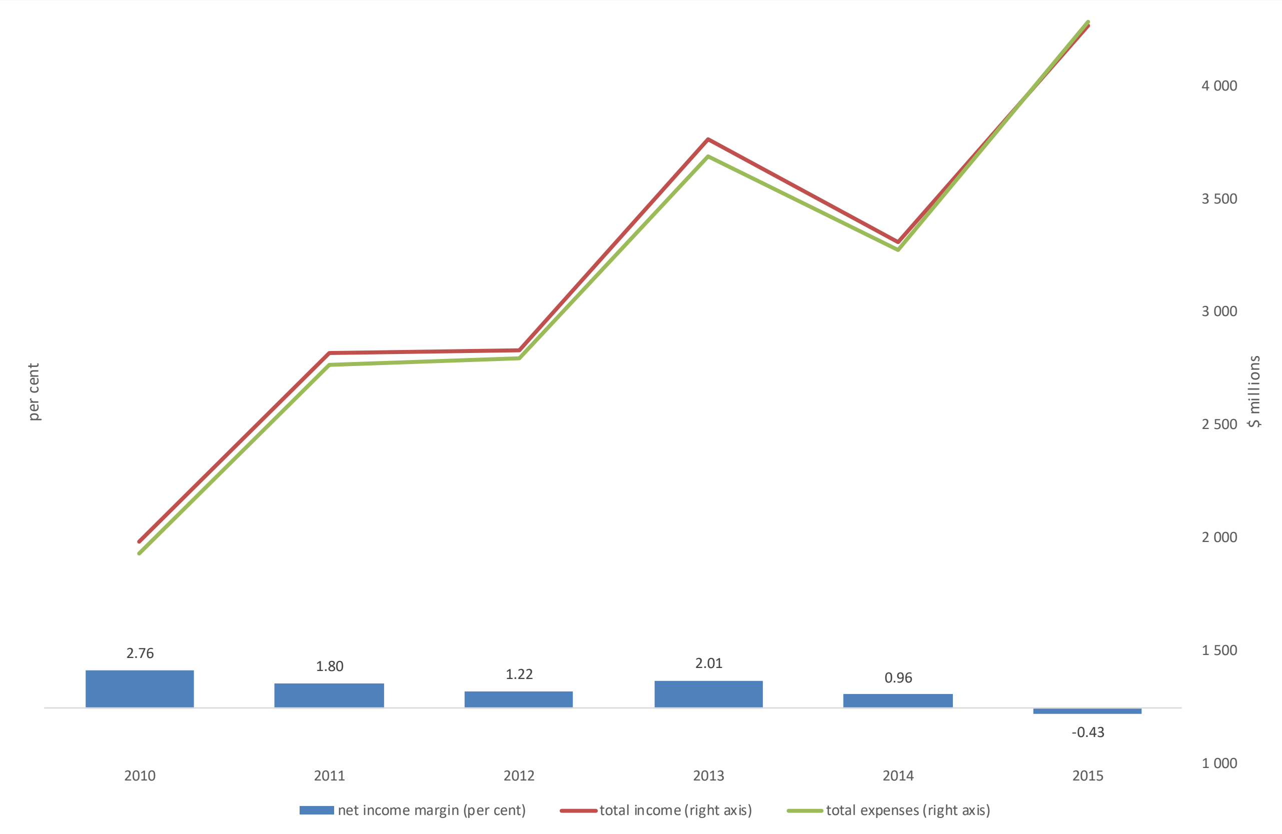
- Wages (45%)
- Maintenance (19%)
- Fuel (16%)
- Rent including airport lease costs (8%)
- Aviation Agencies (CASA/Airservices) (4%)
- Finance, including aircraft leases (2%)
- Airport landing fees (2%)
- Insurance (2%)
- Other, including utilities, rates, bookkeeping, etc. (3%).

The major costs for GA aircraft operators are wages, fuel and maintenance. VH- registered operators reported that while the fees charged by CASA were relatively small, the true cost was higher as additional wages and administration costs are required to achieve regulatory compliance in areas such as flight crew licencing, flying training and maintenance.

The study also looked at overall income and expenditure for GA businesses compiled by matching CASA's list of approved operators and licensed repair and maintenance organisations to income and expenditure data held by the Australian Taxation Office (ATO). On this occasion, CASA was not able to share the full list of approval holders due to privacy concerns. Instead, BITRE collaborated with ATO to run a key word search on businesses' description of their main activity.

This collaboration yielded experimental estimates for total income and expenditure for predominantly GA businesses, which are presented in Figure 3.1. These estimates suggest that GA businesses averaged less than 3 per cent profit margins in tax years 2010 through to 2014 and averaged a marginal net loss in 2015. To provide context, Figure 3.2 presents ATO income and expenditure data for all Australian businesses, showing average profit margins closer to 9 per cent.

Figure 3.1 Experimental income and expenditure estimates for GA business



Source: ATO 2017, Custom dataset

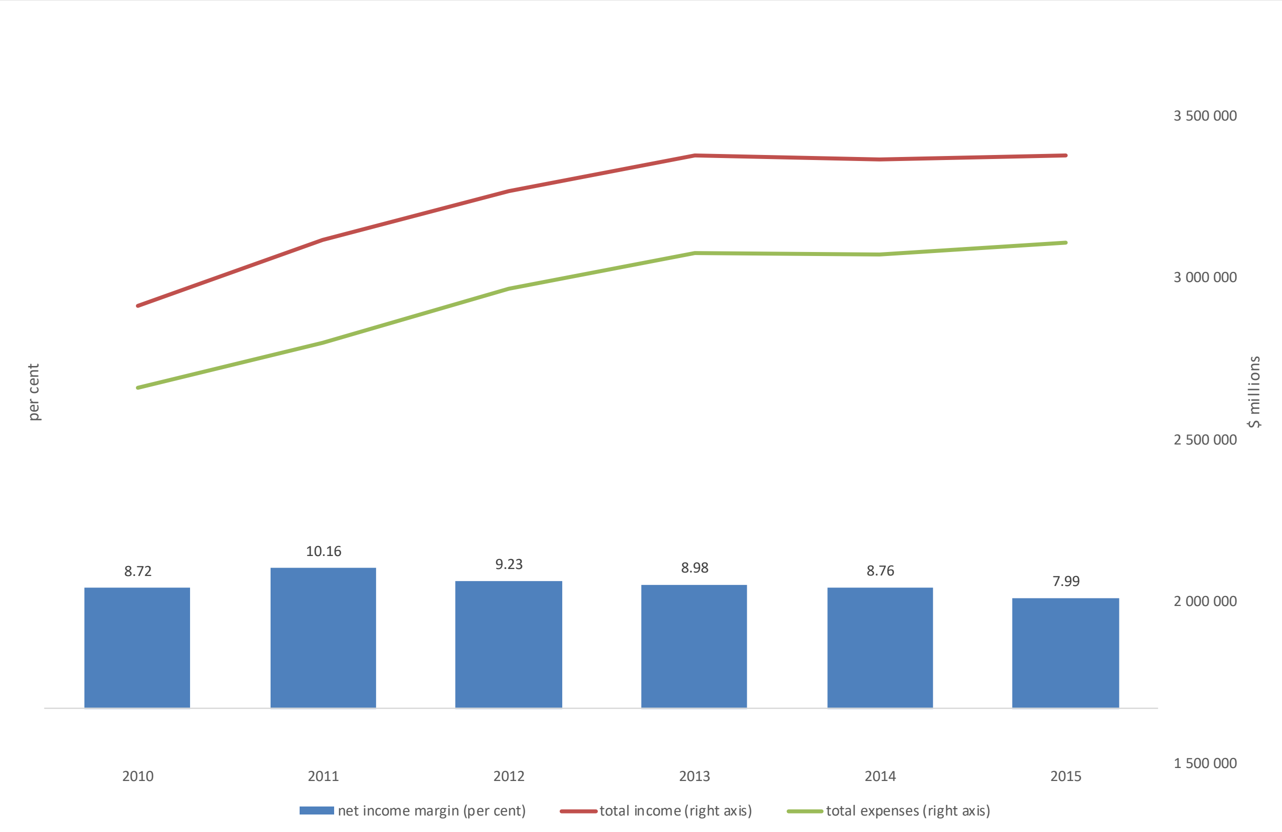
This collaboration proves the feasibility of matching CASA lists of GA businesses to ATO records. However, such an exercise would not provide a complete measure of the contribution of GA to the Australian economy.

It would not include the economic benefit of non-commercial (self-fly) aviation to other industries (e.g. a farmer using his own helicopter to muster livestock on his own property, or a vet using her own aircraft to provide a remote consultation). Nor would it include the economic benefit to households (e.g. a regional family flying to town for groceries instead of a lengthy drive by road).

ICAO is currently developing statistical standards to compile estimates of the economic contribution of aviation through its Aviation Data Analysis Panel. The outcome of this activity would be a valuable starting point for the calculation of the economic contribution of GA to the Australian economy.

General economic conditions, including increasing fuel prices, are likely to have had a significant impact on the number of hours flown by GA. In more conservative economic times, aviators may find they have less discretionary funds available for pleasure flying. Similarly, when fuel prices are high, aviators may find their discretionary funds buy fewer flying hours.

Figure 3.2 Australian Taxation Office total business income and expenses



Source: ATO 2017, Custom dataset

In addition, advances in Australia's road network, advances in car technology and the use of email instead of the postal service may also result in aviators flying less.

Figure 5.2 provides a graphical representation of the hours flown by GA in USA, UK, Canada, NZ and Australia, while Figure 5.3 provides central bank monetary policy interest rates for the same five countries as a proxy for general economic sentiment in each country. Comparing the two charts, it would seem that there is a relationship between general economic conditions in an economy and the level of GA activity.

While Australia and New Zealand have generally enjoyed more favourable economic conditions than USA and Canada over the last fifteen years, Australian interest rates decreased significantly from 2010. Similarly, GA in Australia experienced a slight increase in activity up to 2010, but has decreased since.

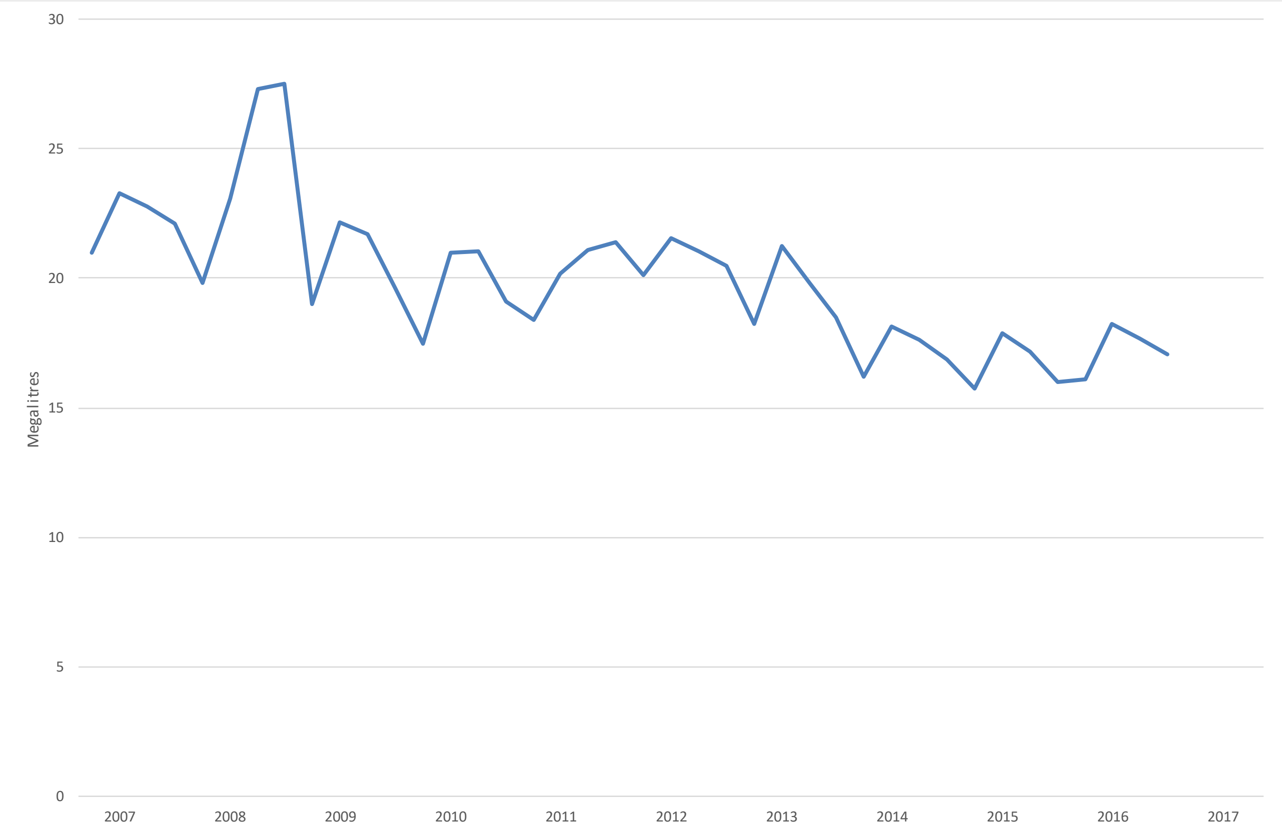
A small number of newer light aircraft use diesel or Jet A1 fuels, which is readily available at most airports. However, the majority of small piston engine aircraft in Australia use aviation gasoline (Avgas), which is generally more expensive than Jet fuel.

Avgas is a high-octane fuel developed in the 1940s that has a relatively low vapour pressure that remains in liquid state at high altitudes. Tetraethyl lead (TEL) is added to the fuel to achieve the required (high) octane rating, however it was phased out of automotive gasoline in Australia in the 1980s. There is only one company globally that legally produces TEL, which places it in a monopoly position.

Falling demand has resulted in Avgas being produced in discrete batches, rather than being produced continuously like other fuel types. The shipping and delivery of Avgas is significantly more expensive than other fuels as the volumes tend to be smaller and there is limited shipping/freight synergy with other (non-leaded) products. In addition, the availability of Avgas in remote areas has declined as fuel companies close bowsers due to the cost of manning and maintaining them.

Sales of Avgas in Australia (Figure 3.3) have been falling for some time, mirroring the gradual fall in hours flown in VH- registered aircraft (Figure 2.2).

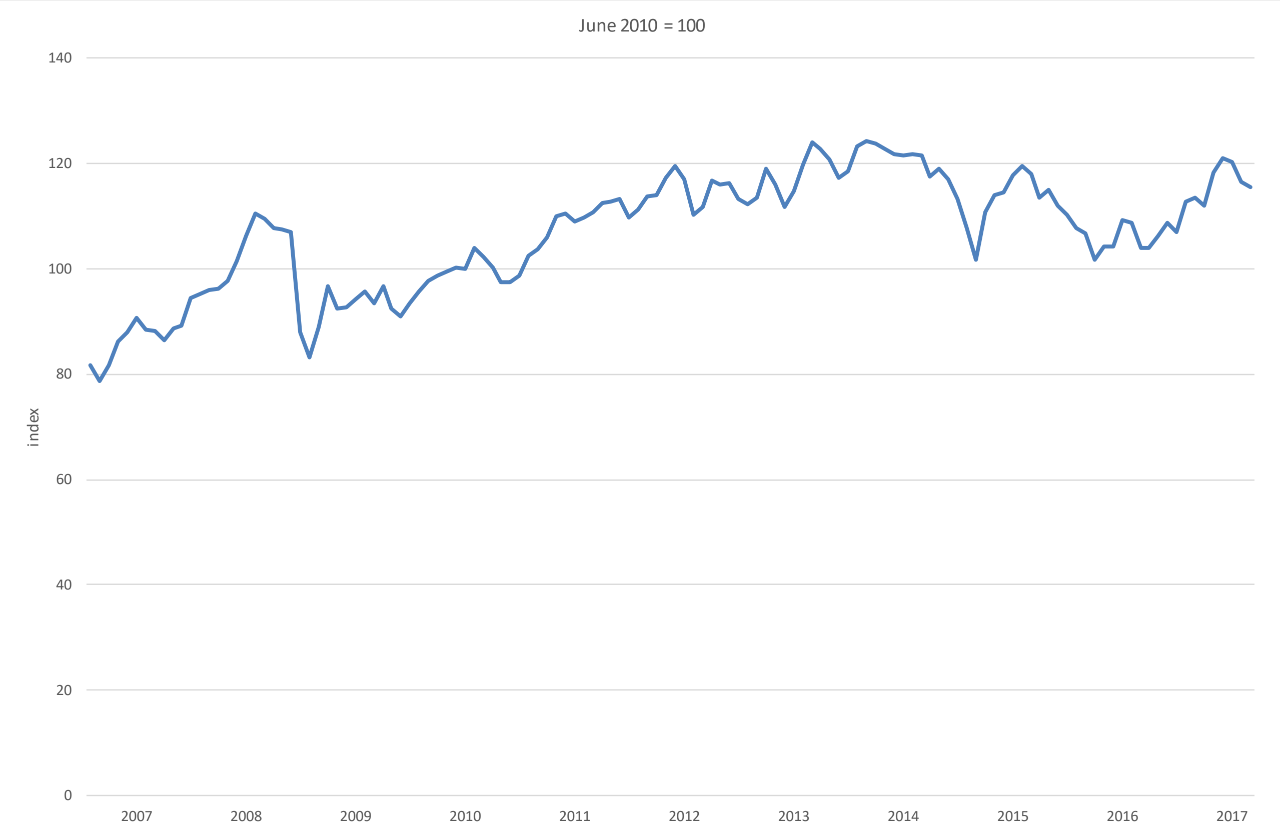
Figure 3.3 Volume of aviation gasoline sold in Australia



Source: Department of Environment and Energy 2017, Australian Petroleum Statistics 2016

As the volume of Avgas shipped has declined, the unit price of Avgas has generally increased (Figure 3.4). In the USA, the FAA are working with the Environmental Protection Agency to develop alternative fuels to remove lead from avgas.

Figure 3.4 Aviation gasoline price index



Source: Air BP 2017, Custom dataset

3.1.1 Airports

The Australian Airports Association estimates that there are over 2,000 airports and airfields in Australia. The airports include approximately 600 which are local council owned, 21 Federal airports on Commonwealth land leased to private operators, joint civil-military use airports (such as Darwin and Townsville), Defence air bases and privately owned aerodromes.

Airports are an important economic factor for any aircraft operator, particularly GA. A key finding of this Study has been that for many small GA aircraft there may be a number of airfields to choose from nearby, with different costs depending on services provided (see Case Study 2).

In the early days of aviation, airfields were exactly that – a large grassy field in regional Australia or the rural fringe of an urban centre where aircraft could take off and land in whatever direction they wanted. If there was any wind, aircraft would take off facing into the wind to minimise the distance required to take off. For airfields located near areas with a growing population, passenger services often developed. As passenger aircraft were increasingly operated and increased in size, sealed runways were required and developed, usually in alignment with the prevailing wind direction.

As the number of larger aircraft visiting an airport increases, the potential for them to damage a runway increases. The potential effect an aircraft may have on pavement depends on a combination of the aircraft's weight and the weight distribution attributes of its landing gear. This potential effect is expressed as an aircraft classification number (ACN). Similarly, the strength of a pavement is expressed as a pavement classification number (PCN). Should an airport operator wish to cater for larger aircraft and increase the runway's PCN, expensive reinforcement activity needs to take place (see Case Study 1).

In normal circumstances, an airport operator will not permit an aircraft to land at an airport if the ACN exceeds the runway's PCN. Similarly, GA operators should carefully consider their needs: If an airport's PCN significantly exceeds their aircraft's ACN they may be paying for a standard that they do not need. Indeed, many light aircraft have an ACN of zero, meaning that they can land on a cheap grass or gravel airstrip without causing damage.

In addition to the evolutionary process mentioned above, Australian airports have, over an extended period of time, also been transitioning to more market-based charges and rents. While for many aircraft operators, these charges and rents represent a relatively small proportion of their total costs, they are a fixed cost, which businesses must pay regardless of their turnover.

Where infrastructure is upgraded to handle larger aircraft, it is reasonable to expect the airport operator will seek aircraft operator contributions to help fund that investment. However, the extent of the aircraft operator's contribution continues to be an issue, particularly where, for example, airport infrastructure has been upgraded to where the runway PCN significantly exceeds a GA operator's ACN. In such cases, it may be in the operator's interests to relocate to an airport with infrastructure more appropriate to their aircraft's needs, if that is an option.

At the capital city secondary airports in particular, the leasehold sale of the airports did not result in an immediate change in operating arrangements for GA aircraft or maintenance operators. Many of the tenant leases were issued in the early 1990s and have only recently expired.

In several interviews, airport tenants stated that former Federal Airports Corporation provisions covering hand back of land in its original state and demolition of structures had been a standard condition in leases with the Commonwealth prior to the FAC but had never been enforced. However, in a number of cases, the new airport operators have enforced this provision.

There has been an extended time to prepare for airport operators seeking commercial rents. However, with the expiry of their long term leases, many GA tenants were surprised by the large increases in rents, including new rents on hangars and infrastructure that they built and paid for, but relinquished at the expiry of their lease. Some airport operators have purchased hangars and other structures to ensure they remain on site, and this has helped some tenants in the short term.

Some airport operators have been reluctant to issue GA aircraft operators with long term leases due to future airport development plans, including the creation of GA precincts. This has made it difficult for some GA operators to justify investment in construction work to meet their business' needs.

While recognising the evolution of airport arrangements has had some impact on traditional GA operators, it is important to note that the Australian Airports Association has reported that two-thirds of council-owned airports operate at a loss.

Case Study 1 – Mount Gambier Airport

Mount Gambier Airport is a regional airport owned by the District Council of Grant. The airport serves the local GA community and regular airline services to Adelaide and Melbourne with Regional Express. Regional Express provided 3,972 flights into and out of Mount Gambier Airport in 2016, carrying 76,109 passengers.

The airport manager reports not insignificant costs associated with apron repairs from GA aircraft fuel spills. These spills originate either directly from the refueling process or from aircraft fuel tanks being overfilled and then left out in hot weather to expand and overflow. These spills cause bitumen to deteriorate rapidly and need to be cut out and patched immediately to minimise spreading of the damaged area.

Airport costs are recovered from airport tenants and VH- registered aircraft operators, retaining a small surplus each year which is held in reserve for airport maintenance and upgrades, when required. RAAus registered aircraft operators are not charged as their contact information is not freely available.

As with most airports, the depreciation costs at Mount Gambier Airport are high, amounting to around $600,000 per year out of an annual income of about $1 million.

Mount Gambier Airport operates with a level of financial independence from the Council and does not borrow funds for upgrades or maintenance.

Regional Express' flights to Mount Gambier use 34 seat Saab aircraft. These aircraft have been out of production since 1999 and airport management assume that they will be nearing the end of their useful life by 2030. As there are no aircraft of a similar size currently in production, Airport management expect replacement aircraft to be larger. The pavement classification number (PCN) of the main runway at Mount Gambier, while adequate for the 34 seat Saab, will not be sufficient to accommodate larger aircraft.

Mount Gambier Airport selected the Bombardier Dash 8-Q300 as the design aircraft for the main runway into the future. DC Grant plans to upgrade the runway through a thickening of the runway surfacing as part of their regular runway maintenance program. The airport manager expects the use of Q400 aircraft will also be possible, but on a restricted basis.

This case study illustrates the increasing costs faced by airports as they cater for larger aircraft, with costs necessarily passed on to airport users.

Case Study 2 – North Queensland Aero Club

The North Queensland Aero Club is a flight training school, scenic flight operator and light aircraft charter company that commenced operations in the late 1940s out of Cairns Airport. The Club currently has about 150 members and offers training up to CPL. The North Queensland Aero Club recently started offering recreational flight training to attain RPCs with a Jabiru 160 registered with RAAus.

Ownership of the Cairns Airport did not shift to the Cairns Regional Council as part of the Commonwealth's divestment program, but instead shifted to the Queensland Government in 1982, with the airport managed by the Cairns Harbour Board (later named the Cairns Port Authority). In 2008, the Queensland Government sold Cairns Airport to North Queensland Airports group.

The North Queensland Aero Club building was owned by the Cairns Airport, which provided the building to the Club on a lease. In 2014, the lease expired and the rent costs rose 500 per cent to $5,500 per month, with an additional land tax of $10,000 per year. Only a short term (one year) lease renewal was available as the Airport was planning to move all GA businesses to a new GA precinct on the Eastern side of the airport, to make space for a business district on the Western side of the airport on the Captain Cook Highway. The Aero Club expected rents to double on the Eastern side of the airport.

Cairns Airport subsequently abandoned plans to move the GA precinct to the Eastern side of the Airport as there is insufficient demand for a business district.

The Aero Club accumulated significant debt under the higher rents. In 2015, the Aero Club relocated to the Mareeba Airport on the Atherton Tableland, about an hour's drive from Cairns. The Aero Club's accommodation costs are now $1,500 per month.

The North Queensland Aero Club has found that the nature of their business has changed since it moved to Mareeba. While at Cairns Airport, 80 per cent of the Aero Club's business was flight training and about 20 per cent was charter/scenic flights. At Mareeba, it is now 98 per cent flight training and about 2 per cent charter/scenic flights. This has resulted in a better financial return to the Club in terms of flying hours. This was due to the very competitive nature of the tourism industry in Cairns and the high cost (25 per cent of ticket price) paid to booking agents.

The North Queensland Aero Club noted that the increase in airport costs at Cairns Airport happened at roughly the same time as they put their aircraft through the Cessna SIDS program. The Aero Club found that while the initial costs associated with the SIDS inspection was roughly double the annual or 100 hourly maintenance costs (about $3,000 for the annual maintenance and $7,000 for the SIDS inspection), the costs associated with repairing the faults found in the SIDS inspection were high. For one aircraft the costs were $26,000, for some the cost of repairs was too high and the aircraft were written off.

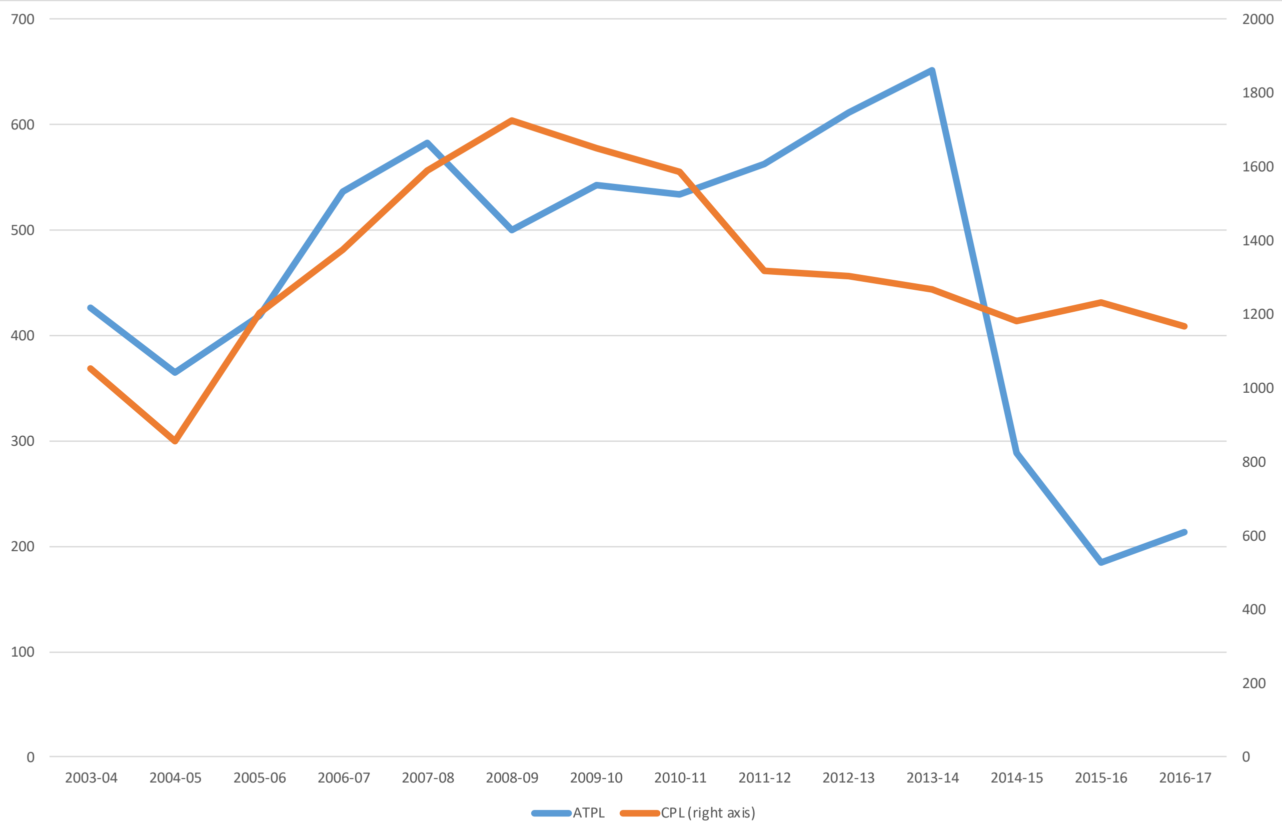
This case study illustrates how GA operations can be put on a more sustainable financial basis by moving to an airport with lower costs, where that is an option.

3.2 Demographic factors

Demographic factor impacts on the GA sector in Australia are not easily demonstrated, given a lack of detailed data on the sector.

Some GA operators, interviewed as part of this study, were concerned by recent falls in the number of new ATPL and CPL licences issued (see Figure 3.5) and the possibility that this may lead to a future shortage of skilled commercial and air transport pilots. However, this concern may be lessened if there are already pilots with existing licences that are being underutilised (see Table 1.2).

Figure 3.5 New ATPL and CPL licences issued



Source: CASA 2017a, Annual Report

3.2.1 Flying training pathways

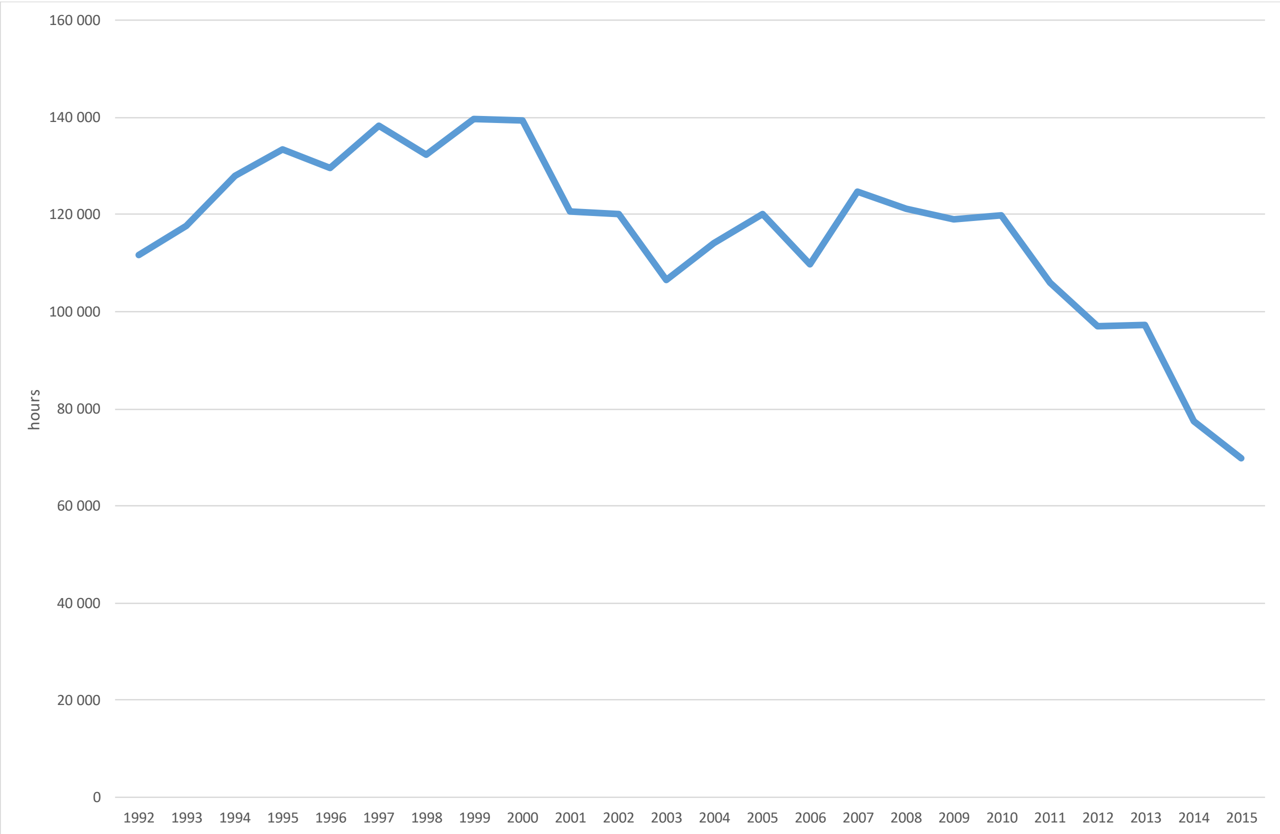
There are now two main pathways to achieving an ATPL. The "traditional" pathway is through a flying school with a student gaining flight hours "on the job" to meet ATPL requirements (see Case Study 3). This pathway also often involved gaining experience in small charter or regular public transport (RPT) flights. For this pathway, declining activity by small charter operations may slow their progress to an ATPL (see Figure 3.6).

The second pathway involves integrated instruction in a flying academy, often with access to modern and sophisticated flight simulators, with fewer flight hours required to achieve an ATPL.

The increased use of the second pathway does not necessarily mean demographically, a drift away from flying training at regional airports. An example is the operation of flying training college operations at Port Macquarie and Kempsey in New South Wales and proposals for flying training at Mareeba in Queensland and Glen Innes in New South Wales.

Aviation industry representatives have commented on the need to attract more young people and women into aviation, including GA. Flying training for operations in sport and recreational aviation and for RPA are potential areas for enhancing the participation of young people and women in GA and by advancing through the licence types, a potential career as a pilot.

Figure 3.6 Small charter and RPT flying activity (fixed wing, single piston engine)



Source: BITRE 2017, Australian Aircraft Activity 2015

Case Study 3 – Gambi Air Flying School

Gambi Air is a traditional flying school based in Mount Gambier that provides RPC through to CPL instruction approved by Recreational Aviation Australia Ltd RAAus, and CASA respectively.

The school currently has Part 141 Certification Interim Approval, but indicated they are able to compete strongly against larger Part 142 academies, despite the additional 50 hours flying requirement necessary in the Part 141 Certification.

This company prepares students for the traditional General Aviation Charter and Aerial Work sector, a sector that the larger Part 142 academies appear to have ignored. Whilst there is a shortage of pilots worldwide, this is not so in Australia. Pilots having graduated through a traditional school prepared for the GA sector can progress through to the airline industry, if this is the pilot's objective.

When these pilots present to an airline for employment they come well prepared with a vast array of experience (usually in northern Australia) and often with over 2000 hours as Pilot In Command (PIC) of an aircraft below 5700kg weight. It is apparent that Australian airline companies prefer to employ those pilots who have followed the traditional pathway through their training and early aviation career.

Part 142 academy schools complete the CPL training in 150 hours of flight training. These graduates in the main are primarily prepared for airline flying, and are underprepared and over qualified for jobs in the GA sector. The result is that those job seekers in most cases need to attend a traditional school to gain the skills to fulfil the requirements of operators in northern Australia.

The Chief Flying Instructor (CFI) of Gambi Air Flying School, and previously Gippsland Flight Centre, has trained many pilots who, on graduating from an academy have realised that they were not as "job ready" as they were told and were expecting to be, but needed further specific training in the skills they would need for their job "up north".

Gambi Air contends that the Commercial Pilot with significant experience in the bush conducting single pilot operations will be far more employable in airline operations than the pilot without that experience.

This case study illustrates that Part 141 flight schools can provide relatively high job placement rates for new commercial pilots by addressing the needs of their market.

While the number of new ATPLs issued has fallen in recent years, the average age of aviators issued with Class 1 Medical Certificates remained relatively static in the years to 2014-15 (see Table 3.1). Aviators issued with a Class 1 Medical Certificate for the first time average approximately 28 years of age, while the average age of aviators renewing their Class 1 Medical Certificate was 41. While female aviators represent approx. 9 per cent of all aviators issued with a Class 1 Medical Certificate for the first time, they represent only 5 per cent of aviators renewing Class 1 Medical Certificates.

Table 3.1 Average age of aviators issued with Aviation Medical Certificates

Class	2010-11	2011-12	2012-13	2013-14	2014-15
Class 1					
Initial certificate	28.1	28.0	28.2	27.8	28.3
Renewal of certificate	40.9	40.9	41.3	41.5	41.3
Class 2					
Initial certificate	31.0	30.8	30.3	30.5	30.3
Renewal of certificate	44.0	44.1	44.2	44.6	44.5
Class 3					
Initial certificate	29.5	29.4	31.9	30.4	32.3
Renewal of certificate	43.6	43.3	43.9	43.5	44.2

Source: CASA 2017, Custom dataset

3.3 Regulatory factors

Many participants in the study highlighted aviation safety regulatory changes as a major concern of the GA industry. These concerns include:

- the cost of specific changes (including where CASA has subsequently changed the nature and timing of compliance at the request of industry);
- the safety justification and reason for the changes;
- the regulator's system for charging for services and turnaround speed;
- a "one size fits all" approach to regulation with some changes brought in for all aircraft not appropriate for smaller GA aircraft; and
- regulations should be aligned with a particular regulatory regime overseas - an issue examined in the Aviation Safety Regulation Review (ASSR) Report in 2014.

These concerns are highlighted in a number of examples outlined below.

- Parts 141/142 for flight training organisations;
- Civil Aviation Regulation (CAR) 30 to Civil Aviation Safety Regulation (CASR) Part 145 (maintenance personnel functions);
- Civil Aviation Order (CAO) 48 - fatigue management;
- Aircraft maintenance mandates e.g. Cessna Supplementary Inspection Documents (SIDS program) and Control Cables replacement; and
- The requirement for ADS-B installation.

3.3.1 Parts 141/142 for flight training organisations

An initial discussion paper proposing the move to CASR Part 141 was released in March 2002.

The discussion paper noted that previously flying school requirements were contained in CAR 5 as well as CAOs, CAAPs and a CASA Manual for Air Operators Certification. The paper proposed that Part 141 would draw all requirements into the one Part, with supplementary material to be provided in a Manual of Standards.

The discussion paper stated that:

> *The main purpose of the proposed CASR Part 141 organisations will be to provide flight training for the issue of pilot licences and ratings in the same way that flying schools currently do, whereas CASR Part 142 organisations will mainly provide proficiency training and checking under contract for aircraft operators holding an AOC.*

GA representatives have stated that as part of the CASA consultation process, CASA indicated that flying schools would be able to do everything they currently do in the new Part 141.

However, when CASA Part 141 was introduced in 2013, flight schools were not permitted to conduct integrated training courses under Part 141. Flight schools that wanted to provide integrated training courses were required to obtain Part 142 certification, which required additional documentation from the flight school. Integrated courses allow students to obtain a CPL in fifty hours less flying time than they would require for a standard course conducted by a Part 141 flight school.

Many flight schools interviewed felt that obtaining Part 142 certification was vital to the viability of their businesses. The extra fifty hours of flying time was considered too great a competitive disadvantage for Part 141 flying schools to survive.

However, Part 142 certification required flying schools to provide extra documentation in the form of a detailed exposition including details such as fatigue management plans, an operations manual and safety management system. The absence of a Manual of Standards or guidelines was criticised by industry, with some flight schools engaging expensive consultants to write their expositions.

The strong feedback in interviews for this Study was that smaller flight schools did not have the resources to prepare detailed expositions, and so would be placed at a competitive disadvantage.

It is worth noting that not all flying schools felt that they would be disadvantaged by not having Part 142 certification (see Case Study 3) and that CASA recently published a sample exposition package and sample Integrated Commercial Pilot Licence (aeroplane) training plan.

Flying schools can modify these sample documents to suit their business. CASA has stated that if the “sample is fully adopted, the applicant’s submission is considered acceptable which also reduces CASA’s assessment time.” (Part 61 Solutions Taskforce Closure Report, December 2016).

Overall, flying training represents a mixed picture in Australian aviation as some operators have attracted domestic and international airlines and students to train in Australia, while other flight training schools have struggled. The need to maintain key personnel, who hold the relevant qualifications and who perform statutory responsibilities to meet CASA regulatory requirements, continues to be a challenge for several flying schools.

3.3.2 CAR 30 to CASR Part 145 (approved maintenance organisations)

Both CAR 30 and CASR Part 145 deal with the certification of aircraft maintenance organisations, with Part 145 certification a requirement for businesses maintaining aircraft used in commercial air transport.

The new Part 145 certification, similar to the CASR Parts 141 and 142 above, required maintenance organisations to prepare an exposition stating how the maintenance organisation will comply with CASA standards as presented in the Part 145 Manual of Standards (MOS).

The MOS provides an extensive list of what issues the exposition needs to address for CASA approval, including a description of the personnel, facility, tools and equipment as well as monitoring programs for skills and training, human factors, quality assurance and error reporting.

The MOS also requires maintenance organisation to nominate who will fill the roles of:

- Accountable manager,
- Responsible manager,
- Quality manager, and
- Safety manager.

While CASR Part 145 organisations are popular with larger air transport operations, organisations working on smaller GA aircraft feel they should not be required to transition from CAR 30 to CASR 145 in order to maintain small RPT aircraft identical to the GA aircraft they maintain under CAR 30.

The strong feedback from maintenance organisations interviewed was that small maintenance organisations rarely have the skills or resources to prepare expositions or perform the various monitoring roles required by the regulations.

Several organisations stated that they had to pay a consultant to prepare their exposition. Almost all organisations interviewed stated that the burden of self-monitoring compliance with the exposition required the hiring of additional staff. Small businesses reported that they are struggling to afford these additional costs. This is a particular concern at small remote airports that are more likely to be serviced by small RPT services, but with only small 1-2 person maintenance facilities.

3.3.3 CAO 48.1 (fatigue management)

Several commercial GA operators expressed concern with the introduction of an updated Civil Aviation Order 48.1 (CAO 48.1), which covers fatigue management.

In July 2011, ICAO issued new standards and recommended practices (SARPS) for flight crew and cabin crew fatigue management and fatigue risk management systems (FRMS).

CASA drafted the updated CAO 48.1 in response to the SARPs, after researching international scientific understanding of fatigue, fatigue risk and fatigue risk management. CAO 48.1 commenced on 30 April 2013, however existing AOC holders and flight crew members have until 31 October 2018 to transition to the new fatigue management rules.

The updated CAO 48.1 addressed several new areas of fatigue management raised by the ICAO SARPs not adequately covered by the previous Order. Of particular concern were issues around:

- Circadian rhythms,
- The impact of crossing multiple time zones,

- Differences in the quality of rest at different locations and different times of the day,
- Number of sectors flown in a flight duty period,
- Flight duty period start times, and
- Late night operations.

As with the previous CAO 48, the updated CAO 48.1 stated that a pilot must not operate an aircraft (and an operator must not assign a pilot to operate an aircraft) when the pilot is fatigued to such an extent that safety may be affected. The operator must also document fatigue management policies in its operations manual and keep records to provide for continuous improvement in fatigue management policy.

The updated CAO 48.1 has a three tier structure:

- Tier 1 - restrictive and highly prescriptive rules appropriate for very simple operations, usually conducted during the day only.
- Tier 2 - slightly less restrictive, but still prescriptive rules appropriate to more complex operations. Operators may select from five different sets of rules tailored to different types of operation, such as simple multicrew operations, complex multicrew operations, single pilot public transport, aerial work, and flying schools.
- Tier 3 - establishing and operating a Fatigue Risk Management System (FRMS).

CASA has indicated there is a safety case for bringing over 50-year-old fatigue regulations into a modern aviation safety environment. The Australian Transport Safety Bureau (ATSB) has also identified 65 incidents/accidents over the 10 years to 2015 in which fatigue was identified as a factor.

However, some GA operators have highlighted challenges with some of the proposed changes:

- Animal welfare - aerial mustering operations need to be able to start work in the coolest part of the day and take the time required to move the cattle in a humane manner (e.g. pregnant cows may need to move at a slower pace, more so in drought conditions when stock are in poor condition). It is impossible to accurately predict how long a mustering duty period will take and if pilots stop for a break, the herd will most likely disperse.
- Fire chiefs may be reluctant to let firefighting operations take place in the coolest and most effective part of the day if it means that they are grounded for the hottest part of the day (with fiercest fire conditions) due to fatigue regulations.
- For aerial applications, the window available to operators for spraying can be very narrow (due to low wind speed, no rain, optimal chemical application times, etc.). While fatigue management is very important during these bursts of activity, the new regulations do not adequately take into account the extended periods of rest between bursts of activity.
- Again, for aerial application operations, daytime temperatures may be too high for the chemicals being applied, necessitating night operations. While the new CAO recognises some night time operations and late night operations, it does not provide a balanced solution for fully nocturnal operations.
- Most operators claim that the new CAO 48.1 will present a large compliance cost for regional airlines and emergency medical providers, with regional airlines disputing the relevance of the science used to justify the implementation of the new CAO.

Clearly there is a safety imperative to ensure that modern fatigue management arrangements are in place in Australian aviation while having regard to impacts on GA operations. CASA is currently undertaking an independent review of the proposed CAO 48.1 arrangements.

3.3.4 Aircraft maintenance mandates

The Cessna Supplementary Inspection Documents (SIDs) program and the mandatory 15-year replacement cycle for control cables have attracted criticism from some GA operators.

While many agree that there may be safety benefits from these programs, some have suggested that they should have been advisory rather than mandatory, or mandatory using a different implementation schedule, giving operators more time to comply (noting that in many cases, extensions were granted).

3.3.4.1 Cessna SIDS program

The FAA and Cessna Corporation jointly developed the Cessna SIDs program in response to the aging of the global Cessna fleet, combined with deficiencies in the original type certification process and 'grandfathering' provisions in the type certification process.

'Grandfathering' provisions allow new models of aircraft with only minor changes from the previous model to just certify the changes and record them as an amendment to the previous model's type certificate. This process can continue iteratively without end. Indeed, the most popular aircraft model on the Australian VH- register, the Cessna 172, was originally type certified in 1956.

This model has been iteratively upgraded over the years and is still being manufactured today as the Cessna Skyhawk. Although safety standards have advanced over time, manufacturers are usually only required to comply with the standards that applied at the time of certification.

This is not just an issue for the Cessna 172. The majority of piston-engine aircraft manufactured by Cessna were originally type certified in the 1950s and early 1960s under United States Civil Aviation Regulation Part 3 (CAR 3), prior to the 1 February 1965 introduction of Federal Aviation Regulation Part 23 (FAR 23). While CAR 3 included standards for the strength of aircraft, it included no provisions for the weakening of aircraft components due to corrosion or metal fatigue over time. These provisions were introduced in FAR 23 (Appendix G23.4), which requires manufacturers to provide mandatory replacement times for aircraft components and structural inspection intervals.

By the mid-1990s, a significant proportion of the Cessna fleet was quite old and corrosion and metal fatigue issues were being reported to the FAA. The FAA initially funded a project to develop a supplemental inspection document for all variants of the Cessna 402 (a high number of these aircraft were used in the US regional airline fleet).

Further SID programs were developed for other Cessna models, with SIDs issued for all Cessna 100, 200, 300 and 400 series aircraft. CASA issued a number of Airworthiness Bulletins in 2015 and 2016 stating that compliance with the Cessna SIDs program was mandatory. Similar mandates have been issued by New Zealand and Japan. The FAA in USA mandated compliance with the Cessna SIDs program for commercial operations, but not for aircraft in private operations.

While GA participants in this study agreed that the Cessna SIDs program came at a significant cost, some acknowledged that the program had led to critical safety issues being identified and rectified.

For an example of the approximate costs involved, the North Queensland Aero Club (Case Study 2) reported that the basic cost of the inspections was $7,000, with additional costs increasing depending on the amount of repair work required. Some repair costs were so high, the Club decided to scrap the aircraft.

3.3.4.2 Control cables

Aviation safety agencies have been concerned with stress corrosion cracking in aged control cable terminals since 2000. Both the National Transport Safety Board (NTSB) in USA and the Australian Transport Safety Bureau (ATSB) have released safety reports outlining instances of stress corrosion cracking in terminals manufactured from SAE-AISI 303 SE stainless steel attached to control cables that were over 15 years old.

Piper Aircraft released a service letter in 2003 requiring all Piper aircraft flight control cable terminals be inspected on all aircraft aged 15 years or older, updating maintenance manuals for current production models and progressively updating manuals for out-of-production models. CASA issued an airworthiness bulletin urging operators to consider replacing cables before they reach 15 years in service (AWB 27-001). In 2007, CASA published a discussion paper (DP 0702CS) listing five options to address control cable terminal issues, including mandatory inspection or retirement.

In 2013, CASA supplied several control cable terminals from several aircraft makes to ATSB for metallurgical examination. The ATSB study (Aircraft control cable terminal fittings – ATSB technical examination, 2013) found that “visual inspection alone has been shown to be an incomplete defence against stress corrosion cracking related failures”.

In 2015, CASA issued Airworthiness Directive AD/GENERAL/87, which mandated that all primary flight control cable assemblies with total time in service of 15 years or more should be replaced by 1 January 2018. While the airworthiness directive received only 33 comments, significant concerns were raised after the directive was issued related to the cost and waste of replacing serviceable cables and the lack of discretion available to the maintainer to determine serviceability.

Taking feedback into account, in June 2017 CASA issued a proposed airworthiness directive (PAD/GENERAL/87) that empowered the maintainer to determine “serviceability through the use of enhanced inspections rather than mandatory replacement regardless of condition.” CASA noted that “evidence from reported defects indicates surface corrosion was present and visible on all terminal failures attributed to internal corrosion.”

In recent interviews most GA operators were pleased with the June 2017 change, but were concerned with the considerable unnecessary investment they had made replacing control cables ahead of the mandated introduction date. Participants in this study felt that CASA should have got the directive right the first time.

3.3.4.3 ADS-B mandate

Automatic Dependent Surveillance Broadcast (ADS-B) is an on-board technology that every half-second, automatically broadcasts an aircraft’s precise location and flight and aircraft identification information to other aircraft and air traffic control. Dedicated ground stations receive the broadcasts and relay the information to air traffic control via ground or satellite links.

The installation of ADS-B devices on all aircraft should yield significant safety improvements to aircraft users and the travelling public.

CASA mandated the installation of ADS-B in all instrument flight rules (IFR) aircraft in accordance with ICAO's Global Air Navigation Plan. This mandate was gradually introduced as follows:

- 12 December 2013 - all aircraft operating in Australian airspace at or above FL290.
- 4 February 2014 - any aircraft operating at Brisbane, Sydney, Melbourne or Perth must have a Mode S Transponder (transponder required for ADS-B), with ADS-B required by any IFR operation in airspace north and east of Perth Airport.
- 6 February 2014 - any aircraft new to the Australian VH- register or aircraft that are modified by the installation of new or replacement ATC Transponder systems.
- 2 February 2017 - Originally, this deadline was for all aircraft operating under IFR, however on 22 November 2016, private operators were effectively given an extension under certain conditions, until 1 January 2020. In addition, foreign registered aircraft received an extension under certain conditions, until 6 June 2020 (the deadline for European-registered aircraft to install ADS-B).

Some GA operators opposed ADS-B altogether for their operations while others wanted the ADS-B mandated installation date of 2 February 2017 aligned with the 2020 date in the USA. Many think that by mandating their installation ahead of the larger USA market, Australian operators will face a higher price; assuming that the larger USA market would generate scales of economy for ADS-B manufacturers. BITRE notes that the notion that the price of ADS-B units will fall is not supported by standard economic theory.

In subsequent interviews, most GA participants were pleased with the CASA November 2016 delay. However, several complained that they had invested a significant amount of money installing ADS-B earlier than they needed to, and at a higher price than they would pay when the demand for ADS-B units increases. Many stated that CASA should have got the implementation date right the first time.

3.3.5 Regulation as a barrier to safety improvements

Several GA participants pointed out that regulations surrounding aircraft and parts certification focus on meeting the original design standards. For an aircraft like the Cessna 172, it means that new aircraft are being manufactured to standards from the 1950s, rather than the minimum set of standards current at the date of manufacture. In reality, manufacturers tend to incorporate modern standards in their aircraft over time.

For operators that wish to replace components on their older aircraft, safety standards strongly favour original replacement parts. Upgrading the aircraft with more modern components, including safety components requires the new component to either have a supplementary type certificate for each aircraft model, or an engineer's certificate on a case by case basis. The certification process for each component for each aircraft make and model can be expensive and for many older aircraft, prohibitive.

For example, it was reported that when recently upgrading the GPS unit in an aircraft to a new model from the same manufacturer, the engineer's certificate was the major cost. Several participants suggested that with today's plug and play electronics, the need for specific engineering orders is excessive.

Case Study 4 – Gipps Aero

GippsAero (formerly Gippsland Aeronautics) has been designing and manufacturing aircraft at Latrobe Regional Airport in Victoria since the early 1990s.

The first aircraft manufactured by GippsAero was the GA200 Fatman, a crop duster that was produced through to the late 1990s, when production was ceased to make way for the GA8 Airvan. The Airvan is a high-wing piston engine utility aircraft that seats eight. The GA8 Airvan was developed initially as an alternative to the six- to eight-seat Cessna 206/207, which ceased production in 1986. The first prototype Airvan was built in 1993, with CASA providing type certification in late 2000. In the meantime, production of Cessna 206/207 aircraft recommenced in 1998.

Aviation regulators issue 'type certificates' to certify that aircraft manufacturing designs comply with airworthiness standards maintained by the regulator. Once certified, an aircraft design can be changed if the regulator issues an amendment to the type certificate.

The GA10 Airvan was developed as a stretched version of the GA8 with a more powerful turboprop engine to increase payload and/or seating capacity, and to build a market in countries where avgas is unavailable or extremely expensive. Where feasible, parts are common across both aircraft. The first flight for the GA10 Airvan was in 2012 and type certification was sought from CASA and the FAA (USA) in 2015. As Australia is the state of design for the Airvan10, CASA was the primary certifying authority. The USA is expected to be a major export market for the Airvan10, so the FAA was approached to validate the aircraft under the CASA/FAA bilateral agreement.

Certification was issued by both CASA and the FAA on 19 May 2017.

Based on sales of the GA8 Airvan, GippsAero expects to market the GA10 Airvan in North America, China, Africa and Europe.

GippsAero stated that they do not face a level playing field when competing with manufacturers from other countries (particularly their main competitors from USA), regarding certification costs. GippsAero provided the following comparison of costs between CASA and FAA related to the recent type certification of the GA10 Airvan.

Type certification costs: CASA generally charge 100 per cent for the time incurred on certification projects. The hourly rate is typically AUD$160 per hour. The original estimate of type certification costs given to GippsAero when the project was given internal investment approval was AUD$192,000. Due to a variety of factors, the final cost was AUD$391,920.

The FAA do not charge for type certification, including the validation of type certificates for foreign domiciled entities. The inspection in support of the validation of the Australian issued type certificate issue was conducted in Australia – the FAA team travelled to Australia without charging for their time, airfares or accommodation.

Gipps Aero suggests that type certification costs should receive equivalent taxation treatment as investment in research and bringing the design to certification as it is an expensive component of the development of the new model. This would allow aircraft manufacturers to write off the costs up front, when they occur. Investment in aircraft manufacture in Australia is not only for the local market – in the case of Gipps Aero, more than 80 per cent of aircraft built are exported.

Noise certification costs: CASA is not the responsible department for noise certification. The noise test was undertaken by a US based consultant (Acoustical Engineers), who travelled to Australia. AirServices Australia charged AUD$2,200 to validate the consultant's noise test and issue an Australian Noise Certificate.

This case study illustrates that international inconsistencies in regulation and charging can add to difficulties for Australian GA aircraft manufacturing and that clearer pricing from regulators would create greater certainty in a challenging industry.

3.3.6 User pays and response times

In Case Study 4, CASA charged an hourly rate of approximately $160. This is claimed to be high compared with what industry would charge, given only a handful of experienced specialists with high level performance and accountability expectations charge at a similar hourly rate. It is worth noting that as CASA generally charges by the hour rather than at a fixed rate, any inefficiencies or errors by either party will result in increased charges.

When compared to other aviation safety regulators, the rate charged by CASA is below the rate charged in New Zealand and the European Union, however as noted in Case Study 4, the USA does not have a user pays charging system for type certification (USA funding comes from excise tax revenues on aviation fuel and various airline passenger and freight taxes).

Several study participants felt that turnaround times for non-controversial approvals and certifications were slower than necessary on the basis that they were routine and did not require much work by regulatory staff. Many of these approvals and certificates provide GA operators with permissions to conduct their business. Any delay in processing times delays operators' ability to earn an income, potentially placing them under financial stress.

3.3.7 Aviation medicals

Most comments from GA participants in this study on medicals have revolved around two issues; the relationship between CASA's Aviation Medicine area (AvMed) and designated aviation medical examiners (DAMEs); and the medical standards that are applied. The medical standards have cost impacts on the person seeking a licence from CASA due to additional medical testing requirements.

Many of the comments relating to CASA's AvMed area revolved around who should have ultimate responsibility to clear a person to fly. As primary carer for a patient, most thought it is the DAME's role to monitor and advise a patient, rather than someone that hasn't even seen them. Some participants reported that some patients have had their condition under control for decades, but are still required to undertake annual tests that a specialist in the field would consider to be excessive.

Several participants in this study queried the logic of withholding a pilot's licence from someone that had failed a medical examination, but then allowing them to obtain a RPC or RPL (maximum 2 seats and 1500kg MTOW for RPL; 600kg MTOW for RPC). Several participants in this study had failed their medical and resorted to flying ultralight aircraft on an RPC. They expressed frustration that it was so easy to fail a medical, but so hard to have the decision overturned. In 2016-17, there were 27,518 applications for a Class 2 Medical Certificate, of which 50 were refused. Also in 2016-17, the Administrative Appeals Tribunal (AAT) overturned 2 decisions and upheld 4, with 9 decisions pending.

CASA recently announced a number of initiatives aimed at addressing these concerns, including the introduction of a basic Class 2 medical certificate using Austroads commercial vehicle driver standards, carried out by general practitioners.

3.3.8 What is appropriate regulation for GA?

Key messages from GA representatives interviewed about current regulatory approaches were they:

- lacked a compelling safety case to justify changes;
- were too complex and incorrectly treated GA like larger aircraft or maintenance operators;
- did not have enough regard to the cost implications;
- were not risk-based (although GA have higher accident rates than major commercial airline operations, the number of people at risk is significantly lower); and
- were not aligned fully with international regulatory regimes (missing harmonisation benefits).

Case Study 5 – Control cables by Aircraft Propellers and Spares

Aircraft Propellers and Spares (APS) in addition to their retail business, manufacture control cables for many GA aircraft. As well as serving the Australian market, APS also exported cables to New Zealand until approximately 2000, when New Zealand ceased to accept CASA certification of aircraft parts. APS believe the CASA certification process takes too long, costs too much and requires a higher standard of Australian manufacturers than foreign competitors.

Drawing on the experience of another aircraft parts manufacturer, APS argued CASA's initial requirement that every cable have an approved drawing. After lengthy discussions, CASA gave permission for APS to manufacture cables to sample or aircraft manufacturers' drawings.

CASA required that APS mark each control cable with a unique identification number. The marking of such a small, thin product with a legible number is not a simple process and required APS to invest in expensive, specialised equipment. It is APS's belief that cable manufacturers from USA are not required to mark their control cables for the Australian market and therefore do not face the same costs as Australian manufacturers.

This case study illustrates that aviation regulations can impact GA support businesses, particularly where they are applied differently to overseas competitors.

CASA is responding to many of these matters through its ongoing implementation of the Government's response to the Aviation Safety Regulation Review report. CASA has also released discussion papers on a number of key issues for GA including pilot medical requirements as well as committing to the completion of the ten regulations outstanding in the regulatory reform program, several of which are of relevance to GA.

Chapter 4: Emerging areas in General Aviation

Two emerging areas of GA growth are having a significant effect on the GA sector in Australia:

4.1 Self-administered associations

There has been significant growth in the operation of sport and recreational aircraft through associations such as RAAus (see Figures 15 and 16).

Sport and recreational aircraft (such as ultralights) operate under an exemption from the Civil Aviation Regulations and Civil Aviation Safety Regulations. Operators need to be a member of an approved self-administering association, which operates under the oversight of CASA.

Many aircraft involved in sport aviation are designed and built to different requirements than those required for VH- registered aircraft. There are several restrictions on their operations that reduce the level of risk. These include the number of aircraft occupants, their operation away from other airspace users, and their operation away from people on the ground.

There are a number of reasons put forward for the increased popularity of RAAus aircraft over the past three decades compared to VH- registered aircraft:

- Less expensive way of getting into flying;
- An increasing number of relatively inexpensive ultralight aircraft on the market;
- Lower ongoing operating and maintenance costs;
- Lower medical standards - equivalent to a driver's licence - lets people stay flying;
- Less expensive way of building up hours to advance to larger aircraft; and
- Increased array of (non-commercial) activities permitted in RAAus aircraft.

It is difficult to assess the full range of activities being undertaken by RAAus aircraft, given the lack of detailed data available.

However, at present while all activity in RAAus aircraft has been seen as recreational flying, with the licencing structure encouraging more pilots to start their flying in RAAus aircraft, there would be an increasing amount of training taking place in RAAus that is recorded as private flying.

Also, with the new RAAus Utility Endorsement permitting non-commercial "stock spotting and movement, water trough or fence line inspection, etc.", it is reasonable to expect that there will be significant aerial mustering activity taking place. Indeed, this will perhaps be a significant growth area for ultralights, with at least two ultralight aircraft manufacturers currently targeting this market.

With a significant amount of VH- mustering activity taking place as non-commercial activity without an Air Operator Certificate, the aerial mustering industry is looking to develop training that includes non-commercial mustering pilots. If the level of ultralight mustering activity warrants it, trainers may consider incorporating ultralight pilots in this training.

Several participants questioned the robustness of ultralight aircraft, particularly in the inexperienced hands of trainee pilots. Several questioned the 600kg maximum weight limit for ultralight aircraft, and whether this encouraged manufacturers to reduce the size of fuel tanks and use less robust components.

Most airport managers that participated in this study expressed frustration with RAAus aircraft being exempted from the requirement that the details of all Australian registered aircraft be publicly available. With the ownership details of RAAus aircraft not published, airport managers can not charge landing fees using the current system for VH- registered aircraft. RAAus have offered to pass on invoices to RAAus aircraft owners, however this adds a cost that airport managers are reluctant to bear. Many airport managers put up with RAAus aircraft not paying their landing fees. However, some airport managers have resorted to black-banning RAAus aircraft that do not volunteer the landing fee, while others are considering closing their airport to all RAAus aircraft.

CASA is required to publish a list of all VH-registered aircraft and their registered operators. Other GA operators have also queried why RAAus are not required to keep a publicly available register.

4.2 Remotely piloted aircraft systems (RPAS)

Remotely Piloted Aircraft Systems (RPAS) are seen as one of the growth areas for general aviation and at the same time, a source of competition for traditional VH- registered GA.

Like elsewhere in the world, Australia has experienced rapid growth in commercial and recreational RPAS use in recent years. The number of RPAS users is expected to continue to grow rapidly as RPAS become even more prevalent due to advances in technology, their availability to the general public at low cost and their growing use across an increasing number of commercial applications.

The potential of RPAS is significant as they promise to reduce the cost and risk associated with hazardous, difficult or time-consuming work.

However, there are a number of key challenges that RPAS operators need to overcome to realise this promise. These include the safe integration of RPAS into airspace, including access to flight operations that travel beyond visual line of sight, using greater levels of autonomous flying to allow single operators to fly multiple aircraft to reduce human costs, and ultimately, autonomous flight. These challenges are made more complex by other issues not immediately related to safety, such as disparate local government by-laws, privacy, security and noise issues.

This is a relatively new and rapidly evolving form of aviation that finds the pace of regulatory reform slow. However, the RPAs industry has already formed a good working relationship with CASA, seeking regulation that is proportional to the real risk RPAs present to other airspace users and ground-based infrastructure and people.

There is significant investment being undertaken by international companies coming to Australia to flight test due to our relatively favourable regulatory environment.

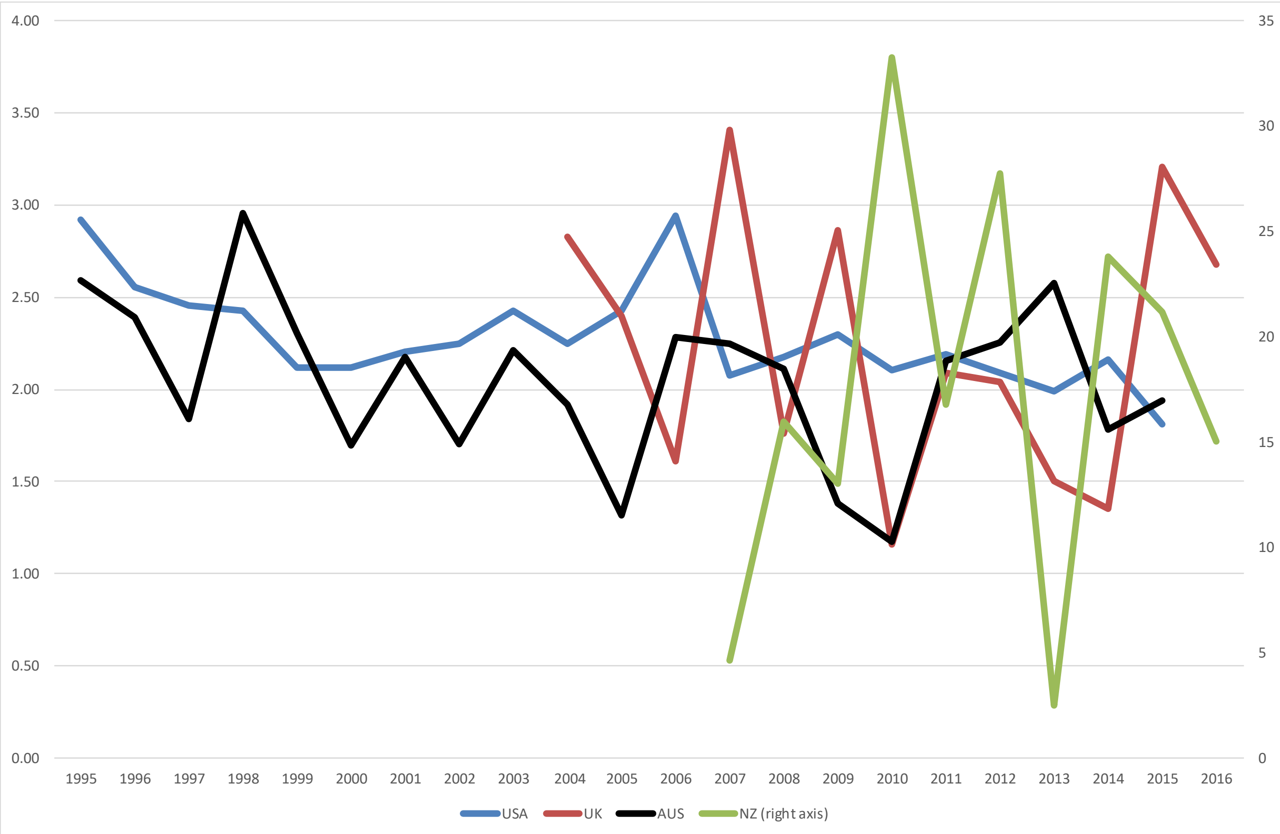
CASA is currently undertaking a review of RPAS aviation safety regulation.

Chapter 5: Comparison of Australian and overseas General Aviation

5.1 Safety statistics

Comparisons of Australian safety measures with the USA and the UK show that overall, Australian general aviation compares well with similar countries. Drilling down into safety statistics specific to General Aviation, Australia has a generally better safety rate as a proportion of hours flown (Figure 5.1).

Figure 5.1 GA fatality rate per million hours flown - international comparison



Source: BITRE 2017, ATSB 2017, BTS 2017, UK CAA (custom dataset) and CAA NZ (custom dataset)

This should come as no surprise – many industry participants point out that Australia's geography is much more suitable for aviation:

- Large, open spaces
- Very few mountains/obstacles
- Relatively stable weather patterns.

As an illustration, the most frequent single model of aircraft on the CASA register is the Cessna 172, followed by the Piper PA 28 Cherokee. Both aircraft have a service ceiling of about 14,000 feet. In the USA there are 78 mountain peaks above this height. In Australia the highest mountain, Mount Kosciusko, peaks at just over half this height.

Australia is relatively sparsely populated, with a population of 24 million, mostly concentrated in the major cities in a country with a land area of 7.6 million square kilometres. In contrast, the USA has population of 325 million that is less concentrated in the major cities in a country with a land area of 9.1 million square kilometres. That is a population almost 14 times larger than Australia with a land area one-fifth larger.

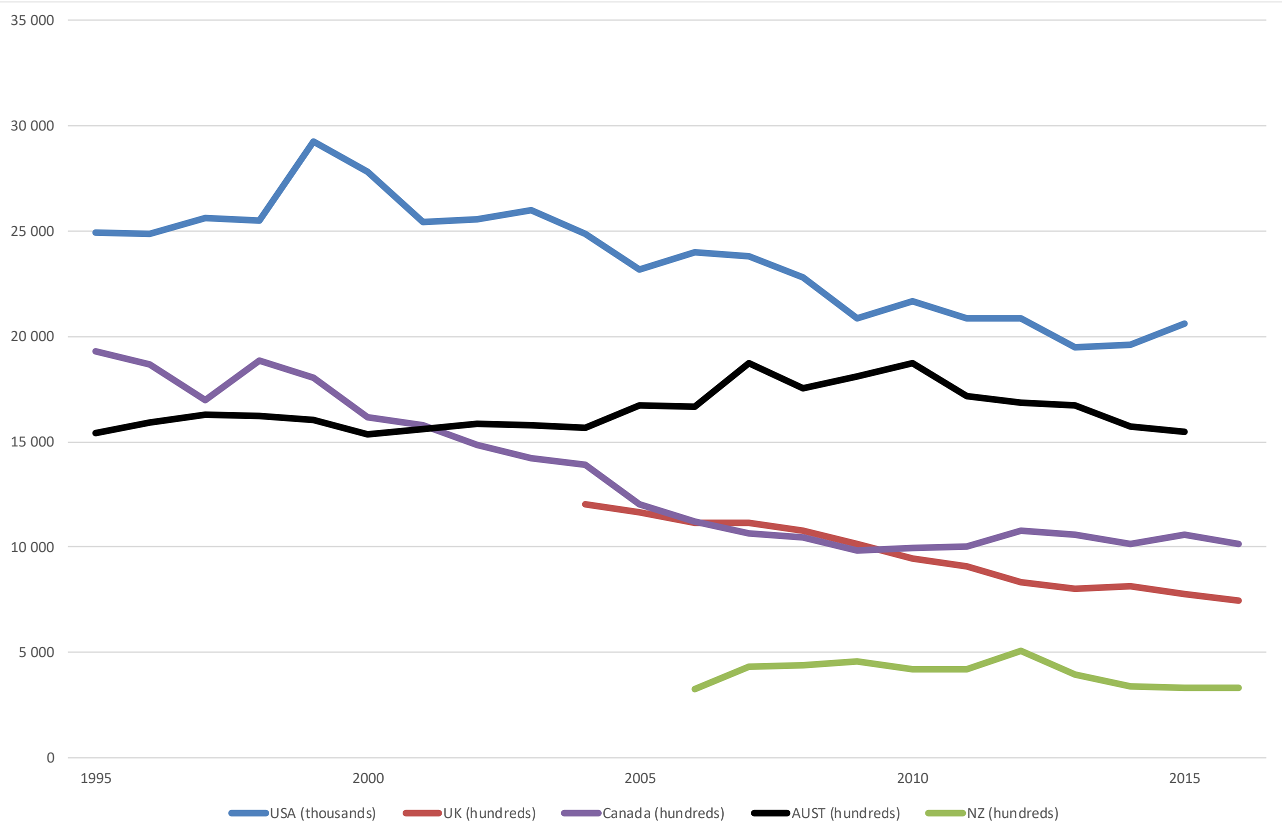
5.2 Flying activity

Growth in Australian GA flying activity in the 20 years to 2010 is in contrast with an extended period of falling GA activity levels in USA (Figure 5.2). The USA use a similar definition of GA to Australia where air carrier (14 CFR Part 121) and commuter and on demand (14 CFR Part 135) operations are excluded. All other flying activity is included, including activity by powered parachutes and light sport aircraft.

A recent report commissioned by the UK Ministry of Transport stated that hours flown by GA fixed wing aircraft between 751 and 5,700kg MTOW fell 50 per cent between 2005 and 2015 and hours flown by GA fixed wing aircraft below 750kg fell 35 per cent over the same period (York Aviation, 2015).

Customised datasets obtained from the UK CAA and NZ CAA include estimates for helicopters, but do not include estimates for light sport aviation (including ultralights). In the UK, GA hours flown fell by 33 per cent between 2005 and 2015, while in New Zealand, GA hours flown remained virtually unchanged over the ten years to 2016.

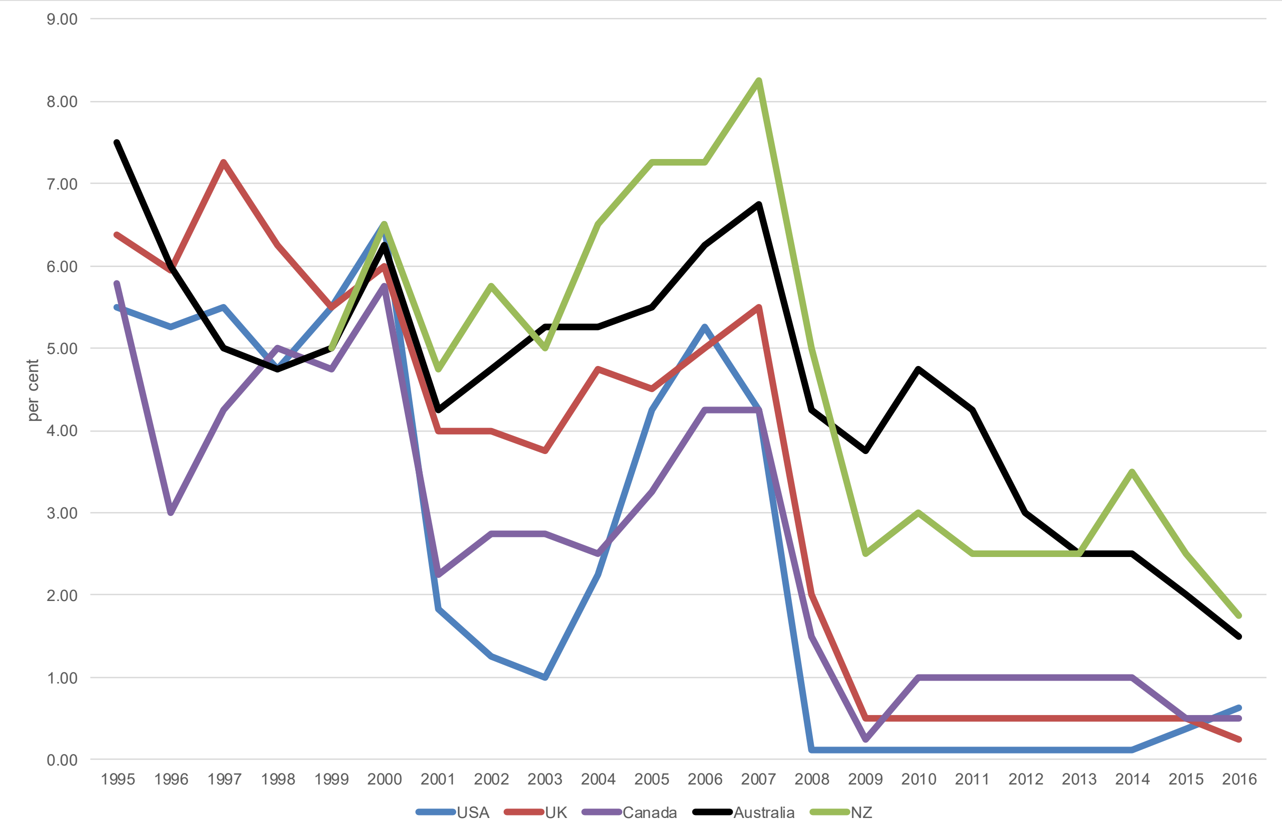
Figure 5.2 General Aviation hours flown – international comparison



Source: BITRE 2017, BTS 2017, UK CAA (custom dataset), Transport Canada (custom dataset) and CAA NZ (custom dataset)

Using central bank monetary policy interest rates as a proxy for general economic conditions in each country (Figure 5.3) suggests there is a relationship between general economic conditions and the level of GA flying activity taking place in each country. Australia and New Zealand generally enjoyed more favourable economic conditions than Canada and the USA in the first decade of the century, which coincides with GA activity in the respective countries.

Figure 5.3 Monetary policy-related interest rates – international comparison



Source: IMF 2017, International Financial Statistics

Chapter 6: Challenges for General Aviation

6.1 Key challenges

Given the diverse nature of GA, there are both broader sectoral and specific challenges inside parts of the sector that have been identified during the study.

The GA sector covers all flying activity, manned or unmanned, other than commercial transport operations. GA includes flying training, mustering, firefighting and emergency service operations, search and rescue, aerial surveying and photography, towing, and private flying.

Some of these activities are quite specialised and therefore have challenges in terms of training and retaining key personnel.

GA activities also present challenges for regulators in terms of determining the appropriate type and level of regulation, balancing the level of risk inherent in the activity with the risk to aircraft occupants, other airspace users and population below.

Some activities have the potential to attract export earnings including flying training of international students and for international airlines. Challenges in this area of a different nature involving Australia's competitiveness against other potential Asia-Pacific flying training locations.

Some of the overall challenges facing the GA industry in adapting to changes in the economic, demographic and regulatory environment include:

- likely fluctuations in the cost and availability of avgas fuel;
- the maintenance of an ageing, fixed wing VH-registered aircraft fleet with high ongoing maintenance and repair costs and outdated instrumentation;
- transitioning to the increased commercial use of RPAS, with these activities replacing some traditional VH- operations;
- increased use of ultralight aircraft as a business tool and access to specialized training (e.g. mustering);
- cost of pilot and maintenance training and attracting/retaining staff;
- market-based airport rents and charges;
- the impact of regulatory changes including the outcome of a number of current CASA reviews of aviation safety regulations that apply to GA operations;
- GA business access to foreign markets, noting that not all GA operators are involved in activities that seek to export their products and services; and
- a serious lack of comprehensive and robust data on the entire GA sector, including its level of activity and its economic and community contribution.

Chapter 7: Opportunities for General Aviation

7.1 Key opportunities

While there are a number of challenges facing GA, there are also a number of opportunities, including a number of emerging areas in GA, as indicated in Chapter 4.

It is also important to recognize that the key economic factors identified in Chapter 3 will inevitably play a major role in shaping the continued evolution of GA in Australia.

Like many other industry sectors, the demand for and supply of the services offered by GA has changed over the past few decades and will continue to do so with developments in aviation technology and the way in which our economy operates.

It is important to recognize that there is already work underway in a number of areas that is looking to address many of the challenges in Chapter 6.

CASA has commenced, and continues to work with GA, on risk profiles for the industry to better inform future regulatory work.

CASA is progressing specific issues where the GA sector has called for a review. Issues under review include fatigue management, pilot medical requirements, safety regulatory requirements for self-administering organisations (e.g. RAAus) and RPAS.

Several of the ten elements of the outstanding safety regulatory reform program – notably CASR Parts 103 and 105 (relating to sport aviation) and CASR Part 138 (aerial work) directly relate to GA.

There is also clearly a need for Government agencies and the GA sector to get together to work on establishing a means of collecting comprehensive data on GA, including the sector's economic contribution, to better inform future policy and regulatory development.

While there are clearly challenges ahead, there are many opportunities for the industry and Government to respond to these challenges including:

- fleet renewal and use of engines with fuel requirements other than avgas;
- targeted measures for enhanced training and retention of pilots and maintenance staff;
- CASA to pursue opportunities for harmonization of regulations or mutual recognition of Australian aviation industry services and products by other countries to enhance export opportunities for GA.
- examination of aviation safety regulatory fees including a review of the number of hourly rates used by CASA relative to the number of fixed fees and possible removal/reduction of certain fees for GA;
- better engagement between airport and aircraft operators on future airport planning and development; and
- harnessing the benefits of potential multiple commercial applications of RPAS, noting that increased integration of RPAS will only occur where safety standards are maintained.

Chapter 8: Conclusion

General aviation (GA) is a diverse sector playing an important role in Australian aviation including in serving regional communities. It has many participants passionate about flying.

While overall GA activity is declining, it is not accurate to say that all sectors of GA are declining.

What is apparent is that for some aviators, operating a GA business is a way of funding their passion.

Some aviators continue to operate the same way they have for decades, in aircraft that are decades old, and at airports with few GA operators remaining.

These older aircraft are significantly cheaper than similar new aircraft and with regular maintenance, have proven to be remarkably durable. So durable that they still dominate the Australian civil aircraft fleet today. The most common year of manufacture for Australian-registered aircraft is currently 1978, with the most popular aircraft model originally certified in the 1950s.

However, even the most durable VH- registered aircraft wear out eventually. The number of aircraft not flying due to mechanical issues has been increasing. These aircraft are being largely replaced by other aircraft types, such as ultralight and owner-built aircraft and small helicopters.

GA is operating in an airport environment that has evolved over the last two decades. It is still an important part of most airports in regional Australia, but in some parts of Australia, GA aircraft operators have moved away from larger airports to other, more economically and operationally compatible airports outside urban areas.

The aviation safety regulatory framework has also changed over that period and many study participants struggle to find benefits in these changes.

With CASA about to finalise many relevant parts of the regulatory framework applicable to GA, there is an opportunity to reduce the regulatory burden on GA through regulatory requirements that are more proportionate to the risks associated with GA activities but still maintain safety standards.

The combination of ageing traditional aircraft and higher costs, and regulatory compliance have led many aviators to turn to the sport and recreational aviation sector.

Sport and recreational aviation is an important introduction to flying for aspiring pilots. Generally lower maintenance costs and certification standards present aviators with a financial incentive to start in this part of GA. RPAS also represent a potential area of significant future growth for GA.

The GA industry in Australia has experienced a number of challenges over the past decade, due to a combination of economic, demographic and regulatory factors. Some parts of the industry have done well over the period while others have struggled to respond to changes in the aviation environment.

The GA industry will need to continue to adapt to the changing nature and structure of the Australian and international aviation environment to ensure its continuing safe and sustainable operation.

Appendix A Study participants

As part of this study, BITRE officers undertook an extensive series of interviews across a wide range of industry participants. While the analysis in this report is BITRE's alone, BITRE would like to thank the following individuals for their assistance with this study:

Shane Addis	ERGT Australia
Christopher Andrews	Designated Aviation Medical Examiner
Tony Bates	Heliflite
David Bell	Australian Business Aviation Association
Mike Borgelt	Australian Experimental Aircraft Association Chapter 1308
Trevor Breed	Helitreck
Glen Buckley	Melbourne Flight Training
Ken Cannane	Aviation Maintenance Repair and Overhaul Business Association Inc.
Reece Clothier	Australian Association for Unmanned Systems
Craig Crumblin	Unofficial representative, Aerial Mustering industry
David Currey	Royal Aero Club of Western Australia Inc.
Sheryl de Bruyn	Archerfield Airport Corporation
Christopher De Luis	Civil Aviation Safety Authority
Marc De Stoop	Aircraft Owners and Pilots Association of Australia
Peter Edwards	Regalair
Peter Francis	Aerodrome Design Pty Ltd
John Fraser	Jandakot Airport
Ian Fritsch	Mount Gambier Airport
Peter Gash	Seaair
Wayne Grant	Gulfstream Aviation
Ben Hall	Professional Helicopter Services
Linton Hayres	Aircraft Propellers and Spares
Mike Higgins	Regional Aviation Association of Australia
Matt Hobson	Alliance Airlines Pty Ltd
Brian Horton	University of New South Wales School of Aviation
Phil Hurst	Aerial Application Association of Australia Ltd
Denis Land	Private flier
Gil Layt	Gil Layt's Flying School Pty Ltd
Mick Macfarlane	ERGT Australia

Heather Mattes	Archerfield Airport Corporation
Sam McCabe	Aerotech
Richard McCooey	Australian Parachute Federation
Jim McDowell	Private RAAus pilot
Jason McHeyzer	Civil Aviation Safety Authority
Chris Monahan	Civil Aviation Safety Authority
Shaun Moss	ExecuJet Australia Pty Ltd
Ian Ogilvie	Civil Aviation Safety Authority
Michael Perren	CHC
Derek Pratt	Helistar Aviation
Roger Puehl	Professional Helicopter Services
Steven Sartain	WA Department of Fire and Emergency Services
Sally Scott	North Queensland Aero Club
Russell Shields	John Cameron Aviation
Kevin Smith	Jandakot Airport
Walter Thomson	Tomson Design
Brad Turner	Australian Parachute Federation
Lee Ungermann	Civil Aviation Safety Authority
Mike Watson	Rotorvation Helicopters
Denis Wisby	Aero Service

In addition, there were another 44 participants that did not wish to have their names published, or could not be contacted. BITRE is also grateful for their participation.

References

Aircraft Owners and Pilot Association of Australia (AOPA) 2016, ***Project Eureka***, AOPA, Sydney

Australian Government 2014, ***Government Response to The Aviation Safety Regulation Review Report***

Australian Industry Standards Ltd (AIS) 2017, ***Australian Workforce Skills Study***

Australian Transport Safety Bureau (ATSB) 2006, ***International Fatality Rates: A Comparison of Australian Civil Aviation Fatality Rates with International Data***, Aviation Research & Analysis Report – B2006/0002, ATSB, Canberra

Australian Transport Safety Bureau (ATSB) 2009, ***Perceived threats, errors and safety in aerial work and low capacity air transport operations***, Aviation Research & Analysis – AR-2006-156(2), ATSN, Canberra

Australian Transport Safety Bureau (ATSB) 2017, ***ATSB Transport Safety Report***, Aviation Research Statistics – AR-2016-122, ATSB, Canberra

Aviation Safety Regulation Review Panel 2014, ***Report of the Aviation Safety Regulation Review***

Bureau of Infrastructure, Transport and Regional Economics (BITRE) 2017, ***Australian Aircraft Activity 2015***, Statistical Report, Canberra

Bureau of Transport and Regional Economics (BTRE) 2005, ***General Aviation: An industry overview***. Report 111, BTRE, Canberra

Bureau of Transport Economics (BTE) 1980, ***Basic Characteristics of General Aviation in Australia***, Occasional Paper, Canberra

Civil Aviation Authority of New Zealand (CAA NZ) 2017, ***Aviation Safety Report***, CAA NZ, web release

Civil Aviation Safety Authority (CASA) 2001, ***Maintenance Organisations Proposed Part 145 of the CASRs***, NPRM 0110MS, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2002, ***Flight Training Organisations, Proposed Part 141 of the CASRs***, CP 0205FS, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2003, ***Flight Training Operators Proposed Part 141 of the CASRs,*** NPRM 0311FS, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2006, ***A Proposal to Modernise and Harmonise Rules for the Maintenance of Australian Aircraft and Licensing of Aircraft Maintenance Personnel***, NPRM 0604MS, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2009, ***A Proposal to Modernise Rules for the Licensing of Maintenance Personnel for Small Aircraft***, NPRM 0804MS, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2013, ***Fatigue – The rules are changing***, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2014a, ***Maintenance personnel licensing for small aircraft***, NPRM 1310SS, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2014b, ***Proposed Airworthiness directive to Mandate Inspection or Retirement of Control Cable Assemblies with Terminals manufactured from SAE-AISI 303 Se Stainless Steel***, NPRM 1303MS, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2015, ***A review of the case for change: CAO 48.1 Instrument 2013***, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2016, ***Development and Application of Risk-Based and Cost-Effective Aviation Safety Regulations***, Directive 01/2015, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2017a, ***Annual Report 2016-17***, CASA, Canberra

Civil Aviation Safety Authority (CASA) 2017b, ***Civil Aircraft Register***, CASA, on-line extract August 2017

Civil Aviation Safety Authority (CASA) 2017c, ***Part 61 Solutions Taskforce Closure Report***, CASA, Canberra

Civil Aviation Safety Authority (CASA) and Aerial Agricultural Association of Australia Ltd (AAAA) 2014, ***Sector Risk Profile for the Aerial Application Sector***, CASA, Canberra

Crumblin, Craig 2014, ***Australian Mustering Industry Report***

Department of the Environment and Energy (DEE) 2017, ***Australian Petroleum Statistics 2016*** Commonwealth of Australia

Independent Inquiry into Aviation Cost Recovery 1984, ***Aviation Cost Recovery Report of the Independent Inquiry***, Australian Government Publishing Service, Canberra

International Civil Aviation Organization (ICAO) 2013, ***Reference Manual on the ICAO Statistics Programme***, Fifth edition, Doc 9060/5, International Civil Aviation Organization, Montreal

International Monetary Fund (IMF) 2017, ***International Financial Statistics (IFS)***, IMF, web release

Recreational Aviation Australia (RAAus) 2016, ***Operations Manual*** Issue e7.1, RAAus, Canberra

The Australian Aviation Associations Forum (TAAAF) 2016, ***Aviation Policy 2016***, TAAAF

U.S. Department of Transportation Bureau of Transportation Statistics (BTS) 2017, ***National Transportation Statistics***, web-only report

York Aviation 2015, ***The Economic Value of General Aviation in the UK***, Report for Department for Transport

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