UFUA Aviation Branch
PO Box 5197
Alberton SA 5014
Phone: 0428 553 859
Email: admin@ufuav.asn.au
Web: ufuav.asn.au
ABN: 96 533 521 914

INITIAL SUBMISSION - AVIATION WHITE PAPER TOR

10/3/2023

RE: Aviation White Paper Branch
Domestic Aviation & Reform Division
Department of Infrastructure, Transport, Regional Development, Communications, and the Arts
By email only: aviationwhitepaper@infrastructure.gov.au

Dear Departmental Staffers,

Thank you in anticipation of your consideration of our submission on the important themes of efficiency, safety, sustainability, and competitiveness of the aviation sector to 2050.

Our emphasis will focus on safety, as 98% of operational Aviation Rescue Fire Fighters employed by Airservices Australia are our members, along with the Fire Fighters stationed at Norfolk Island Airport in the Pacific.

Kindly refer to our prior correspondence to the Department on the Recommendations (not wholeheartedly endorsed by the then government of the day and/or not yet implemented) from the 2019 Senate Inquiry into “The provision of rescue, firefighting and emergency response at Australian airports”.

We also refer to the content of the UFUA - Aviation Branch’s commissioned reports from the Centre of Full Employment and Equity [“CofFEE”], which detail many changes required in ARFFS, these have been previously supplied to the Department, but we enclose further copies of July 2020 and May 2022 (as the most recent) for your information and consideration.

For ease, we will set out our submission in the headings under the 10 areas contained within the scope of the terms of reference:

- **aviation’s role in economic development, trade, and the visitor economy - general, domestic, regional, and international aviation**

  The aviation industry (covid aside) is very profitable and can afford the investment into compliance with, equal to, or greater than, Australia’s obligations under the Chicago Convention and the guidance of the International Civil Aviation Organisation.

  Airservices Australia is already applying pressure to Aviation Rescue Fire Fighting Services (ARFFS) in regional Australia for deregulation, cost-cutting measures and privatisation.

  To better increase development, trade, and visitor numbers ARFFS should be an essential service irrespective of region, domestic or international aviation. It should

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be a high priority for Australia to lead our region in aviation safety and to build upon and maintain our long held international reputation for aviation safety.

- **how to maximise the aviation sector's contribution to achieving net zero carbon emissions including through sustainable aviation fuel and emerging technologies.**

Western Sydney Aerodrome, when operational, must meet several environmental parameters, including net zero carbon emissions, to date ARFFS employees have not been consulted on how this might be achieved - including by any station and training facilities design, build etc.

Whilst Airservices has aspirational corporate goals to adopt emerging technologies, many are only in a prototype phase at present.

The early stages of the development, of ARFFS net zero carbon plant and equipment, are only in their infancy - worldwide.

We can only really see Airservices achieving a goal of offsetting emissions.

Irrespective of the above we are generally concerned about the lack of consultation for the procurement of any plant and equipment in ARFFS.

The most aging of ARFFS' current plant and equipment is reaching the end of its service life. Limited progress is being made in progressing these procurement programs.

We will elaborate on further environmental impacts of ARFFS operations later in the scope of the terms of reference.

- **changing aviation technologies and ways to position our policies, regulations, and systems to encourage the uptake and manufacturing of new, more efficient, transport technologies.**

Our branch would welcome the opportunity to be involved in consultation about changes to policy and regulation.

The changing technologies, in particular future aviation fuel technology, will impact ARFFS operations and service delivery - which until now has been singularly focussed on traditional aircraft design and their use of hydrocarbon fuels.

- **airport development planning processes and consultation mechanisms that consider the impact and changing nature of aircraft noise and related expectations on the role of noise sharing and noise mitigation.**

We are concerned about the ongoing provision of Water Rescue Services by ARFFS, particularly at regional aerodromes. Where possible and to mitigate aircraft noise, aircraft movements are encouraged to occur over bodies of water.

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Airservices is placing this essential service under significant pressure at many locations including but not limited to Adelaide/West Beach, Townsville, Sunshine Coast/Marcoola.

This specialist, dedicated, ARFFS service can make an immediate intervention, without delay, to aviation disasters over water.

- how to support and regenerate Australia's general aviation sector.

- future industry workforce skills and training requirements.

Irrespective of government assistance (i.e. operational funding) during covid to maintain ARFFS, decisions by Airservices during covid have placed staffing and resourcing pressure on ARFFS.

We will elaborate on the skills and training and the need to rebuild the staffing capability of ARFFS.

As a result of Airservices' reduction in ARFFS staffing and service provision capability, Airservices have revised several of their internal parameters for industry reporting requirements which have sought to hide the true extent of understaffing and its impact on service provision.

Extensive recruiting, including by direct and lateral intakes, of new Aviation Rescue Fire Fighters, is urgently needed.

When undertaking training for the development and maintenance of skills in ARFFS the following are key considerations: Operational Requirements, Work Health and Safety, and Environmental Impact.

In the event of operational response control measures to eliminate or reduce exposures to hazards/risks presented by chemical exposure are often not possible when protecting life, property, and the environment.

However, in the ARFFS training environment selection of fuels, frequency and duration of training are all valid control measures which ARFFS future skills development must focus. This focus must not diminish the quality and fidelity of the

training. Considerable investment is required to address a regression in many areas of ARFFS skills development.

For further information kindly refer to attachment "ARFFS Training Fidelity".

It needs to be noted that the ARFFS training grounds around Australia are contaminated by Per- and Polyfluorinated Substances ["PFAS"] and Total Petroleum Hydrocarbon ["TPH"] groups of chemicals. Remediation, to date, has not eliminated or sufficiently reduced the risk to workers and local communities.

- appropriate consumer protections and access to services

  Put simply adequate funding of ARFFS is required as an essential public safety service, the air travelling public should have confidence in the ongoing provision of world leading ARFFS standards.

  The aviation industry has had to navigate unprecedented ARFFS service provision changes which has resulted in a substantial increase in the use of 'Notice to Air Men' (NOTAM, may we suggest the move to a gender-neutral term Notice to Air Missions as recently adopted by the US's Federal Aviation Administration).
  This can impact aircraft movements in preparation of flight plans and nomination of appropriately serviced contingency aerodromes.

  Accuracy in reporting to industry is safety critical.

- maintaining fit-for-purpose aviation safety, air navigation and aviation security systems and service delivery agencies

  This is where we see ARFFS playing its most crucial role now and into the future, again we commend the expert opinion detailed in our CoffEE-commissioned reports.

  To stem the tide of previous cuts to ARFFS it is recommended that an ARFFS service be re-established at all registered aerodromes which will bring Australia into line with international standards.

  ARFFS rescue and firefighting equipment should play a vital role in "all hazards, all agencies" responses to ever-increasing national disasters. For example, in 2019 ARFFS ultra-large fire vehicles provided invaluable support to the nation's bushfire fighting efforts, particularly in regional centres where ARFFS is the only professional firefighting service. Additionally, ARFFS provided support in urban settings to help backfill against State and Territory resources that had been deployed to assist wildfire firefighting in the regions.

  ARFFS should build its resourcing to facilitate a national surge capacity for State and Territory Fire Services and volunteer wildfire brigades. Current resources are stretched at best, but never more so than during catastrophic wildfire events.

  Ever-increasing risks from climate change, extreme weather and changed fire behaviour heighten the need for this extra capacity we have indicated ARFFS can (if properly resourced) fulfil. The Department needs to start forecasting the capacity, funding, and resources now.

  More career firefighters present an opportunity for greater public sector employment for the good of local communities.

  The service delivery agencies responsible for aviation safety and associated services to quote the now Minister have been 'lost in the wilderness in the nearly 10 years the

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coalition was in power' now more than ever these agencies require greater scrutiny and supervision from the Department.

ARFFS and other aviation safety services are not political playthings subject to the winds of change in political power (where they face cuts in conservative leadership or injection of much-needed funding during progressive leadership) they should always be properly funded because they are essential public services.

Under no circumstances should any of these safety services be privatised for financial gain, it is but an additional bonus when ARFFS makes money to drive back into the government's coffers, it should not to be operated as a "for-profit" service, it should be operated as a service for the Australian people.

Operating a safety service chasing profit ignores the social costs and benefits of adequately funding an essential public service.

- the role of airlines and airports in supporting regional economies

  In addition to those benefits already highlighted by the provision of ARFFS in the regions, the volunteer fire brigades in these communities, in which our members live and work, are supported by their professional skills and their generous service to their communities.

- any other significant issues

  We are concerned about the stewardship of Airservices Executive Leadership and the negative influence industry and economics have on safety.

  The aviation industry is driven by profits, this should not drive a race to the bottom for Australia on safety standards and conditions of service provision.

  In caucusing with our counterparts at TWU, AIPA, FAAA, Civil Air, CPSU, ETU, Professionals Australia, and other trade unions we would encourage the introduction of a 'Safe and Secure Skies' Division of the Fair Work Commission to independently oversee and scrutinise the entire aviation industry and ensures a workable balance between safety and profit. Australia deserves to be a country that complies with and exceeds international safety standards and recommended practices.

We look forward to receiving details of upcoming in-person or virtual roundtables for further discussions and consultation on these important themes.

The Senate

Rural and Regional Affairs and Transport References Committee

The provision of rescue, firefighting and emergency response at Australian airports

August 2019

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Ms Kate Morris, Administration Officer

PO Box 6100
Parliament House
CANBERRA ACT 2600

Telephone: (02) 6277 3511
Fax: (02) 6277 5811
Email: rrat.sen@aph.gov.au

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List of Recommendations

Recommendation 1

7.11 The committee recommends that the Australian Government conduct a review of Australia's adherence to the International Civil Aviation Organization Standards and Recommended Practices for the provision of Aviation Rescue Fire Fighting Services in Australia. The review should consider:

- **Subpart 139.H of the Civil Aviation Safety Regulations 1998;**
- **the associated Manual of Standards;**
- **Australia's adherence to Chapter 9 of Annex 14 of the Chicago Convention; and**
- **any other relevant regulations, standards and procedures (including those issued by the National Fire Protection Association).**

Where the review identifies non-compliance with international standards, the rationale for this should be explained.

Recommendation 2

7.18 The committee recommends that the Civil Aviation Safety Authority conduct an audit of all Aviation Rescue Fire Fighting Service (ARFFS) vehicles and equipment currently in operation across Australia, to determine the level of compliance with the International Civil Aviation Organization standards, and associated Australian regulations and standards (such as the Civil Aviation Safety Regulations 1998 and the Manual of Standards). The audit should consider whether the vehicles and equipment adhere to the relevant ARFFS airport category at each aerodrome.

Recommendation 3

7.22 The committee recommends that the Civil Aviation Safety Authority implement a testing program for the firefighting foams in use at Australian airports, in accordance with International Civil Aviation Organization guidelines. The testing should take place under conditions unique to Australia (such as higher ambient temperatures), to establish whether the foams operate effectively to extinguish aviation fires.

Recommendation 4

7.36 The committee recommends that the Civil Aviation Safety Authority mandates that Aviation Rescue Fire Fighting Service (ARFFS) providers use the Task Resource Analysis (TRA) methodology, as prescribed by the International Civil Aviation Organization, to determine the suitable staffing

levels for ARFFS at all aerodromes in Australia where an ARFFS is provided. The TRA should take into consideration the category of each aerodrome.

Recommendation 5

7.42 **The committee recommends that the Civil Aviation Safety Authority mandate that the Task Resource Analysis (TRA) process undertaken by Airservices must involve appropriate consultation, via the direct engagement of Aviation Rescue Fire Fighting staff and officers at all stages of the TRA process. The consultation should be transparent, and the outcomes made publicly available as soon as is practicable.**

Recommendation 6

7.47 **The committee recommends that the Australian Government introduce legislation which stipulates the minimum Aviation Rescue Fire Fighting (ARFF) staffing level in accordance with airport category, at all Australian aerodromes where an ARFF service is provided. The legislated staffing levels should reflect the outcomes of the Task Resource Analysis at each aerodrome.**

Recommendation 7

7.56 **The committee recommends that the Department of Infrastructure, Transport, Cities, and Regional Development undertake a review of the current establishment criteria used for determining whether to implement an Aviation Rescue Fire Fighting Service (ARFFS). The review should consider whether the current methodology of utilising passenger numbers allows for sufficient provision of ARFFS across Australian aerodromes, in light of increasing passenger numbers in recent years.**

Recommendation 8

7.63 **The committee recommends that the Australian Government mandate the establishment of a Task Resource Analysis for Domestic Response Services responding to emergencies at aerodromes (DRS TRA). The DRS TRA should determine the additional Aviation Rescue and Fire Fighting (ARFF) staff required for responses to non-regulated ands non-aviation emergencies across the aerodrome, over and above the staff required for an ARFF station to maintain category in the case of an aviation emergency.**

Abbreviations

AAA	Australian Airports Association
AFAC	Australasian Fire and Emergency Service Authorities Council
AIIMS	Australasian Inter-Service Incident Management System
Airservices	Airservices Australia
ALARP	As low as reasonably practicable
ARFF	Aviation Rescue Fire Fighting
ARFFS	Aviation Rescue Fire Fighting Services
ATC	Air traffic control
AusALPA	Australian Airline Pilots' Association
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations 1998
CEO	Chief Executive Officer
CFO	Chief Fire Officer
Chicago Convention	*Convention on International Civil Aviation 1944*
Committee	Senate Rural and Regional Affairs and Transport References Committee
DIRDC	Department of Infrastructure, Regional Development and Cities
DRS	Domestic Response Service
DRV	Domestic Response Vehicle
DSUs	Distress signal units
EGM	Executive General Manager
EVTs	Emergency Vehicle Technicians
F3	Fluorine Free Foam
FPAA	Fire Protection Association Australia
FRNSW	Fire and Rescue NSW
ICAO	International Civil Aviation Organization
Legislation committee	Rural and Regional Affairs and Transport Legislation Committee
MFS	Metropolitan Fire Services
MOS	Manual of Standards
MTOW	Maximum take-off weight
NFPA	National Fire Protection Association
NOTAM	Notice to Airmen
NSWRFS	New South Wales Rural Fire Service
OEM	Office of Emergency Management (New South Wales)
OM	Operations Manual
PFAS	Per- and poly-fluoroalkyl substances
PIR	Post-implementation review

QFES	Queensland Fire and Emergency Services
Review	2015 Regulatory Policy Review
SAMFS	South Australian Metropolitan Fire Service
SARPs	Standards and Recommended Practices
SCARD	Safety Case Assessment and Reporting Determination
SMS	Safety Management System
TRA	Task Resource Analysis
UFUA	United Firefighters Union of Australia
UFUAB	United Firefighters Union of Australia Aviation Branch

Chapter 1
Introduction and background

Referral

1.1 On 5 December 2018, the following matters were referred to the Senate Rural and Regional Affairs and Transport References Committee (committee) for inquiry and report by the second sitting day in August 2019:

1.2 The provision of rescue, firefighting and emergency response at Australian airports, with particular reference to:

(a) the current standards applicable to the provision of aerodrome rescue and firefighting services relating to community safety and the emergency personnel safety;
(b) the standards for the provision of emergency response at Australian airports, including emergency medical response and response to structure fires and other incidents;
(c) the comparison of safe systems of emergency response standards and systems of work for firefighting and rescue operations for structure fires, aircraft rescue, emergency medical response and other emergency incidents;
(d) the consideration of best practice, including relevant international standards;
(e) the mechanisms and criteria for the review of the provisions of safety standards for the provision of rescue and firefighting services, if any;
(f) a review of Airservices Australia policy and administration of aviation rescue and firefighting services;
(g) the effectiveness and independence of the regulator, the Civil Aviation Safety Authority (CASA), to uphold aviation rescue and firefighting safety standards;
(h) the impact on Australia's national and international reputation and aviation safety record as a result of any lowering of aviation rescue and firefighting services; and
(i) any other related matters.[1]

1.3 The inquiry lapsed with the ending of the 45th Parliament. On 23 July 2019, the Senate of the 46th Parliament agreed to re-refer the inquiry to the committee, for report by 5 December 2019.[2]

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1 *Journals of the Senate*, No. 136, 5 December 2018, p. 4439.

2 *Journals of the Senate*, No. 5, 23 July 2019, p. 187-188.

Conduct of the inquiry

1.4 Information about the inquiry was made available on the committee's webpage. During the 45th Parliament, the committee also wrote to aviation stakeholders, state emergency service organisations and other interested groups to invite submissions. Details regarding the inquiry and associated documents are available on the committee's webpage.

1.5 The committee received 25 public submissions which are listed at Appendix 1. Public submissions to the inquiry are also published on the committee webpage.[3]

1.6 The committee held a number of public hearings in relation to the inquiry during the 45th Parliament, as follows:

- Melbourne, Victoria, on 14 March 2019;
- Adelaide, South Australia, on 20 March 2019; and
- Brisbane Airport, Queensland, on 16 April 2019.

1.7 A list of witnesses who appeared at these hearings is at Appendix 2.

Acknowledgements

1.8 The committee thanks all individuals and organisations that participated in the inquiry, by making submissions and giving evidence at public hearings.

Structure of the report

1.9 This chapter provides a brief overview of Aviation Rescue Fire Fighting Services (ARFFS).

1.10 The second chapter details the international and Australian standards and regulations in place which determine how aviation rescue services should be implemented at aerodromes across Australia.

1.11 Chapter 3 examines the suitability of firefighting equipment and resources at ARFFS stations, and considers the concerns raised about the location of the new fire station, built to service the new Brisbane Airport runway.

1.12 Chapter 4 highlights the concerns of stakeholders regarding the level of staffing provided at ARFFS fire stations, including issues that may arise with the redeployment of crews to non-regulated emergency responses.

1.13 The fifth chapter highlights the division of responsibilities between the ARFFS and state and territory fire services. It highlights the concerns raised about the allocation of aviation rescue services to non-regulated emergency responses.

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3 See: https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Rural_and_Regional_Affairs_and_Transport/Aviationrescueservices45

1.14 Chapter 6 details the use of task resource analyses to determine the adequate resourcing of aviation firefighting stations. It also considers a number of reviews which have been undertaken into the regulatory framework for aviation and rescue firefighting, and presents overall views as to the adequacy of the provision of ARFFS by Airservices Australia.

1.15 Chapter 7 presents the committee's views and recommendations.

What are Aviation Rescue Fire Fighting Services?

1.16 Aviation Rescue Fire Fighting (ARFF) is a unique branch of firefighting, requiring specialised equipment and specialist skills and training to properly fulfil its role of optimising the chances of survival of passengers and crew in the event of an aircraft accident.[4]

1.17 International standards developed for the provision of ARFF services (discussed further in Chapter 2) were developed based on the following parameters:

- about 70 per cent of aircraft crashes occur on aerodromes;
- of those that occur on aerodromes, 90 per cent are survivable;
- people on board a major aircraft involved in a fire can survive up to four minutes; and
- intervention of an ARFF service within that four minutes can extend that time limit, allowing people on board to be rescued.[5]

1.18 The United Firefighters Union of Australia (UFUA) further observed that approximately 38 per cent of airline accidents that result in fatal injury occur on or near the ground, whilst an aircraft is parked, being towed or during taxiing, take-off and landing.[6]

1.19 ARFF responds to such aircraft and airport emergencies. An ARFFS at an Australian aerodrome is responsible for:

- rescuing persons and property from an aircraft that has crashed or caught fire during landing or take-off; and
- controlling and extinguishing, and protecting persons and property threatened by, a fire on an aerodrome, whether or not in an aircraft.[7]

1.20 The Department of Infrastructure, Regional Development and Cities (DIRDC[8]) stated that the primary function of the ARFFS is to:

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4 See for example: United Firefighters Union of Australia, *Submission* 10, p. 3; Australian Airline Pilots' Association, *Submission 21*, p. 2.

5 House of Representatives Standing Committee on Transport and Regional Services, *Regional Aviation and Island Transport Services: Making Ends Meet*, November 2003, p. 155.

6 United Firefighters Union of Australia, *Submission 10*, p. 3.

7 Civil Aviation Safety Authority, *Submission 7*, p. 1.

> …rescue people from an aircraft that has crashed or caught fire during landing or take-off on or in the vicinity of an aerodrome and to control and extinguish fires relating to aviation activities on the airport site.[9]

1.21 It was put to the committee that the Australian ARFF service is considered one of the world's largest, with more than 900 operational and support personnel charged with responding to the broad range of aviation and airport emergencies which may occur on an aerodrome.[10]

1.22 Airservices Australia (Airservices) provides ARFF services at 26 Australian airports. In 2017–18, ARFFS responded to nearly 6800 emergencies, and saved 17 lives.[11]

1.23 Fire stations at the busiest Australian airports are equipped to provide a 24-hour ARFF service, with the largest ARFF stations located at Melbourne, Sydney, Brisbane and Perth. The hours of operation at smaller airports are determined by commercial passenger aircraft flight schedules.[12]

1.24 The ARFFS stations located across Australia are listed in Table 1.1 below.[13]

Table 1.1 Aviation rescue firefighting service locations in Australia

Jurisdiction	Location
Australian Capital Territory	Canberra
New South Wales	Sydney, Ballina, Coffs Harbour
Northern Territory	Alice Springs, Ayers Rock, Darwin
Queensland	Brisbane, Cairns, Gladstone, Gold Coast, Hamilton Island, Mackay, Rockhampton, Sunshine Coast, Townsville
South Australia	Adelaide

8 Since making its submission, the Department has been renamed the Department of Infrastructure, Transport, Cities and Regional Development.

9 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 2.

10 Australasian Fire and Emergency Service Authorities Council, *Submission 3*, p. 3.

11 Airservices Australia, *Submission 11*, p. 3. A 27th ARFFS is currently being established at Whitsunday Coast Airport, to commence operations in 2020; see Airservices Australia, *Submission 11*, p. 3.

12 Airservices Australia, *Submission 11*, p. 3.

13 In addition, the Norfolk Island Administration provides ARFF services at the Norfolk Island International Airport, and the Department of Defence provides ARFF services at the Royal Australian Airforce Base Williamtown (Newcastle Airport); see Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 5.

Tasmania	Hobart, Launceston
Victoria	Avalon, Melbourne
Western Australia	Broome, Karratha, Newman, Perth, Port Hedland

Source: Airservices Australia, Aviation rescue fire fighting, 24 April 2018, *http://www.airservicesaustralia.com/about/our-facilities/aviation-rescue-fire-fighting* *(accessed 11 December 2018).*

1.25 In its provision of firefighting services, the ARFFS must respond to an aircraft incident at either end of a runway within three minutes of the initial call alerting it to the emergency, and be able to apply firefighting agent (namely water and foam) at 50 per cent of a pre-determined maximum discharge rate. Further, the ARFFS must be able to respond to any part of the airport movement area within three minutes.[14]

1.26 Airservices provides ARFFS in accordance with the Civil Aviation Safety Regulations 1998 (CASRs). The provision of ARFFS requires investment by Airservices in buildings, vehicles, technical equipment, personnel and the development and implementation of operations manuals and a safety management system at each location.[15]

1.27 Airservices owns, operates and maintains a fleet of over 120 specialised, high performance ARFFS vehicles, aerial rescue vehicles, water rescue boats, difficult terrain vehicles and domestic response vehicles. Airservices advised that this allows for responses to a broad range of emergencies, including aircraft incidents, water rescue responses, fire alarm activations and structural fires, medical assistance requests and hazardous material incidents.[16]

1.28 According to DIRDC, additional services are performed by Airservices, via ARFFS, but these must not prevent ARFFS from performing its core functions. DIRDC advised that the additional services include:

> …emergency first aid, alarm monitoring, building certification, and assisting other fire and police services under mutual aid arrangements. Airservices is not required to provide these additional services, and they must not impede on Airservices' capacity to perform its core ARFFS function and maintain its required ARFFS category without compromise. The [*Air Services Act 1995*] specifies that in performing its functions,

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14 Airservices Australia, *Submission 11*, p. 3; Airservices Australia, *About our aviation fire service*, 8 August 2018, http://www.airservicesaustralia.com/services/about-our-aviation-fire-service/ (accessed 11 December 2018).

15 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 9.

16 Airservices Australia, *Submission 11*, p. 3.

> Airservices must regard the safety of air navigation as the most important consideration.[17]

1.29 Under the CASR, there is nothing to prevent an ARFFS provider from an aerodrome performing fire control or rescue services elsewhere than on the aerodrome, but the provider must give priority to its main responsibilities of rescuing persons and property, and controlling aircraft and aerodrome fires.[18]

17 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 10.

18 Civil Aviation Safety Authority, *Submission 7*, p. 1.

Chapter 2
International and Australian regulatory framework for ARFFS

2.1 The provision of ARFFS in Australia is governed by a number of international standards and local regulatory frameworks. This chapter outlines these standards and frameworks.

2.2 Within these frameworks the particulars of ARFF service delivery are detailed, including safety standards; establishment (and disestablishment) thresholds for the founding of an ARFF service at an airport; the determination of airport categories; and the allocation of firefighting staff to each airport.

2.3 This chapter considers these various elements and how ARFFS is provided in Australia.

International obligations and standards

2.4 The *Convention on International Civil Aviation 1944*, known as the Chicago Convention, established airspace rules, including in relation to safety, and the air travel rights of those states which are signatories to the Convention. The Convention also established the International Civil Aviation Organization (ICAO), which—among other things—works with member states to reach consensus on international civil aviation Standards and Recommended Practices (SARPs), and other policies supporting safety in civil aviation.[1]

2.5 Australia, as a signatory to the Chicago Convention, generally adopts the ICAO SARPs, including those in relation to ARFF services which are formalised in Chapter 9 of Annex 14 to the Convention.

2.6 Chapter 9 of Annex 14 contains an introductory note, detailing the primary objectives of ARFF services as:

> …to save lives in the event of an aircraft accident or incident occurring at, or in the immediate vicinity of, an aerodrome. The rescue and fire fighting service is provided to create and maintain survivable conditions, to provide egress routes for occupants and to initiate the rescue of those occupants unable to make their escape without direct aid. The rescue may require the use of equipment and personnel other than those assessed primarily for rescue and fire fighting purposes.
>
> The most important factors being an effective rescue in a survivable aircraft accident are: the training received, the effectiveness of the

---

1 International Civil Aviation Organization, *About ICAO*, https://www.icao.int/about-icao/Pages/default.aspx (accessed 17 June 2019).

> equipment and the speed with which personnel and equipment designated for rescue and fire fighting purposes can be put into use.[2]

2.7 DIRDC explained that the ARFFS SARPs require that rescue and firefighting equipment and services be provided at all international aerodromes. Further, the SARPs include:

- the level of protection required;
- the provision of extinguishing agents, rescue equipment and personnel; and
- a response time to the emergency not exceeding three minutes.[3]

2.8 The ICAO SARPs also detail the level of resourcing required for an ARFF service. ICAO recommends the use of a Task Resource Analysis (TRA) to determine the resourcing needs for an ARFFS. The TRA should 'establish justification as to the minimum number of qualified/competent personnel required to deliver' an effective ARFF service. ICAO goes on to state that:

> A task analysis should primarily consist of a qualitative analysis of the RFFS response to a realistic, worst-case, aircraft accident scenario. The purpose should be to review the current and future staffing levels of the RFFS deployed at the aerodrome. The qualitative analysis could be supported by a quantitative risk assessment to estimate the reduction in risk. This risk assessment could be related to the reduction in risk to passengers and aircrew from deploying additional personnel. One of the most important elements is to assess the impact of any critical tasks or pinch points identified by the qualitative analysis.[4]

2.9 According to the Civil Aviation Safety Authority (CASA), the ICAO resourcing model, applied at each ARFFS location:

> …focusses on a balance between available resources and the risks associated with an aircraft accident rather than exclusively on the availability of certain resources.[5]

2.10 The ICAO framework also provides guidance on the implementation of Annex 14. Each member state's civil aviation authority is then responsible for publishing regulations which correspond with Annex 14 (in Australia, the CASRs), along with guidance for service providers (in Australia, Airservices).[6]

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2 Chapter 9.2 (Rescue and fire fighting), Annex 14 to the *Convention on International Civil Aviation*, as cited in Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 3.

3 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 3.

4 International Civil Aviation Organization, *Doc 9137-AN/898: Airport Services Manual*, Part 1—Rescue and Firefighting, Fourth Edition, 2015, p. 10-3.

5 Civil Aviation Safety Authority, *Submission 7*, pp. 2-3.

6 United Firefighters Union of Australia, *Submission 10*, p. 5.

2.11 The legislation governing Airservices acknowledges that the Australian ARFFS derives from an international framework. Under section 9 of the *Air Services Act 1995*, Airservices must:

> …perform its functions in a manner that is consistent with Australia's obligations under:
>
> (a) the Chicago Convention; and
>
> (b) any other agreement between Australia and any other country or countries relating to the safety of air navigation.[7]

Lodged differences with ICAO

2.12 There was some commentary throughout the inquiry as to the binding nature of the ICAO SARPs, and the adherence of Australian ARFF services to these international standards.

2.13 While the ICAO SARPs govern the provision of ARFFS, Airservices commented that each ARFFS provider needed to consider its local operating context and regulatory framework, to ensure services met the required standards.[8]

2.14 This view was supported by DIRDC, which observed that many countries had legislation differing from the ICAO SARPs, and had different criteria used to determine the establishment of ARFF services. DIRDC concluded that there was 'no common approach adopted overseas in the provision of ARFFS'.[9]

2.15 The UFUA suggested that while the SARPs were published as Annexes to the Convention, they did not have the same legal binding force as the Convention itself—the Annexes were not international treaties. Further, the UFUA observed that:

> …member states only agree to undertake to collaborate in securing uniformity regarding the SARPs. That agreement does not necessarily extend to complying with them. This is confirmed in Article 38, where each member state may notify ICAO of any differences between SARPs and its own practices.[10]

2.16 To this end, in circumstances where Australia does not adopt ICAO standards, it formally lodges a difference with ICAO. DIRDC advised that ICAO standards were not adopted in Australia if they were not considered suitable for local circumstances.[11]

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7 *Air Services Act 1995*, s. 9(3).

8 Airservices Australia, *Submission 11*, p. 6.

9 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 3.

10 United Firefighters Union of Australia, *Submission 10*, p. 4.

11 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 2.

2.17 DIRDC pointed out that while the CASR broadly aligns with ICAO SARPs, there are some differences to ARFFS delivery in Australia, notably that ARFFS is not provided at all international aerodromes:

> In this regard, Australia has lodged a difference with ICAO stating that ARFFS, in compliance with Annex Standards, are not available at some international and alternate international aerodromes and outlines the establishment criteria adopted by Australia.[12]

2.18 DIRDC noted that the ICAO standard requiring ARFF services at all international passenger airports is problematic in the Australian context, due to low passenger volumes and flight frequencies. These conditions are 'not conducive to providing a cost effective and permanent ARFFS capability' at such airports. DIRDC did observe, however, that some ARFF services at Australian airports exceed ICAO requirements.[13]

2.19 Those airports in Australia which do not have ARFF services provided by Airservices receive firefighting services from the relevant state or territory fire authority.[14]

Provision of ARFF services in Australia

2.20 The two main services provided by Airservices are air traffic control, and ARFFS. The *Air Services Act 1995* stipulates that Airservices will provide a rescue and firefighting service 'with the specific functions and other associated elements of the service described in the Airservices regulations'.[15]

2.21 The functions of ARFF services are specified in Subpart 139.H of the CASR ('Aerodrome rescue and firefighting services'), which details how a person can become approved as an ARFFS provider, and the operating and technical standards applicable to such a service.[16] The CASRs are accompanied by an associated Manual of Standards (MOS), which commenced in 2003. The MOS is a CASA policy manual, and is a legislative instrument.[17]

2.22 CASA has regulatory oversight of Airservices, given Airservices is an ARFFS provider. As part of the CASRs, an ARFFS provider must have an appropriate

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12 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 5.

13 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 3.

14 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 3. This is discussed further in Chapter 5.

15 Airservices Australia, *Submission 11*, p. 10.

16 Civil Aviation Safety Authority, *Submission 7*, pp. 1-2.

17 Airservices Australia, *Submission 11*, p. 3; MOS Part 139.H—Standards Applicable to the Provision of Aerodrome Rescue and Fire Fighting Services, Version 1.2, January 2005, https://www.legislation.gov.au/Details/F2008C00128 (accessed 20 June 2019).

organisational structure with 'sound and effective management in relation to the provision of an ARFFS'. CASA regulates only those matters relating to safety, and does not regulate Airservices's corporate administration of the ARFFS.[18]

2.23 DIRDC plays a lead role in the management of ARFFS regulatory policy, while working with CASA and Airservices to monitor ARFFS delivery, in order to determine whether regulatory amendments are required. The Department noted that a number of views have been expressed 'over what should be the right regulatory and policy framework for ARFFS', particularly with regard to the establishment and scope of activities of ARFF services at different aerodromes.[19]

ARFFS establishment and disestablishment thresholds

2.24 ARFFS must be provided at aerodromes providing international flight services. Additionally, in Australia, a decision whether to establish—or disestablish—an ARFF service at an airport can be determined by the number of passengers travelling through that airport.

2.25 Until 2002, the provision of ARFFS by Airservices was to those airports which cumulatively accounted for approximately 90 per cent of all domestic passenger travellers on scheduled passenger services, over a one-year period.[20]

2.26 When the CASRs were introduced in 2002, there was no change made to these arrangements. DIRDC observed that at that time, the 90 per cent coverage equated to approximately 350 000 passengers per year (based on 2000–01 financial year data). Accordingly, under the CASR, '350 000 passengers per year was adopted as the trigger for requiring the establishment of an ARFFS'. Based on 2017–18 passenger movements, DIRDC suggested that the threshold now captured 96 per cent of passengers.[21]

2.27 Conversely, passenger numbers can also be used to disestablish an ARFF service. Should passenger numbers for an airport fall below 300 000, and remain below this level for a 12-month period, the ARFFS provider must provide CASA with a safety case to justify the closure of the ARFFS. DIRDC

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18 Civil Aviation Safety Authority, *Submission 7*, p. 2. It was suggested by the New South Wales Government Office of Emergency Management that the Australasian Fire and Emergency Services Authority Council, rather than CASA, would be an appropriate national body to assess aviation fire-related standards; see *Submission 4*, [p. 2].

19 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 2.

20 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 4.

21 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 4.

advised that, to date, no ARFF services had been disestablished due to passenger numbers falling below the threshold.[22]

2.28 Mr Rob Walker, Executive Manager of Stakeholder Engagement at CASA, observed that the disestablishment of an ARFF service 'would be contentious, particularly for the communities that are involved'. The matter was further complicated by the 'ebb and flow of the local Australian aviation industry' (for example, fluctuating tourist numbers or the varying schedules of fly-in fly-out workers).[23]

2.29 Mr Walker further noted that while the ARFFS in Australia covered the majority of passenger movements at airports, some passengers travelled through airports which do not have ARFF services. Mr Walker noted that the establishment of an ARFF service was:

> …very much a balancing act between making sure that an appropriate level of services is provided but that it's also done in a cost-effective way.[24]

Aerodrome categories

2.30 Once an ARFF service has been established, each aerodrome is placed into a category, determined by the type of aircraft which operates at the airport. An airport category determines the standard of ARFF services required at that aerodrome.

2.31 As noted by the UFUA, categories enable ARFF services and equipment to be assigned appropriately to each aerodrome, as determined by either the length or maximum fuselage width of the largest aircraft using the airport, whichever is greater. The UFUA remarked that wider aircraft may carry more fuel and passengers than narrower aircraft, and therefore require a higher category rating to best respond to emergencies.[25]

2.32 ICAO, via Annex 14, stipulates the criteria for determining ARFF categories.[26] DIRDC advised that in an Australian context, aerodrome categories are determined against the ICAO criteria based on the busiest consecutive three-month period of the previous twelve months, and identifying the largest aircraft over 700 movements. Examples of the types of aircraft for each category include:

(a) Category 6 – Airbus A320, Embraer 190
(b) Category 7 – Boeing 737-900ER

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22 Department of Infrastructure, Regional Development and Cities, *Submission 9*, pp. 4-5.

23 Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 24.

24 Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 23.

25 United Firefighters Union of Australia, *Submission 10*, p. 4.

26 As reproduced by United Firefighters Union of Australia, *Submission 10*, p. 4.

(c) Category 9 – Boeing 747-400, Airbus A350-900
(d) Category 10 – Boeing 747-8, Airbus A380.[27]

2.33 DIRDC further noted that, in accordance with ICAO standards, the category at an aerodrome could be reduced, or dropped during:

> …periods of reduced activity (for example night operations), to no less than that needed for the highest category of aircraft planned to use the aerodrome during that time.[28]

2.34 The CASRs stipulate the minimum number of fire vehicles and the quantity of extinguishing agent (water and dry chemical powder) to be carried against each aerodrome category. Additionally, the minimum number of staff per shift is developed by Airservices and approved by CASA, for each category level.[29]

2.35 In addition, the United Firefighters Union of Australia Aviation Branch (UFUAB) noted that ICAO provides for a 'remission factor', which is an allowance for an ARFFS provider to knowingly operate at a category below the largest aircrafts using that airport. The remission factor is based on the reasoning that:

> …if the airport does not meet a minimum of 700 movements of that largest aircraft in the 3 busiest months of operation then it can reduce category based on the reduced exposure risks.[30]

2.36 DIRDC advised that, in line with Annex 14 of the Chicago Convention, the standard of ARFFS required at Australian aerodromes—and the associated airport categories—have been adopted in Subpart 139.H of the CASR, and the associated MOS.[31]

2.37 Categories at the 26 Australian airports which provide ARFF services range from Category 6 to Category 10, as determined by CASA and ICAO regulations. During the curfew period at Adelaide Airport, that airport is classified as Category 5. Categories determine the amount of water and foam that is needed to be carried, the response times, water discharge rates and number of personnel. Some of these determinations are summarised below in Table 2.1.

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27 Department of Infrastructure, Regional Development and Cities, *Submission 9*, pp. 6, 12 (Attachment B).

28 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 6.

29 Airservices Australia, *Submission 11*, p. 4.

30 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 23. The UFUAB contended that remission was currently being implemented at the Darwin, Coolangatta and Cairns Airports, which were staffed to Category 8 but regularly receiving Category 9 aircraft; see *Submission 17*, p. 23.

31 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 6.

Table 2.1 ARFFS airport categories and level of service

	Category 6	Category 7	Category 8	Category 9	Category 10
Airports	Ayers Rock Ballina Broome Coffs Harbour Gladstone Karratha Newman Port Hedland Rockhampton	Alice Springs Hamilton Is Hobart Launceston Mackay Sunshine Coast Townsville	Avalon Cairns Canberra Darwin Gold Coast	Adelaide Brisbane Perth	Melbourne Sydney
Water (litres)	7900	12 100	18 200	24 300[32]	32 300
Discharge rate (foam/litres per min)	4000	5300	7200	9000	11 200
Dry Chemical Powder (kgs)	225	225	450	450	450

Source: Department of Infrastructure, Regional Development and Cities, Submission 9, p. 12 (Attachment B) and Airservices Australia, 'ARFF levels of service', *http://www.airservicesaustralia.com/services/about-our-aviation-fire-service/arff-levels-of-service/* *(accessed 20 June 2019).*

2.38 The UFUA advised that the required quantities of extinguishing agent must be available for discharge from operational fire vehicles within a response time of two minutes to the end of each runway, or not exceeding three minutes to any part of the movement area.[33]

Staffing requirements

2.39 In addition to determining the level of service required, the airport categories also determine the minimum requirements with regard to staff and fire vehicles per shift. The minimum number of staff per shift is developed by Airservices, and approved by CASA, against each category. Table 2.2 below details the staff per shift, and the fire vehicles required per category.

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32 Mr Glen Barker submitted that, in 2015, ICAO raised the required water amount from 24 000 litres to 27 859 litres; however, under the MOS and CASRs, Australia maintained the original level of 24 000 litres; see *Submission 22*, p. 10.

33 United Firefighters Union of Australia, *Submission 10*, p. 4.

Table 2.2 Minimum staffing requirements by airport category

Category	Staff per shift	Fire vehicles	Typical aircraft type
10	14	3	A380
9	10	3	B747
8	8	3	A330-2
7	6	2	B737-8
6	5	2	A320
5	3	1	ATR72

Source: Airservices Australia, Submission 11, p. 4.

2.41 The UFUA clarified that the minimum number of ARFF personnel required to effectively and safely respond to an incident at an airport depends on the size of the aircraft utilising the airport. However, ICAO does not specifically mandate the number of firefighters required, 'other than what is implied with the number of vehicles' and the ability to operate those firefighting vehicles at maximum capacity.[34]

2.42 Airservices advised that while the CASA-approved number of firefighters for a Category 10 airport was 14, at Sydney and Melbourne Airports, Airservices chose to provide 'three supplementary people to help us maintain categories'.[35] These two airports were therefore staffed with 17 ARFFS crew members.

Civil Aviation Safety Regulations

2.43 CASA was tasked with developing the CASRs, under the *Civil Aviation Act 1988*, to ensure compliance with the ICAO SARPs.[36] CASR Subpart 139.H outlines the functions of the ARFFS. An introductory paragraph to Subpart 139.H outlines the purpose of the subpart for the provision of ARFFS in Australia:

> As a signatory to the Chicago Convention, Australia is obliged to require, as part of its domestic law, that certain classes of airport provide rescue and firefighting services of an adequate standard. (See generally section 9.2 of chapter 9 of Annex 14 to the Chicago Convention.) To satisfy that obligation, this Subpart requires operators of aerodromes that have scheduled international traffic, or specified levels of domestic passenger

34 United Firefighters Union of Australia, *Submission 10*, p. 8.

35 Mr Glenn Wood, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 40.

36 Mr Andrew Hanson, *Submission 16*, p. 3.

traffic, to provide those services, and sets out the standards that apply to such services.[37]

2.44 Specifically, Regulation 139.710 of Subpart 139.H of the CASR states that:

> (1) The functions of an ARFFS for an aerodrome are:
>
> (a) to rescue persons and property from an aircraft that has crashed or caught fire during landing or take-off; and
>
> (b) to control and extinguish, and to protect persons and property threatened by, a fire on the aerodrome, whether or not in an aircraft.
>
> (2) Nothing in subregulation (1) prevents the ARFFS provider for an aerodrome from performing fire control services or rescue services elsewhere than on an aerodrome, but the provider must give priority to operations mentioned in subregulation (1).[38]

2.45 Airservices advised that the CASRs and the MOS operate so that ARFFS must be provided at aerodromes:

- from or to which an international passenger air service operates; and
- any other aerodrome where the number of passenger movements has reached 350 000 in the previous financial year.[39]

2.46 DIRDC noted that at some locations, CASA has granted exemptions from certain operational requirements that would normal apply due to the ICAO SARPs.[40]

Airservices, the CASRs and the MOS

2.47 Airservices advised that Subpart 139.H of the CASR, and the MOS reflect ICAO standards, but that the ARFFS also complies with other relevant legislation such as the *Work Health and Safety Act 2011* (and supporting regulations), and the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012*.[41]

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37 Civil Aviation Safety Regulations 1998, Subpart 139.H—Aerodrome rescue and firefighting services, introductory note.

38 Civil Aviation Safety Regulations 1998, Part 139, Subpart 139.H, section 139.710; see Civil Aviation Safety Authority, *Submission 7*, pp. 1-2.

39 Airservices Australia, *Submission 11*, p. 4.

40 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 3.

41 Airservices Australia, *Submission 11*, p. 7.

2.48 Airservices noted, however, that it could set its own standards over and above the CASR requirements, if considered necessary for service provision or 'the safety of our people'.[42]

2.49 DIRDC explained that the MOS provided detailed requirements for the provision of ARFFS, including:

- ARFFS vehicle performance;
- response times;
- hours of operation;
- competency level of firefighting staff;
- staffing and training requirements; and
- ARFFS qualification training establishments.[43]

2.50 The CASRs and the MOS also require airport operators to prepare aerodrome emergency plans, detailing the activation, control and coordination of emergency service organisations for airport emergencies.[44]

2.51 Importantly, under Regulation 139.760 of the CASR, if there are inconsistencies between a requirement of the MOS and a particular aerodrome, and a requirement of Chapter 9 of Annex 14 of the Chicago Convention, 'the requirement of the Manual prevails to the extent of the inconsistency'.[45]

2.52 This position is reiterated in the MOS itself, which, at section 1.1.1.2, notes that the MOS prevails where there are any discrepancies between it and the prescribed standards in the ICAO SARPs.[46]

2.53 Further, the CASR, at Subpart 11.F, provides that CASA can, by instrument, grant an exemption from compliance with a provision of the CASR, and may impose any condition on that exemption which is 'necessary in the interests of the safety of air navigation'. CASA can grant an exemption either on application, or on its own initiative; granted exemptions are then published on CASA's website.[47]

2.54 In addition to the CASR and MOS, Airservices has also developed a safety management system (SMS). The SMS provides a framework for managing

42 Airservices Australia, *Submission 11*, p. 10.

43 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 6.

44 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 9.

45 Civil Aviation Safety Regulations 1998, Part 139, Subpart 139.H, section 139.760.

46 Section 1.1.1.2, MOS Part 139.H—Standards Applicable to the Provision of Aerodrome Rescue and Fire Fighting Services, Version 1.2, January 2005, p. 1-1.

47 Civil Aviation Safety Regulations 1998, Subpart 11.F, sections 11.160 and 11.205. CASA exemptions are listed at: https://www.casa.gov.au/rules-and-regulations/current-rules/legislative-and-non-legislative-instruments/non-legislative-instruments.

safety in accordance with legislation, regulations and standards, such as the CASRs, the *Work Health and Safety Act 2011* and the Civil Air Navigation Services Organisation Standard of Excellence in SMS. Airservices advised that it monitored its performance against the regulatory safety standards, and engaged with CASA to consider the effectiveness of the regulations.[48]

2.55 Airservices manages risk in the provision of ARFF services through its Risk Management Standard. Airservices suggested that the purpose of ARFFS risk management was to 'actively identify, assess, control and manage hazards', to ensure that risk was managed to a level that was as low as reasonably practicable (ALARP).[49]

2.56 Under the CASR, Airservices is also required to document in an Operations Manual (OM) how it complies with the mandatory safety standards of the CASRs and the MOS. The OM, approved by CASA, 'comprehensively describes the key elements' of ARFFS service delivery. Airservices detailed those key elements of the OM, which included:

> the level of service (Category) provided, number of operating personnel, the performance of fire fighting vehicles (including response times), equipment and fire fighting agent, training and qualifications frameworks and programs, required buildings and facilities, protective clothing and equipment, operational doctrine including standard operating procedures and contingency plans, the requirements to maintain service including the process to advise industry should the level of service be temporarily reduced (such as when ARFFS is responding to an emergency), the interface arrangements with other fire fighting services, safety management systems (SMS) and quality control systems.[50]

Safety standards for ARFFS

2.57 CASA's regulatory responsibilities for ARFFS includes the initial approval of the ARFFS at a location (certification), and undertaking surveillance of the provision of ARFFS at each location. The frequency of CASA’s surveillance is based on the category of ARFFS.[51]

2.58 CASA informed the committee that the safety standards in the legislation governing the provision of ARFFS were based on, or informed by, a number of factors, including:

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48 Airservices Australia, *Submission 11*, pp. 8, 10. DIRDC advised that the SMS defines the policies, procedures and practices for managing the safety of the provision of services, and any changes in their provision; see *Submission 9*, p. 10.

49 Airservices Australia, *Submission 11*, p. 8.

50 Airservices Australia, *Submission 11*, pp. 7-8.

51 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 10.

> …internationally recognised standards and recommended practices (SARPs) specified by the International Civil Aviation Organization, published Australian Standards and the United States' National Fire Protection Association standards.[52]

2.59 CASA advised that it undertakes a number of activities to determine whether the legislation governing the provision of ARFFS requires amendment. CASA uses planned surveillance events and audits, as well as post implementation reviews of regulations, to identify any deficiencies in current practices which could be addressed by legislative change. For example, CASA advised that as part of a post implementation review of Subpart 139.H, it was reviewing the ARFFS standards as they applied in the United Kingdom, New Zealand, Canada and the United States.[53]

2.60 Airservices reported that since 1 January 2016, CASA has conducted 102 surveillance events of ARFFS facilities and operations. CASA surveillance included audits, operational checks involving system testing and examination, product sampling, and the gathering of evidence, data, information and intelligence.[54]

2.61 CASA advised that it takes a risk-based approach to the assessment of ARFFS operations. In doing so, these assessments:

> …focus on the effectiveness of an authorisation holder's management of its systems and risks and enable targeted surveillance of high-risk areas of an authorisations holder's systems. It also provides a basis on which CASA can evaluate all the regulated activities conducted by an authorisation holder to help ensure they are as safe as reasonably practicable.[55]

2.62 In undertaking its oversight functions, CASA informed the committee that it considers the views and concerns of DIRDC, ARFFS providers and 'other industry and community stakeholders in the consideration of relevant regulatory matters'. Further, in developing ARFFS standards, CASA noted that it consults and engages with all relevant stakeholders.[56]

2.63 In the event that Airservices makes changes to its provision of ARFFS, CASA assesses such changes through a review and approval of safety case information, 'having regard to the provider's standard operating procedures'.

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52 Civil Aviation Safety Authority, *Submission 7*, p. 1.

53 Civil Aviation Safety Authority, *Submission 7*, p. 2.

54 Airservices Australia, *Submission 11*, p. 11.

55 Civil Aviation Safety Authority, *Submission 7*, p. 2.

56 Civil Aviation Safety Authority, *Submission 7*, p. 2.

CASA also utilises independent reviews which consider changes to Airservices's procedures and practices, where available.[57]

National Fire Protection Association

2.64 Considerable evidence was received during the inquiry from firefighting unions regarding the National Fire Protection Association (NFPA), which the unions and other stakeholders view as an industry leader in developing firefighting standards.

2.65 The NFPA, a global non-profit organisation, aims to 'eliminate death, injury, property and economic loss due to fire' and other related hazards, through more than 300 consensus codes and standards aimed at minimising the risks and effects of fire.[58] The UFUA observed that the NFPA's codes and standards are 'generally recognised as a major source of firefighting best practice by industry professionals'.[59]

2.66 The NFPA 403 standard, titled 'Standard for Aircraft Rescue and Fire-fighting Services at Airports', contains standards for the operation of the ARFFS, including the minimum number of vehicles and personnel required by airport category.[60]

Funding of ARFF services

2.67 Airservices noted that the cost of providing ARFFS is determined by the category of service, and an airport's hours of operation. ARFFS charges depended on the category of the aircraft, with more firefighters, vehicles and infrastructure required for higher-category aircraft. Airservices advised that charges were applied in accordance with the following:

- for aircraft up to Category 6: a single network charge applying at all locations where and when an ARFFS is provided; and
- for aircraft at Category 7 and above: a location-specific, category-based charge, 'recognising the incremental increase in costs associated with each higher category of service'.[61]

2.68 In line with international practice, the costs of providing the ARFFS are recovered through a landing charge, paid by airlines, based on the maximum

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57 Civil Aviation Safety Authority, *Submission 7*, p. 2.

58 National Fire Protection Association, *NFPA overview*, https://www.nfpa.org/overview (accessed 20 June 2019).

59 United Firefighters Union of Australia, *Submission 10*, p. 9.

60 United Firefighters Union of Australia, *Submission 10*, p. 9.

61 Airservices Australia, *Submission 11*, p. 6.

take-off weight (MTOW) of an aircraft. Airservices observed that prices therefore vary by airport, based on the category of the aircraft flown.[62]

2.69 Airservices went on to state that for a Category 6 aerodrome, it costs approximately $4.5 million per annum to provide base level ARFF services, with the annual cost rising to $19 million for Category 10 ARFFS. Given that some regional locations recover less than 10 per cent of the costs of ARFFS, the costs at these locations were cross-subsidised by capital city airports with higher levels of traffic and larger aircraft.[63]

2.70 DIRDC confirmed that the charges imposed by Airservices for the provision of ARFF services is subject to regulatory oversight by the Australian Competition and Consumer Commission, with current charges forecast to remain at 2016 levels 'for the foreseeable future'.[64]

2.71 It was suggested by the UFUA that the current ARFF funding arrangement had prompted resistance to the establishment of ARFF services by airline companies, thus limiting the expansion of ARFFS to more airports due to cost, over considerations of safety. As an alternative funding model, the UFUA proposed the introduction of a passenger charge, imposed on all air passengers, to fund and expand ARFF services 'in circumstances where there is insufficient funding from other sources'.[65] The UFUAB suggested that this approach better recognised passengers as 'the real customer of ARFFS'.[66]

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62 Airservices Australia, *Submission 11*, p. 5. Airservices clarified that general aviation aircraft, such as the King Air B200, are not charged for ARFFS.

63 Airservices Australia, *Submission 11*, p. 6. Before 1 January 2006, ARFFS was funded by location-specific pricing, which saw destinations with low volumes of airline activity incur high charges. It has been suggested that cross-subsidisation through the MTOW charge has therefore significantly reduced costs at regional and smaller airports; see Government Response to the Report of the House of Representatives Standing Committee on Transport and Regional Services, *Regional Aviation and Island Transport Services: Making Ends Meet*, 10 May 2007, p. 26.

64 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 9.

65 United Firefighters Union of Australia, *Submission 10*, p. 17. These views were supported by Mr Glen Barker; see *Submission 22*, pp. 13-14.

66 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 34.

Chapter 3
ARFFS equipment and resources

3.1 There were a number of serious concerns raised throughout the inquiry as to the performance of Airservices in its delivery of ARRFS across Australia's major airports.

3.2 In particular, concerns were raised with regard to the suitability of some ARFF equipment and resources currently in use across the country, and decisions of Airservices which would directly impact on the ability of the ARFFS to respond quickly to an emergency. Specific issues were raised about the location of the fire station at the new runway currently under construction at Brisbane Airport.

3.3 This chapter details these concerns alongside the views of Airservices as to its performance and decision-making.

Firefighting equipment and ARFFS facilities and training

3.4 Evidence to the inquiry questioned the suitability of certain firefighting equipment currently in use by the ARFFS, or removed from service, as determined by Airservices.

3.5 Concerns with equipment, the ARFF service regulations, firefighter training and ARFFS facilities were raised extensively in evidence. These concerns included (but were not limited to) the following:

- out of date and unsafe procedures for compressed air breathing apparatus (CABA), despite CABA procedures presenting 'more risk to firefighters than any other task';[1]
- radio communications over obsolete UHF radios, with no access to Government Radio Networks for communication;[2]
- a lack of adequate and ongoing emergency vehicle driver training;[3]
- a lack of suitable training and provision of equipment and suitable vehicles for water rescue services (WRS) and difficult terrain operations (DTO);[4]

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1 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 12; Mr Andrew Hanson, *Submission 16*, p. 6.

2 United Firefighters Union of Australia Aviation Branch, *Submission 17*, pp. 8, 13; Mr Glen Barker, *Submission 22*, p. 5.

3 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 13; Mr Glen Barker, *Submission 22*, p. 8.

4 United Firefighters Union of Australia Aviation Branch, *Submission 17*, pp. 15-16; Mr Glen Barker, *Submission 22*, p. 14.

- the age and fitout of Mk8 and Mk9 ARFFS vehicles, and the adherence of ARFFS vehicles to international standards;[5]
- operational fire hoses not being tested to Australian standards, with dispensations sought by Airservices from CASA to not comply with the Australian standard;[6]
- 'impoverished', 'non-compliant and unsafe' fire stations, requiring expansion and replacement;[7]
- the engagement of personnel without suitable qualifications and competencies (particularly Local Operations Managers);[8]
- reduced or inadequate training opportunities, with training led by officers with no operational ARFFS experience;[9]
- concerns with the Airservices internal hazard and incident reporting system (known as CIRRIS) and responses by Airservices to the safety issues raised through that system;[10]
- diesel particulate matter contamination at fire stations across the country;[11] and
- mould outbreaks at the Brisbane ARFF station, exposing staff to mould spores.[12]

3.6 A number of other concerns are considered in more detail below.

Distress signal units

3.7 The UFUAB voiced concerns over the adherence of ARFFS distress signal units (DSUs) to international safety standards and best practice. DSUs, worn by firefighters, emit visual and audio alarms when a device remains motionless for 30 seconds, and are thus considered vital in ensuring the safety of

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5 United Firefighters Union of Australia Aviation Branch, *Submission 17*, pp. 16-17; Mr John Hancox, *Submission 25.1*, [p. 2].

6 United Firefighters Union of Australia Aviation Branch, *Submission 17*, pp. 17-18; Mr Glen Barker, *Submission 22*, p. 7. At Additional Estimates in February 2019, Airservices advised that once it was identified that ARFFS was not complying with the Australian standard for hose testing, a directive was issued to all locations to move to the Australian standard as quickly as possible; see Mr GlennWood, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 18 February 2019, p. 201.

7 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 18.

8 United Firefighters Union of Australia Aviation Branch, *Submission 17*, pp. 19-20.

9 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 30; Mr John Hancox, *Submission 25.1*, [pp. 2-3].

10 Mr Tim Limmer, *Submission 20*, [p. 2]; Aviation Fire and Rescue Brisbane, *Submission 23*, [p. 1].

11 Mr Tim Limmer, *Submission 20*, [pp. 3-4].

12 Mr Tim Limmer, *Submission 20*, [pp. 5, 12-14].

firefighters (the DSUs can also be operated manually if a firefighter is in distress, for example, trapped or injured).[13]

3.8 The UFUAB noted that, in accordance with the CASRs, ancillary equipment must conform to Australian standards. The UFUAB suggested, however, that as there were no Australian standards for the DSU, international standards applied, such as those issued by the NFPA. The UFUAB asserted that CASA had exempted Airservices from compliance with the relevant international standards, in order to continue with the use of outdated equipment (that is, Airservices had been issued a dispensation from CASA).[14]

3.9 The UFUAB argued that the DSUs currently in use by the ARFFS were older models, and therefore were not compliant with the NFPA. Further, the DSUs were using outdated technology when compared with more modern versions, and were only replaced in instances of failure—as opposed to adherence to a set replacement timeframe of five to seven years.[15]

3.10 In using older technology, the UFUAB argued that the DSUs did not have the 'modern improved safety features' which would help protect firefighters, and suggested that there was 'no evidence' that CASA had 'given any consideration to the improved safety benefits' of using new DSU technology. Further, the UFUAB contended that Airservices was purchasing replacement DSUs that did not adhere to the MOS or the NFPA standards.[16]

3.11 This view was supported by Mr Glen Barker, a recently retired Fire Commander, who suggested that through the dispensation from compliance issued by CASA, Airservices were not only aware of these issues with the DSUs, but had 'failed to seek an alternative DSU to comply with safety regulations'.[17]

Rescue saws

3.12 The MOS states that power saws must be included in ARFF services as ancillary equipment, for operational use.[18]

3.13 During Additional Estimates in February 2019, Airservices advised the Rural and Regional Affairs and Transport Legislation Committee (legislation

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13 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 5.

14 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 5.

15 United Firefighters Union of Australia Aviation Branch, *Submission 17*, pp. 5-6. See also Mr Tim Limmer, *Submission 20*, [p. 4]; Mr Glen Barker, *Submission 22*, p. 4.

16 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 7.

17 Mr Glen Barker, *Submission 22*, p. 4.

18 Section 13.1.1.3, MOS Part 139.H—Standards Applicable to the Provision of Aerodrome Rescue and Fire Fighting Services, Version 1.2, January 2005, p. 13-1.

committee) of its decision to remove rescue power saws from ARFFS operation.[19]

3.14 Mr Glenn Wood, Chief Fire Officer (CFO) with Airservices, advised that this decision was made as the rescue saws were out-of-date and not fit for purpose, presenting a 'significant safety hazard' to ARFFS crew. Mr Wood indicated that Airservices had examined its history, and 'could not see when we had ever used that piece of equipment', nor had the type of saw in question been used in the last 15 years. Mr Wood went on to advise that:

> We have later generation—as you would know, jaws of life and that sort of equipment—that can do some of that work. They are not rescue saws; we know that. We've also got arrangements in place with the local fire service to bring their rescue saw. In terms of moving forward, we've completed some research. There is a more modern kit available. We've completed a concept of operations, and I expect we'll be approaching market in the next few weeks. The safety regulator is aware of the removal of that piece of equipment because of the safety risk it presents to our staff.[20]

3.15 Mr Wood confirmed that removal of the saws meant that the ARFFS was not compliant with the MOS. Airservices had advised CASA that the saw had been removed due to concerns for the safety of staff, and had undertaken to 'look at an alternative solution that is more fit for purpose'.[21]

3.16 CASA confirmed that it was a statutory requirement of the MOS that the ARFFS was equipped with a rescue saw. CASA informed the committee that it was voluntarily advised by Airservices about its rescue saw decision 'after that decision was made'. Mr Walker of CASA continued that as of March 2019, CASA was:

> …still in consultation with Airservices on what the impacts of that are and whether or not it is safe for them to continue to [remove the saw from service].[22]

3.17 Mr Walker said that with regard to the actions of Airservices, 'CASA is not comfortable with the decision that they have made'. CASA was therefore continuing its discussions with Airservices, to understand why Airservices had taken the actions it had.[23]

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19 Mr Glenn Wood, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 18 February 2019, p. 197.

20 Mr Glenn Wood, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 18 February 2019, p. 197.

21 Mr Glenn Wood, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 18 February 2019, p. 198.

22 Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 25.

23 Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 26.

3.18 Mr Wood advised that the ARFFS was still equipped with instruments to make forcible entry onto an aircraft, and that the decision to remove the saws from service was due to the fact that they presented an unacceptable workplace health and safety risk, the risk being a loss of operator control. Once aware of the risk, Mr Wood argued that he had 'no choice' but to remove the saws from service or possibly end up in breach of workplace health and safety laws.[24]

3.19 Mr Wood acknowledged that CASA was not comfortable with the decision to remove the saws, however he argued that:

> Workplace health and safety legislation is not optional; it is mandatory. I deemed from that that I had no choice but to take the action that I did.[25]

Stakeholder views

3.20 The UFUA noted that this decision was made despite the MOS requiring that power saws be part of the equipment required for operational use. The UFUA suggested that the power saws were removed from operation in September 2018, despite no consultation taking place and no exemptions being granted from CASA. The union expressed considerable concern over the risks to passenger safety and survival as a result of the actions by Airservices.[26]

3.21 The UFUAB observed that, as Airservices did not have an exemption from CASA for the power saw requirement in the MOS, the ARFFS was non-compliant with the required standards. The UFUAB disputed the evidence of Airservices to the legislation committee, stating that the power saws which were in operation were relatively new and 'state of the art', and that the 'jaws of life' were not a suitable replacement for the power saw in an emergency. The UFUAB concluded that, without the saw:

> …ARFFS have no ability to rapidly cut in to an aircraft, or structures for access or egress in order to perform rescues or to create ventilation holes or drainage. Loss of the saw is severely impacting our ability to safely do our job.[27]

3.22 Mr Justin Hunter, Branch Committee Member with the UFUAB, voiced his concerns about the removal of the rescue saws, and the inadequacy of substitute equipment. Mr Hunter noted that the 'jaws of life' and other equipment were not suited for entry into an aircraft, but rather to vehicle rescues, and concluded that the jaws of life could be used to 'remove seats and

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24 Mr Glenn Wood, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 36.

25 Mr Glenn Wood, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 37.

26 United Firefighters Union of Australia, *Submission 10*, pp. 13-14. See also Mr Glen Barker, *Submission 22*, pp. 5-6.

27 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 9.

we can use them to do others things, but we can't get into the aircraft with them'.[28]

3.23 The UFUAB further asserted that the safety concerns held by Airservices over the saw had never been detailed to staff or union representatives, no replacement saw had been brought forward, and no consultation had yet taken place to identify suitable replacement equipment—although a working group was being established.[29]

Ladders

3.24 On 5 December 2018, an operational bulletin was issued by Airservices, stating that all ARFFS training on ladders over two metres high was banned, effective immediately, while a 90-day review was undertaken.[30]

3.25 Mr Wood elaborated on the decision to limit training on ladders, stating that due to the risk of a fall from height, Airservices had determined to 'restrict our firefighters from climbing up ladders greater than two metres'. Mr Wood went on to advise that ladders would still be used in an operational context (for example, during aircraft rescues). Mr Wood further suggested that the necessary skills could still be practised below two metres, while a working group was formed to look at an improved way forward, and whether that 'improved way includes harness systems and the like'.[31]

3.26 Ms Michelle Bennetts, then Acting Chief Executive Officer (CEO) of Airservices, was of the view that the greatest risk of injury to firefighters was during training, and therefore Airservices was 'constantly looking at ways we can reduce this risk while still building the skills and capabilities' of ARFFS firefighters. Ms Bennetts went on to suggest that 'the risk of putting people in danger in a training environment unnecessarily is simply unacceptable', and with regard to ladders concluded that:

> …the actual skills that a firefighter requires to climb a ladder they can learn regardless of the height at which they are practising those skills.[32]

Stakeholder views

3.27 Mr Steve Horton, Industrial Officer with the UFUA, noted the confusion of the union over the ban, observing that 'there has never been an incident to our

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28 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, p. 9.

29 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 9.

30 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 10.

31 Mr Glenn Wood, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 18 February 2019, pp. 198, 200.

32 Ms Michelle Bennetts, Airservices Australia, *Committee Hansard*, 14 March 2019, pp. 33, 37.

knowledge on a ladder in 40 years', and concluded that the UFUA found the decision 'bizarre'.[33]

3.28 The UFUAB likewise raised its concerns over this ban, noting that many training activities demonstrating competent use of a ladder could no longer take place. However, the expectation remained that firefighters would use ladders in gaining access and conducting rescues during emergencies, and thus the ban 'increases the risk to the firefighters'.[34]

3.29 Mr Barker observed that in making the decision regarding the ladders, Airservices had not provided any alternative equipment on which to train, such as air stairs, nor were there any local agreements in place with airports or airlines for the use of their equipment—and even if there were, the ARFF staff were not trained in the use of equipment from other companies.[35]

3.30 In correspondence to the committee dated 2 April 2019, Airservices acknowledged the concerns expressed by the UFUA and ARFFS staff about the ARFFS equipment, and advised that a number of programs were underway which would address areas of key concern including:

- replacement of rescue saws;
- improving safety for training at heights, including on ladders; and
- improving the Breathing Apparatus Framework and training.[36]

3.31 Airservices confirmed that these initiatives included 'appropriate representation and input from the UFU and operational staff'.[37]

Firefighting foams

3.32 Some evidence to the inquiry drew attention to the ongoing issues around the use of fluorine-free firefighting foams in an aviation setting, and raised concerns with the adequacy of firefighting foams in use under Australian conditions. It was suggested that while fluorine-free foams may be in use at Australia aerodromes, per- and poly-fluoroalkyl substances (PFAS) foams may be better suited to aviation fires.

3.33 Willson Consulting advised that Fluorine Free Foam (F3) was certified to ICAO fire test standards, as required by the MOS. Despite this, it was suggested that foams containing PFAS 'remain unrivalled in their speed and

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33 Mr Steve Horton, United Firefighters Union of Australia, *Committee Hansard*, 14 March 2019, p. 15.

34 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 10.

35 Mr Glen Barker, *Submission 22*, p. 6.

36 Mr Jason Harfield, Chief Executive Officer, Airservices Australia, correspondence received 2 April 2019.

37 Mr Jason Harfield, Chief Executive Officer, Airservices Australia, correspondence received 2 April 2019.

effectiveness' when applied to volatile fuel fire incidents. Willson Consulting suggested that C6 fluorotelomer foams be used instead, as they:

> …provide the fastest, effective and reliable fire protection to control and extinguish the fire quickly, minimising damage, reducing volumes of foam and water resources used.[38]

3.34 Willson Consulting acknowledged the concerns held about the health and environmental risks associated with fluorine-containing foams. However, the submission also noted that there were considerable benefits to using C6 foams:

> The faster the fire is controlled and extinguished the smaller the incident, the less harm and damage is usually created, less risk of escalation or flare up, less danger to life safety and less adverse environmental damage usually results. Any realistic consideration of environmental impacts can only focus on the whole of incident from fire and environmental performances, not just firefighting foam properties in isolation.[39]

3.35 The UFUAB similarly noted its acceptance and agreement of a transition away from fluorine-containing foams, as a way to 'protect the environment and the health of our members' using such foams. However, the UFUAB continued that there was significant evidence creating concerns 'as to the real operational effectiveness of the primary firefighting agent in use for ARFFS' in Australia. The UFUAB therefore questioned whether the ARFFS was provided with enough quantities of this agent, particularly at Category 9 airports.[40]

3.36 The views expressed by the UFUAB were echoed by Willson Consulting, and by Fire Protection Association Australia (FPAA), both of which noted that F3 should not be used in high risk applications, such as aerodrome rescue, and would be more appropriate for training and for smaller fires.[41] The FPAA explained that F3 foams have 'significantly different physical and firefighting properties' to other foams, which could impact on safety outcomes.[42]

3.37 Willson Consulting went on to suggest that F3 foams may not be the best type to provide 'adequate life safety protection of firefighters, aircrew and the travelling public'. Indeed, Willson Consulting could not identify 'any major aircraft fire successfully and quickly extinguished' by F3. The submission questioned whether this foam had been:

> …adequately tested at larger scale to address the major hazards of large Airbus A380 aircraft, increased passenger numbers and flight frequencies,

38 Willson Consulting, *Submission 1*, pp. 6, 8.

39 Willson Consulting, *Submission 1*, pp. 44-45.

40 United Firefighters Union of Australian Aviation Branch, *Submission 17*, p. 11.

41 Willson Consulting, *Submission 1*, pp. 2-3, 48; Fire Protection Association Australia, *Submission 2*, pp. 1, 3.

42 Mr Brendan Scully, Fire Protection Association Australia, *Committee Hansard*, 14 March 2019, p. 1.

> larger fuel loads, and increasingly volatile climatic conditions being experienced at airports around Australia.[43]

3.38 The FPAA also supported the use of C6 fluorotelomer foams in high risk applications, while drawing attention to issues with the testing and performance of firefighting foams under Australian conditions. The FPAA advised that ICAO sets the requirements for firefighting foam fire tests, including the provision that testing can occur 'with ambient air and foam solution temperatures as low as 15°C'. However, the FPAA noted that:

> These temperatures are much lower than typically experienced in Australia, especially during summer. Foams which pass the ICAO tests at these minimum temperatures may not perform adequately at the higher temperatures typically experienced in Australia.[44]

3.39 The FPAA argued that any firefighting foam being considered for use on Australian aerodromes should be subjected to ICAO testing, but at 'much higher minimum temperatures' to better reflect the Australian climate.[45] Mr Brett Staines of the FPAA noted the concerns held about foam performance in Australia in the absence of clear testing results:

> The concern we have is that, with the foams we used to use, we had a high level of safety margin. What we're saying now is that the new foams don't have that same safety margin. Is the margin that we have sufficient to allow us to provide good fire protection under Australian conditions? We don't know.[46]

3.40 Willson Consulting made a similar point, and suggested testing parameters for the Australian context:

> Fire test standards even if based on ICAO Level B for regulatory purposes, should also be tested to a higher standard which adequately reflects higher ambient conditions experienced around most of Australia. This could be done by requiring the ICAO Level B test to be independently witness tested on Jet A1 fuel at ambient and fuel temperatures of 35°C.[47]

3.41 DIRDC confirmed to the committee that the issue of testing firefighting foams would be a matter for CASA.[48]

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43 Willson Consulting, *Submission 1*, pp. 2-3, 8, 19. See also Dynax Corporation, *Submission 13*, Attachment 1 for general views on the efficacy of firefighting foams.

44 Fire Protection Association Australia, *Submission 2*, pp. 2-3.

45 Fire Protection Association Australia, *Submission 2*, p. 3.

46 Mr Brett Staines, Fire Protection Association Australia, *Committee Hansard*, 14 March 2019, pp. 4-5.

47 Willson Consulting, *Submission 1*, p. 48.

48 Ms Pip Spence, Department of Infrastructure, Regional Development and Cities, *Committee Hansard*, 14 March 2019, p. 19.

Vehicle shortages

3.42 The category of an airport determines the number of fire vehicles required at that airport (see Table 2.2 in Chapter 2). It was put to the committee that the ICAO standards stipulate that the ARFFS should have a spare vehicle, in order to maintain category in the event of maintenance or repairs.[49]

3.43 Mr Robert Porter, Executive General Manager (EGM) of ARFFS, Airservices, advised that as of April 2019 there were 90 fire trucks in Australia, with an operational requirement for 67 vehicles in the ARFFS fleet. This capacity over the minimum allowed Airservices to 'maintain service for the existing fleet'. However, Mr Porter suggested that the standards do not stipulate that a spare vehicle was required; rather, that category needs to be maintained and advice given to airline pilots—via the Notice to Airmen (NOTAM) system—when category could not be maintained.[50]

3.44 The UFUAB, however, suggested that a 'serious shortage' of ARFFS firefighting vehicles around the country had led to an inability to maintain category when vehicles were out of service, and also reduced the amount of water or agent available at an incident.[51] It was asserted that, in 2018, all spare vehicles had been removed from remote locations, and a vehicle sharing system between regional stations implemented by Airservices. The UFUAB voiced concerns over this approach, stating that:

> These sharing arrangements for these fire stations present a substantial risk to the travelling public, in that these stations do not have the minimum requisite contingency to manage breakdowns and maintain a minimum standard of service delivery.[52]

3.45 By way of example, the UFUAB stated that one vehicle was shared between the Sunshine Coast, Gladstone and Rockhampton Airports, with a total distance of 543 kilometres between them. The UFUAB also raised concerns about a lack of emergency vehicle technicians (EVTs), noting that at least eight airports—including Coffs Harbour, Launceston and Alice Springs—did not have such technicians on site, which contributed to significant delays in 'returning stations to operational capability'.[53]

3.46 The UFUAB summarised its concerns with a lack of EVTs by saying:

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49 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, pp. 23-24.

50 Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, pp. 45-47.

51 The UFUAB advised that a spare vehicle provides an additional 9434 litres of agent at any one incident; see *Submission 18*, p. 8.

52 United Firefighters Union of Australia Aviation Branch (Remote stations), *Submission 18*, p. 7.

53 United Firefighters Union of Australia Aviation Branch (Remote stations), *Submission 18*, p. 8. See also United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 26.

> The danger of removing expert technicians from ARFFS is blatantly obvious to every operational ARFFS Fire Fighter who relies so heavily on the expertise of our EVT's to keep our fire service operational and minimise down time. High tech ARFFS vehicles and equipment, need highly trained expert technicians to maintain them to their maximum potential and effectiveness.[54]

3.47 Further, without the benefit of a spare vehicle, the UFUAB took the view that the ARFFS would be without firefighting agent within six minutes. An incident response would thereafter be relying on the arrival of other (non-ARFFS) fire services.[55]

3.48 The UFUAB called for more ARFFS vehicles to be purchased as a matter of priority, alongside the reinstatement of spare vehicles at all locations and the engagement of more EVTs. The UFUAB argued that such actions would help to overcome any shortage of ARFFS operational vehicles and to maintain category at airports.[56]

3.49 In response, Airservices advised that it was:

> …investing significantly in sustainment activities for our existing emergency vehicle fleet in the coming years and have commenced planning for fleet replacement.[57]

3.50 Mr Porter confirmed to the committee that spare vehicles (or spare capacity) were shared between locations, where they were closely located (for example, between Hobart and Launceston). Such vehicles would be put on a low-loader and transported between locations, so that 'a service has business continuity in terms of maintaining the service'.[58]

3.51 Mr Porter did go on to state, however, that in recent years new ARFFS stations were being equipped with vehicles from the existing fleet. Airservices was undertaking a staggered approach to replenishing the fleet, noting that the vehicles in the fleet were of different ages and that there was 'still a lot more analysis to go'. As of April 2019, the cost of the vehicle replenishment program was unknown.[59]

3.52 Mr Porter advised that historically, fire vehicles have been sourced from the international market, due to a lack of local product. Mr Jason Harfield, CEO of Airservices, noted that Airservices was looking to see what was available in

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54 United Firefighters Union of Australia Aviation Branch, *Submission 17*, pp. 26-27.

55 United Firefighters Union of Australia Aviation Branch (Remote stations), *Submission 18*, p. 9.

56 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 34.

57 Airservices Australia, *Submission 11*, p. 11.

58 Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, p. 45.

59 Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, pp. 45, 47.

the local market; but, as the current fleet of vehicles (Mk8 and Mk9) have had their production line ceased, Airservices needed a new organisation to produce the vehicles. Further, there are very few companies around the world making these vehicles (potentially no more than three), and the product itself was highly engineered without a great demand.[60]

3.53 The UFUAB suggested that, given a manufacturing time of three years, the ARFFS did not have enough vehicles in a 'rapidly growing industry', resulting in category drops in locations where vehicles were already being shared.[61]

Domestic response vehicles

3.54 In addition to fire vehicles, Airservices also provides a domestic response service (DRS), whereby a smaller vehicle, a Domestic Response Vehicle (DRV), is equipped to attend to other emergencies occurring around the aerodrome.

3.55 For example, the UFUA advised that at the Sydney, Melbourne, Brisbane and Perth Airports, Airservices provides a DRV which responds to non-aviation incidents around an airport, such as medical emergencies like heart attacks or injuries, as well as non-aircraft fires, structural fires around the airport, hazardous material events or alarms (among other things).[62]

3.56 The legislation committee was advised that staff on the DRS are 'over and above the safe staffing levels that are required to respond to an incident', in accordance with CASA regulations.[63]

3.57 However, the UFUA reported that the DRVs were staffed with one officer and two firefighters, which was an insufficient number to adhere to the 'two-in, two-out' principle of firefighting. This principle means that no firefighter enters a dangerous situation unless four firefighters are on the scene. The reduced staffing of DRVs meant that a DRV response team may have to wait for backup from suburban fire stations in responding to structural fires. The UFUA additionally noted that:

> …while the DRV is responding to the aviation incident there is no rescue appliance or crew on site to attend to any medical emergencies, structure fires or alarms at the airport.[64]

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60 Mr Robert Porter and Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 8 April 2019, pp. 32-34.

61 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 16.

62 United Firefighters Union of Australia, *Submission 10*, p. 10.

63 Ms Michelle Bennetts, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 26 February 2018, pp. 132-133.

64 United Firefighters Union of Australia, *Submission 10*, p. 10.

Establishment of new ARFFS fire stations

3.58 In accordance with section 2.1.1 of the MOS, all airports which reach the 350 000 passenger establishment trigger, must establish an ARFFS. CASA explained that with regard to the establishment trigger, it would look for the passenger numbers to be sustained over a 12-month period. Once the trigger was reached, CASA conducts a 'full review to satisfy itself that the projected growth is either maintained, sustained, or continued'.[65]

3.59 There was some concern expressed during the inquiry about the time lag between the hard trigger of passenger numbers being reached and sustained, and the subsequent establishment of the ARFF service.

3.60 In an acknowledgement of this delay, CASA does allow for Airservices to implement a graduated ARFF service, whereby firefighting capacity at an airport is built up over time, in order to reach the category that is required at a particular airport.[66]

3.61 Mr Harfield of Airservices has previously advised the legislation committee that the organisation was conscious of the time lag between reaching the trigger and establishing an ARFFS, and thus implemented the graduated service. However, Mr Harfield made clear that new fire stations create additional financial burdens on airlines; therefore, if an ARFFS was established too quickly, it could add extra charges which could hamper growth at the airport. Mr Harfield argued that Airservices was 'balancing managing the risks associated with the airport and the firefighting service'.[67]

3.62 When questioned about the practicalities of the hard passenger trigger, and the subsequent timeframes required in which to establish an ARFF service, Mr Walker of CASA advised that:

> Whilst the trigger is a hard trigger, you would appreciate that the conversation that needs to occur between the service provider, the regulator and the actual airlines themselves, and also some of the work that is done to actually make the assessment, do take a little bit of time. In taking the time, it is about making sure that you don't necessarily build fire stations and end up with stranded assets…Historically, both Airservices and CASA have seen the pros and the cons of acting quickly, and it is about trying to strike the right balance and making sure that we do get it right.[68]

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65 Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 27.

66 Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, pp. 27-28.

67 Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 22 May 2018, p. 112.

68 Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 30.

3.63 Ms Bennetts of Airservices made a similar point, and observed that the CASR did not provide a time frame in which an ARFF service had to be established (once the trigger threshold was met). Ms Bennetts observed that the silence of the regulations regarding timeframes 'has required ongoing consultation and collaboration' between CASA and Airservices.[69]

3.64 The passenger trigger was reached at Proserpine (Whitsunday Coast Airport) on 30 June 2017.[70] DIRDC advised that the ARFF service at Proserpine was expected to be online by the end of June 2020.[71] Ms Bennetts provided details on how an ARFF service might be established, using Proserpine as an example:

> …we sought clarity from the regulator, which said to us that within three months of receiving the [passenger] data we would need to put a safety case to the regulator setting out how we were going to provide a service and when we were going to do it. We did that. We put a safety case to the regulator in January 2018 setting out how we are going to provide the service and saying that we would have it up and running by the second quarter of 2020, which is roughly the time frame it has taken to establish most of our fire services in recent years.[72]

3.65 Mr Wood confirmed that it took two to two and a half years to implement an ARFFS service at an airport.[73] Involved in this process was procurement for establishing and building the new station, identifying a suitable location for the station in order to meet regulated response times, and working with the airport on these matters.[74] Further, any proposal to establish a new ARFFS station required the approval of the Parliamentary Standing Committee on Public Works.[75]

3.66 With regard to recent fire station developments, Airservices advised that:

> In recent years we have completed an upgrade of the Brisbane fire station, commenced an upgrade of the Canberra fire station and have committed to upgrading the Rockhampton and Coolangatta fire stations. We are

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69 Ms Michelle Bennetts, Airservices Australia, *Committee Hansard*, 14 March 2019, pp. 34-35.

70 Civil Aviation Safety Authority, answers to questions taken on notice, 14 March 2019 (received 28 March 2019).

71 Department of Infrastructure, Regional Development and Cities, answers to questions on notice, 14 March 2019 (received 1 April 2019).

72 Ms Michelle Bennetts, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 34.

73 Mr Glenn Wood, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 34.

74 Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 8 April 2019, p. 99.

75 Airservices Australia, *Submission 11*, p. 11.

> constructing a second fire station at Brisbane and a new station at Whitsunday Coast Airport.[76]

Case study – Brisbane Airport

3.67 A new, additional runway currently under construction at Brisbane Airport has necessitated the construction of a new ARFFS fire station (also known as a fire control centre), to ensure ARFF services can be provided on this runway alongside the existing facilities.

3.68 The new parallel runway is due for completion in mid-2020, and is located two kilometres from the current, primary runway.[77]

3.69 In addition to the three minute response time for the ARFFS, as required by ICAO and stipulated by the MOS, the ICAO SARPs provide that a fire station should be located so that the access for rescue and firefighting vehicles into the runway area is direct and clear, requiring a minimum number of turns.[78]

Site selection for new station

3.70 Airservices informed the committee that in order to select the site for the new ARFFS station at Brisbane, an initial review of feasible locations was undertaken, in 2015. This review identified three possible sites for further detailed assessment. The detailed assessment stage considered a number of factors, including:

> …the ability to meet regulated response times, the ability to observe all landings and take-offs from the Fire Control Centre (FCC), any impact on air traffic control tower line of sight, the ability to meet the opening date of the new runway, and cost.[79]

3.71 As a result of this process, two preferred options were identified as having the fastest response times and the least amount of operational risk, and thus 'providing the best opportunity for ARFF to save the maximum number of lives in the event of an incident'. The selected sites were referred to as 'site 2' (or option three), and 'site 3' (option four).[80]

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76 Airservices Australia, *Submission 11*, p. 11.

77 United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, p. 2.

78 International Civil Aviation Organization, *Annex 14 to the Convention on International Civil Aviation: Aerodromes*, Recommendation 9.2.38, as cited by United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, p. 4.

79 Mr Jason Harfield, Airservices Australia, correspondence dated 31 May 2019, [p. 1].

80 Mr Jason Harfield, Airservices Australia, correspondence dated 31 May 2019, [p. 1].

3.72 Once the two sites had been selected, line of sight and expected response time assessments were undertaken by external expert consultants, and 'vehicle time tests were subsequently conducted to validate estimated response times'.[81]

3.73 Site 3 was selected as the site of the new runway, as it had:

> …the fastest response times of the remaining options, would allow ARFFS to meet required response times to all runways, could be completed in time to support the new runway opening, and involved significant lower capital costs than site 2.[82]

3.74 In order to ensure line of sight at the new station, which would be impeded in future due to forthcoming airport developments, Airservices had obtained CASA approval to install viewing cameras to 'enable fire fighters to observe all landings and take-offs from the new runway at the existing main station'.[83]

3.75 CASA also advised that the new ARFFS station at Brisbane Airport would meet all response times, 'according to the supplied Airservices Safety Case'. CASA noted that these will be tested when the taxiway and runway facilities were completed. Mr Walker of CASA continued that with the testing conducted by Airservices:

> They have to physically demonstrate, including timing, to make sure they meet the standard. They have to be able to reach all runway ends for the aerodrome in that time and be delivering foam at an appropriate rate.[84]

3.76 With an overall budget of $24.92 million, construction of the new station commenced at the beginning of June 2019, with practical completion due in 15 months (with operational readiness to be achieved no later than August 2020).[85]

Views on station site selection

3.77 It was made clear to the committee that some stakeholders objected to the location of the new fire station, suggesting it would not meet various ARRFS regulatory requirements.

3.78 For example, the UFUAB asserted that the new fire station was 'very poorly located', and that the site selected for the station had 'no chance of complying with the ICAO and CASR requirements' for a fire control centre. The UFUAB

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[81] Airservices Australia, answers to questions taken on notice, 16 April 2019 (received 21 May 2019).

[82] Mr Jason Harfield, Airservices Australia, correspondence dated 31 May 2019, [p. 2].

[83] Mr Jason Harfield, Airservices Australia, correspondence dated 31 May 2019, [p. 2].

[84] Civil Aviation Safety Authority, answers to questions taken on notice, 14 March 2019 (received 28 March 2019); Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 29.

[85] Mr Jason Harfield, Airservices Australia, correspondence received 31 May 2019, [pp. 2-3]. The budget included funding for the new station, and associated air navigation infrastructure.

further suggested that Airservices wished to remove the ICAO and CASR requirement that a firefighter observe all landings and take-offs, instead transferring this function to air traffic control (ATC), thus reducing safety by removing a firefighter dedicated to the task, to an ATC officer with other duties.[86]

3.79 The UFUAB asserted that minimum safety standards could not be met at site 3, and that there was no contingency plan for when the standards might be breached. The UFUAB suggested that one option then available to Airservices would be to seek a dispensation from CASA in relation to emergency response times, which the UFUAB considered 'completely unacceptable, unsafe, and has never occurred before'.[87]

3.80 Mr Mark von Nida, Branch Secretary with the UFUAB, argued that the site selected for the new fire station was in the middle of the Brisbane Airport, 'nowhere near the runway', and that it would therefore be a struggle for the ARFFS to meet the required three minute response times.[88]

3.81 The UFUAB further asserted that site 3 would result in congested taxiways, an increase in the number of turns required by fire vehicles attending to incidents on the new runway (thus negatively impacting on response times), and would not have an unimpeded view of the new runway. The UFUAB instead suggested that site 2 met all national and international safety criteria and response times.[89]

3.82 Conversely, Mr Porter argued that a 'vast amount of work' had been completed, analysing the different sites for the station across the airport. Mr Porter noted that Airservices had worked closely with Brisbane Airport to identify suitable locations, and concluded that the selected site 'will satisfy all the regulatory requirements'.[90]

3.83 Airservices also advised that the response times for site 3 to the new runway had been tested, and—while longer than the other preferred site—was within seven seconds of response times of the existing service to the current runway. Further, response times to the existing runway was 24 seconds faster than the

86 United Firefighters Union of Australia Aviation Branch, *Submission 17*, pp. 20-21.

87 United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, p. 11.

88 Mr Mark von Nida, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 20 March 2019, p. 13.

89 United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, pp. 5-6.

90 Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, p. 27.

current services, and 19 seconds faster than the other proposed site for the new station.[91]

3.84 Airservices informed the committee that following an extensive assessment process (as detailed earlier in this chapter), the site for the new satellite fire station was endorsed by the Chief Fire Officer and the then Executive General Manager Aviation Rescue Fire Fighting, and approved by the then acting CEO, in July 2015.[92]

3.85 Mr Porter acknowledged that some stakeholders were unhappy with the selected site (with others happy with the choice). Mr Porter and Airservices confirmed, however, that consultation regarding site selection was undertaken, with the Brisbane Fire Station Manager and Northern Regional Operations Manager both consulted 'for their operational expertise'. Further, Airservices advised that specialist firefighters from the Chief Fire Officer's office were also involved, and that the decision on the chosen location had to be approved by CASA. CASA did so in October 2018.[93]

3.86 Airservices further advised that the Brisbane Local Operations Manager was involved in the safety and risk assessment work, completed to assess the site options for the new station. Airservices indicated that it did not receive:

> …concerns from local fire fighting staff in relation to the location of the new Brisbane fire station during the site selection process.[94]

Line of sight at the new station

3.87 It was confirmed by Mr Porter that while the regulations require a line of sight to aircraft landings and take-offs from the fire control centre, the regulations do not stipulate 'who or where or how' this line of sight should be maintained. Therefore, line of sight could be maintained via the ATC or via CCTV. Airservices could therefore designate the ATC as a fire control centre for the purpose of maintaining line of sight.[95]

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[91] Airservices Australia, answers to questions taken on notice, 16 April 2019 (received 21 May 2019).

[92] Airservices Australia, answers to questions taken on notice, 16 April 2019 (received 21 May 2019). As part of the response to the questions on notice, Airservices provided a chronology of key documentation and decision points for the new runway project.

[93] Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, pp. 28-30; Airservices Australia, answers to questions taken on notice, 16 April 2019 (received 21 May 2019).

[94] Airservices Australia, answers to questions taken on notice, 16 April 2019 (received 21 May 2019).

[95] Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, pp. 36-37.

3.88 Airservices advised that in August 2015, CASA confirmed that there were no regulatory barriers to the use of viewing cameras to meet visibility requirements.[96]

3.89 Mr Porter provided further information on the line-of-sight issue, and noted that the two options considered by Airservices for delivering line of sight involved either CCTV cameras to improve sight issues, or officers in the ATC tower alerting operational crews to the need for an ARFFS response. Mr Porter explained that the use of the ATC controller was in the early stages of a trial, to determine whether it was a feasible option—controllers already have an obligation to scan the runway when aircraft movements occur, and operate a crash alarm to alert the ARFFS if necessary.[97]

3.90 Mr Porter drew attention to the fact that there were some international examples of ATC alerting ARFFS operational crews to emergencies, resulting in some time efficiency for the air traffic controller. Mr Porter detailed this efficiency, stating that under pre-trial conditions:

> The air traffic controller would need to activate a crash alarm, make contact with the fire station and relay a message to say that there's an incident on the particular runway, and it's this type of aircraft. Rather than that process, the controller would turn out the crew directly and make a PA announcement from the tower that would be relayed to the fire station so that the crews get it firsthand—therefore, cutting down the time that's required.[98]

3.91 As of April 2019, the trial involving the ATC had yet to commence. The first phase of the trial was establishing the risk associated with the trial, followed by a safety analysis. The trial will aim to determine whether the controller has capacity to properly alert the ARFFS, and the practical ability to do so (for example, by having the appropriate equipment).[99]

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96 Airservices Australia, answers to questions taken on notice, 16 April 2019 (received 21 May 2019).

97 Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, p. 31; Airservices Australia, answers to questions taken on notice, 16 April 2019 (received 21 May 2019).

98 Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, p. 31.

99 Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, p. 36.

Chapter 4
Staffing levels within the ARFFS

4.1 Alongside the concerns raised in the previous chapter regarding ARFFS equipment and the development of new stations, significant concerns were raised with regard to the level of staffing provided at ARFFS locations, against each aerodrome category.

4.2 Concerns over staffing related to insufficient staffing levels or reductions in staffing levels against airport category at certain airports; a lack of proper risk assessment and consultation prior to the implementation of significant ARFF service delivery changes; and the redeployment of firefighting crews to other, non-regulated activities. This chapter explores these concerns.

Staffing levels

4.3 Throughout the inquiry, ARFF firefighters and their union representatives voiced serious concerns over apparent reductions in staffing levels by Airservices at ARFFS locations across Australia, and over inadequate staffing numbers against aerodrome categories.

NFPA staffing levels

4.4 It was often raised in evidence that the staffing profile developed by the NFPA in relation to ARFFS was to be preferred over the Australian regulations. Mr Andrew Hanson, currently a Fire Commander, provided a comparison of the recommended staffing levels put forward by the NFPA, and those currently in place for the ARFFS in Australia. Mr Hanson suggested that the 'disparity is staggering' between the two organisations, particularly at the lower categories, and that to date, no explanation had been provided by Airservices as to the discrepancy.[1] The comparison is provided at Table 4.1.

Table 4.1 Comparison of staffing levels - NFPA against ARFFS

Airport Category	NFPA staffing	ARFFS staffing
6	9	5
7	9	6
8	12	8
9	15	10
10	15	14

Source: Mr Andrew Hanson, Submission 16, p. 5.

[1] Mr Andrew Hanson, *Submission 16*, p. 5.

4.5 Mr Hanson suggested that the NFPA standards, when compared with the ARFFS requirements in Australia, were to be preferred. Mr Hanson observed that the NFPA numbers were developed using an expert panel, and considered realistic staffing numbers. The greatest disparities between the ARFFS and the NFPA were at the lower category levels (for example, nine staff recommended by the NFPA for Category 6 airports, compared with actual staffing of five at Australian airports). Mr Hanson expressed particular concern about this, noting that:

> In Australia this is compounded by the fact that these stations do not receive the same level of outside support within the same timeframes as the larger city airports.[2]

4.6 This view was supported by the UFUAB, which said that many regional ARFF stations did not have ready access to local ambulance services, or appropriate medical facilities, such as hospitals within close proximity to the airport. While noting that the ARFFS was not responsible for providing this type of support, the UFUAB suggested that additional firefighters should be provided in such areas in order to provide adequate emergency responses. The UFUAB was particularly concerned that the ARFFS was 'failing to meet the minimum staffing numbers in remote and regional locations'.[3]

4.7 It was also noted by the UFUA that the NFPA standards were preferred, as they exceeded the personnel and firefighting vehicle numbers required by Airservices.[4]

Reduction in staffing levels

4.8 It was put to the committee during the inquiry that staffing levels were being reduced or re-allocated across the ARFF service, placing the safety of both crews and the travelling public at risk.

4.9 For example, the UFUAB explained that until recently, the ARFFS had resourced its DRS with staff separate to those who were maintaining category requirements. This was to 'reduce the risk of a domestic response (non-aviation) degrading the category coverage'. However, under a 'hybrid model', ARFFS crew were now responding to non-aviation incidents.[5]

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2 Mr Andrew Hanson, *Submission 16*, pp. 5-6.

3 United Firefighters Union of Australia Aviation Branch (Remote stations), *Submission 18*, pp. 6-7; 11-15.

4 United Firefighters Union of Australia, *Submission 10*, pp. 9-10. See also United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, p. 13.

5 United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, pp. 18-19.

Mr Hunter confirmed to the committee that there were significantly more domestic responses than responses to aircraft incidents.[6]

4.10 In another example, evidence to the committee suggested that in 2013, Brisbane Airport was reclassified as a Category 10 airport following the completion of a Safety Case Assessment and Reporting Determination (SCARD), in light of the fact that the A380 was entering service at that airport. The SCARD determined the staffing level at Brisbane as 17 ARFFS staff, in order to accommodate the newly arrived A380s.[7]

4.11 However, it was put forward by the UFUA that in recent years, there had been a reduction in crewing levels at the Brisbane Airport from 17 to 14 crew (as well as at Perth Airport, which faced similar circumstances). The UFUA argued that both airports had been reclassified from Category 10 to Category 9 airports, despite both still receiving Airbus A380 aircraft (although infrequently).[8]

4.12 The UFUAB noted that this reduction in crew equated to three staff per crew, a total loss of 12 operational positions (based on a 24-hour roster), or 24 crew members across the two airports.[9]

Cross-crewing and the Brisbane and Perth airports

4.13 In light of the above staff reductions, the UFUA took the view that a Category 10-level ARFFS response at these airports could therefore only be achieved through Airservices 'cross-crewing' its ARFF and DRV vehicles. Cross-crewing means that 'the same crew can respond *either* to a DRV or ARFF incident, but not both simultaneously' (emphasis in original). For example, at a Category 10 airport an ARFF domestic response with the DRV, with three crew, would leave 11 crew at an ARFFS station, below the 14 personnel required for a Category 10 response.[10]

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6 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, p. 19.

7 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, and Mr John Hancox, *Committee Hansard*, 16 April 2019, pp. 13-15.

8 United Firefighters Union of Australia, *Submission 10*, p. 10. The UFUAB stated that Brisbane Airport was considered as Category 10 between 6.10am and 7.10am, and between 8.15pm and 9.15pm; see United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, p. 2.

9 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 22. See also Mr Mark von Nida, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 20 March 2019, p. 15.

10 United Firefighters Union of Australia, *Submission 10*, pp. 10-11.

4.14 Mr John Hancox, an ARFFS firefighter, provided the committee with an example of this occurring, when in February 2019 three staff from the Brisbane ARFFS responded to a cardiac event on a plane at the international terminal. During this time, an A380 taxied and took off. However, as there were only 14 staff available at the station, the domestic response meant that the ARFFS station was left with 11 crew during the A380's movements. Previously, when the Brisbane ARFFS had 17 staff, three staff could attend a first-aid emergency while 14 staff remained at the station, thus maintaining category.[11]

4.15 The UFUA suggested that this cross-crewing approach was occurring regularly, and concluded that such an approach was a risk to both firefighter and public safety. The UFUA summarised the cross-crewing process, stating that:

> …when firefighters are required to turn out in the DRV, the level of staffing remaining at the station is insufficient to maintain a Category 10 response (the level required when an A380 Airbus utilises the airport) and to respond to any major incident. Maintaining crewing and vehicle numbers appropriate to the Airport Category is crucial to the safety of airport passengers, staff and visitors.[12]

4.16 Mr Peter Marshall, National Secretary of the UFUA, suggested that cross-crewing was a 'cost-cutting exercise' which put ARFF firefighters in an 'untenable position'. Conversely, before its implementation, Mr Marshall said there were adequate staffing levels to contend with multiple scenarios (for example, a Category 10 aircraft and a medical emergency). Mr Marshall continued that:

> Emergency response is not predictable; it is time critical. Aircraft intervention is time critical…it's seconds, not minutes, to be able to intervene. The point I'm making is that you can't be in two places at the one time.[13]

4.17 Mr Tim Limmer, a firefighter at the Brisbane ARFFS, also argued that the cross-crewing occurring at Brisbane Airport was compromising safety and causing 'great stress' among firefighters.[14]

4.18 There was some confusion as to when cross-crewing was implemented at Brisbane. In light of this, Airservices provided to the legislation committee a

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[11] Mr John Hancox, *Committee Hansard*, 16 April 2019, pp. 16-17.

[12] United Firefighters Union of Australia, *Submission 10*, pp. 10-11. The UFUA presented examples of the 'cross-crewing' approach at the Brisbane and Perth Airports; see p. 11.

[13] Mr Peter Marshall, United Firefighters Union of Australia, *Committee Hansard*, 14 March 2019, pp. 8-9.

[14] Mr Tim Limmer, *Submission 20*, [p. 1].

timeline of events leading to the change of category at Brisbane Airport. The timeline is as follows:

- January 2018 – local ARFFS management was advised that A380 operations at Brisbane would reduce to one arrival and one departure per day, as of 25 March 2018, and would potentially cease entirely between 2 June and 1 September that year;
- Following this advice, staff consultation was commenced by Airservices regarding amendments to the staffing roster, and due to the further consultation and safety work required, no changes to staffing were made at the time;
- February 2018 – staff were advised that there was no intent to implement staffing changes in March 2018, and at that stage, there was no intention to implement cross-crewing at Brisbane Airport;
- March 2018 – Airservices received confirmation that, as of 2 September 2018, Brisbane Airport would only receive one arrival and one departure daily of A380s, with services to cease between 2 June and 1 September 2018;
- 2 June 2018 – Brisbane Airport reverted to a Category 9 airport, 24 hours a day (with 13 crew at all times), and consultation commenced with staff about 'upcoming reversion to periodic Category 10 operations';
- August 2018 – Airservices determined that from 2 September 2018, 14 staff would be on duty at all times at the Brisbane ARFFS, and that the DRV could be utilised safely using these 14 staff.[15]

4.19 Airservices advised that this staffing model has been in place 'effectively and safely' at Perth Airport since 2016. Further, with these category amendments and cross-crewing there were no changes at all to the provision of ARFF services in response to any fire on an aerodrome, or the provision of first aid responses, with no intention to change this in the future.[16]

4.20 Mr Harfield noted that the staffing levels at Brisbane were in accordance with the category of the airport, particularly in light of the fact that Brisbane Airport's service of A380s had been reduced to once or twice a day—thus making it appropriate to change the airport's category to Category 9 (with the ability to service Category 10 aircraft movements when required). Mr Harfield explained this situation as follows:

> Brisbane Airport is a category 9 station that is staffed to category 10 levels when there are A380 movements from time to time. The required category 10 staffing is 14, which is three officers and 11 firefighters. Sydney and Melbourne are category 10 stations 24 hours a day. They also have a

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15 Airservices Australia, answers to questions taken on notice, Supplementary Estimates 2018-19, 22 October 2018 (received 10 December 2018); Attachment A to question 96, pp. 1-2.

16 Airservices Australia, answers to questions taken on notice, Supplementary Estimates 2018-19, 22 October 2018 (received 10 December 2018); Attachment A to question 96, p. 2.

> domestic response vehicle which does the extra first aid, which is staffed separately. It's also provided at Brisbane, but it's staffed within the existing crew.[17]

4.21 Mr Harfield conceded that it was possible, at the Brisbane and Perth airports, that only 11 crew could be available during a Category 10 movement, if other crew were responding to, for example, a first aid call. However, Mr Harfield asserted that 'there was the ability to handle that scenario prior to this change, as there is now', and that the ARFFS was adhering to CASA requirements. Mr Harfield concluded that at Brisbane Airport:

> They still have a full complement of crew for the required and appropriate level of staffing and service.[18]

4.22 Airservices later asserted that the staffing currently in place at Brisbane Airport was developed 'through a risk assessment process based on task resourcing'.[19]

4.23 Airservices stated that the safety of the travelling public remains the primary concern of Airservices, and argued that:

> Staffing models for the provision of ARFFS across Australia, including at Brisbane Airport, are designed with paramount regard to stringent safety and risk analysis, and are approved by the Civil Aviation Safety Authority as meeting the required regulatory standards.
>
> The recent changes to the Brisbane staffing model did not impact Airservices' ability to both provide fire response services in accordance with regulatory requirements, and respond to first aid incidents in and around the terminal.[20]

Category changes

4.24 The MOS provides, in Chapter 25, that if there is a need to temporarily reduce the category of the ARFFS provision due to an unforeseen circumstance affecting impending aircraft movements, all affected parties shall be notified immediately via the Notice to Airmen (NOTAM) system.[21] The officer in charge at the time makes a determination as to the ability of ARFFS to respond

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[17] Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 22 October 2018, p. 180.

[18] Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 22 October 2018, pp. 180-181.

[19] Airservices Australia, answers to questions taken on notice, 16 April 2019 (received 21 May 2019).

[20] Airservices Australia, answers to questions taken on notice, Supplementary Estimates 2018-19, 22 October 2018 (received 10 December 2018); Attachment A to question 96, p. 3.

[21] Section 25.1.3.1, MOS Part 139.H—Standards Applicable to the Provision of Aerodrome Rescue and Fire Fighting Services, Version 1.2, January 2005, p. 25-1.

to an aircraft emergency, and advises accordingly through NOTAM and through the control tower.[22]

4.25 The UFUAB observed that this requirement then allows the air crew of a plane to determine whether the level of ground service is suitable to their needs.[23] However, this would also be dependent on whether they were notified in a timely manner of the change to category.[24]

4.26 Mr Wood explained that in the event of reduced ARFF services, airlines could determine whether to land a plane at that airport. By way of example, Mr Wood said that if there was a major fire in an airport terminal:

> …regardless of the number of staff, they are all going to respond to that fire. And in that instance, they will advise through the tower the aircraft that are operating a reduction in service level or category, and then the pilot will make a decision whether or not they still want to land or take off.[25]

4.27 DIRDC further advised that the category of an aerodrome can be reduced (dropped) during periods of reduced activity—for example during night operations—to no less than that needed for the highest category of aircraft planning to use the aerodrome during that time.[26]

4.28 In documents provided to the committee, it was stated that sustained variations to category could trigger a requirement for a category change, to ensure there were adequate staff and resources to respond to the worst possible scenario. Variations could also be triggered 'due to a regular aircraft movement which is of a greater category than that currently provided', and where Airservices ARFFS:

> …seeks to supply that level of category without utilising the ability to provide services one level below the largest regularly operating aircraft.[27]

Case study: Adelaide Airport

4.29 For some time, concerns have been raised by firefighters and local stakeholders about Adelaide Airport being reduced in category during its curfew period.

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22 Mr Glenn Wood, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 41.

23 United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, p. 20.

24 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, p. 18.

25 Mr Glenn Wood, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 41.

26 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 6.

27 Civil Aviation Safety Authority, answers to questions take on notice, 14 March 2019 (received 28 March 2019); Attachment: *Perth ARFFS Permanent Change from Category 9 to Category 9 with the ability to increase to 10*, Safety Case, 5 December 2018, p. 5.

During curfew, the airport is classed as Category 5, whereas during daytime operations, the airport is classed as Category 9.

4.30 The curfew at Adelaide Airport does not prevent all aircraft movements, but rather limits aircraft movements between 11.00pm and 6.00am by restricting the types of aircraft operating, and the number of flights permitted. Mr Terry Buss, the CEO of the City of West Torrens (where the Adelaide Airport is located) observed that despite the curfew, there are a significant number of flights overnight:

> On average, over the past three years, the number of permitted aircraft movements during the curfew period has been 4,160 movements annually—those numbers have been taken from Airservices figures—and that equates to approximately 11.4 aircraft movements per night-morning, or per curfew period, every day. This is not an insignificant number of aircraft movements, considering the curfew that exists.[28]

4.31 Mayor Michael Coxon, of the City of West Torrens, advised that the majority of these flights were for commercial or freight purposes.[29]

4.32 It was argued that despite being classified as Category 5 during curfew, Adelaide Airport was receiving Category 6 aircraft during this time. While the airport had five staff during curfew—two more than required by the category—it was suggested that Airservices was looking to reduce these numbers back to three, as per the regulated Category 5 requirements.[30]

4.33 Mr Buss noted the concerns of the City of West Torrens over any reduction to ARFF crews at Adelaide Airport, arguing that less firefighters could 'jeopardise the ability of rescue and firefighting personnel to deal with emergencies and security threats' at the airport. Mr Buss suggested a reduction in ARFFS staffing, at a time when the Airport and its surrounding precincts were continuing to rapidly grow, was 'illogical' and 'counterintuitive'.[31]

4.34 Mr Barker likewise suggested that this approach presented a direct risk to safety, was a breach of the MOS, and placed an 'increased and unrealistic reliance on external agencies', such as the South Australian Metropolitan Fire Service (SAMFS), to attend in a timely manner to on-airport emergencies. Mr Barker concluded that:

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28 Mr Terry Buss, City of West Torrens, *Committee Hansard*, 20 March 2019, p. 1.

29 Mayor Michael Coxon, City of West Torrens, *Committee Hansard*, 20 March 2019, p. 4.

30 Mr Glen Barker, *Submission 22*, p. 15.

31 Mr Terry Buss, City of West Torrens, *Committee Hansard*, 20 March 2019, pp. 2-3.

> In the event of an incident requiring ARFF intervention the resources for Category 5 are nothing short of dangerous and compromise the safety of the crew and people who need to be rescued.[32]

4.35 Mayor Coxon suggested it would take approximately five minutes from notification of an emergency event at the airport to when SAMFS could potentially arrive at that event. Mayor Coxon raised concerns about this, noting that 'every second counts' when dealing with highly flammable material.[33]

4.36 Mr Barker continued by saying that in the event ARFF crew were dispatched to an emergency—either at the airport or within the response area off airport—the Adelaide Airport would be left with no ARFF at all, and therefore no capacity to respond to an aircraft incident. Mr Barker suggested that such an approach represented a 'gross misinterpretation and understanding' of the CASR and the MOS, and demonstrated a failure to recognise the services required to respond to the 'hazards of a major international capital city airport'.[34]

4.37 Mayor Coxon voiced his concern about the lack of ARRFS coverage when passenger aircraft were not in operation. Mayor Coxon reasoned that such an approach led to a perception that that no aircraft were operating during such a time, however he noted that:

> We have aircraft that come in and out of this airport during the curfew period courtesy of the Royal Flying Doctor Service. I would be really concerned that, should an event occur, we would be unable to proactively respond to an event that involved the Royal Flying Doctor Service, just as an example.[35]

4.38 Mr Buss also noted that a number of dispensations to either land or take off were granted to commercial passenger aircraft during the curfew period (for example, due to flight diversions or departure delays). By way of example, Mr Buss stated that:

> …in the period of July to September 2018 there were a number of approved dispensations. There was a Tiger Australia dispensation with 164 passengers on board, a Qantas dispensation with 109 passengers on board, a Virgin Australia with 153 passengers on board, a Jetstar with 138 passengers, a Virgin Australia with 176 passengers, an Emirates with 331, and so on.[36]

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32 Mr Glen Barker, *Submission 22*, pp. 15, 21-22.

33 Mayor Michael Coxon, City of West Torrens, *Committee Hansard*, 20 March 2019, p. 3.

34 Mr Glen Barker, *Submission 22*, p. 19.

35 Mayor Michael Coxon, City of West Torrens, *Committee Hansard*, 20 March 2019, p. 4.

36 Mr Terry Buss, City of West Torrens, *Committee Hansard*, 20 March 2019, p. 5.

4.39 Mayor Coxon was of the understanding that when these dispensations during curfew occurred, the ARFF service did not have 'enough lead time for them to increase their complement' of staff, in order to maintain or achieve the appropriate category.[37] Mr Buss made a similar point, stating that:

> If there were an incident involving one of those aircraft movements, I doubt whether even the current crew could deal with it, let alone a reduced crew.[38]

4.40 To remain compliant with the MOS, Mr Barker recommended that the category during curfew at the Airport be raised from Category 5 to Category 7, and be resourced accordingly. Doing so would provide an extra fire vehicle, and three extra ARFF staff during curfew.[39]

4.41 In correspondence to Mr Buss dated 15 February 2019, the Minister for Infrastructure, Transport and Regional Development, the Hon Michael McCormack MP advised that Airservices was 'conducting a review of its ARFFS staffing levels' during the curfew period, when no regular passenger transport aircraft were in operation. Minister McCormack further noted that there was no obligation to provide any ARFFS coverage outside the operating hours of passenger aircraft at Adelaide. However:

> …reflecting its commitment to aviation safety, Airservices has elected to provide a Category 5 level of service overnight for many years and current staffing levels are above the minimum required for a Category 5 service. Its decision to review staffing levels does not diminish Airservices' commitment to continue to provide a Category 5 service during the curfew period.[40]

4.42 In response to concerns raised about staffing at Adelaide, Airservices advised the legislation committee that no changes had been made to staffing at Adelaide, and that Airservices was undertaking a review of the Adelaide staffing roster in order to:

> …understand why rostered staffing numbers at Adelaide are considerably above the staffing levels approved by CASA [and the review] will be informed by the TRA methodology. No changes to current staffing numbers will be made until they are assessed against the TRA framework after it is introduced in early 2019.[41]

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37 Mayor Michael Coxon, City of West Torrens, *Committee Hansard*, 20 March 2019, p. 6.

38 Mr Terry Buss, City of West Torrens, *Committee Hansard*, 20 March 2019, p. 6.

39 Mr Glen Barker, *Submission 22*, p. 23.

40 The Hon Michael McCormack MP, correspondence to Mr Terry Buss PSM, City of West Torrens, dated 15 February 2019 (tabled 20 March 2019).

41 Airservices Australia, correspondence to the Senate Rural and Regional Affairs and Transport Legislation Committee for its inquiry into the Performance of Airservices Australia, 30 November 2018.

4.43 Moving forward, Mr Wood advised that Airservices would examine the number of emergencies at Adelaide Airport in recent years, together with the proximity of the local fire services, to feed into an upcoming staffing level review using the TRA framework.[42]

4.44 Mr Harfield stressed the fact that there were no cuts to staffing levels at any location, and said it was not correct that staffing would be reduced at Adelaide. He further noted that Airservices had maintained services at locations where, under the current regulations, the ARFFS could in fact be disestablished. Airservices had instead taken the decision to maintain the services.[43]

4.45 Mr Harfield contended that a Category 5 ARFFS at Adelaide was adequate 'for the type of aircraft operating at the airport during those curfew hours and according to what's required under the regulations'. Mr Harfield continued that:

> We're certified by CASA for the standard of service, and we have to operate to the level that is provided under the certificate. If the certificate allows us to go to category 5, it's been assessed as appropriate.[44]

4.46 Mr Harfield further informed the legislation committee that if a dispensation was given for passenger aircraft, ARFFS would have to provide services corresponding to category, regardless of what aircraft arrived during curfew. Despite this, Mr Harfield conceded that at that time, no assessment had been done as to how many people worked at the airport during curfew hours.[45]

4.47 In October 2018, Mr Harfield refuted the suggestion that a downgrade of category at certain airports was a cost-cutting exercise. Mr Harfield explained that Airservices would save no money from changes to category; rather, Airservices was examining its 'resourcing profile around the country', noting that some airports were changing with different aircraft mixes, requiring either an increase or decrease to category.[46]

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42 Mr Glenn Wood, Airservices Australia, *Committee Hansard*, 14 March 2019, pp. 39-40.

43 Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 8 April 2019, p. 28.

44 Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 22 October 2018, pp. 182-183.

45 Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 22 October 2018, p. 184.

46 Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 22 October 2018, p. 185.

Views on staffing reductions

4.48 The UFUAB took the view that in reducing staff numbers, Airservices had 'completely ignored' the views of a committee of ARFFS operational experts, and had excluded the input of these experts in considering the reduced staffing model. Further, the UFUAB argued that it and many ARFFS firefighters saw reduced staffing, including via ICAO's remission factor, to be 'completely unsafe'.[47]

4.49 The UFUAB indicated that ARFFS staff at Brisbane Airport did not believe that they could properly respond to a Category 10 emergency, 'within the current resourcing models'. Staff at the Brisbane ARFFS argued that an incident with a Category 10 aircraft under reduced staffing would 'result in unacceptable increased loss of life', while also endangering ARFFS staff.[48]

4.50 The UFUA contended that there was little to no oversight of staffing reductions, therefore placing 'airports, staff, passengers and ARFF personnel at risk on a regular basis'. The UFUA concluded that there was a need to:

> …review ARFF regulations and standards to better align them with ICAO SARPs, with consideration given to the standards established in NFPA 403 as examples of best practice.[49]

Legislating staffing levels

4.51 The UFUA contended that ARFFS staffing levels should be legislated, rather than placed in regulations or operational procedure documents. The UFUA argued that changes to regulations and operational procedures did not require or involve public scrutiny, and did not properly consider the unintended consequences of reduced staffing levels; if enshrined in legislation, any amendments to staffing levels would be subject to a 'rigorous process of examination and investigation'.[50]

4.52 Mr Hunter of the UFUAB supported this position, arguing that 'staffing numbers must be regulated or legislated to prevent the watering down' of safe crew numbers, with the NFPA standards used as the baseline for any legislated staffing levels. Mr Hunter continued that 'legislation and regulations

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47 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 23.

48 United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, pp. 13, 15.

49 United Firefighters Union of Australia, *Submission 10*, p. 1.

50 United Firefighters Union of Australia, *Submission 10*, p. 12. The UFUA also argued, however, that as the MOS was a legislative instrument, it could be 'unilaterally amended' by CASA; see *Submission 10*, p. 5.

must be brought into line with ICAO', which would include identifying staffing needs above the NFPA.[51]

4.53 The UFUA also called for an independent review of current ARFFS staffing levels, to establish an 'appropriate minimum staffing level' by airport category, taking into consideration the NFPA 403 standard.[52]

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51 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, p. 2. The same views were put forward by Mr John Hancox; see *Committee Hansard*, 16 April 2019, p. 3.

52 United Firefighters Union of Australia, *Submission 10*, p. 12.

Chapter 5
Division of responsibility in aviation emergency responses

5.1 A number of concerns were raised during the inquiry regarding the provision of non-regulated services by ARFFS. ARFF services provided, for example, emergency first aid responses or responded to other requests for assistance within an aerodrome, services which were not related to its regulated service delivery—those functions relating to aircraft and aerodrome safety.

5.2 This chapter considers the concerns raised about the division of responsibilities in responding to emergency situations on aerodromes, and the interaction of ARFF services with state and territory fire services.

Provision of non-regulated services

5.3 Airservices pointed out that in 2017–18, its ARFF service responded to over 4000 emergencies which were not related to its regulated service delivery; the majority of these emergencies were requests for first aid assistance.[1]

5.4 Airservices remarked that the CASRs do not contain a specific requirement for ARFFS to provide emergency first aid. While ARFFS providers were skilled and trained in providing first aid assistance, and were provided with the necessary equipment with which to do so, this was to enable ARFFS providers to attend aircraft and other regulated emergencies. However, Airservices advised that:

> …the vast majority of first aid responses provided by ARFFS are non-regulated responses such as a person requesting assistance in the terminal.[2]

5.5 Ms Bennetts advised that Airservices did not charge for these additional, non-regulated services, on the basis that they provide an 'important contribution to community safety' whilst affording ARFFS firefighters opportunities to 'practice and develop their skills and experience'.[3]

5.6 ARFFS, as part of regulated services, also responds to fire alarm activations. However, Airservices observed that many fire alarm responses were to commercial or non-aviation related developments, such as business parks, on airport land. Airservices questioned the appropriateness of ARFFS responding

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1 Airservices Australia, *Submission 11*, p. 7.

2 Airservices Australia, *Submission 11*, p. 8.

3 Ms Michelle Bennetts, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 33.

to increasing numbers of fire alarms on non-aviation related commercial developments, given the safety and cost implications. To better address this issue, Airservices suggested that:

> The local state/territory fire services may in some cases be more appropriate to respond to these type[s] of emergencies. This approach would allow ARFFS to remain focused and ready to respond to aircraft emergencies and aviation related infrastructure on the aerodrome.[4]

5.7 Airservices noted that, in addition to its regulated requirements, the ARFFS was working with a number of airports where the CASRs did not require ARFFS to be provided. Firefighting subject matter experts had been allocated to these airports, to assist with airport emergency planning and preparation.[5]

5.8 Ms Bennetts of Airservices voiced some concerns over the approach to non-regulated services, and noted that there was 'no set formula' for making decisions about attending non-regulated events. Ms Bennetts put forward the view that while attending non-regulated services utilises existing resource capacity, attendance at such events should not jeopardise the ability of the ARFFS to respond to aircraft emergencies. Airservices cautioned that the provision of non-regulated services:

> …must be carefully managed to ensure they do not grow to an extent that they require significant resources beyond what can be provided within existing capacity [and] therefore lead to an increase in landing charges at aerodromes.[6]

5.9 Mr Porter indicated that further work was required in the area of domestic response services, noting there was greater clarity around the regulation of aviation responses, as opposed to domestic responses. Mr Porter agreed with the assertion that the TRA process, as recommended by ICAO for the provision of resources to ARFFS, could not help to determine the demand for resources for domestic responses. Mr Porter further confirmed there was no regulatory driver for a TRA-like process for the domestic response. Mr Porter noted that:

> ICAO requires a TRA [for aviation], so that part of the business or the operations is covered by the TRA. It doesn’t have the same level of prescription in terms of that domestic response.[7]

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4 Airservices Australia, *Submission 11*, p. 7.

5 Airservices Australia, *Submission 11*, p. 12.

6 Airservices Australia, *Submission 11*, p. 7; Ms Michelle Bennetts, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 33.

7 Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, p. 44.

5.10 While the firefighting union expressed some concerns over the Airservices approach to non-regulated services, a number of its views aligned with those of Airservices.

5.11 The UFUAB suggested that saving lives via the provision of first aid would be viewed by the public as a 'very successful and effective use of ARFFS staff and resources'. The UFUAB continued that the provision of first aid by ARRFS firefighters adds value to airports, and argued that first aid responses:

> …utilises the skills and capability already in place at the ARFFS stations at the 26 busiest airports without generating significant extra costs. It provides our members with exposure to emergency responses that makes them better and more effective firefighters and first responders. Over the past 20 or more years that the ARFFS has provided this service literally hundreds of Australian lives have been saved.[8]

Division of responsibilities in emergency response

5.12 DIRDC undertook a Regulatory Policy Review in 2015 (Review), and released an associated discussion paper. This paper considered the 'other' services which were provided by Airservices, alongside its regulated, ARFFS responsibilities.[9]

5.13 Such services included monitoring of fire alarms, first aid, and 'non-aviation' rescue and firefighting. While assisting with these services was provided for under the *Air Services Act 1995*, the Review noted that 'these services should not impede on Airservices' capacity to perform its core aerodrome-related' ARFFS functions.[10]

5.14 It was noted by Mr Porter that airports across the country are seeing major developments occur around the airport. This was not limited to large capital city airports, with Mr Porter acknowledging that smaller airports and regional locations are developing hotels and other revenue-generating projects at airports.[11] These expansions could have a direct impact on the ability of ARFFS to respond to an increasing volume of emergency responses.

5.15 Similar to the concerns raised by Airservices during this inquiry, the 2015 Review drew similar conclusions about an increasing amount of non-aviation

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8 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 33.

9 This Review is considered in detail in Chapter 6.

10 Department of Infrastructure and Regional Development, *Aviation Rescue and Fire Fighting Services Regulatory Policy Review: Public Discussion Paper*, December 2015, p. 24, https://www.infrastructure.gov.au/aviation/arffs/files/ARFFS_Policy_Paper_for_Consultation.pdf (accessed 19 June 2019).

11 Mr Robert Porter, Airservices Australia, *Committee Hansard*, 16 April 2019, p. 44.

development on airport land in recent years, such as retail outlets and business parks, which had challenged 'the notion of what should be considered the 'aerodrome' in determining the exact role of the ARFFS'. The Review noted that:

> The provision of non-aviation activities presents challenges for Airservices' capacity, as the primary ARFFS provider, to continue to provide services to these non-aviation areas at an aerodrome, while maintaining the required ARFFS category of service to respond at any time to aircraft and aviation-related incidents.
>
> The current regulations need to be updated to better reflect what activities constitute core ARFFS aviation-related activities at an airport.[12]

5.16 The Review suggested that the definition of an 'aerodrome' needs to be reviewed. As drafted, the definition provides no clear indication of what area of land was to be selected for the purpose of applying the definition of 'aerodrome'. The Review highlighted the difficulties that could occur with differences of interpretation of the definition:

> A broad interpretation would see the aerodrome area aligning with the outer boundaries of the airport while a narrower interpretation would see the aerodrome constituting some area of land of lesser size than the airport, within the airport boundaries, principally the area related to aviation activity including airport terminals from which aircraft arrive or depart.[13]

5.17 DIRDC submitted that the recommendations of the Review were aimed at clarifying for ARFFS providers and state and territory authorities the 'operational agreements that delineate their respective roles and responsibilities' at airports where ARFF services are provided.[14]

5.18 The Review recommended that narrower, 'activity-based' concepts be introduced to better determine ARFFS responsibilities, while moving away from a reliance on the definition of an 'aerodrome'. DIRDC explained that in this way, ARFF services could be aligned to areas or facilities at an airport which are used (or intended to be used) for aviation activities, or activities closely connected with aviation activities. DIRDC concluded that under this model:

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12 Department of Infrastructure and Regional Development, *Aviation Rescue and Fire Fighting Services Regulatory Policy Review: Public Discussion Paper*, December 2015, p. 24.

13 Department of Infrastructure and Regional Development, *Aviation Rescue and Fire Fighting Services Regulatory Policy Review: Public Discussion Paper*, December 2015, p. 24.

14 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 7.

> …ARFFS would still be able to assist with fire fighting services on other, non-aviation related parts of the aerodrome, but this would not be their primary responsibility.[15]

5.19 Ms Pip Spence, Deputy Secretary with DIRDC, explained that the regulatory reforms presented by the Reivew were aimed at providing clarity between the different fire services, and would help to ensure that there were 'no gaps between what Airservices does and what the state and territory fire services would do at airports'. Airservices also confirmed that there would be no change to the way ARFFS provided first aid or other emergency services on aerodromes.[16]

5.20 The approach suggested by the regulatory reforms would accord with ICAO's TRA process, which states that consideration should be given to the impact of an ARFFS responding to other aerodrome emergencies. ICAO states that:

> If an airport operator requires the RFFS to attend structural incidents and road traffic accidents in addition to aircraft incidents/accidents, due regard must be given to the inability of not meeting required response times and robust procedures should be introduced accordingly.[17]

Interaction with state emergency and fire services

5.21 The provision of emergency responses to non-aerodrome sites near airports, and for emergencies which do not fall within the ARFFS regulated framework, require a cohesive approach between the ARFF services and state and territory fire services. Some evidence was provided detailing how this cooperation took place.

5.22 Mr Harfield has previously noted that Airservices would work with local fire services, to instruct them and help them to grow their capability in dealing with an aviation accident. As ARFFS could not be provided at all airports, Airservices and its ARFF services could instead increase the capability of the local fire services.[18]

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15 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 8.

16 Ms Michelle Bennetts, Airservices Australia and Ms Pip Spence, Department of Infrastructure, Regional Development and Cities, Senate Rural and Regional Affairs and Transport Legislation Committee, *Estimates Hansard*, 26 February 2018, p. 126.

17 International Civil Aviation Organization, *Doc 9137-AN/898: Airport Services Manual*, Part 1—Rescue and Firefighting, Fourth Edition, 2015, p. 10-3.

18 Mr Jason Harfield, Airservices Australia, Senate Rural and Regional Affairs and Transport Legislation Committeee, *Estimates Hansard*, 22 May 2018, p. 113.

5.23 The Australasian Fire and Emergency Service Authorities Council (AFAC) advised that the CASRs mandate the 'Interface Agreements between ARFF and state or territory fire brigades and/or other third-party providers'.[19]

5.24 Further, AFAC identified that the ARFFS operated under the Australasian Inter-Service Incident Management System (AIIMS), which was the nationally recognised system of incident management for fire and emergency service agencies.

5.25 An AIIMS Steering Group, which was established to provide 'greater assurance arrangements to aid the implementation of the AIIMS', was made up of representatives from the ARFFS, urban operations, rural operations, land management, State Emergency Service operations, community safety and learning and development bodies. In order to ensure operational readiness, the AIIMS structure was utilised to undertake regular exercises to:

> …ensure a multi-agency response is available at Australian airports. These regular exercises form part of each Aerodrome or Airport Emergency Plan, with consideration given to all other appropriate jurisdictional emergency or disaster plans.[20]

5.26 AFAC went on to advise that the ARFFS developed Memorandums of Understanding (MoUs) to 'ensure an adequate service delivery with other relevant jurisdictional emergency service agencies'. AFAC offered its support for the current structure of ARFF services, and noted that it was supported by 'appropriate planning, operational readiness and multi-agency training exercises at all airports'.[21]

5.27 Several jurisdictions detailed to the committee their interactions with ARRF services, as detailed below.

New South Wales

5.28 The NSW Government's Office of Emergency Management (OEM) advised the committee that Fire and Rescue NSW (FRNSW), alongside the NSW Rural Fire Service (NSWRFS), provide—within their respective districts—fire and emergency response capability to all airports in NSW. The OEM continued that:

> Both fire services work collaboratively with emergency services, military and private resources at airports to ensure a comprehensive response to fires and other emergencies, including aviation incidents.[22]

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19 Australasian Fire and Emergency Service Authorities Council, *Submission 3*, p. 3.

20 Australasian Fire and Emergency Service Authorities Council, *Submission 3*, p. 4.

21 Australasian Fire and Emergency Service Authorities Council, *Submission 3*, pp. 4-5.

22 New South Wales Government Office of Emergency Management, *Submission 4*, [p. 1].

5.29 Further, FRNSW could become involved in aircraft incidents where hazardous materials were involved, as FRNSW was the 'combat agency for hazardous material incidents'.[23]

5.30 The OEM made the point that it was 'essential' that any operational response to emergencies at Australian airports consider the 'broader risk profile of the region'. The OEM noted that both FRNSW and the NSWRFS worked collaboratively with Airservices (or other private contractors) to ensure a comprehensive response to fire and other emergencies.[24]

5.31 The OEM observed that its 32 certified airports[25] presented the greatest level of risk, due to the size and number of movements of aircraft. To deal with a significant aviation incident, the NSWRFS and FRNSW carried:

> …both A and B class foam concentrates and recommend that [a] certified airport maintains a bulk supply of foam appropriate to size of the aircraft using the airport and of a type appropriate to the risk. This allows for an immediate and effective fire attack and fuel vapour suppression on the arrival of the first fire truck.[26]

Queensland

5.32 Queensland Fire and Emergency Services (QFES) advised that Airservices provided ARFF services at nine Queensland airports, under a Memorandum of Arrangement between QFES and Airservices. The Arrangement stipulates the operational arrangements for specified airports, and delineates the roles and responsibilities between the services. QFES observed that, in larger airports, the arrangements 'extend to substantial responsibility for business precincts within the airport boundary'.[27]

5.33 QFES offered its support for close collaboration between airport operators and ARFF providers, including via joint exercises, emergency planning and skills training.[28]

Stakeholder views

5.34 The UFUAB submitted that the MoUs entered into between the ARFFS and state fire services 'ensure a continued firefighting and rescue capability for

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23 New South Wales Government Office of Emergency Management, *Submission 4*, [p. 1].

24 New South Wales Government Office of Emergency Management, *Submission 4*, [p. 1].

25 Certified airports are those which have been certified by CASA under the CASRs, which prescribe the requirements for aerodromes used in air transport operations. Certified aerodromes are used by aircraft of more than 30 passenger seats.

26 New South Wales Government Office of Emergency Management, *Submission 4*, [p. 1].

27 Queensland Fire and Emergency Services, *Submission 14*, p. 1.

28 Queensland Fire and Emergency Services, *Submission 14*, p. 1.

large-scale incidents', whereby state fire services could offer immediately available resources. The UFUAB did note, however, that support from other fire services was not always possible in regional and remote areas where ARFF services were established.[29]

5.35 The UFUAB was of the view that Airservices had not given adequate consideration to the complexities and risk associated with ARFF service provision in regional and remote areas. Accordingly, the UFUAB argued that the ARFFS at such locations has to be resourced appropriately by Airservices, as a stand-alone service.[30]

5.36 The UFUAB further suggested that Airservices was reliant on state fire services to cover staff shortages within the ARFFS, despite a lack of guarantees from the state services as to availability of their staff and resources at any specific time—primarily due to the fact that the state services could be attending other emergencies. It was put forward by the UFUAB that ARFFS response planning was based on the best case scenarios, when the worst case should instead be considered to ensure an adequate response. The UFUAB therefore suggested that the ARFFS should:

> …have the capability to manage the incident for far longer than is currently the practice in order to allow a realistic time frame for the arrival of the other services.[31]

5.37 Mr Hunter, of the UFUAB, noted that under the ICAO SARPs, all vehicles must be able to arrive at the emergency in less than four minutes; however, Mr Hunter continued that, on average, support from other fire services was 17 minutes away, and firefighting agent carried in these vehicles could be exhausted 'in as little as one minute and 30 seconds'. Mr Hunter raised a number of concerns about the reliance on other fire services, stating that the support vehicles:

> …have no access, they do not have keys and they cannot enter or operate on an aerodrome without escort, under airport security regulations. It must be noted there are no hydrants on the taxiways or runways, and metropolitan fire services do not have enough water capacity to fill a single vehicle. A truck takes 15 minutes to refill from departing and returning to scene. This leaves a critical gap of anywhere from the six-minute point to the 17-minute point—an 11-minute pinch point or dead spot.[32]

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29 United Firefighters Union of Australia Aviation Branch (Remote stations), *Submission 18*, pp. 10-11.

30 United Firefighters Union of Australia Aviation Branch (Remote stations), *Submission 18*, pp. 3, 16.

31 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 12.

32 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, pp. 1-2.

5.38 Mr Barker further suggested that there were a number of incompatibilities between the metropolitan fire services and the ARFFS, including between equipment and procedures. Mr Barker suggested that in the event of an aircraft incident, the metropolitan services did not have 'the required aviation training, equipment and knowledge' to deal with the incident. Mr Barker concluded that 'aviation firefighters do not presume to be a Metropolitan Fire Fighter and vice versa'.[33]

5.39 The opposite view, however, was put forward by Mr Wood of Airservices. Mr Wood argued that while firefighters from a local fire service may not have expertise in aviation firefighting, in areas where there were no ARFFS established metropolitan or rural firefighters were able to respond to airport emergencies.[34]

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33 Mr Glen Barker, *Submission 22*, p. 24.

34 Mr Glenn Wood, Chief Fire Officer, Airservices Australia, *Committee Hansard*, 14 March 2019, p. 35.

Chapter 6
Resourcing and administration of ARFFS in Australia

6.1 Throughout the inquiry, it was consistently noted that Airservices had not completed Task Resource Analyses (TRAs) to determine the adequate level of resourcing at ARFFS stations across Australia. This chapter provides details on the TRA process, and the views of stakeholders as to its importance for the ARFFS.

6.2 This chapter also considers various elements of the regulatory framework, including the oversight role of CASA. It also discusses a number of regulatory reviews undertaken by DIRDC and CASA regarding the appropriateness and adequacy of the ARFFS regulatory framework. The chapter concludes by presenting some overall views as to the provision of ARFFS in Australia by Airservices.

Task Resource Analysis

6.3 In 2013 and 2014, the ICAO SARPs were amended to recommend that, in determining the minimum number of aviation rescue and firefighting personnel required, 'a task resource analysis should be completed and the level of staffing documented in the Aerodrome Manual'.[1]

6.4 ICAO states that the TRA should establish the minimum number of staff required to deliver an effective ARFFS, considering the worst-case scenario in an aviation incident. The TRA should also include a workload assessment, to determine the effectiveness of current staffing levels and 'to identify the level of improvement resulting from additional staffing'.[2]

6.5 There was significant support expressed for the TRA approach throughout the inquiry, to determine the appropriate amount of resourcing—both personnel and equipment—required for the ARFFS.

6.6 The UFUA described the TRA process (as it is written in the ICAO SARPs) as the following:

> …a qualitative risk-based approach which focuses on **probable and credible worst-case scenarios** [and] seeks to identify the minimum

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1 International Civil Aviation Organization, *Annex 14 to the Convention on International Civil Aviation: Aerodromes*, Recommendation 9.2.45, as cited by United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, p. 12.

2 International Civil Aviation Organization, *Doc 9137-AN/898: Airport Services Manual*, Part 1—Rescue and Firefighting, Fourth Edition, 2015, p. 10-3.

> number of personnel required to undertake identified tasks in real time before supporting external services are able to effectively assist ARFF personnel.[3] [emphasis in original]

6.7 The UFUA submitted that both ICAO's Annex 14 and the NFPA 403 standard endorsed the use of a TRA in determining the minimum number of ARFF personnel at an airport. Indeed, it was submitted that ICAO had adopted the NFPA TRA model.[4] The UFUA went further and suggested that the TRA be used to determine additional staffing requirements, over and above the minimum.[5]

6.8 Mr von Nida of the UFUAB noted that undertaking a TRA would allow for assessments of individual airports, and take into consideration the unique circumstances surrounding each airport, particularly airports in regional and remote areas. By way of example, Mr von Nida said:

> …if you're in Newman and all you've got coming is a bunch of auxiliaries it should take that into account as a factor. If you're in, say, the Sunshine Coast where you've got three hospitals and 16 different fire services around there, it should take that into account. The cavalry are really coming on that occasion, as opposed to in Newman, where there is no cavalry. You're the cavalry.[6]

6.9 Mr Horton also described the importance of a TRA in helping the ARFFS to undertake effective rescue operations, by describing the processes involved in an emergency response:

> So within three minutes the water has suppressed an aircraft fire. We are talking about a fire being fuelled by aviation fuel. On top of that—and this is where the task and the resource analysis comes in—you've got other tasks that need to be done, such as the rescue of the passengers and obtaining entry into a fuselage if entry has been prevented. That's additional staff who should be doing additional tasks. So we're not talking about the task resource analysis suddenly saying, 'You only need three people to do all of this.' You've got your bare minimum at the moment, according to ICAO standards, to be able to suppress the fire. It is all about rescuing the passengers and crew within the aircraft. It's about their survival. It's not just about saying, 'Yes, we put out the fire,' but everyone

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3 United Firefighters Union of Australia, *Submission 10*, pp. 11-12.

4 Mr Andrew Hanson, *Submission 16*, p. 5.

5 United Firefighters Union of Australia, *Submission 10*, p. 12. The UFUAB noted that the TRA concept was introduced by ICAO in 2013; see *Submission 17*, p. 29.

6 Mr Mark von Nida, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 20 March 2019, p. 14.

> perished onboard; it is about achieving the saving of lives. That is what we are looking at with task resources analysis.[7]

6.10 Mr Hanson suggested that the TRA was an inexpensive, table-top exercise, 'designed to identify "pinch points" in operations where staffing resources may be deficient', and which would ensure the safe and effective operations of the ARFFS. Mr Hanson was of the view that the TRA process is:

> …an extremely important issue for operational commanders. The provision of sufficient, well trained firefighters is fundamental to conducting safe and efficient fire ground operations.[8]

6.11 The UFUAB further argued for a TRA to be undertaken prior to any reduction in ARFFS staffing levels. Such an approach would also align with the requirements of the ICAO SARPs.[9]

6.12 This was considered particularly important in light of the fact that the TRA only considers the aviation component of an emergency response, and does not consider responses to, for example, emergencies in the terminal. Mr Hancox noted that this fact highlighted the issues with cross-crewing, when trying to determine the resources needed for an emergency response via a TRA.[10]

Use of the TRA in Australia

6.13 Evidence to the committee indicated that the TRA process was yet to be implemented formally in Australia, and had not yet taken place at the ARFFS locations across the country.

6.14 Mr Hanson noted that the justification for this noncompliance with ICAO standards by Australia was that the 'legislation does not specifically identify that a [TRA] should be completed to determine staffing numbers'. Mr Hanson suggested that this was a 'simplistic and subjective interpretation of the legislation', and said that:

> The fact that there is no specific reference to staff justification in the legislation indicates there can be no inconsistency with the ICAO amendment.[11]

6.15 Mr Hanson went on to argue that, regardless of the binding nature of ICAO with regard to the TRA, it should be completed by Airservices as part of best

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7 Mr Stephen Horton, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 20 March 2019, p. 15.

8 Mr Andrew Hanson, *Submission 16*, p. 2.

9 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 24.

10 Mr John Hancox, *Committee Hansard*, 16 April 2019, p. 16.

11 Mr Andrew Hanson, *Submission 16*, p. 2.

practice, and to address the discrepancy between current ARFFS staffing numbers, and those recommended by the NFPA.[12]

6.16 Mr Hunter advised the committee that the union had completed a TRA of its own, in light of its view that Airservices had not completed one. The TRA undertaken by the UFUAB was based on Brisbane Airport, and the final report was provided to the committee.[13] Mr Hunter stated that, as a result of that TRA and using the minimum standards of ICAO, the union did not believe that the minimum standards for staffing numbers were being met by Airservices.[14]

6.17 The UFUAB cautioned, however, against 'incomplete and inaccurate' TRA models, which were based on assumptions developed using 'incorrect procedures and data'. Doing so, it was argued, could 'reduce the safety of aviation in Australia and the operational safety' of ARFFS firefighters.[15]

6.18 Overall, the UFUAB agreed with the assertion that if a TRA was completed by Airservices now, it may meet the minimum ICAO standards, but these standards may be inadequate to respond to an aviation event. The TRA would also not take into account domestic demands on the same crews and resources.[16]

Airservices' views

6.19 Airservices advised the legislation committee, in November 2018, that it supported the use of task resourcing analyses to determine ARFFS staffing levels, and had 'used this approach to underpin development of staffing levels for many years'.[17]

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12 Mr Andrew Hanson, *Submission 16*, p. 5.

13 United Firefighters Union of Australia, *Task Resource Analysis – Brisbane ARFFS* (tabled 16 April 2019), available at: https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Rural_and_Regional_Affairs_and_Transport/Aviationrescueservices/Additional_Documents

14 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, pp. 10-11. At the time of the hearing, Mr Hunter advised that the UFUAB was in the process of finalising a Category 7 TRA for the Sunshine Coast Airport; see pg. 11.

15 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 25.

16 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, p. 16.

17 Airservices Australia, correspondence to the Senate Rural and Regional Affairs and Transport Legislation Committee for its inquiry into the Performance of Airservices Australia, 30 November 2018, https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Rural_and_Regional_Affairs_and_Transport/AirservicesAustralia45/Additional_Documents.

6.20 In response to concerns raised about staffing at specific airports, Airservices explained that the:

> Current approved ARFFS staffing levels at Brisbane and Adelaide (and all other locations across Australia) were developed by Airservices, and approved by CASA, using a risk assessment process that is based on task resourcing.[18]

6.21 Airservices elaborated that it supported ICAO's TRA methodology, and that both it and CASA supported the introduction of the ICAO TRA methodology into the Australian regulatory framework. Airservices indicated that incorporation of the TRA method was being progressed as part of a current review into Subpart 139.H of the CASRs.[19]

6.22 Airservices confirmed that commencing in 2019, location-specific reviews would take place at every AFRRS location in Australia—including at Adelaide and Brisbane. Airservices would implement a TRA framework based on the latest ICAO guidance material, 'benchmarked against other international ARFFS providers'.[20]

6.23 Airservices informed the committee that it would be utilising the TRA framework to undertake the national review to 'ensure service delivery remains commensurate with the operating environment at each aerodrome'.[21]

Consultation

6.24 Firefighters and their union representatives made clear their views that Airservices was failing to properly engage in consultation, over the TRA process in particular, but also over other matters such as staffing changes.

6.25 The UFUAB indicated that it was 'vital' firefighters with a broad knowledge of operations were consulted when undertaking risk assessments. The UFUAB views the risk assessment phase as the best opportunity for experienced ARFFS officers to speak freely and provide details of their operational experience. However, the UFUAB suggested there was a lack of consultation by Airservices with the unions, arguing they were 'excluded completely' from

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18 Airservices Australia, correspondence to the Senate Rural and Regional Affairs and Transport Legislation Committee for its inquiry into the Performance of Airservices Australia, 30 November 2018.

19 Airservices Australia, correspondence to the Senate Rural and Regional Affairs and Transport Legislation Committee for its inquiry into the Performance of Airservices Australia, 30 November 2018.

20 Airservices Australia, correspondence to the Senate Rural and Regional Affairs and Transport Legislation Committee for its inquiry into the Performance of Airservices Australia, 30 November 2018.

21 Airservices Australia, *Submission 11*, p. 12.

such assessments, and that participants in risk assessments were 'cherry picked'.[22]

6.26 Mr Horton raised concerns over a lack of consultation between the union and Airservices when considering the implementation of TRAs at airports. Mr Horton advised that, for a number of years, the Aviation Branch of the union had been asking Airservices to complete TRAs to determine resourcing. However, Mr Horton indicated that Airservices was reluctant to consult:

> It got to the point where the branch took Airservices to Fair Work Australia over lack of consultation. Airservices came back with a compromise: there could be one union representative. There was a committee looking at the trial of setting up the task resource analysis and Airservices would pick who that union representative was. That committee met once with the union representative on it. The union has received no documentation regarding the outcome of that process. There's no indication of whether actual task and resource analysis at individual airports—because it needs to happen at individual airports—will involve union consultation.[23]

6.27 The UFUAB confirmed that it had been invited by Airservices onto a TRA committee. However, since an initial meeting, the union had had no indication that Airservices was to consult further on the TRA process.[24]

6.28 It was further asserted that the unions were spending significant time dealing with the current 'confrontational environment' between it and Airservices, with 'a dispute every week'. Mr Hunter suggested that this situation should be resolved, as it was 'not productive for anyone', and did note that since the commencement of this inquiry, consultation between the union and Airservices had improved.[25]

6.29 Mr Walker of CASA advised that a technical working group, established under CASA's Aviation Safety Advisory Panel to consider amendments to the MOS, had over 600 interested parties registered with it. Mr Walker stated that 'Airservices, obviously the UFU and any other interested parties' would be invited to attend and participate in the technical working groups, prior to public consultation on amendments to the MOS.[26]

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[22] United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 27.

[23] Mr Steve Horton, United Firefighters Union of Australia, *Committee Hansard*, 14 March 2019, p. 13.

[24] Mr Mark von Nida and Mr Stephen Horton, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 20 March 2019, pp. 12, 15.

[25] Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, pp. 24-25.

[26] Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 24.

Regulatory reviews

6.30 In recent years, a number of reviews have been completed into Australia's regulatory framework for the provision of ARFFS. Some of the outcomes of these reviews offer support for better adherence to international standards, and would assist in effective implementation of the TRA process. These reviews are detailed below.

2015 Regulatory Policy Review

6.31 In December 2015, the DIRDC released a Regulatory Policy Review (Review) discussion paper, which considered what should be the appropriate criteria for the establishment of an ARFFS, including both higher and lower passenger numbers.

6.32 As part of the Review, DIRDC was asked to consider the use of risk assessments, rather than the current 'hard trigger' requirement for the establishment of an ARFF service (the 350 000 passenger threshold).[27]

6.33 The Review found that a passenger threshold number lower than 350 000 passengers was not supported, and suggested that available ARFFS resources should be targeted to major passenger airports. Further, it was noted that lowering the threshold would only marginally improve ARFFS coverage across the system because:

> …there would be a relatively small increase in the total percentage of passengers covered…but there would be a significant cost imposition on regional airlines which could adversely affect the level of airline services to regional airports.[28]

6.34 The Review instead recommended that passenger numbers should be used as a trigger for a risk review, rather than be used for the automatic requirement for the provision of ARFFS. DIRDC advised that this was the preferred approach, as the current approach did not 'allow for consideration of the likelihood or consequence of an incident occurring at a particular location for determining whether ARFFS resources should be deployed'. DIRDC further stated that:

> Factors such as safety measures already in place (e.g. the nature of air traffic control services), the variety of operations undertaken at the location and geographic factors affecting access to the site are not currently considered, and as a result resources are not allocated according to safety risk.[29]

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27 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 6.

28 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 7.

29 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 7.

6.35 DIRDC advised that the regulatory reform package arising from the Review determined that risk reviews would be used to determine whether to establish ARFFS at airports, using the introduction of scheduled international passenger air services and total number of passenger movements—500 000 over a rolling 12 months—as triggers for undertaking the risk review.[30]

6.36 Further, risk reviews would be used to determine whether to disestablish ARFFS at airports with passenger movements falling below 400 000 and remaining below this level for 12 months, or the withdrawal of international services, as triggers for the risk review.[31]

6.37 However, in June 2018, Minister McCormack adjusted the regulatory reforms, such that the passenger number trigger for risk assessments remained at 350 000—rather than increase to 500 000 as proposed—and for disestablishment, remained at 300 000 rather than 400 000.[32]

6.38 Other recommendations of the Review included:

- improving and modernising the regulatory framework, including the regulations and the associated MOS, by replacing prescriptive requirements with a systems and outcome-based approach underpinned by the ARFFS provider having an SMS approved and audited by CASA;
- clarifying the roles and arrangements with the state and territory fire services and the airport operator in relation to the provision of ARFFS; and
- maintaining arrangements at existing ARFFS locations, including that it would not be necessary to undertake a disestablishment risk review for an existing ARFFS unless the total number of passengers falls below the existing disestablishment threshold of 300 000 in the twelve month period.[33]

6.39 The outcomes of the Review are currently being implemented via changes to CASR Subpart 139.H and the associated MOS. DIRDC advised that draft regulations would be released for comment during 2019.[34] CASA also advised that drafted amendments to the MOS would be provided for broad consultation with industry.[35]

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30 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 8.

31 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 8.

32 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 8.

33 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 8.

34 Department of Infrastructure, Regional Development and Cities, *Submission 9*, p. 8.

35 Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 24.

6.40 Airservices noted that it was working with both DIRDC and CASA to implement the outcomes of the 2015 Review, by amending Part 139.H and the associated MOS.[36]

Responses to the Review

6.41 The Australian Airline Pilots' Association (AusALPA) was of the view that implementation of the recommendations of the Review would diminish aviation safety standards in Australia, and make Australia 'even less compliant' with the ICAO SARPs. AusALPA also questioned whether CASA was equipped with the relevant expertise with which to conduct risk assessments for the ARFFS, particularly given the rarity of aircraft incidents in Australia.[37]

6.42 AusALPA further suggested that there would be other serious ramifications to adopting the recommendations:

> Australia would risk not only failing to meet its international obligations, but also could cause serious harm to its international reputation should a fatal aircraft accident, involving multiple loss of life, occur at an airport where insufficient or no ARFFS provision was shown to be a major contributory factor in the non-survivability of that event.[38]

6.43 The UFUAB likewise suggested that implementation of the Review's recommendations would 'see the standard of ARFFS in Australia' decline, particularly in rural and regional areas where ARFF services would be reduced or not provided in the foreseeable future.[39]

6.44 Mr von Nida voiced serious concerns over the proposal to increase the passenger threshold to 500 000, as suggested by the Review. Mr von Nida suggested such an increase would move Australia further away from the ICAO standards, and compared the Australian establishment trigger to those overseas:

> When you look around the world, you've got the UK, where every certified airport has an ARFF service of some type. In the US, anything with 12 seats and above has a fire service. If you look at New Zealand, for 30 seats and above there's a fire service. In Canada, get more than 180,000 passengers through the gate and you get a fire service.[40]

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36 Airservices Australia, answers to questions taken on notice, 16 April 2019 (received 21 May 2019).

37 Australian Airline Pilots' Association, *Submission 21*, pp. 1, 4-5.

38 Australian Airline Pilots' Association, *Submission 21*, p. 2.

39 United Firefighters Union of Australia Aviation Branch, *Submission 17*, p. 21.

40 Mr Mark von Nida, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 20 March 2019, p. 10.

6.45 The Australian Airports Association (AAA) advised that in submitting to the Review, it was largely supportive of the shift to risk-based assessments, in conjunction with the revised passenger threshold triggers. The AAA suggested that these approaches recognise the increased passenger numbers at airports, and 'signalled a move towards more outcomes-based regulation in line with international best practice'. Despite the later announcement by Minister McCormack, the AAA remained supportive of the suggested risk assessment process, as it would allow a number of relevant factors to be considered, rather than just passenger numbers in isolation.[41]

6.46 Airservices wrote to DIRDC as part of the Review, offering its support for improved regulatory settings for ARFFS, and in particular for the shift to a risk-based assessment approach for the establishment and disestablishment of ARFF services. Airservices remarked that the use of the hard trigger could be 'improved through consideration of the operational environment of each airport'.[42]

General concerns with the establishment threshold

6.47 The UFUA suggested that, rather than passenger numbers—an 'arbitrary threshold figure'—the type of aircraft utilising an aerodrome should be used to determine whether ARFF services were provided. An ARFFS would therefore be established via a risk assessment, as opposed to a threshold trigger. The UFUA argued that such an approach could 'meaningfully model' the consequences of—for example—an aircraft crash, and was therefore preferable to the current approach which could not anticipate the worst case scenario.[43]

6.48 Further, the UFUA argued that a number of airports in Australia with significant aircraft movements (over 200 000 aircraft movements each year, such as at Bankstown or Moorabin), but with fewer passenger movements, did not have an ARFFS. The UFUA questioned this approach, asking whether 'these busy airports, surrounded by residential suburban housing' should have ARFF services.[44]

6.49 The UFUA continued that a number of other countries applied a 'more rigorous standard' than Australia to the establishment of ARFFS. For example,

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41 Australian Airports Association, *Submission 12*, p. 2.

42 Airservices Australia submission to the Aviation Rescue Fire Fighting Regulatory Policy Review, 11 February 2016, https://www.infrastructure.gov.au/aviation/arffs/files/Airservices_Australia.pdf (accessed 9 July 2019).

43 United Firefighters Union of Australia, *Submission 10*, pp. 6, 8. The UFUA drew attention to fluctuating passenger numbers at the Coffs Harbour and Ballina Airports to highlight its concerns with this issue; see p. 8.

44 United Firefighters Union of Australia, *Submission 10*, p. 8.

all licenced airports in the UK had ARFF provisions, and most licenced airports in the USA and New Zealand also had established ARFF services. The UFUA stated that:

> If Australia were to adopt the formula used by any of these other nations, more Australian airports would provide ARFF services, in turn ensuring a safer airport experience for more domestic and international travellers.[45]

Post-implementation review – Subpart 139.H

6.50 In 2007, following implementation of CASR Subpart 139.H in 2005, CASA undertook to complete a post-implementation review (PIR) of the rules that would 'look at ensuring the rules were effective in protecting the delivery of a safe ARFF service for the benefit of the travelling public'.[46]

6.51 CASA stated that over time, it had 'become aware of some issues that could be better addressed' by the CASR, and further noted that the recommendations of the 2015 Review by DIRDC required amendments to the rules. CASA also saw the PIR as an opportunity to better align Australian rules with current ICAO standards and international best practice, and to incorporate technological improvements.[47]

6.52 The PIR would consider a number of matters, including (but not limited to):

- the key challenges facing the industry, in order to propose policy improvements;
- a gap analysis between the existing CASR Subpart 139.H and the associated MOS against the Chicago Convention and its Annexes, to ensure the MOS continues to meet Australia's international responsibilities to ICAO;
- a review of existing draft amendments to the MOS to reconcile these against the gap analysis;
- the approach taken by other regulators internationally; and
- the training and qualification framework for aviation firefighters.[48]

6.53 In July 2018, CASA advised that the legal drafting of the CASR amendments and the MOS was underway, which, after review by the independent Aviation

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45 United Firefighters Union of Australia, *Submission 10*, pp. 6-7.

46 Civil Aviation Safety Authority, *Project AS 07/14 – Post-implementation review (PIR) – Subpart 139.H – Aerodrome rescue and firefighting services*, 31 July 2018, https://www.casa.gov.au/standard-page/project-0714-post-implementation-review-pir-aerodrome-rescue-and-firefighting-services (accessed 21 June 2019).

47 Civil Aviation Safety Authority, *Project AS 07/14 – Post-implementation review (PIR) – Subpart 139.H – Aerodrome rescue and firefighting services*, 31 July 2018.

48 Civil Aviation Safety Authority, *Project AS 07/14 – Post-implementation review (PIR) – Subpart 139.H – Aerodrome rescue and firefighting services*, 31 July 2018.

Safety Advisory Panel, would be released for public consultation prior to final drafting.[49]

6.54 CASA also advised that under its current review of Subpart 139.H, proposed changes would include additional requirements for ARFFS providers to apply the ICAO resourcing model at each ARFFS location.[50]

Concerns with the regulatory framework

6.55 Despite these reviews and their suggestions to improve the ARRFS regulatory structure, submitters raised concerns that the regulations were outdated and not aligned with international best practice.

6.56 For example, Mr Kiegan Rice noted that the MOS had been subject to the PIR process since 2007, and further suggested that it had been 14 years since the MOS was updated. Mr Rice contended that in this time, Annex 14 to the Chicago Convention had been updated 11 times, and therefore CASA was not supporting Australia in its adherence to Convention commitments. Mr Rice expressed concern over Australia's lack of adherence to the recommended practices, and was of the personal view that:

> …decision makers within the ARFFS believe that ICAO SARPS is split between the standards: certain standards that must be adhered to, and recommended practices which are nice to adhere to…Australian civil aviation strives for world best practice - shouldn't we be aiming to adhere to all recommended practices?[51]

6.57 Mr Rice put forward his views for addressing these concerns, including finalisation of the MOS Review and update, and clearer understanding and advice from ARFFS operational standards and performance teams that the MOS is required to be read in conjunction with the ICAO publications.[52]

6.58 Mr Hancox went further and suggested that there be a 'full rewrite of the regulations completed as soon as possible', in order to the align them with current international standards and recommendations. Mr Hancox argued that such a rewrite was 'years overdue'.[53]

General views on the provision of ARFF services

6.59 There were divided views as to the overall efficacy of Australia's ARFF services, as well as its adherence to international standards.

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49 Civil Aviation Safety Authority, *Project AS 07/14 – Post-implementation review (PIR) – Subpart 139.H – Aerodrome rescue and firefighting services*, 31 July 2018.

50 Civil Aviation Safety Authority, *Submission 7*, p. 2.

51 Mr Kiegan Rice, *Submission 24*, [p. 1].

52 Mr Kiegan Rice, *Submission 24*, [p. 2].

53 Mr John Hancox, *Committee Hansard*, 16 April 2019, p. 3.

6.60 It was CASA's view that there was 'no evidence' to suggest that ARFF services had been compromised in any way that 'could reasonably be seen to impact negatively on Australia's reputation or safety record'.[54]

6.61 Similarly, the AAA expressed 'no concerns' regarding the standards for ARFF services, or the performance of Airservices in its ARFFS operations. It was the view of the AAA that Airservices undertook its functions in a 'professional, effective and collaborative manner', ensuring that incidents were responded to as quickly as possible.[55]

6.62 Conversely, the UFUAB expressed concerns that Australia's ARFFS was no longer adhering to operational best practice, and was instead operating in accordance with a business model and looking for ways to cut services.[56]

6.63 The UFUAB was of the view that Australia had 'without a doubt the worst ARFFS safety regulations in the world, with nearly 300 unprotected airports' and an excessively high establishment threshold of 350 000 passengers. The UFUAB concluded that:

> Right now is the time to act to prevent any changes to Australian ARFFS regulations that will take us even further away from internationally accepted standards.[57]

6.64 Mr Hunter, of the UFUAB, made clear his views that the Airservices approach to safety was based on business and industrial models which were 'not suited to the provision of emergency services'. Mr Hunter expanded on his views, suggesting that the Airservices approach allowed for:

> …risk to be reduced based on likelihood [of an emergency], which allows them to manipulate the outcomes. Whilst this works in most industries, it is not relevant to an emergency services provider. ARFF should be based on the assumption that there is an event, not the likelihood. It assumes the worst plausible case scenario. The baseline for this event is and must always be 'catastrophic'.[58]

Performance of CASA

6.65 A number of submitters and witnesses were of the view that CASA is not providing effective regulatory oversight of Airservices and its provision of ARFF services.

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54 Civil Aviation Safety Authority, *Submission 7*, p. 3.

55 Australian Airports Association, *Submission 12*, p. 2.

56 United Firefighters Union of Australia Aviation Branch (Brisbane ARFFS safety review), *Submission 19*, p. 28.

57 United Firefighters Union of Australia Aviation Branch, *Submission 17*, pp. 31, 33.

58 Mr Justin Hunter, United Firefighters Union of Australia Aviation Branch, *Committee Hansard*, 16 April 2019, p. 1.

6.66 The UFUA voiced its strong concerns over CASA's role as the regulatory body for ARFF services, suggesting that CASA was 'reluctant to investigate and act' on what it perceived as a 'continual failure' by Airservices to provide and maintain category levels at aerodromes, alongside other ARFF regulatory breaches. The UFUA suggested that this 'failure' was a result of ARFF crew being utilised in responses to off-airport emergencies, or for 'non-operational extraneous duties', leading to reduced staffing levels and an inability to maintain category at an aerodrome.[59]

6.67 It was the view of the UFUA that Subpart 139.H of the CASR 'falls significantly short of the international standard' for the provision of ARFF services, and identified a number of exemptions which had been granted to Airservices by CASA (such as an exemption to reduce the frequency of foam application training from every 90 days to every 180 days).[60]

6.68 The UFUA called for an independent review of the CASRs, which would serve as an opportunity to 'better align the CASRs and MOS with international best practice and current ICAO standards', while taking into consideration the NFPA 403 standard as best practice, and the views of ARFF and firefighting experts.[61]

6.69 Regarding dispensations from adherence to the regulations, DIRDC confirmed to the committee that the Department could not require CASA to issue an exemption to Airservices, and could not prevent CASA from doing so. However, if it was later identified that there were issues with a granted exemption, DIRDC would work with CASA and take the lead 'if an amendment to legislation or regulation were needed to require changes to the way in which CASA was undertaking its functions'.[62]

6.70 Ms Spence of DIRDC confirmed that at this time, there was no evidence to suggest that there were any issues with the accuracy and efficacy of ARFFS decision-making, and the Department was confident that the appropriate and correct decisions had been made.[63]

6.71 According to Mr Walker, Airservices voluntarily and regularly informs CASA as to its ARFFS activities, and that when a concern was raised by the unions, that was 'fully explored'. Mr Walker continued that, in that instance, a risk

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59 United Firefighters Union of Australia, *Submission 10*, pp. 1, 13.

60 United Firefighters Union of Australia, *Submission 10*, pp. 12-13.

61 United Firefighters Union of Australia, *Submission 10*, p. 14.

62 Ms Pip Spence, Department of Infrastructure, Regional Development and Cities, *Committee Hansard*, 14 March 2019, p. 19.

63 Ms Pip Spence, Department of Infrastructure, Regional Development and Cities, *Committee Hansard*, 14 March 2019, p. 20.

assessment or safety case was sought from Airservices by CASA. Following that, the safety case was:

> …assessed and analysed by our technical experts. We have a team within the air navigation and aerodromes branch who are ARFF specialists; many of them have actually been active ARFF members historically. They conduct the assessment. If CASA satisfies itself that the safety case meets the requirement, then permission is granted to proceed. If required, an exemption may or may not be issued. If further work is required, that is sought from Airservices. It's not unusual, though, for that to occur or for CASA to determine that it's not satisfied that it is safe to do so.[64]

6.72 Mr Brad Parker, Acting Branch Manager, Air Navigation, Airspace and Aerodromes, CASA, confirmed that any changes by Airservices to its operations manual did not need to involve CASA, as the manual was an internal Airservices document. Airservices were able to make changes, and then advise CASA. Mr Parker noted that CASA would then undertake a review, and CASA 'does have the power to instruct the service provider to revert to what they were doing before or something else'.[65]

Performance of Airservices

6.73 Strong views were put forward as to the performance of Airservices in its provision of ARRFS.

6.74 For example, Mr Barker submitted that Airservices had 'an appetite for risk', while ignoring calls from ARFF personnel for 'more staff, more resources and better compliance' with the regulatory framework. Mr Barker also suggested the lack of a serious aircraft incident in Australia may have led to a sense of complacency:

> Although ARFF have responded to many aviation incidents, Australia is 'lucky' to have avoided a major aircraft crash or incident. This complacency has infiltrated Airservices and decisions are being made based on the likelihood of 'nothing' happening rather than 'in all probability, one day it will'.[66]

6.75 Mr Hancox commented that there was a disconnect between Airservices management, and front-line ARFF staff. Mr Hancox suggested that a corporate mindset from Airservices compromised the safety of operational staff, as did a 'compromised relationship' between CASA and Airservices management.[67] Mr Hancox argued that ARFF staff are frustrated with Airservices management, and that:

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64 Mr Rob Walker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 25.

65 Mr Brad Parker, Civil Aviation Safety Authority, *Committee Hansard*, 14 March 2019, p. 31.

66 Mr Glen Barker, *Submission 22*, p. 3.

67 Mr John Hancox, *Submission 25*, [p. 1].

> …safety critical issues are ignored or aren't being fixed in appropriate timeframes. This seriously impedes operations and is a WHS issue for staff…Management need to be accountable and transparent if they are to regain our trust.[68]

6.76 Further, Mr Tim Limmer felt that there was a 'disappointing level of care and concern for the genuine safety and wellbeing' of ARFFS firefighters.[69]

6.77 The sentiments expressed by submitters and witnesses were not shared by Airservices. Airservices took the view that it provides ARFF services 'at or above the regulated category requirement at every fire station'. Airservices went on to state that:

> By effectively utilising capacity established to meet regulated ARRFS requirements, Airservices has been able to maintain the required category level to ensure an immediate response to an aircraft emergency while also providing non-regulated services such as first aid response and mutual aid to other fire services.[70]

6.78 As part of its submission, Airservices presented information which indicated that, for each of the 26 ARFFS airports, staffing was provided at either the CASA-approved level, or above this level (in a combination of officers and firefighters).

6.79 For example, Airservices indicated that Adelaide Airport (during curfew) and Melbourne Airport had more staff than was required by CASA. Additionally, Brisbane and Perth Airports were staffed at Category 10 levels, for Category 10 aircraft operations (such as A380s).[71]

6.80 Airservices further suggested that it had developed performance targets, aimed at ensuring that ARFFS vehicles, firefighting agents and firefighters for the required category were available to:

> …meet the regulated response times 99.9% of the time the service is available. This means additional resources are provided at some locations over and above the regulatory standard so that ARFFS can respond to other regulated (e.g. fire alarm activations) and non-regulated (e.g. requests for first aid assistance) emergencies while still maintaining category at or above 99.9%.[72]

6.81 Airservices pointed out that it had consistently maintained its service performance in line with its performance targets, achieving 99.93 per cent in 2017, and 99.94 per cent in 2018. The performance targets were applied

68 Mr John Hancox, *Submission 25.1*, [p. 1].

69 Mr Tim Limmer, *Submission 20*, [p. 6].

70 Airservices Australia, *Submission 11*, p. 5.

71 Airservices Australia, *Submission 11*, pp. 13-14 (Appendix A).

72 Airservices Australia, *Submission 11*, p. 5.

across all locations, to allow Airservices to 'better understand key impacts on maintaining service delivery', and where resources over and above the regulatory standard might be provided.[73]

6.82 Airservices further noted that its operations were exceeding regulatory standards in a number of areas. Airservices pointed to the following as examples of this:

- staffing over the CASA-approved staffing level at some locations, including Sydney, Adelaide and Melbourne;
- in some locations, having up to 100 per cent more firefighting agent than required by the regulatory standard;
- ARFFS coverage beyond the regulated hours of operation at Sydney and Adelaide Airports; and
- firefighting (‘front line’ foam producing) vehicles in excess of the number required to deliver the service (the operational requirement is for approximately 75 vehicles compared to an overall current fleet number of 90 vehicles).[74]

Comparison with international standards

6.83 Airservices noted that, as part of its operating model, it regularly compares Australian ARFFS with the safety standards and practices implemented by ARFF services internationally. By doing so, Airservices stated that it was able to remain aware of the latest research, industry changes and the 'impacts and benefits of emerging technologies', while working cohesively with international peers in training and the exchange of information related to ARFFS.[75]

6.84 Despite this approach, Airservices noted that it was difficult to draw comparisons between Australian and other ARFF services, 'as the operating environment, regulatory framework and ownership structures vary across jurisdictions'. Airservices suggested that Subpart 139.H of the CASR was more extensive than its international counterparts, requiring the ARFFS to comply with a broader range of safety standards.[76]

6.85 Similar views were put forward by DIRDC. In a letter dated 18 May 2018 to the legislation committee, DIRDC advised that differences filed with ICAO were subjective as to how each member state meets a particular standard. DIRDC highlighted that Australia was ranked sixth with ICAO and against other member states for the effective implementation of safety oversight

73 Airservices Australia, *Submission 11*, p. 5.

74 Airservices Australia, *Submission 11*, p. 11.

75 Airservices Australia, *Submission 11*, p. 9.

76 Airservices Australia, *Submission 11*, p. 9.

arrangements. DIRDC argued that the number of differences filed was 'not an appropriate indicator of Australia's commitment to international standards or the safety of our aviation system'.[77]

6.86 Airservices described its processes for researching other regulatory and industry standards:

> Airservices approach to international standards is to analyse their applicability to the broader environment here in Australia, consider their relationship to the regulations, consider their validity and where merit can be demonstrated, adopt or adapt elements of them.
>
> For example, elements of ARFFS vehicle design and performance and training frameworks have been drawn from NFPA standards.[78]

[77] Department of Infrastructure, Regional Development and Cities, correspondence regarding notification of differences to ICAO Standards and Recommended Practices, 18 May 2018 (tabled 22 May 2018).

[78] Airservices Australia, *Submission 11*, pp. 9-10.

Chapter 7
Committee views and recommendations

7.1 The vital role of aviation rescue and firefighting services in keeping flying passengers and crew safe should not be underestimated. A properly resourced and trained ARFFS is critical in optimising the chances of survival for travellers and crew, should the worst happen in an aviation accident.

7.2 The ARFFS also plays a fundamental role in responding to various emergencies across aerodromes, such as terminal fires, alarm activations and medical emergencies, where the ARFFS is able to promptly administer first aid and save lives.

7.3 Australia has thus far not experienced the worst of aviation accidents, and the committee hopes that this continues to be the case well into the future. It was made evident to the committee that adequate staffing and resourcing of ARFFS, as well as adequate time in which to respond to an emergency, were all key elements in reducing the risk of a catastrophic aviation incident taking place in this country.

7.4 The committee acknowledges that in many instances, Australia is meeting the minimum ICAO standards; whether these standards are appropriate for the Australian context—and for specific Australian aerodromes—is another consideration. Evidence to the inquiry made clear that there are a number of serious and ongoing concerns with the provision of ARFFS by Airservices across the 26 aerodromes at which it operates, which put the key elements of ARFF services at risk. These concerns, and the committee's recommendations, are detailed below.

International standards

7.5 The Chicago Convention and the ICAO framework, to which Australia is a signatory, sets the relevant ARFF standards to which Australia should aim to adhere, as far as is reasonably practicable. Other organisations, such as the NFPA, have also developed stringent criteria for the delivery of effective aviation rescue and firefighting services.

7.6 Despite this, Australia has lodged a number of differences with ICAO, which reflect Australia's unique requirements. It was argued consistently during the inquiry that Australia's regulatory framework—the CASRs, the MOS and other operating documents therefore do not adhere to international standards.

7.7 It was argued that this lack of adherence significantly increases the risks associated with ARFFS operations, and therefore increases the risks to the travelling public and aircrews.

7.8 The committee supports CASA reviewing and revising the CASRs, in light of the issues identified by the 2015 Review and the post-implementation review of Subpart 139.H. However, the committee notes that despite CASA's post-implementation review first commencing in 2007, drafted amendments to Subpart 139.H have not yet been released for public consultation. The committee views this as far too long a period in which to complete the review and amend the CASRs.

7.9 A considerable amount of time has lapsed since CASA's review commenced, and very significant concerns have been raised during this inquiry about Australia's lack of adherence to international standards, and the inherent risk this presents to the travelling public. The committee therefore recommends that the government undertake a major and wide-ranging review into Australia's adherence to the ICAO SARPs, as they relate to ARFFS. This review should consider the Australian regulatory framework—including the CASRs and the MOS—against international best practice, and consider Australia's adherence to Chapter 9 of Annex 14 of the Chicago Convention.

7.10 The review should consider any other relevant regulations, standards and procedures as required, such as those of the NFPA, and, when non-compliance with international standards is identified, reasons for this should be provided.

Recommendation 1

7.11 The committee recommends that the Australian Government conduct a review of Australia's adherence to the International Civil Aviation Organization Standards and Recommended Practices for the provision of Aviation Rescue Fire Fighting Services in Australia. The review should consider:

- **Subpart 139.H of the Civil Aviation Safety Regulations 1998;**
- **the associated Manual of Standards;**
- **Australia's adherence to Chapter 9 of Annex 14 of the Chicago Convention; and**
- **any other relevant regulations, standards and procedures (including those issued by the National Fire Protection Association).**

Where the review identifies non-compliance with international standards, the rationale for this should be explained.

ARFFS equipment and resources

7.12 The committee was concerned to hear about the considerable issues ARFFS firefighters have with the equipment, training and facilities currently in place for the ARFF service across Australia.

7.13 In particular, the committee was alarmed by the removal of rescue saws from operation, despite no replacement for the saws having yet been identified, and despite the fact that the removal meant the ARFFS was no longer compliant with the MOS. Such equipment is vital for effective responses to aviation incidents, where time is of the essence.

7.14 Further, the implementation of training for firefighters on ladders below two metres remains an ongoing concern for the committee. While the committee acknowledges the work health and safety concerns raised by Airservices, the fact remains that this limited-height training is not reflective of operational conditions—particularly for larger aircraft. The committee trusts that Airservices will continue to look at ways that allow firefighters to train safely at height as soon as possible, whether that is via harnesses or other systems.

7.15 The ARFFS fire vehicle replacement program also appears to be taking some time to come to fruition, and is still in the early stages of a request for information after what appear to be significant delays. Noting the suggestion that ARFFS stations are already having to share vehicles, and that local manufacturers may not be able to develop these vehicles, the committee encourages Airservices to ensure that the replacement program progresses as a matter of priority.

7.16 Notwithstanding the removal of, or amendments to, the equipment and vehicles in use by ARFFS, Australia should maintain compliance with international standards and Australian regulations as far as is practicable. Firefighters strongly asserted throughout the inquiry that a lack of adherence to relevant international and other standards was placing both their safety, and the safety of others, at risk.

7.17 Given the recent changes to equipment, issues with fire vehicles, and the serious concerns raised by firefighters regarding adherence to ICAO and other standards, the committee recommends that a full audit be undertaken of the adherence of ARFFS equipment and vehicles to ICAO standards, the CASRs and the MOS. In completing the audit, consideration should be given as to whether the equipment and vehicles in place are appropriate for the aerodrome category.

Recommendation 2

7.18 The committee recommends that the Civil Aviation Safety Authority conduct an audit of all Aviation Rescue Fire Fighting Service (ARFFS) vehicles and equipment currently in operation across Australia, to determine the level of compliance with the International Civil Aviation Organization standards, and associated Australian regulations and standards (such as the Civil Aviation Safety Regulations 1998 and the Manual of Standards). The audit should consider whether the vehicles and equipment adhere to the relevant ARFFS airport category at each aerodrome.

Firefighting foams

7.19 The committee was alarmed by the evidence regarding firefighting foams, and the fact that the foams in use at Australian airports may not have been tested to Australian standards. The committee notes that ICAO's international framework for testing foams may not be suitable for the conditions at local aerodromes.

7.20 Given the higher ambient temperatures in Australia, and the lack of evidence indicating whether these foams had been tested in such conditions, it appears to the committee that the foams should be tested to ensure they provide appropriate protection for Australian travellers in the event of an aviation incident.

7.21 The committee therefore recommends that CASA (in conjunction with any other relevant organisation, such as Airservices) institute a testing program for firefighting foams in use at Australian airports, utilising the ICAO testing framework as a starting point, to determine the efficacy of the foams under Australia's unique conditions.

Recommendation 3

7.22 The committee recommends that the Civil Aviation Safety Authority implement a testing program for the firefighting foams in use at Australian airports, in accordance with International Civil Aviation Organization guidelines. The testing should take place under conditions unique to Australia (such as higher ambient temperatures), to establish whether the foams operate effectively to extinguish aviation fires.

Staffing levels and task resource analyses

7.23 A matter of great importance to the committee was the issue of adequate staffing at ARFFS stations, particularly against aerodrome category. It seems counterintuitive that firefighting crews may be reduced at a time when passenger numbers are only increasing. It does not appear appropriate to the committee that staffing reductions should be taking place.

7.24 A well-trained and fully-staffed ARFFS will be essential in maintaining Australia's aviation safety record. Having the ARFFS crewed to an appropriate level will allow it to respond to aviation emergencies in a timely manner, and without additional risks to crews or travellers.

7.25 The committee therefore expresses its considerable concern that no clear evidence could be provided demonstrating that a comprehensive safety assessment was completed by Airservices (and subsequently approved by CASA), prior to the reduction in ARFF crew numbers at Brisbane Airport. The committee acknowledges that the crew levels at Brisbane may be in accordance with the category of the airport, but without the support of a thorough safety assessment, it could not be ascertained whether this level of staffing was safe—rather than just adequate.

7.26 The committee welcomed the advice from Airservices that it would undertake a TRA prior to making any staffing adjustments at Adelaide Airport. However, given the substantial volume of aircraft movements which occur at that airport during curfew, the committee is of the firm view that no reductions in staffing should be made at Adelaide Airport. The committee would not be surprised to learn that the TRA in fact supports an increase to crew numbers at Adelaide.

Cross-crewing

7.27 The committee holds great concerns over the practice of cross-crewing. While the committee holds no doubts as to the ability of ARFFS crew and officers to attend to a variety of emergencies, the committee is of the view that ARFFS staff should not be put in the stressful situation of having to attend multiple emergency events, while trying to maintain category.

7.28 Airservices even acknowledged that, with a base crew of 14 staff, a Category 10 response may not be able to be maintained if the DRV was attending to a first aid call.

7.29 Airlines are paying for a service at ARFFS aerodromes, and it is reasonable for the airlines to expect that category is maintained. Cross-crewing could therefore take away the confidence of international airlines in the ability of Australia to respond to emergencies and maintain category. Despite the fact that airlines are paying for the service, the safety of the flying public remains paramount, and airlines should have confidence that Australian aerodromes can maintain category.

7.30 As discussed below, the committee urges Airservices to undertake the TRA assessments at ARFFS stations as soon as is practicable, in order to properly ascertain the impact of cross-crewing on the ability of ARFF services to maintain category, and adequately respond to aviation emergencies.

Task resource analysis

7.31 The committee recognises that staffing profiles cannot address every possible risk in the aviation sector, and that the allocation of resources needs to be proportionate to the assessed level of risk. To this end, the TRA is an invaluable tool in ensuring that the ARFFS is suitably resourced to perform its functions in the event of the worst-case emergency.

7.32 However, it was apparent that Airservices had yet to fully implement the TRA process which had been incorporated into the ICAO standards a number of years ago.

7.33 The committee therefore welcomes the advice of Airservices, that it and CASA both support the introduction of the ICAO TRA standards into the Australian regulatory framework. The committee was also pleased to hear that

Airservices would look to utilise the TRA framework at every ARFFS location, commencing this year.

7.34 The committee also notes that CASA has indicated that its proposed changes to Subpart 139.H include additional requirements for ARFFS providers to apply the ICAO resourcing model at each ARFFS location. The committee supports this approach, and hopes that CASA progresses its amendments to the regulations as a matter of some urgency.

7.35 Given the demonstrated importance of the TRA process, and the support for the TRA from all key stakeholders, the committee recommends that CASA continue with its proposed amendment to the CASRs, and mandate that the TRA process—as prescribed by ICAO—is used at all ARFFS aerodromes to determine the suitable staffing levels at each aerodrome. In undertaking the TRA, consideration should be given to the category of the airport.

Recommendation 4

7.36 The committee recommends that the Civil Aviation Safety Authority mandates that Aviation Rescue Fire Fighting Service (ARFFS) providers use the Task Resource Analysis (TRA) methodology, as prescribed by the International Civil Aviation Organization, to determine the suitable staffing levels for ARFFS at all aerodromes in Australia where an ARFFS is provided. The TRA should take into consideration the category of each aerodrome.

Consultation

7.37 There were concerns raised consistently during the inquiry that changes to staff numbers had occurred without appropriate consultation by Airservices with operational experts.

7.38 A number of firefighters made the point that firefighters with a broad range of knowledge and skills were well placed to consider risks within the ARFFS framework. However, it was suggested that Airservices were excluding such key personnel from consultation and risk assessment processes.

7.39 This was evidenced by the fact that Airservices had not heeded the calls from the UFUA and other bodies, over a number of years, to undertake the TRA process at ARFFS stations. Concerns were also raised over the fact that there was a lack of publicly available documentation regarding risk assessments and other processes.

7.40 The committee views consultation by Airservices with firefighting crews on the ground as vital to the development of effective TRAs, which accurately reflect the reality of delivering aviation emergency services. Constructive and collaborative consultation is also key to ensuring the best outcomes for all parties, as it allows for a suitable contest of ideas.

7.41 The committee therefore recommends that CASA mandate that the TRA process must involve appropriate consultation by Airservices with ARFFS staff and officers (and where necessary, their union representatives), at all stages of the TRA process. This consultation should be transparent, and the outcomes of any meetings made publicly available as soon as is practicable.

Recommendation 5

7.42 The committee recommends that the Civil Aviation Safety Authority mandate that the Task Resource Analysis (TRA) process undertaken by Airservices must involve appropriate consultation, via the direct engagement of Aviation Rescue Fire Fighting staff and officers at all stages of the TRA process. The consultation should be transparent, and the outcomes made publicly available as soon as is practicable.

Legislating staffing levels

7.43 It became apparent during the inquiry that changes to staffing levels in ARFFS crews could occur without appropriate oversight, via changes to regulations and operating procedures. This has resulted in calls for ARFFS staffing levels to be legislated.

7.44 Legislating for staffing levels would limit the ease with which staffing amendments can occur. Such amendments could move Australia further away from the ICAO standards, and the recommended NFPA standards.

7.45 Legislating for appropriate staff levels also means that the provision of ARFF staff at each aerodrome cannot be changed without parliamentary scrutiny, and without engagement of the relevant stakeholders. It would also seem appropriate to the committee that the staffing levels placed in legislation reflect the outcomes of the TRA process at each aerodrome.

7.46 The committee is therefore of the view that the staffing levels against each aerodrome category for the provision of ARFFS should be enshrined in legislation, and recommends that the government introduce legislation which stipulates the minimum ARFFS staffing level against aerodrome category. The legislation should apply to all aerodromes where an ARFF service is provided, and should take into consideration the findings of TRAs conducted at each ARFFS airport.

Recommendation 6

7.47 The committee recommends that the Australian Government introduce legislation which stipulates the minimum Aviation Rescue Fire Fighting (ARFF) staffing level in accordance with airport category, at all Australian aerodromes where an ARFF service is provided. The legislated staffing levels should reflect the outcomes of the Task Resource Analysis at each aerodrome.

ARRFS establishment threshold

7.48 Since the 2015 Regulation Policy Review, there has been ongoing discussion as to the appropriate trigger for establishing an ARFF service.

7.49 The proposal to increase the passenger trigger threshold from 350 000 to 500 000 was met with considerable concern from key stakeholders, including firefighters, and Minister McCormack's decision to retain the original threshold was welcomed.

7.50 However, the use of a hard trigger continues to be of particular concern given the ongoing increase in passenger numbers—an increase which shows no sign of abating. The committee questions whether the 350 000 passenger trigger remains suitable, given it was first implemented in 2002, and there is an ever-increasing need for ARFFS to respond to non-regulated emergencies and other calls for assistance.

7.51 The committee echoes the calls for Australia not to increase the threshold, as to do so could move Australia further away from ICAO's international standards, and is likely to see even less passengers covered by an ARRF service. The committee calls on the government to commit to making no amendments to the establishment (and disestablishment) triggers at this time.

7.52 The move to a risk-based assessment for establishing an ARFF service appears logical, and was supported by Airservices in its submission to DIRDC. Support for the risk-based approach was also offered by other key stakeholders, including the UFUA. An assessment of risk would better consider the individual circumstances of each airport, such as the operational environment of an airport, and may determine that ARFFS should be established at aerodromes where currently none exists.

7.53 A risk assessment would also assist in clarifying the timeframes in which an ARFFS must be established. Currently, there is a time lag between the passenger trigger being reached—and importantly, sustained—and the establishment of the ARFF service. A risk assessment approach could better clarify whether an aerodrome should have an ARFFS, and would allow for the relevant safety case to commence development immediately, as safety concerns are identified.

7.54 It appears evident to the committee that there are considerable safety benefits in moving away from a hard trigger for ARFFS establishment. In light of the significant support for a risk-based assessment to ARFFS establishment, and the fact that this approach could consider the need for a dedicated ARFF service at an aerodrome holistically, the committee recommends that DIRDC complete a review into the current establishment criteria for ARFFS.

7.55 The review should seek to determine whether the current methodology of utilising passenger numbers allows for sufficient provision of ARRFS across

Australian aerodromes, particularly in light of increasing passenger numbers in recent years.

Recommendation 7

7.56 The committee recommends that the Department of Infrastructure, Transport, Cities, and Regional Development undertake a review of the current establishment criteria used for determining whether to implement an Aviation Rescue Fire Fighting Service (ARFFS). The review should consider whether the current methodology of utilising passenger numbers allows for sufficient provision of ARFFS across Australian aerodromes, in light of increasing passenger numbers in recent years.

Division of responsibilities at airports

7.57 It was made clear to the committee that ARFFS is responding to a significant number of emergencies, not related to its core, regulated functions. These non-regulated functions are no doubt important, particularly with regard to first aid assistance. However, the increasingly large commercial areas of airports and other nearby developments are seeing the number of non-regulated responses increase considerably.

7.58 As was noted by Airservices, it may not always be appropriate for the ARFF services to respond to fire alarms at non-aviation-related commercial developments—a job that is perhaps better suited to state and territory fire services.

7.59 In light of cross-crewing and other staffing pressures, it is apparent that attendance at non-regulated emergencies and the deployment of the ARRFS domestic response service is placing considerable strain on ARFFS resources. Further, it has not been clearly established exactly what resources are required for attendance at non-aviation, domestic emergencies, with an associated lack of clarity around the division of responsibilities between airport operators and state fire services.

7.60 Similar to the fact that a TRA is required to determine the appropriate level of staffing for the ARFFS, a similar process should take place to determine what resources are needed to attend to non-regulated, non-aviation emergencies—a Domestic Response Service TRA (DRS TRA). This analysis would help to identify gaps in the provision of services against category.

7.61 The DRS TRA may identify that additional resources are required, to ensure that the ARFFS can maintain category while also attending to other emergencies—or may identify that other services, such as state fire services, would be better suited to attend some non-regulated events (and therefore, what interaction may be needed between ARFFS and state fire services). The staffing TRAs and DRS TRAs should therefore complement each other, and identify the appropriate level of staffing at an ARFF station that would allow all relevant emergencies to be responded to.

7.62 In light of the above, the committee recommends that the government, in consultation with the relevant regulatory bodies, mandate for the establishment of a DRS TRA. This TRA should determine the additional ARFF crews required for responses to non-aviation emergencies across the aerodrome, over and above the staff required for an ARFF station to maintain category in the case of an aviation emergency.

Recommendation 8

7.63 The committee recommends that the Australian Government mandate the establishment of a Task Resource Analysis for Domestic Response Services responding to emergencies at aerodromes (DRS TRA). The DRS TRA should determine the additional Aviation Rescue and Fire Fighting (ARFF) staff required for responses to non-regulated ands non-aviation emergencies across the aerodrome, over and above the staff required for an ARFF station to maintain category in the case of an aviation emergency.

2015 Regulation Policy Review and CASR amendments

7.64 The committee is of the view that the 2015 Regulation Policy Review completed by DIRDC brought forward a number of sensible suggestions which would improve the administration of ARFFS.

7.65 In particular, the committee sees benefit in clarifying the roles and arrangements between the state and territory fire services and airport operators in the provision of ARFFS—this would also assist with the assessment of the DRS TRA. Further clarity over the definition of an aerodrome, to better reflect the core aviation activities of ARFFS, would also complement the DRS TRA process.

7.66 The committee encourages DIRDC to progress with these amendments by consulting with key stakeholders about the changes, and bringing forward legislative amendments in due course.

Senator Glenn Sterle

Chair

Appendix 1
Submissions and additional information

Submissions received during the 45th Parliament

1 Willson Consulting
2 Fire Protection Association Australia
3 Australasian Fire and Emergency Service Authorities Council
4 New South Wales Government
5 Mr Melville Miranda
6 Mr Geoff Fuller
7 Civil Aviation Safety Authority
8 Queensland Nurses and Midwives' Union
9 Department of Infrastructure, Regional Development and Cities
10 United Firefighters Union of Australia
- 10.1 Supplementary to submission 10

11 Airservices Australia
12 Australian Airports Association
13 Dynax Corporation
14 Queensland Fire and Emergency Services
15 Tasmania Fire Service
16 Mr Andrew Hanson
- 16.1 Supplementary to submission 16

17 United Firefighters Union of Australia – Aviation Branch
18 United Firefighters Union of Australia – Aviation Branch – Remote stations
19 United Firefighters Union of Australia Aviation Branch – Brisbane ARFFS safety review
- 19.1 Supplementary to submission 19

20 Mr Tim Limmer
21 Australian Airline Pilots' Association (AusALPA)
22 Mr Glen Barker
23 Aviation Fire and Rescue Brisbane
24 Mr Kiegan Rice
25 Mr John Hancox
- 25.1 Supplementary to submission 25

26 *Confidential*

Additional Information received during the 45th Parliament

1 Response by Airservices Australia to evidence provided to the inquiry, dated and received 2 April 2019.

Additional Information received during the 46th Parliament

1 May 2019 presentation by Willson Consulting on the use of various firefighting foams at aviation accidents.

2 Correspondence of April and May 2019 between Airservices Australia and the United Firefighters Union of Australia, regarding ARFFS staffing at Adelaide Airport.

Answers to Questions on Notice received during the 45th Parliament

1 Questions taken on notice at a public hearing in Melbourne, Victoria on 14 March 2019 by the Civil Aviation Safety Authority. Answer received 28 March 2019.

2 Questions taken on notice at a public hearing in Melbourne, Victoria on 14 March 2019 by the Department of Infrastructure, Regional Development and Cities. Answer received 1 April 2019.

3 Questions taken on notice at a public hearing in Brisbane, Queensland on 16 April 2019 by Airservices Australia. Answer received 21 May 2019.

Correspondence received during the 45th Parliament

1 Correspondence of May 2019 between the Committee and Airservices Australia, regarding the new ARFFS fire station at Brisbane Airport.

Tabled Documents received during the 45th Parliament

1 Opening statement of the City of West Torrens, tabled at a public hearing in Adelaide, South Australia on 20 March 2019.

2 Correspondence between the City of West Torrens and the Hon Michael McCormack MP, Minister for Infrastructure, Transport and Regional Development, regarding firefighting personnel at Adelaide Airport. Tabled at a public hearing in Adelaide, South Australia on 20 March 2019.

3 Opening statement of Mr Justin Hunter, tabled at a public hearing in Brisbane, Queensland on 16 April 2019.

4 Task Resource Analysis – Brisbane ARFFS, tabled by the United Firefighters Union of Australia at a public hearing in Brisbane, Queensland on 16 April 2019.

5 ARFF Operational Bulletin OB-19-001 – Operating at reduced category due unavailability of ULFV Mk8, tabled by Mr John Hancox at a public hearing in Brisbane, Queensland on 16 April 2019.

6 Email correspondence of 23 August 2013 regarding Rosenbauer Panther vehicles, tabled by Mr John Hancox at a public hearing in Brisbane, Queensland on 16 April 2019.

7 Email correspondence of 12 July 2013 regarding the Fire Vehicle Replacement Program, tabled by Mr John Hancox at a public hearing in Brisbane, Queensland on 16 April 2019.

8 Airservices Australia document – ARFF Fire Vehicle Replacement 5, Concept of Operations, tabled by Mr John Hancox at a public hearing in Brisbane, Queensland on 16 April 2019.

9 Opening statement of Mr John Hancox, tabled at a public hearing in Brisbane, Queensland on 16 April 2019.

Appendix 2
Public hearings and witnesses

Thursday, 14 March 2019
Stamford Plaza Melbourne
111 Little Collins Street
Melbourne

Fire Protection Association Australia

- Mr Brett Staines, Chair, Special Hazards Fire Protection Committee
- Mr Brendan Scully, Senior Technical Officer

United Firefighters Union of Australia

- Mr Peter Marshall, National Secretary
- Mr Stephen Horton, Industrial Officer
- Mr Rodney Reith

Department of Infrastructure, Regional Development and Cities

- Mr Simon Moore, General Manager, Air Traffic Policy
- Mr Benedict Lyons, Director, Airservices Policy and Governance
- Mrs Ros Pyett, Aviation Policy and Governance
- Ms Pip Spence, Deputy Secretary

Civil Aviation Safety Authority

- Mr Chris Monahan, Executive Manager National Operations and Standards
- Mr Brad Parker, A/g Branch Manager Air Navigation, Airspace and Aerodromes Branch
- Mr Rob Walker, Executive Manager Stakeholder Engagement

Airservices Australia

- Ms Michelle Bennetts, Acting Chief Executive Officer
- Mr Paul Logan, Chief Financial Officer
- Mr Robert Porter, Executive General Manager, Aviation Rescue Fire Fighting Services
- Mr Glenn Wood, Chief Fire Officer

Wednesday, 20 March 2019
Atura Adelaide Airport
1 Atura Circuit Adelaide Airport
Adelaide

City of West Torrens

- Mayor Michael Coxon

- Mr Terry Buss PSM, Chief Executive Officer

United Firefighters Union of Australia – Aviation Branch
- Mr Mark von Nida, Branch Secretary
- Mr Stephen Horton, Industrial Officer
- Mr Robert Skelton, Branch President

Tuesday, 16 April 2019
Heathrow Room, Brisbane Airport Conference Centre
2 Dyandra Drive
Brisbane Airport

Brisbane ARFF Firefighters
- Mr John Hancox
- Mr Justin Hunter, Branch Committee Member, UFUA Aviation Branch

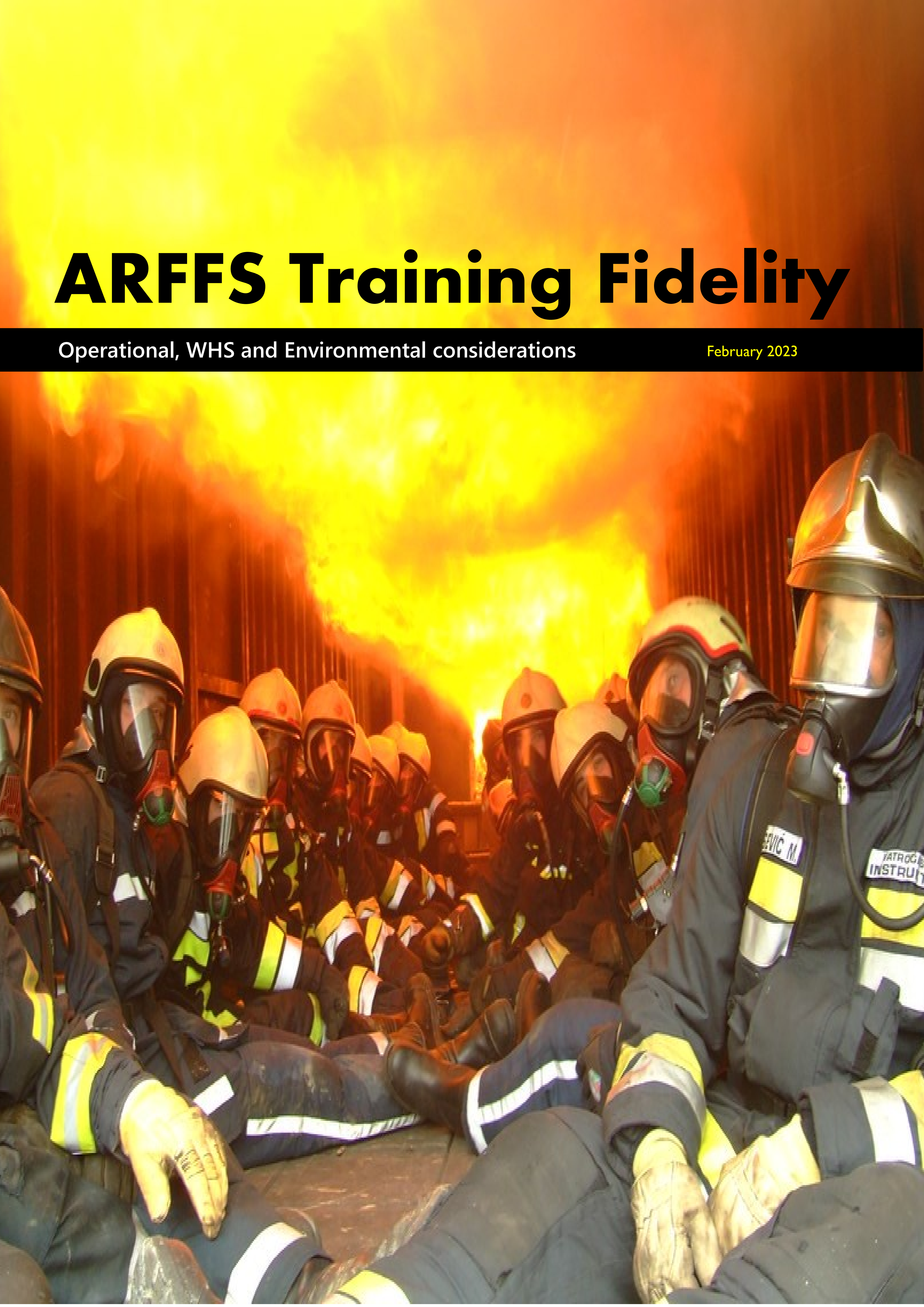
United Firefighters Union of Australia
- Mr Peter Marshall, National Secretary
- Mr Stephen Horton, Industrial Officer

Airservices Australia
- Mr Robert Porter, Executive General Manager, Aviation Rescue Fire Fighting Service
- Mr Mark Best, Acting Chief Fire Officer

ARFFS Training Fidelity

Operational, WHS and Environmental considerations

February 2023



EXECUTIVE SUMMARY

The Safety, Rehabilitation and Compensation Act 1988 recognises the likelihood and consequence of firefighting personnel contracting cancer as a result of occupational exposure to the by-products of combustion. Any other simultaneous and/or sequential exposures to Diesel Particulate Matter (DPM), Poly Fluorinated Alkyl Substances (PFAS) or Kerosene/Total Petroleum Hydrocarbons (TPH) simply increase the foreseeable and preventable risks associated with occupational chemical exposure. Due to the likelihood criteria of several of the chemical hazards identified in this assessment being unknown, a detailed Human Health Risk Assessment (HHRA) is required to determine these criteria. A fundamental decision is required by ARFFS, either to invest resources into determining the theoretical risk posed by these chemicals and their combined effects via a detailed HHRA. This will yield a conservative yet theoretical line which demarcates between safe and unsafe. ARFFS proximity to this line can then be fine-tuned via the implementation of low-level Administrative and PPE controls, which will ensure that a tolerable cost versus health benefit As Low As Reasonably Practicable (ALARP) determination can be achieved. Alternatively, ARFFS could develop strategies to invest resources into creating safer, higher quality training fidelities, in turn enhancing the operational capability and skills of personnel and of our organisation more generally. The by-product of this strategy would eliminate the need to flirt with a theoretical safety margin and the low-level controls that underpin it, by replacing them with high level safety controls that eliminate the risk and/or isolate personnel from the hazard. WHS risk management principles encourage adopting the latter strategy.

ARFFS competency-based training cycle in conjunction with traditional hot fire training facilities, requires that personnel be routinely exposed to the risks presented by chemical exposure. This is primarily due to the design of the training infrastructure provided. The basic concept of this design can be traced back several decades, pre-dating current scientific knowledge and the insertion of a rebuttable presumption for occupational cancer into the SRC Act. The introduction of this legislation provides a powerful catalyst to initiate a review into the customs and work practices associated with the use of ARFFS Hot Fire Training Grounds (HFTG) and smoke hut training facilities. The advent of presumptive legislation has seen the introduction of a small number of low-level administrative controls by ARFFS however, since the legislation was introduced in 2012 little progress has been made to identify or monitor the effectiveness of existing controls. The WHS issues that revolve around chemical exposure within ARFFS operational and training environments, and the firefighting industry at large are well established. The industry as a whole is aware of these issues and is moving toward addressing them. In 2013 ARFFS commissioned the LHFTG at the Learning Academy in Tullamarine, the design of this training asset introduced a number of high level controls including; substitution from kerosene to LPG, isolation through the use of sub-surface kerosene containment pits which allowed personnel to operate on the fire ground without the need to wade through kerosene and fire water. Substituting from fluorinated to non-fluorinated firefighting foam and passing contaminated fire water through a sophisticated treatment system prior to release to sewer. The controls designed into the LHFTG are substantially more effective than its predecessors (Large Mock Up (LMU)), Although, class-A fuels are still used for internal compartment fire simulation. By comparison, the MFB's Craigieburn training facility is a best practice example of the level of safety that can be afforded to fire and rescue personnel in a training environment, their training fidelities have been increased and at the same time their chemical exposures and environmental footprint considerably reduced. Safety by design principles have been integrated into the design of the entire facility.

It must be acknowledged that the importance of conducting Compartment Fire Behaviour Training (CFBT), which endeavours to replicate conditions associated with extreme fire behaviour, has limitations without the use of class A fuels. This form of training serves to enhance a firefighter's ability to assess and safely control incidents that involve extreme fire behaviour. The risks associated with the frequency and duration of exposure resulting from this form of training must be strictly controlled, with due diligence applied to fuel selection, decontamination and hygiene protocols. Although chemical exposure is inevitable when participating in CFBT, it is reasonable to conclude that by qualifying personnel to identify and safely operate in such an environment, that the risk presented by chemical exposure is *less* than the risk of not providing personnel with the proficiency and skillset to adequately assess and potentially control conditions associated with extreme fire behaviour.

The training fidelities, products and fuels traditionally utilised at ARFFS HFTG's and smoke huts along with their negative environmental and human health consequences, are merely a by-product of infrastructure that was designed with little, if any, consideration given to environment or human health. It is only now, 50 to 60 years later, and after irreversible damage has been realised that any substantial improvement may even be considered.

Long term it is worth noting that several commercially available ARFFS related and general firefighting technologies, which have been recognised for providing significant enhancements to operational capability, are equally able to provide higher levels of WHS risk control to their operators. In some instances, their implementation could impact on whole systems of work currently utilised by ARFFS, at the same time positively influencing a number of existing human factors related limitations.

WHS COMPLIANCE IN THE OPERATIONAL AND TRAINING ENVIRONMENTS

Operational Environment

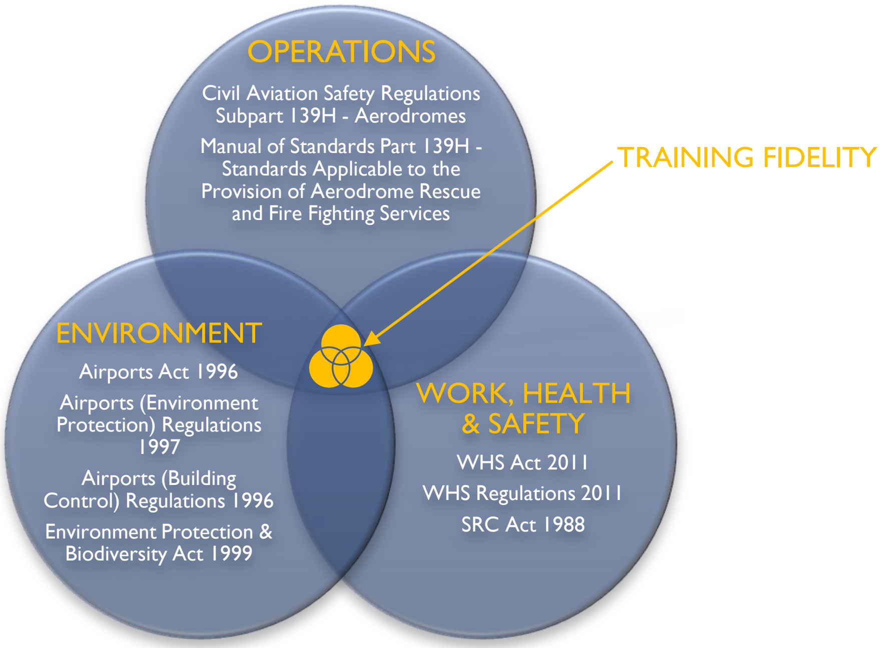
The application of WHS legislation in an operational rescue and firefighting environment can prove challenging for responsible organisations. In the context of emergency personnel attending incidents that necessarily involve the risk of chemical exposure, it is important to acknowledge that high level controls such as elimination, substitution and isolation may not be reasonably practicable. Accordingly, personnel may not be able to effectively control or mitigate some safety related aspects of the working environment. Additionally, dynamic risk assessment (an assessment where some elements of information about an incident are not known or available) may identify an acceptable risk versus reward profile for a scenario involving saveable life, property or environment. There are numerous operational scenarios that require personnel to risk exposure to hazardous materials in order to fulfil their legislated role and responsibilities. When considering chemical exposure in the operational environment, specifically in the context of by-products of combustion, firefighting foams and kerosene, dynamic risk assessment combined with administrative and PPE controls are able to effectively treat these risks to ALARP.

Training Environment

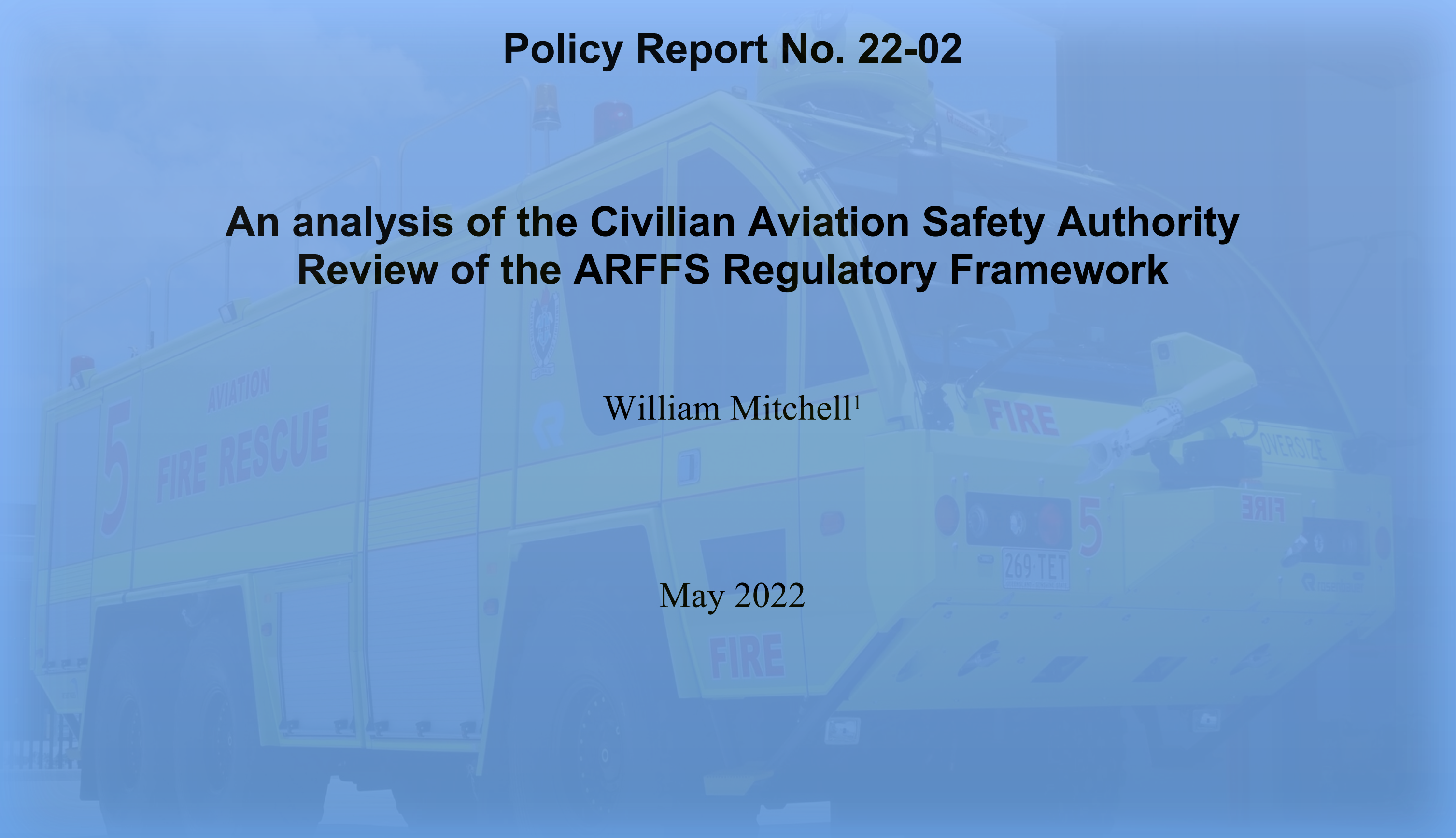
The training environment differs significantly to that of the operational environment, in that any consequential chemical exposures resulting from a selected "training fidelity" are foreseeable, preventable and therefore able to be strategically controlled. When considering the requirements of WHS legislation and its application in this environment, the operational challenges associated with providing high level controls such as elimination, substitution and isolation ***are not present.*** Additionally, some key elements of dynamic risk assessment are not required, as this environment allows for a full detailed assessment of risk to be conducted prior to the simulated scenario commencing, every element is known and able to be considered and therefore controlled. In turn allowing due diligence to be applied to its fullest extent. Almost all skills practised and acquired in the training environment are able to be transferred to the working environment via training fidelities that do not require chemical exposure. When considering chemical exposure in the training environment, specifically in the context of by-products of combustion, firefighting foams and kerosene, high level controls such as elimination, substitution and isolation become reasonably practicable and should be considered when seeking to treat these risks to ALARP.

TRAINING FIDELITY AND ITS RELATIONSHIP WITH OPERATIONAL, WH&S AND ENVIRONMENAL LEGISLATION

In the context of the ARFFS training environment, training fidelities and safety by design principles should consider equally, the legislative requirements associated with Operations, Work Health and Safety and the Environment. The design of training fidelities directly impacts on all three elements, all of these impacts should be considered equally and balanced in such a way, so as to minimise negative outcomes and maximise positive outcomes. Traditional training fidelities involving LMU's and smoke huts have disproportionately weighted the design of training fidelities in favour of operational considerations. Subsequently, significant and permanent impacts have been realised in both our working environment and to our workers health and wellbeing. Formulating a strategy to transition from traditional ARFFS HFTG infrastructure toward facilities that are equipped to successfully strike a balance between all three elements is urgently required. Doing so will provide an opportunity for ARFFS to improve the health and wellbeing of our staff, to improve our environmental footprint and to improve our operational capability.


OPERATIONS
Civil Aviation Safety Regulations Subpart 139H - Aerodromes
Manual of Standards Part 139H - Standards Applicable to the Provision of Aerodrome Rescue and Fire Fighting Services
TRAINING FIDELITY
ENVIRONMENT
Airports Act 1996
Airports (Environment Protection) Regulations 1997
Airports (Building Control) Regulations 1996
Environment Protection & Biodiversity Act 1999
WORK, HEALTH & SAFETY
WHS Act 2011
WHS Regulations 2011
SRC Act 1988

Centre of Full Employment and Equity



Policy Report No. 22-02

An analysis of the Civilian Aviation Safety Authority Review of the ARFFS Regulatory Framework

William Mitchell[1]

May 2022

Centre of Full Employment and Equity
The University of Newcastle, Callaghan NSW 2308, Australia
Home Page: http://e1.newcastle.edu.au/coffee
Email: coffee@newcastle.edu.au

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List of Abbreviations

ACCC	Australian Competition and Consumer Commission
AEP	Aerodrome Emergency Plan
AGA	Aerodromes and Ground Aids
AHJ	Authority having jurisdiction
AIP	Aeronautical Information Publication (Australia)
ANC	Air Navigation Commission
ANO	Air Navigation Order
ARFFS	Aviation Rescue and Fire Fighting Service
ASA	Airservices Australia
ASAP	Aviation Safety Advisory Panel (CASA)
ATSB	Australian Transport Safety Bureau
CAA	Civil Aviation Authority (UK)
CAP	Civil Aviation Publication (CAA document)
CASA	Civil Aviation Safety Authority (Australia)
CFR	Code of Federal Regulations (FAA)
CMA	Continuous Monitoring Approach
CSA	Comprehensive systems approach (ICAO now CMA)
DIRD	Department of Infrastructure and Regional Development (Australia)
DRV	Domestic Response Vehicle
EI	Effective Implementation score (from ICAO audit)
ERSA	Enroute Supplement Australia
F & R	Findings and Recommendations (ICAO audit)
FAA	Federal Aviation Authority (US)
GA	General Aviation (Australia)
HRET	High reach extendable turrets
ICAO	International Civil Aviation Organisation
ICVM	ICAO Coordinated Validation Mission
LTPA	Long Term Pricing Agreement (Australia)
MOS	Manual of Standards (CASA document)
MTOW	Maximum Take-Off Weight
NFPA	National Fire Protection Administration (US)
NIST	National Institute of Standards and Technology
NPAT	Net profit after tax
OSHA	Occupational Safety and Health Administration (US)

PCA	Practical Critical Area (ICAO)
PFC	Passenger Facility Charge (FAA US)
SARPs	Standards and Recommended Practices (ICAO document)
TCA	Theoretical Critical Area (ICAO)
TN	Terminal Navigation
TRA	Task Resource Analysis (ICAO)
USOAP	Universal Safety Oversight Audit Programme (ICAO)

1. Introduction

1.1 Terms of Reference

The Centre of Full Employment and Equity (CofFEE) at the University of Newcastle, Australia was commissioned by the United Firefighters Union of Australia (UFUA) Aviation Branch, which represents most workers providing Aerodrome Rescue and Firefighting Services (ARFFS), to provide an independent analysis of the following issues, in relation to the policy review being undertaken by the Civilian Aviation Safety Authority (CASA, 2021) into the ARFFS regulatory framework:

1. The functions of ARFFS.
2. The ARFFS establishment criteria.
3. The ARFFS establishment requirements.
4. Graduated ARFFS services.
5. Removal of prescriptive regulatory requirements; and
6. Modernisation of ARFFS standards.

CofFEE has a well-established research record relating to this sector having produced several reports in the past examining issues relating to the provision of ARFFS.

Our work is respected throughout the research community for its independence and its data-driven quality.

1.2 Outline of the Report

The report is structured as follows:

Executive Summary.

Part 1 Background, context, and overview

- Background and overview of the current system of aviation rescue and fire fighting (ARFF) at Australian airports.
- Section 3 reviews the regulatory system governing ARFF in Australia. It also looks at the international system of compliance to standards.
- Section 4 provides a detailed examination of the requirements of ARFFS and compares the Australian standards with international best practice.
- Section 5 evaluates how Australian standards comply with the international standards and recommendations.

Part 2 The CASA 2021 Policy Proposals – Analysis and Critique

- The functions of ARFFS.
- The ARFFS establishment criteria.
- The ARFFS establishment requirements.
- Graduated ARFFS services.
- Removal of prescriptive regulatory requirements; and
- Modernisation of ARFFS standards.

Executive Summary

Part 1 Background, context, and overview

2 Overview of Aviation Rescue and Fire Fighting (ARFF) in Australia

- ARFFS is a branch of fire fighting and rescue that deals specifically with fires and rescue situations arising from aviation incidents. ARFFS personnel respond to multiple types of incidents involving aircraft at and in the immediate vicinity surrounding airports, with their primary role to optimise the chance of survival of occupants of an aircraft that has crashed and to protect property and equipment from the effects of fire.
- In Australia, ARFFS are required at airports that receive scheduled international passenger air services, or airports with over 350,000 passenger movements on scheduled passenger air services in a 12-month period. The obligation of airports to have ARFFS readily available is a requirement of the International Civil Aviation Organisation (ICAO), of which Australia is a signatory. ARFFS are provided at 27 of the 195 certified airports around Australia, with Airservices Australia (ASA) responsible for ARFFS at 26 of these. The Act stipulates that ASA must regard the safety of air navigation as the most important consideration. ASA has stipulated that ARFFS personnel must respond to incidents within a three-minute response time.
- ARFFS are categorised according to the size of aircraft that use the airport. The different categories determine the resources provided to the ARFFS, including the number of vehicles, staffing levels and quantity of agent. As well as responding to aircraft incidents on or in the immediate vicinity of the airport, ARFFS personnel respond to a number of calls for a variety of different reasons. The primary purpose of ARFFS is to respond to aircraft incidents on or in the immediate vicinity of the airport. However, ARFFS personnel respond to a variety of calls for person or asset protection. Aircraft incidents include crashes, engine fires and fuel spills, while other incidents ARFFS personnel respond to include emergency medical response (first aid) calls, motor vehicle accidents, hazmat incidents, other fires and alarms. Importantly, they also support local fire brigades in mutual aid calls including bushfire emergencies.
- ARFFS require specialised equipment and training as the hazards facing ARFFS personnel are unique to the aviation industry. ASA have their own specialised training facility in Melbourne for this purpose.

3. Regulatory system of ARFF provision

- The Civil Aviation Safety Regulations 1998 (CASR), made under the Civil Aviation Act 1988, set out the regulations for the civil aviation sector in Australia. The Civil Aviation Safety Authority (CASA) is responsible for issuing and enforcing the regulations. Section 9 of the Civil Aviation Act sets out CASA's functions: to maintain, enhance and promote the safety of civil aviation, with particular focus on preventing aviation accidents and incidents. Subpart 139.H of the CASR specifies the requirements for the provision ARFFS. CASA publishes the Manual of Standards (MOS), which is a policy manual and how CASA meets its responsibilities under the Act for promulgating aviation safety standards.
- The CASR and MOS broadly align with international standards outlined by the ICAO. Differences between Australian and ICAO standards are published in the Aeronautical Information Publication, as required by ICAO. In addition, Australia

is required to file a note of difference with ICAO. CASA has the authority to grant exemptions from provisions of the CASR under Subpart 11.F.

- The Australian Transport and Safety Bureau (ATSB) is the prime body in Australia for the independent investigation of civil aviation accidents, incidents and safety deficiencies. It is governed by a Commission which is separate from policy makers and industry operators and regulators and its' purpose is to investigate in line with the Transport Safety Investigation Act 2003 for "no blame" safety improvements.
- Airservices Australia (ASA) was established under the Air Services Act 1995. It is a corporate Commonwealth entity under the Public Governance, Performance and Accountability Act 2013 (ASA, 2018). ASA is responsible for providing safe, secure, efficient and environmentally responsible air navigation and Aviation Rescue and Fire Fighting Service services. ASA provides terminal navigation (TN), ARFFS and *en route* navigation services at airports around Australia, for which it charges aircraft operators appropriate charges. Charges are set subject to notification to the Australian Competition and Consumer Commission (ACCC), which reviews ASA pricing every five years.
- In 2015 the Australian Government asked the Department of Infrastructure and Regional Development (DIRD) to provide policy advice on potential improvements to the efficiency and clarity of ARFFS requirements. These changes were subsequently accepted in June 2018.
- Trigger events were defined which would instigate a CASA risk review to determine if establishment/disestablishment was appropriate. Trigger events that would lead to the establishment of a service included an airport receiving scheduled international passenger services or when passenger movements on scheduled passenger air services exceeded 350,000 over a 12-month period. Disestablishment would follow if scheduled international air services were withdrawn or if passenger movements fell below 300,000 and persisted at that level for a 12-month period. Areas and facilities that are the responsibility of ARFFS include aviation-related infrastructure, which may be infrastructure identified in an agreement between an ARFFS and state / territory fire authority.
- The ICAO was set up following the Convention on International Civil Aviation, also known as the Chicago Convention, signed in 1944. The ICAO sets out Standards and Recommended Practices (SARPs) for Aerodromes in Annex 14 to the Convention on International Civil Aviation, with Rescue and Fire Fighting at airports dealt with in Chapter 9.2 of Volume 1 of the Annex. It is a requirement by ICAO that Member States notify the ICAO of any differences between their national regulations and practices and the SARPs, particularly where such a difference is important for the safety of air navigation. ICAO monitor the implementation of the SARPs of Member States through the Universal Safety Oversight Audit Programme (USOAP).
- The USOAP, set up by ICAO to monitor compliance with their SARPs, has evolved into a Continuous Monitoring Approach. The aim of the current approach is move to a systematic ongoing process of gathering safety information (ICAO, 2010).
- Australia has been involved in two audits from the ICAO. Australia's first audit was in 2008 under the old system, at which time it received an Effective Implementation (EI) score of 82.63 per cent.

4. International best practice of ARFFS

- As well as the ICAO, the international, non-profit National Fire Protection Administration (NFPA) publishes standards related to all types of fire fighting. As with the ICAO, the NFPA develop and review their standards through a public process overseen by a Technical Committee or Panel. Many of the standards developed by the NFPA have been adopted at locations around the world, however they are not binding unless the Authority Having Jurisdiction (AHJ) has adopted them and committed to the particular standard. In practice the NFPA standards are more stringent than the ICAO standards in relation to ARFFS. CASA regulations closely align with ICAO SARPs. The Federal Aviation Authority (FAA), the authority responsible for regulation of all aspects of civil aviation in the United States, include requirements in their Code of Federal Regulations, which often reference the NFPA standards, but in practice are generally more relaxed. The Civil Aviation Authority (CAA), the United Kingdom's independent specialist aviation regulator, base their standards on the ICAO SARPs. The process of 'remission' is not allowed by the more stringent guidelines set by the US NFPA but operates in some Australian airports.
- Airports are categorised based on the length of the longest aeroplane (and their maximum fuselage width) to use the airport during the busiest consecutive three months of the preceding 12 months. If the longest aircraft to use the airport does not reach 700 movements it is not deemed the 'critical' aircraft and the category can be set one category below the designated category. This is known as remission and is allowed by CASA, ICAO, FAA and CAA, but not referenced by NFPA.
- CASA only requires ARFFS at Level 1 airports, which are airports receiving scheduled international passenger air services or those above the threshold passenger numbers referred to above. All airports with ARFFS in Australia correspond to Category 6 or above. A survey of similar countries and their requirements for airports to be serviced with ARFFS found all other countries had less restrictive obligations than Australia, such that if Australia adopted any of the alternative systems, ARFFS would be required at many more airports around the country. More Australian airports would require ARFFS if the guidelines used by the US, UK or New Zealand were adopted.
- CASA and CAA follow the ICAO Recommendation on the minimum number of rescue and fire fighting vehicles required at an airport to provide adequate protection for each category. Airservices Australia (ASA) operations stipulate four vehicles for Category 10 aerodromes (ASA, 2017). NFPA standards require one more vehicle than the ICAO standard at the equivalent airport categories 5, 9 and 10. NFPA allow for more extinguishing agent than CASA requirements.
- The methodology for rescue and fire fighting at airports is based on the critical area concept. It is further broken down into the theoretical critical area (TCA) and the practical critical area (PCA). The TCA is the area within which it may be necessary to control the fire, while the PCA is representative of actual aircraft accident conditions, and is two-thirds of the TCA. Quantities of extinguishing agent are calculated to be sufficient to control the PCA (Q1) and complete extinguishment depending on the aircraft size (Q2). Not only do the NFPA use the maximum aircraft size as opposed to the average aircraft size (ICAO SARPs), they provide for extra water to be used for interior fire fighting (Q3). CASA follows the ICAO standards for quantity of agent (performance level B).
- The ICAO and NFPA both recommend staffing levels to be determined by a Task Resource Analysis (TRA), a process where possible worst-case scenarios are simulated to determine resource requirements. In addition the NFPA recommends

minimum trained personnel staffing levels. ASA use old methodology to determine staffing levels which is not endorsed by the ICAO and uses staffing levels below that recommended by the NFPA.

- The equipment used by ARFFS is important in allowing them to fully carry out their duty of responding to an aircraft incident. Among these are the handlines, monitors and turrets provided on ARFFS vehicles. Monitors and turrets essential to ARFFS fire fighting capacity and as such, when urban brigades are suggested as substitutes for ARFFS, a minimum would be that they have this equipment. Further, specialised equipment such as high reach extendable turrets (HRETs) and low-level high performance monitors can give fire fighters greater control in their fire fighting activities. HRETs allow for better positioning of the fire fighter in relation to the application of agent and may include technology to allow for the penetration of agent to cool the passenger compartment and piercing the fuselage. NFPA, FAA and CAA make allowance to specify for inclusion of HRET's on vehicles due to the effectiveness of this type of equipment, but state that such equipment needs specialised training. ARFFS vehicles are not fitted with HRET technology.
- CASA use response times that align with the ICAO SARPs, specifically that the operational objective is two minutes to any point on the runway, and three minutes to any part of the movement area. The NFPA recommendation is slightly more relaxed at three and four minutes respectively. Response times assist airports and ARFFS in planning the number and locations of fire stations required at an airport. The 2-3 minute response time cannot be met by standard offsite fire crews.

Part 2 CASA Policy Proposal PP 2101AS – Analysis and Critique

5. Overview of the CASA proposals

5.1 Broad concerns with the proposed changes

- CASA adopt only some of the recommendations made in the Senate Report and misses the opportunity to implement some of the important considerations that relate to adopting world's best practice as outlined in the National Fire Protection Association standards on the provision of ARFFS.
- Transitioning the existing Subpart 139.H into Part 176 as 'as a standalone ARFFS regulation Part' will have serious ramifications for aerodrome safety in Australia.
- The prescriptive, rules-based approach that the ICAO SARP introduced to define best-practice in international aviation reflected a need to preserve public safety, prevent loss of life, and protect valuable infrastructure.
- The rules-based approach minimised misinterpretation and provides a consistent framework for the industry to operate within. Safety standards can easily become compromised under a flexible approach because of different interpretations by the operators. There is substantial evidence that when sectors self-regulate some players cut corners to reduce costs and increase profitability.
- Moving to broad-based, outcomes-based regulative models pushes the incentive structure towards a concern for business profitability as a trade-off against public interest (in this case, public safety). While there are some trivial changes to the regulative framework that CASA propose which will not result in such a compromise, in general, the CASA proposals are not supported by the evidence presented or available in the broader literature.
- Australia should endeavour as far as is possible to reduce the differences between its regulative approach and the ICAO SARPS, thus bringing our practice in line

with international standards, rather than propose changes that further differentiate our approach from those standards.

5.2 The assertion of a cost-benefit of reduced ARFFS

- The CASA proposal to solely rely on passenger thresholds triggering a risk analysis, which will widen the gap between Australian and ICAO standards, is based on the view that this approach delivers an acceptable net benefit because the cost savings are significant, and the likelihood of a major disaster is negligible.
- While Australia has had no large commercial jet crash fatalities, there will always be some degree of probability of a major civil aviation accident in Australia and we must always plan for that possibility.

5.3 The difficulties of using risk analysis in aviation

- Risk analysis in aviation is fraught. When we consider the nature of the risk we are attempting to assess in relation to a particular airport, we find that it is not conducive to statistical modelling, nor would other available methods be amenable to testing.
- We consider that national aviation and tourism make such an important contribution to the national economy and protecting our international reputation in aviation safety should be a high priority rather than expose that reputation to cost-cutting.

5.4 The way forward for aviation in Australia

- We cannot find any reasonable basis for the assertion that ARFFS resources should be concentrated at the major airports with passengers at the smaller aerodromes ignored.
- We also do not think it is appropriate to apply a privatised, competitive model to this sector. Where that approach has been applied (for example, the VET sector) dysfunction and failure has been widespread, which has considerably damaged our international reputation as a reliable supplier of first-class education.
- The CASA proposals do not increase safety in the Australian aviation sector and may diminish it.
- We consider the allocation of ARFFS to Australian airports to be woefully inadequate and unreasonably risks exposing the nation to major reputational damage as well as massive human and resource losses.
- The way forward is to increase funding for ARFFS in Australia and to accept a transition to satisfying the ICAO standard at all certified airports, starting at Category 10 and moving as quickly as possible down to the smaller aerodromes.

6. The functions of ARFFS

- The overwhelming impression one gains from reading the CASA Policy Proposal PP 2101AS is that the emphasis is on cutting costs rather than improving safety in and around airports.
- CASA desires to limit the functions of the ARFFS to a narrow ambit concerned with ‘aviation’ incidents, which, of course, leaves a lot of ambiguity as to the limit of such an incident.
- It is hard to see any conflict with the ARFFS functions defined in the ICAO Annexe 14 (9.2) and CASR 139.710. The ICAO standard talks about incidents ‘occurring at, or in the immediate vicinity of, an aerodrome’ while, the CASR regulation adds a prioritisation to these spaces.

- The stipulated sense of priority establishes an ordering of responsibilities. The ARFFS provider, has discretion within that ordering to engage in, for example, non-aviation related fire and rescue operations.
- The difference that CASA is searching for in this proposal is aviation versus non-aviation, which raises further questions as to what the strict demarcation might be. For example, if a person has a heart attack within a terminal or in an airport carpark, does that constitute an aviation or non-aviation incident? The ARFFS must currently prioritise its duties and that decision and ordering should be left to the OIC and their team at the aerodrome.
- The existing functions defined above prioritise the role of the ARFFS as the primary responder to aviation-related events.
- Our enquiry suggests that the functions of the ARFFS should not be narrowed. Trying to restrict the functions of the ARFFS, a series of difficult demarcation issues arise, which cannot be efficiently solved by prescriptive rules. The overwhelming evidence supports the position that professional judgement exercised in an environment where officers understand the ordering of priorities is a more efficient way to organise and execute these services.

7. The ARFFS establishment criteria

- CASA's proposal to base the ARFFS establishment trigger on the total number of scheduled air transport passengers only should be rejected. The proposal is clearly out of international kilter and would add to Australia's non-compliance with the ICAO standards.
- The question that remains unanswered by Australia's regulators is why our standards are so different to Canada and New Zealand, for example, especially when the ICAO standard would suggest we have ARFFS at all certified airports.
- Why does the 350,000 passenger threshold represent a safety improvement, when Canada only has 180,000? The plausible explanation for the difference lies in a cost-cutting agenda rather than have anything to do with safety enhancement.
- The latest CASA proposal is just one of a long history of attempts to cut ARFFS to the Australian aviation sector.
- The question that CASA needs to address in this regard is why targeting aerodromes where more passengers arrive and depart is a better approach than examining each aerodrome on a case-by-case basis for its risk profile, which may not be closely correlated with passenger movements.

8. The ARFFS establishment requirements

- There should be a clear process to introducing an ARFFS once the ARFFS establishment criteria are triggered and there should be legal penalties imposed if an aerodrome operator does not ensure an ARFFS is in operation once the requirements are met.
- CASA proposes to downgrade Airservices Australia to be a 'non-exclusive, provider of ARFFS' and thus allow contestability in the sector.
- While the Australian government considers the contestable supply of ARFFS to be preferable, the case is weak and relies on textbook assertions about economic efficiency and lowest-price provision to aerodromes, which would it is asserted result in lower airport charges for commercial airlines without compromise to safety.

- The theoretical case for using contestability rests on model assumptions that do not hold in the real world. Economists now recognise the shortcomings of this approach.
- While CASA might suppose that breaking the exclusivity of Airservices Australia in relation to the provision of ARFFS at Australian aerodromes will improve outcomes, the theory that underpins this notion is largely inapplicable. Thus, we must make judgements based on the conditions on the ground rather than the textbook. Using these theoretical approaches to design regulatory policy is likely to be fraught.
- It is likely that ARFFS provided by Airservices Australia will be more efficient and at lower cost than services supplied by smaller entrants in localised markets. This is because a single national provider can exploit scale economies in the crucial areas of skills development (training), rotational relief for staff, and the provision of career ladders. A localised operator at a single aerodrome is likely to encounter higher unit costs and may compromise safety as they struggle to make profits.
- Trying to compare a public enterprise to a private enterprise is flawed at the most elemental level because their objectives must be different. A private company owes a duty to its shareholders to maximise value and will ignore social costs and benefits unless the regulative framework force those concerns on the decision-making process. Conversely, thinking of a public enterprise in terms of the same calculus is unsound. The goals of public enterprises should never be to 'make profit'. Rather, we want the public activities to advance net social benefits, which could mean in a strict economic sense that they would record accounting losses.
- The idea of competitive neutrality is thus incommensurate and relies on us considering public enterprises as private corporations, an erroneous logic that will typically lead to poor allocation decisions being taken.

9. Graduated ARFFS services

- It is recognised that the establishment of a new ARFFS requires considerable forward planning given the complexity that such a decision involves. In this context, there is a tension between the current establishment criteria and the practicalities of establishment.
- The problem then is that a qualifying airport, under the current rules, may experience some delay in having an adequate ARFFS. This problem, is in a sense, created by the approach that CASA has chosen to take, which is at odds with the international practice. By seeking to elevate cost-cutting above a more prudential approach to service provision, CASA has introduced a backward-looking regime, which creates these lags.
- There are many problems with CASA's approach. Obviously, some capacity is better than none where risk is involved. But scale is also a significant factor, and the overriding consideration always must be the effective delivery of safety recognising discontinuities in service delivery - the necessity of fixed costs in equipment and personnel at any scale.
- The acceptance of a graduated approach also biases the function of the ARFFS to be narrow in conception. A small presence at an airport would have less degrees of freedom to deal with an emergency that may have several incident theatres.
- The CASA sequence is inadequate because it could easily compromise safety during the period the graduated service is in place, which could be up to 12 months.
- A forward-planning approach is preferred where an aerodrome operator would be compelled to have a fully compliant ARFFS in operation when the establishment

criteria are met. But there is no reason for the establishment trigger for an ARFFS be the same as that used to trigger a graduated service.

- The temporal perspective offered in the CASA proposals is also ambiguous. When would a graduated service commence? It appears that an establishment trigger for an ARFFS must first be observed by the airport operator, who then has 3 months to provide a 'safety case' to CASA to establish an ARFFS. The operator then has up to 12 months to establish either a graduated, non-compliant service or a full ARFFS. Should the graduated option be chosen, the operator has a further 12 months to establish a full ARFFS. The ambiguity lies in the time it takes CASA to respond to the safety case and conduct its risk analysis, but it appears that 27 months could elapse after a trigger event occurs before a compliant ARFFS is in place.
- That appears to be an unacceptable departure from Australia's obligations under the ICAO SARPs. We consider that extent of departure to be highly significant.
- We recommend that CASA ensures that some form of professional firefighting capacity exists at all registered airports and that the necessary investment be made by government to achieve this goal, which will also bring Australia into line with the requirements outlined in the ICAO SARP.

10. Removal of prescriptive regulatory requirements

- Aviation must be highly regulated because the operational risk is high and can generate catastrophic consequences in the case of an accident.
- The traditional approach to regulation has been the prescriptive, rule-based framework which sets the rules that sector players must operate within and provide a path to achieving desired operational outcomes. The rules are typically transparent, and the operators understand their responsibilities. In that sense, it was believed that the regulative approach delivered high levels of certainty in a highly uncertain environment.
- Recent developments in the aviation industry have mirrored the general shifts in regulative thinking over the last several decades where 'free market' approaches have gained dominance. We consider these developments to be more based on ideological zeal than firmly evidence based.
- The short history of CASA shows that is has always been reluctant to adopt the existing ICAO SARPS. For the last 20 years or so, CASA has been increasingly pushing the aviation sector to self-regulate so that the relevant players manage their own risk. The justification for this position is based on the claim that the rules-based approach stifles innovation and inflates costs in the sector, in addition, to being detrimental to business investment.
- However, the rhetoric hides weaknesses with this approach. The literature makes it clear that if there is any propensity among firms to adopt a minimisation strategy then a rules-based regulative model will be preferred.
- There are many examples of self-managed regulation in other sectors which has led to underinvestment in maintenance and capital development and damaging breakdowns.
- For outcomes-based regulation to be effective, the regulator must be able to specify clear outcomes, which then allow the airport owners to be able to demonstrate achievement. However, the outcome can be defined in many ways, which introduces uncertainty in design and measurement.
- Further, outcomes-based approaches suffer from the typical problem of differentiating quality from quantity. An airport owner can satisfy the quantity outcomes (perhaps) but measuring the quality is more difficult.

- The prescriptive, rules-based approach protects public safety in situations where different interpretations by aerodrome operators about training and equipment standards can create divergence in operating effectiveness. The priority must be public safety and any move to flexibility in the way the high-level standards are reached is likely to be detrimental.
- There are many historical examples where business objectives (cost-cutting, profit-seeking) compromise the quality of service and in some cases lead to crises. While governments, for example, were able to bail out banks during the GFC and save the financial system from collapse, the same options are not available once an aviation disaster has occurred.

11. Modernisation of ARFFS standards.

- CASA considers a number of requirements which previously were compliant with Annexe 14 SARPS and Subpart 139.H are effectively obsolete given developments in technology and equipment. They are effectively seeking to ratify the exemptions to these requirements that they have been granting and making the revised practices part of the permanent regulatory framework.
- We consider the majority of the proposed changes to be part of their relentless push to broaden the outcome-based approach which they consider to be an expression of modernised regulation.
- But in aviation, safety must be the paramount concern and a risk-averse, rules-based framework eliminates the possibility of operator flexibility leading to inadequate ARFFS responses.

3.1.6.1 Define the roles and responsibilities of the aerodrome and ARFFS provider in relation to the establishment and provision of ARFFS, including the provision of required facilities and infrastructure on the aerodrome.

- The current regulations do not specify the roles and responsibility of the aerodrome operators in terms of considerations of the ARFFS facilities and infrastructure.
- Research suggests that aerodrome operators typically do not take important issues into account. There are several examples that emerged in our enquiries where safety is compromised by diminished Australian regulations. For example, drainage infrastructure which is not designed to support the axle loads imposed on them by ARFFS crash tenders. There are many such examples.

3.1.6.2 Allow the ARFFS Fire Station Communications Centre (FSCC) to use technology-based solutions, such as runway view cameras, to assist in the observation of all aircraft approaches and departures.

- At first blush, the proposal seems straightforward and should not be used at some future point for eliminating the physical presence of the FSCC infrastructure and operators. Technological devices may improve vision or provide ratifying confirmation of a visual observation, but it is hard to ever see them replacing the human element.
- Further, the proposal is light on where the technology would be deployed.
- There must be a minimum camera standard with high-definition screen capability to ensure that the FSCC operator enjoys ‘enhanced’ vision rather than is forced to used CCTV technology that merely satisfies the requirement that some form of camera system is in place.

3.1.6.3 Amend the requirement for aerodrome fire alarms to terminate at the FSCC, reflecting a change in industry requirements (increasing use of Approved Fire Alarm Service Provider(s)) and the clarified role of ARFFS, i.e. aircraft and aviation-focused refer 2.2.3.1).

- The paramount requirement of the ARFFS infrastructure is to minimise response times in the case of an emergency to maximise public safety. It is hard to understand how creating an organisational break in the chain of alarms is a modernisation, unless one equates modernisation with fashionable practices, such as outsourcing, which has more to do with ideological shifts than improvements in outcomes.
- How does it streamline communications and infrastructure if the alarm signal is diverted from one location to another?

3.1.6.4 Introduce minimum operational staffing requirements for aircraft-related incidents / accidents in accordance with aerodrome-specific requirements, as determined by the Task Resource Analysis (TRA), with minimum staffing levels to be approved by CASA.

- The minimum number of ARFFS personnel that can respond in an efficient manner to maximise safety in the event of an emergency is a function of ICAO aerodrome category (which reflects the size of the largest aircraft using that aerodrome). The ICAO recommendation in this regard relates to the minimum number of vehicles that should be available, which, implicitly, defines the number of firefighting personnel required.
- The specification of the minimum then becomes a technical exercise and there are no requirements in the CASR or MOS.
- The standards expressed by Airservices Australia are well below the NFPA standards, the latter which are designed to deal effectively with extinguishing fires but also dealing with passenger and crew rescue at the same time.
- The other relevant concept which is found in the international context is the 'two-in, two-out' principle, where the minimum number of firefighters dealing with a structure fire is four. The principle provides safeguards for firefighters entering a burning structure who may encounter problems with their breathing apparatus, etc and require rescue capacity themselves.
- An examination of current practices at Australian airports suggests that this minimum principle is not widely enforced.
- While specifying minimum standards is not objectionable, the process must ensure the appropriate minimum staffing levels are in place, rather than establishing levels which are incapable of fulfilling the stated responsibilities of the ARFFS.
- Thorough Task and Resource Analysis (TRA) is clearly the most effective way to establish the minimum levels. As noted above the TRA should also (following NPFA 403) establish additional staffing levels where appropriate. Further it is desirable that these standards be legislated rather than left to regulation or discretion of the aerodrome operator.

3.1.6.5 Introduce flexibility to allow the ARFFS provider to determine location-specific rescue (ancillary) equipment requirements, subject to CASA approval.

- The TRA was the most effective way to determine the minimum and additional staffing levels to meet the needs of aerodrome category. The evidence also suggests that the TRA, which includes a review of firefighting appliances and complementary equipment levels (types etc) is the best framework for determining location specific requirements.

- ICAO also provides considerable guidance to the rescue equipment that is required to satisfy the aims of the ARFFS.
- Previous enquiries in Australia (for example the 2019 Senate Committee) reported 'a number of serious concerns … as to the performance of Airservices in its delivery of ARFFS across Australia's major airports'. There were several other examples presented where the equipment standards had waned under Airservices management.
- The decision to remove power saws from the required equipment is an example of these deficiencies.
- The confidence that the public might have in maintaining safety with appropriately equipped ARFFS and reinforces that the TRA must be the product of broad consultation with experts in the fire field rather than be the outcome of administrative decisions prioritising cost cutting.

3.1.6.6 Update minimum qualification requirements for the ARFFS Officer in Charge (OIC) role and clarify OIC operational requirements, consistent with the functions of ARFFS and industry standards.

- A plausible surmise is that CASA desires to reduce the role of the firefighters both in a discretionary management sense and the operational context. This would be an undesirable strategy given that it is now expected that dynamic organisations should develop their workforce skills to the highest level applicable, given the modern narrative is about lifelong learning.
- The difference between the Diploma and Advanced Diploma is clearly about the seniority of the role to be played. The Advanced Diploma is constructed around skill development that equips the student to perform 'senior management responsibilities' rather than obviously more junior management functions. Another distinguishing feature is the Advanced Diploma develops competency in managing 'human resources', in addition to resource management of 'equipment, services and contingency measures'. The Diploma only concentrates on the latter resources, avoiding mention of the 'human resources' element.
- Another notable difference between the two qualifications is that in the Advanced Diploma students have the chance to undertake two units - *PUAOPE024 - Manage operations for a Level 3 incident* and *PUAOPE019 - Control a Level 3 incident*. Prior to the exemption (noted above) being granted, Airservices Australia, required an officer in charge to successfully complete *PUAOPE024*.
- It is clear that the skill base of the OIC would be degraded under the CASA proposal. We see no substantive reason to justify that sort of deskilling in this industrial context.
- By reducing the minimum qualification, CASA is limiting the scope of the personnel, which accords with its other proposals to limit the ARFFS to aviation matters (mostly) and outsource functions
- Our analysis of international best practice leads to the conclusion that in the case of a Level 3 incident where a Forward Control Post (FCP) has been established as part of the ICS, which is consistent with the AIIMS protocols, the OIC should be situated at the FCP and have the background competencies that are appropriate. We do not consider a case has been made to render this position in the ARFFS structure non-operational and serving mainly non-operational and administrative functions.

3.1.6.7 Modernise ARFFS initial and recurrent training requirements to allow tailored competency-based ARFF training and skill demonstration, in accordance with contemporary training requirements.

- The purpose of formal training and skill development curricula is to develop necessary skills to perform in a productive, and, in this context, safe manner. We question the concept of 'contemporary training requirements'.
- Australia has seen the consequences of outsourcing training to the private-for-profit VET providers in the competitive market. There has been a sequence of scandals involving VET students who neither gained the skills they desired and lost money in the process. Millions of dollars of federal government funding has been misappropriated within this sector.
- We consider there are dangers to eliminating a centralised and formal training system for ARFFS personnel and replacing it with an ad hoc system, which will be at the discretion of the provider. That provider may sense a trade-off between profits (costs) and training outcomes and compromise the training system they introduce accordingly.

3.1.6.8 Introduce specific requirements in relation to foam testing, foam production and foam production systems to ensure foam production and foam performance.

- There is no doubt that all parties agree that the foam testing framework should consider the Australian conditions, which justifies a departure from the ICAO international standards.
- However, it is questionable whether future environmental policy introduced by governments around the world will allow the use of PFAS agents. There is now extensive research being undertaken to investigate the negative consequences of the PFAS contaminations in Australia.
- Environmental policy in the future will likely prohibit the use of firefighting foams containing PFAS and foam products that are less environmentally damaging will be seen as the only viable option.
- This raises further issues given that the lower performance foam requires greater volume to achieve a similar level of effectiveness to the PFAS products. It implies that ARFFS vehicles will need to have increased carrying capacity.

3.1.6.9 Permit the use of training foam, as a substitute for operational foam, during ARFFS training activities/exercises.

- One of the issues that can arise with the use of training foams is the logistics of swapping foams from training applications to being ready for actual operational use. The use of training foams can cause problems for standard foam equipment.
- The training foam should be flushed completely from the AFRRS vehicle and equipment, which then needs to be refilled with operational foam. This requirement is resource intensive and presents possible logistical problems, which need to be taken into account when considering the implications of this proposal.

Part 1

Background, context, and overview

2. Overview of Aviation Rescue and Fire Fighting (ARFF) in Australia

Aviation Rescue and Fire Fighting Service (ARFFS) is a branch of fire fighting and rescue that deals specifically with fires and rescue situations arising from aviation incidents. ARFFS personnel respond to multiple types of incidents involving aircraft at and in the immediate vicinity surrounding airports, with their primary role being to optimise the chance of survival of occupants of an aircraft that has crashed and to protect property and equipment from the effects of fire.

In Australia, the functions of ARFFS are defined in the Civil Aviation Safety Regulations as:

a) to rescue persons and property from an aircraft that has crashed or caught fire during landing or take off; and

b) to control and extinguish, and to protect persons and property threatened by, a fire on the aerodrome, whether or not in an aircraft.

There are several reasons special ARFFS are required to be readily available to deal with aviation incidents. The first is that the type of situation that arises from an aircraft incident is quite different to that which may face emergency responders to accidents involving other types of transport. Specifically, the large amount of fuel that can potentially ignite poses a very real and immediate danger in any aircraft incident. Second, the potential for mass fatalities is very real and hence the speed with which fire fighters must respond to an aircraft incident is of paramount importance. To this end, aviation fire fighters must be located within an airport or very nearby, to reduce the risk of catastrophe. Third, the apparatus and the personal protective equipment used by aviation fire fighters is very specialised and requires advanced training.

In Australia, ARFFS are required at airports that receive scheduled international passenger air services, or airports with over 350,000 passenger movements on scheduled passenger air services in a 12-month period. This means presently in Australia there are ARFFS at 27 of Australia's 195 certified airports. ARFFS are provided by Airservices Australia (ASA) at 26 of these (see Figure 1). The Norfolk Island Regional Council is responsible for providing ARFFS at Norfolk Island International Airport and the Department of Defence is the provider at Newcastle Airport (which is also a RAAF Base, situated at Williamtown, NSW).

ASA is a government-owned organisation established under the Air Services Act 1995. It has a range of functions outlined in the Act, including providing services and facilities for the safety, regularity and efficiency of air navigation; the promotion and fostering of civil aviation; and cooperation with the Australian Transport Safety Bureau in relation to investigations that relate to aircraft incidents. The services ASA provide include air traffic services; aeronautical information, radio navigation and telecommunications services; and Aviation Rescue and Fire Fighting Services. The Act stipulates that ASA must regard the safety of air navigation as the most important consideration.

The obligation of airports to have ARFFS readily available is a requirement of the International Civil Aviation Organisation (ICAO), of which Australia is a signatory. The ICAO was set up following the Convention on International Civil Aviation, also known as the Chicago Convention, in 1944. ARFFS in Australia was established in 1947 and has been provided predominantly by the Commonwealth government, through various entities acting under an authorising Act of Parliament. Sydney

Airport's ARFFS is one of the oldest and longest continually running services in the world.

Deregulation and airport privatisation has seen the introduction of greater competition in the aviation industry and the push for lower cost fares, which has increased passenger numbers. Cost rationalisation has also seen the push to make the provision of aviation safety services, such as ARFFS, cost recoverable. In July 1991 the Civil Aviation Authority, the regulatory authority at the time, announced it would remove ARFFS from capital city secondary airports, such as Bankstown, Essendon, and Jandakot.

Figure 1 Aviation Rescue and Fire Fighting Service services locations

Source: Airservices Australia.

Currently, after a regulatory review in 2015-16, once airports pass the threshold for passenger numbers, or receive scheduled international passenger air services, a risk review is carried out to determine whether ARFFS is required. If it is deemed to be necessary, ARFFS is categorised according to the size of aircraft that use the airport. We consider these processes in later sections. The different aerodrome categories determine the resources provided to the ARFFS, including the number of vehicles, ancillary equipment, and agent quantities. Whilst the ICAO Task Resource Analysis (TRA) determines the staffing level.

The airports in Australia that fit into the various categories are shown in Table 1. The asterisk for Adelaide, Melbourne and Sydney refers to a decision made by CASA in October 2021 to grant Airservices Australia approval to use the remission factor for these airports. That means that the level of fire fighting and rescue services at those airports is now consistent with the level applicable to an airport that is one category below the official Airservices Australia designation. For example, the two 'Category

10’ airports (Melbourne and Sydney) are effectively only receiving Category 9 service, meaning there is a mismatch between the level of service provided and that designated by international standards based on the size of the aircraft using the facility.

The primary purpose of ARFFS is to respond to aircraft incidents on or in the immediate vicinity of the airport. However, ARFFS personnel respond to a variety of calls for person or asset protection. Aircraft incidents include crashes, engine fires and fuel spills, while other incidents ARFFS personnel respond to include emergency medical response (first aid) calls, motor vehicle accidents, hazmat incidents, other fires and alarms. Importantly, they also support local fire brigades in mutual aid calls including bushfire emergencies.

Of significance for this Report, many Australian airports are embedded in localities where surrounding housing and industrial communities are vulnerable to a major event occurring, and ARFFS clearly provide first response capacity to attenuate that risk.

Table 1 ARFFS levels of service at Australian airports

Category 6	Category 7	Category 8	Category 9	Category 10
Ayers Rock	Alice Springs	Avalon	Adelaide *	Melbourne *
Ballina	Hamilton Island	Cairns	Brisbane	Sydney *
Broome	Hobart	Canberra	Perth	
Coffs Harbour	Launceston	Darwin		
Gladstone	Mackay	Gold Coast		
Karratha	Sunshine Coast			
Newman	Townsville			
Port Hedland				
Rockhampton				

Source: Airservices Australia. * See explanation in text.

The most recent data (2020-21) is affected by the pandemic impacts on air travel. The most reliable data ends in 2018-19, which showed that ARFFS personnel responded to 6,700 calls nationally, 468 of which were aircraft incidents (Table 2).

Specialised qualification and skills-based recertification of ARFFS personnel is delivered at the Airservices Learning Academy in Melbourne. The training involves theory sessions and practical training scenarios conducted on a purpose-built hot fire training ground designed to simulate a full-size A380 aircraft fuselage. The Learning Academy can deliver Certificate II, III, IV, Diploma and Advanced Diploma qualifications as well as ongoing CASA regulated recertification and aims to provide aviation fire fighters with the skills and knowledge they will need for the specialised and unique situations they will face, including response to aviation incidents, fireground management, operating breathing apparatus and other specialised equipment, and working as part of the team. On-the-job training continues at regular intervals.

Table 2 ASA ARFFS national performance indicators, 2013-14 to 2020-21

Year	ARFFS Airports	Operational staff	Aircraft incidents	Total call responses	Readiness rate (%)	Response time rate (%)
2020-21	27	852	296	2,401	NA	100
2019-20	26	886	336	5,491	NA	100
2018-19	26	858	468	6700	99.9	100
2017-18	26	843	452	6900	99.9	100
2016-17	26	877	430	NA	NA	100
2015-16	26	856	395	7000	99.94	99.78
2014-15	26	853	NA	6702	99.94	99.64
2013-14	22	669	NA	7200	99.9	NA

Source: Airservices Australia Annual Reports 2014-2021. NA - Not available

3. Regulatory system of ARFF provision

3.1 Civil Aviation Safety Authority (CASA)

The Civil Aviation Safety Regulations 1998 (CASR), made under the Civil Aviation Act 1988, set out the regulations for the civil aviation sector in Australia. The Civil Aviation Safety Authority (CASA) is responsible for issuing and enforcing the regulations. CASA was established in 1995 and is a corporate Commonwealth entity, under the Public Governance, Performance and Accountability Act 2013. Section 9 of the Civil Aviation Act sets out CASA's functions. CASA's stated purpose is to maintain, enhance and promote the safety of civil aviation, with particular focus on preventing aviation accidents and incidents. It is also responsible for fostering the efficient use of, and equitable access to, Australian-administered airspace. Section 9A of the Act makes clear the emphasis CASA places on safety:

> In exercising its powers and performing its functions CASA must regard the safety of air navigation as the most important consideration (Civil Aviation Act 1988).

Among CASA's powers are to regulate aerodrome rescue and fire fighting services. Part 139 prescribes the requirements for aerodromes used in air transport operations. Subpart 139.H specifies the requirements for the provision of aviation rescue and fire fighting services (ARFFS). It also puts in place a safety framework, sets minimum service standards and sets establishment and disestablishment criteria for ARFF.

The CASR sets out the purpose of ARFFS is to rescue persons and property from aircraft that have crashed or caught fire at or near an aerodrome. There is also the expectation ARFFS will respond to other fires at an aerodrome. Part 139.H details the requirements for ARFF, defining minimum service standards including:

- criteria for establishment and disestablishment of ARFFS;
- provision of ARFFS outside of the criteria;

- interface arrangements with State or Territory fire brigades and other third party providers;
- quality control;
- ARFFS personnel recruitment;
- training establishments; and
- applicants organisation (CASA, 2019).

CASA publishes the Manual of Standards (MOS) (CASA, 2005), which defines how CASA meets its responsibilities under the Act for promulgating aviation safety standards. The MOS is a legislative instrument, which outlines detailed technical material (aviation safety standards) that are deemed necessary for the safety of air navigation in Australia. The responsibility for technical matters in the MOS is the responsibility of the National Operations and Standards Division (formerly the Aviation Safety Standards Division).

The CASR and MOS broadly align with international standards outlined by the International Civil Aviation Organisation (ICAO, see below), however there are some differences between them, some of which are in relation to the delivery of ARFFS at Australian airports. The MOS recognises this and sets out that “where there is a difference between a standard prescribed in ICAO documents and the MOS, the MOS standard shall prevail” (CASA, 2005: 1-2). Differences are published in the Aeronautical Information Publication, as required by ICAO.

CASA has the authority to grant exemptions from provisions of the CASR under Subpart 11.F. This can include an exemption from a requirement in the CASR to comply with the MOS, or some other referenced document. Most exemptions are granted through a process of application from a person or organisation and may be in relation to an aircraft or aeronautical product, an operation, or an authorisation. The process followed by CASA for exemptions is set out in Advisory Circular AC 11-02(2). CASA requires exemption applications 3 months prior to when they are required to commence, but exemptions can be made in exceptional circumstances where the application can be made in any reasonable way.

3.2 Australian Transport Safety Bureau (ATSB)

The Australian Transport Safety Bureau (ATSB) is the prime agency in Australia for the independent investigation of civil aviation accidents, incidents, and safety deficiencies. It is governed by the Transport Safety Investigation Act 2003 and investigates for the purpose of “no blame” safety improvements, not for the purpose of taking administrative, regulatory, or criminal action.

The ATSB is governed by a Commission, separate from policy makers, industry operators and regulators such as CASA. The ATSB follows Annex 13 to the Convention on International Civil Aviation (Chicago Convention), which prescribes international principles for aircraft accident and incident investigation, reflected in the Transport Safety Investigation Act. As the primary focus of the ATSB is the safety of the travelling public, the ATSB also investigates safety issues based on occurrence trends in the hope of averting a future accident (ATSB, 2019).

3.3 Airservices Australia (ASA)

Airservices Australia (ASA) was established under the Air Services Act 1995. It is a corporate Commonwealth entity under the Public Governance, Performance and Accountability Act 2013 (ASA, 2018a). ASA is responsible for providing safe, secure, efficient, and environmentally responsible air navigation and aviation rescue and fire fighting services.

Their functions under the Air Services Act include:

- providing facilities for the safe navigation of aircraft within Australian-administered airspace;
- promoting and fostering civil aviation in Australia and overseas; and
- providing air traffic services, aviation rescue fire fighting services, aeronautical information, radio navigation and telecommunications services.

ASA is governed by a Board whose members are appointed by the Minister for Infrastructure, Transport and Regional Development, consisting of eight members. The Board determines the objectives, strategies and policies of ASA, ensuring it fulfils its statutory functions.

ASA provides terminal navigation (TN), ARFF and en route navigation services at airports around Australia, for which it charges aircraft operators appropriate charges. Charges are set subject to notification to the Australian Competition and Consumer Commission (ACCC), which reviews ASA pricing every five years.

3.4 Aviation Rescue and Fire Fighting Services Regulatory Policy Review

There have been a number of reviews and audits into the operation and regulations of the civil aviation industry over the years. These have come from within the industry, for example CASA post-implementation reviews, as well as from government itself in the form of safety reviews and as part of the national commission of audit. For a review of relevant recent reviews into the industry and its effects on the regulation and provision of ARFFS, see Quirk (2016).

In 2015 the Australian Government asked the Department of Infrastructure and Regional Development (DIRD) to provide policy advice on potential improvements to the efficiency and clarity of ARFFS requirements. DIRD released a public policy paper (DIRD, 2015) and invited responses from affected parties, from which there were eleven respondents. The review proposed several regulatory changes particularly about:

- the approach to establishing and disestablishing ARFFS at airports;
- the regulatory role at non-ARFF airports;
- ARFFS' roles and responsibilities; and
- removing red tape.

The recommendations in the DIRD review were accepted by the Minister in December 2016. The primary change was the removal of threshold numbers of passengers at which to establish and disestablish ARFFS at airports. Previously ARFF were required at airports receiving scheduled international passenger air services, and/or airports which had 350,000 passenger movements on scheduled passenger air services over a 12-month period. Similarly, disestablishment would previously occur if there was a withdrawal of scheduled international passenger air services or passenger movements on scheduled passenger air services fell below 300,000 and remained there over a 12-month period.

Following the regulatory review, the approach to the establishment and disestablishment of ARFFS changed, whereby a trigger event would require CASA to perform a risk review to determine if establishment/disestablishment were to occur. For the establishment of ARFFS at an airport, the trigger events were an airport receiving scheduled international passenger services or where passenger movements on scheduled passenger air services were above 500,000 over a 12-month period.

Similarly, the trigger events for disestablishment were the withdrawal of scheduled international air services from an airport, or passenger movements falling below 400,000 and remaining there for a 12-month period. This change would have seen ARFFS removed from up to seven airports, and airports not yet with ARFFS but with increasing passenger numbers, having to wait further years to qualify for ARFFS to be established.

Other reforms included the allowance that if a new ARFFS was deemed necessary at an airport, given these rules, a graduated service (at a level lower than the ARFFS category of services required) would be acceptable prior to the establishment of full operations.

Further, a caveat is included that a fire fighting related service provided at an airport that is not required to have an ARFFS, is not an ARFFS within the meaning of the CASR; and hence would not be subject to the regulatory framework or regulation by CASA. Areas and facilities to be the responsibility of ARFFS were listed as aviation-related infrastructure, which may include infrastructure identified in an agreement between an ARFFS and a state/territory fire authority. State and territory fire authorities are not required to hold separate CASA approval to assist an ARFFS provider in the provision of ARFFS. Responsibilities of the airport operator in facilitating the provision of ARFFS were clarified.

In June 2018, following the appointment of a new Minister, there was a change to the ARFFS establishment and disestablishment passenger thresholds. Remaining is the requirement that receipt or withdrawal of scheduled international passenger air services and/or the number of passenger movements on scheduled passenger air services act as a trigger for a risk review by CASA before the establishment or disestablishment of the service. However, the trigger thresholds were returned to the previous levels of over 350,000 passenger movements at which a review will be conducted into establishing ARFFS, and below 300,000 passenger movements for a review to be conducted to disestablish ARFFS.

Despite the availability of passenger numbers at airports publicly available each year, there remains a time lag from when individual airports pass the threshold to when an ARFFS can be provided.

3.5 International Civil Aviation Organisation (ICAO)

The International Civil Aviation Organisation (ICAO) was set up following the Convention on International Civil Aviation, also known as the Chicago Convention. The Convention, of which Australia is a signatory, was signed in December 1944 by 52 states and the ICAO came into being in April 1947. Later that year the ICAO became a specialised agency of the United Nations. The ICAO was originally created to promote the safe and efficient development of civil aviation around the world.

The ICAO sets out Standards and Recommended Practices (SARPs) for Aerodromes in Annex 14 to the Convention on International Civil Aviation. These standards were first adopted in May 1951. ICAO signatories (Member States) use these standards and recommendations to ensure their civil aviation operations and regulations conform to global norms. ICAO also monitors compliance of its signatories.

Rescue and Fire Fighting at airports is dealt with in Chapter 9.2 of Volume 1 of Annex 14. Annex 14, Chapter 9.2.1 states that rescue and fire fighting equipment and services shall be provided at an aerodrome, and the level of protection provided shall be appropriate to the aerodrome category as determined by aeroplane length and fuselage width. The standards outline that "the principal objective of a rescue and fire fighting service is to save lives in the event of an aircraft accident or incident occurring at, or in the immediate vicinity of, an aerodrome." (ICAO, 2018a, 9-3). The ICAO publishes an Airport Services Manual (Doc 9137-AN/898) which is meant to provide assistance to countries in the implementation of the specifications set out in Annex 14 (ICAO, 2015). In doing so it thereby also ensures the uniform application of the standards.

It is a requirement by ICAO that Member States notify the ICAO of any differences between their national regulations and practices and the Standards outlined in Annex 14. Further, Member States are invited to extend this practice to any differences between their own practices and Recommendations in Annex 14, particularly where such a difference is important for the safety of air navigation. Member States are then required to list any differences between their own regulations and practices and the ICAO SARPs through GEN 1.7 in the Aeronautical Information Service.

Part of the charter of the ICAO is to monitor the implementation of civil aviation safety in countries around the world. Member States are subject to oversight processes to monitor their adherence to ICAO standards, through the Universal Safety Oversight Audit Programme (USOAP). This was initiated in 1999 in response to concerns about the adequacy of aviation safety oversight around the world, which initially consisted of cyclical audits of a country's regulations. In 2010 the ICAO oversight function evolved to a Continuous Monitoring Approach (CMA), which is based on the concept of continuous monitoring and incorporating the analysis of safety risk factors. The aim of the current approach is to move to a systemic, ongoing process of gathering safety information (ICAO, 2010).

3.6 Effectiveness of regulatory system

3.6.1 National

Airservices Australia (ASA) have applied for a variety of exemptions from CASA, which have been granted and are currently in effect. Exemptions from CASA are listed on their website under their 'Current rules for legislative and non-legislative instruments' (see Mitchell and Flanagan, 2019 for further discussion).

A lack of confidence in the exemption process has been expressed at Senate Estimates and Inquiry hearings (for example, Commonwealth of Australia, 2019a; 2019b). There appears scope for an extra layer of oversight that may be useful in reviewing applications for exemptions and providing recommendations on their necessity, appropriateness and most importantly, their impact on safety standards. Indeed, a greater degree of transparency into the rationale behind the requesting and granting of exemptions would assist in ensuring a more robust procedure.

The Aviation Safety Advisory Panel (ASAP) of CASA was established to provide informed, objective, high-level advice from the aviation community on issues that have, or may have, a significant implication on aviation safety and the way CASA performs its functions. The ASAP Terms of Reference provide for Technical Working Groups (TWG) to be established to deal with specific issues within a particular sector of the industry and to offer advice. TWGs may also be established by CASA to provide input on technical issues and proposals. There are a range of TWGs established that deal with aspects of aviation safety, however, while a TWG on ARFF has been approved, it has yet to be established. Indeed, a group such as this may be useful in providing additional oversight in the application of regulation relating to ARFF in Australia.

Senate estimates hearings provide a level of oversight, but usually it requires a senator involved in the hearing to be cognisant of the happenings on the ground. In Senate estimates hearings in February 2019, it was reported that ASA is non-compliant with two requirements in the MOS for which exemptions had not been granted (Commonwealth of Australia, 2019a). The two instances concerned the use of rescue power saws and hose testing standards. These cases highlight the deficiencies in CASA's regulative role.

3.6.2 International

Australia attended the Convention on International Civil Aviation (Chicago Convention) in December 1944 and was one of the original 52 signatories to the ICAO becoming an official agency of the United Nations when it came into force on 4 April 1947. It has been active in providing committee members and contributing to policies over the years. It has also participated in the Universal Safety Oversight Audit Programme (USOAP) on occasions over the years.

Australia has been involved in two audits from the ICAO. Australia's first audit was in 2008 under the old system, at which time it received an Effective Implementation (EI) score of 82.63 per cent. Australia filed a notification of difference with the ICAO to reflect their regulatory system varied from the SARPs. This resulted in Australia providing a corrective action plan to address the Findings and Recommendation (F&Rs), where Australia committed to considering the issue as part of a review (ICAO, 2009).

Australia's second audit was in the form of an ICAO Coordinated Validation Mission (ICVM), where the ICAO sent a team to evaluate the progress of Australia on resolving its F&Rs. On completion of the ICVM, Australia earned an overall EI score of 94.98, ranking it eighth in the world in terms of overall compliance. However, Australia drops to tenth in Aerodromes and Ground Aids (AGA), which covers the operation of ARFFS at airports. Further, in advice to assist Australia prioritise its remedial actions, the ICAO is still listing as a high priority the "full implementation of Annex 14, Volume 1 requirements for the provision of rescue and firefighting services at aerodromes" (ICAO, 2018b: 1-3).

It is a requirement by ICAO that Member States notify the ICAO of any differences between their own regulations and practices and the ICAO SARPs:

> Any State which finds it impracticable to comply in all respects with any such international standard or procedure, or to bring its own regulations or practices into full accord with any international standard or procedure after amendment of the latter, or which deems it necessary to adopt regulations or practices differing in any particular respect from those established by an international standard, shall give immediate notification to the International Civil Aviation Organization of the differences between its own practice and that established by the international standard (Article 38 of the Chicago Convention).

Member States are also required to publish their differences through GEN 1.7 in the Aeronautical Information Publication (AIP). In Australia's case, Airservices Australia publishes a range of documents under the collection – *Differences from ICAO Standards, Recommended Practices and Procedure* (ASA, 2021) and the current version of this publication list several hundred differences with the ICAO regulations in Annex 14 Volume 1. The majority of these are listed as 'Different in character or other means or compliance' or 'Less protective or partially implemented / not implemented.' In many cases it is simply that something defined in the Annex is not defined in Australian legislation. Judging by Australia's relatively high compliance score, the majority of these are not strictly safety issues. Hence, a real possible safety issue, such as non-provision of ARFFS at aerodromes which deal with large aircraft and considerable numbers of passengers, is hidden among a multitude of somewhat trivial differences.

The CMA oversight system currently used by the ICAO is seen as beneficial to Member States as it is cost-effective, resource-efficient, and sustainable. The emphasis of the CMA is on the availability of information on the safety performance of Member States being provided to other Member States. This notification of differences is at the heart of the CMA, yet the degree of non-compliance is not clearly apparent when comparisons are made between countries. For example, for the AGA area of compliance, Australia has an EI score of 95.7 per cent, yet lists over 450 differences with the ICAO SARPs. Norway and Finland, by comparison, have AGA EI scores of 96.67 and 91.3 per cent but only list 14 and 15 differences respectively. Hence, this system does not appear to address the contrasting way countries approach their notification obligations.

Button *et al*. (2004) suggest the problem with the ICAO structure is its reliance on voluntary involvement and application by its Member States. There are no formal mechanisms for imposing penalties on non-compliant States even if they are identified. Spence *et al*. (2015) investigate the link between compliance with international safety standards (the ICAO SARPs) and air accidents and fatalities. They discuss the powerlessness of the ICAO, citing an earlier study where two-thirds of 32 countries reviewed substantially failed to meet ICAO standards:

> Ultimately ICAO has a significant lack of authority to enforce its own policies. It relies on the assumption that the individual member states will do everything they can to maintain the system the way it is designed (Spence *et al*., 2015: 3).

4. International best practice - ARFFS

4.1 Introduction

The Airport Services Manual (Doc 9137-AN/898) published by the International Civil Aviation Organisation (ICAO) states that the principal objective of an ARFFS 'is to save lives in the event of an aircraft accident or incident at, or in the immediate vicinity of, an airport. The ARFFS is provided to create and maintain survivable conditions, to provide egress routes for occupants and to initiate the rescue of those occupants unable to make their escape without direct aid' (ICAO, 2015: 1-1). The document sets out proposals for how countries can best implement the international Standards and Recommended Practices (SARPs) outlined in Annex 14 to the Convention on International Civil Aviation.

The methodology for rescue and fire fighting at airports is based on the critical area concept. This was formed by the Rescue and Fire-Fighting Panel that was first convened in 1970 and met subsequently in years hence, with the concept adopted by the ICAO in 1976. Prior to this, the determination on the level of protection to be provided at airports was based on fuel load and passenger capacity of aircraft. The critical area concept is founded on the critical area to be protected in any post-accident fire that would permit the safe evacuation of aircraft passengers and crew and is determined by the size of the aircraft. This concept provides the basis for ARFFS standards.

The ICAO publish their Standards in Annex 14 to the Convention on International Civil Aviation. While these are the international standard, countries publish their own standards and, as we have seen in the previous section, where these are different need to make a notification to the ICAO.

As well as the ICAO, the international, non-profit National Fire Protection Administration (NFPA) publishes standards related to all types of fire-fighting. The NFPA is a global, self-funded organisation which advocates for the elimination of death, injury, property, and economic loss due to fire, electrical and related hazards. In particular, *NFPA 403, Standard for Aircraft Rescue and Fire-Fighting Services at Airports*, is the principal standard governing ARFFS. This standard is currently in the process of consolidation. As with the ICAO, the NFPA develop and review their standards through a public process overseen by a Technical Committee or Panel. Many of the standards developed by the NFPA have been adopted at locations around the world, however they are not binding unless the Authority Having Jurisdiction (AHJ) has adopted them. In practice, the NFPA standards are more stringent than the ICAO standards in relation to ARFFS.

The Federal Aviation Administration (FAA) is the authority responsible for regulation of all aspects of civil aviation in the United States. Among their powers is the authorisation to certify airports, which they do for airports that receive scheduled air carrier services with aircraft having more than nine seats and unscheduled air carrier services with aircraft having more than 30 seats. The requirements for certification are set out in Title 14 Code of Federal Regulations (CFR) Part 139, Airport Certification. The requirements concerning aviation rescue and fire fighting are set out in Sections 139.315, 139.317 and 139.319. In addition, the FAA publish Advisory Circulars which contain research outcomes and recommendations of the various ARFFS requirements. Some of these include standards but these standards can only have regulatory effect if referenced in a FFA regulation. CFR requirements are generally more relaxed than NFPA standards, but the Advisory Circulars often reference the NFPA standards as providing appropriate guidance.

The Civil Aviation Authority (CAA) is the United Kingdom's independent specialist aviation regulator. They are a public corporation established by Parliament. Among their powers are to grant aerodrome licences according to the Air Navigation Order (ANO). The ANO requires that most public transport flights take place at a licenced aerodrome, or a government aerodrome. Guidance to aerodrome operators is provided in policy document Civil Aviation Publication (CAP) 168 (CAA, 2019). Chapter 8 of CAP 168 provides the minimum requirements relating to ARFFS provision. The UK standards in general align closely to ICAO SARPs.

In essence, ARFFS standards are provided to ensure rapid intervention to aircraft crashes in or near airports, to minimise loss of life, injury, aircraft, property and equipment. Kreckie (2011) argues the consensus standards of the NFPA are provided to indicate a 'best practice' in any number of categories. The standards of the various jurisdictions around the world, including the ICAO provide a minimum standard that Kreckie (2011) argues has no correlation to 'world class'. Instead, regulations and standards provide a foundation for prudent emergency planning and a common-sense approach. The following shows a comparison between the CASA standards and the standards set out by the ICAO, the NFPA, the FAA and the CAA.

4.2 Classification of airports

4.2.1 CASA classification

CASA divides airports into Level 1 and Level 2, as set out in the Manual of Standards (MOS) (CASA, 2005). Level 1 airports are defined as those:

- From or to which an international passenger air service operates; and
- Any domestic aerodrome through which more than 350,000 passengers passed through on air transport flights during the previous financial year.

Level 1 aerodromes are required to have an ARFFS at a level appropriate as outlined below. As we saw in earlier, for new domestic airports to be considered to require ARFFS, once their passenger numbers reach 350,000 this triggers a risk review to be completed by CASA, after which an ARFFS may be recommended, with an allowance for a graduated service lower than the determined appropriate service for an unspecified period. Similarly, if passenger numbers fall below 300,000 and remain below this level for a 12-month period, a risk review will be conducted relating to disestablishment of an ARFF service. The MOS stipulates that the level of protection provided must be in accordance with ICAO Standards, Chapter 9 of the Annex 14 to the Chicago Convention.

Level 2 aerodromes are defined as being where the number of annual passengers on air transport is less than 350,000. Level 2 aerodromes may provide a level of ARFF, which will be subject to an audit if published in Enroute Supplement Australia (ERSA) and form part of the Aerodrome Emergency Plan (AEP). The AEP must be in accordance with ICAO Standards, Chapter 9, of Annex 14 to the Chicago Convention. However, Level 2 airports are not required to have an ARFF service.

The airport category is based on the length of the longest aeroplane (and their maximum fuselage width) to use the airport during the busiest consecutive three months of the preceding 12 months. If the longest aircraft to use the airport does not reach 700 movements, it is not deemed the ‘critical’ aircraft and the category can be set one category below the designated category in Table 4.1 (known as remission).

4.2.2 ICAO, NFPA, FAA, CAA classification

The classification of airports under the ICAO, NFPA and CAA standards are the same as under CASA. The benchmark of 700 movements during the busiest consecutive three months is also outlined in the ICAO Standards, meaning the ICAO permit remission, but is not specified by the NFPA. Remission is also allowable under the CAA.

The FAA uses four classifications based on seating capacity for service type. Class I, II and III are for airports which receive aeroplanes with less than 31 scheduled passenger seats. Class IV is divided into five Indexes, based on aeroplane size as outlined in Table 3. Further, if there are five or more daily departures of air carrier aircraft in a single index group serving the airport, the longest index group is the index required for the airport. If there are less than five daily departures of the longest index group of air carrier, the next lower index is the index required for the airport.

The remission factor is often in force at Australian airports. Cairns, Darwin and Gold Coast airports, for example, are Category 8 airports but regularly receive aircraft that are of Category 9 size. There was concern raised at a Senate hearing that Brisbane and

Perth airports were classified as Category 10 airports but were infrequently unable to provide cover for that size aircraft if their Domestic Response Vehicle (DRV) was called out to an incident (Commonwealth of Australia, 2018). This was due to the fact the three crew on the DRV were included in the 14-crew required under the rules to cover a Category 10 airport. Hence, when they were called to incidents the remaining crew was down to 11. Following a Senate Inquiry hearing in March 2019, Brisbane and Perth airports were downgraded to Category 9.

Table 3 Airport category for rescue and fire fighting

Aerodrome category		Aeroplane overall length	Max fuselage width
CASA, ICAO, NFPA, CAA	FAA Index		Not FAA
1	A	0 up to but not including 9 m	2 m
2	A	9 m up to but not including 12 m	2 m
3	A	12 m up to but not including 18 m	3 m
4	A	18 m up to but not including 24 m	4 m
5	A	24 m up to but not including 28 m	4 m
6	B	28 m up to but not including 39 m	5 m
7	C	39 m up to but not including 49 m	5 m
8	D	49 m up to but not including 61 m	7 m
9	E	61 m up to but not including 76 m	7 m
10	E	76 m up to but not including 90 m	8 m

Source: CASA, 2005; ICAO, 2018a; NFPA, 2018; CAA, 2019; Certification of Airports, 2004.

4.3 Provision of ARFFS

ICAO Standard 9.2.1 states: ‘Rescue and firefighting equipment and services shall be provided at an aerodrome.’ NFPA standards require airport management to be responsible for the provision of ARFFS on an airport (Standard 4.1.1). CASA diminished establishment standards means that Australia has ARFFS at 27 airports, despite having 195 certified airports around the country.

In the US and UK, ARFFS are required at all certified (or licenced) airports. In the US, airports where scheduled flights with more than nine seats (or unscheduled flights with more than 30 seats) take-off or land are required to be certified. In the UK, CAP 168 prescribes ‘Rescue and fire fighting equipment and services shall be provided at an (licenced) aerodrome' (CAA, 2019: 364). There, aircraft whose total maximum weight is greater than 2,730 kg which are being used for commercial air transport of passengers or for instruction or tests for a pilot's licence are required to use a licenced aerodrome.

In preparation for the Regulatory Policy Review into ARFFS in 2015-16, the Department of Infrastructure and Regional Development public consultation paper compared the levels of ARFFS provision at airports in comparable countries, including the US and UK as above, as well as Canada and New Zealand. In all four countries, airport operators are required to provide and to finance ARFFS as part of their licencing arrangements. Canada, like Australia has passenger thresholds, above which ARFFS is required at an airport, however, their passenger threshold is 180,000, just over half of Australia's threshold. New Zealand require certification at airports used by aircraft with a passenger capacity of 30 in regular passenger transport and where there are 700 movements in the busiest consecutive 3-month period.

All these other countries have much lower establishment thresholds for providing ARFFS at airports than Australia. If Australia adopted the trigger used in any of those countries, many more airports around the country would require an ARFFS.

The requirement for passenger number thresholds to be passed for an ARFFS to be implemented covers over 95 per cent of the flying public. However, it doesn't cover a large proportion of flights. Indeed, after successfully lobbying for the removal of ARFFS from secondary airports in the 1990s, most general and recreational aviation flights take-off and land at airports without ARFFS coverage. When counting by aircraft movements, rather than passenger movements, two of the top three and five of the top ten airports in Australia do not have ARFFS. This means that over 3,000 flight movements a day are not covered by ARFFS just at these five airports.

4.4 Number of vehicles

CASA and CAA follow the ICAO Recommendation on the minimum number of rescue and fire fighting vehicles required at an airport to provide adequate protection for each category (Table 4).

Table 4 Number of ARFF vehicles

CASA/ICAO/ NFPA/CAA category	FAA Index	Number of Vehicles			
		ASA	ICAO/CAA	NFPA	FAA
4	A	1	1	1	1
5	A	1	1	2	1
6	B	2	2	2	1-2
7	C	2	2	2	2-3
8	D	3	3	3	3
9	E	3	3	4	3
10	E	4	3	4	3

Source: ASA, 2017; ICAO, 2018a; NFPA, 2018; CAA, 2019; Certification of Airports, 2004

Airservices Australia operations stipulate four vehicles for Category 10 aerodromes (ASA, 2017). While this is an improvement on the three required previously, without being a MOS standard it is much easier to reverse this and require the much less safe three-vehicle requirement. The FAA allows flexibility in the number of vehicles for indexes B and C.

NFPA standards require one more vehicle than the ICAO standard at the equivalent airport categories 5, 9 and 10. In explaining this discrepancy the NFPA 403 points out the importance of having at least two fire-fighting vehicles when dealing with transport-type aircraft, due to the need to rapidly cover any burning fuel spill to protect the aircraft and its occupants from radiated heat. Further, multiple vehicles allow attacking aircraft fires from more than one point, reduces the potential seriousness of vehicle breakdown and minimises the out-of-service consequences when a vehicle is in need of routine maintenance or repairs (NFPA, 2018).

4.5 Quantity of agent

The 'critical area concept' serves as the basis for calculating the quantities of extinguishing agents necessary to achieve protection within an acceptable period. The objective is to control that area of the fire adjacent to the fuselage, thus safeguarding its integrity and maintaining tolerable conditions for occupants until evacuation is possible. The size of the critical area has been determined by experimental means.

The ICAO distinguish between the theoretical critical area (TCA) and the practical critical area (PCA). The TCA is the area within which it may be necessary to control the fire, while the PCA is representative of actual aircraft accident conditions. The TCA is a rectangle having as one dimension the overall length of the aircraft, with the width varying with the length and width of the fuselage, calculable with a mathematical formula. The PCA is two-thirds of the TCA.

Once the PCA is calculable, the control time and extinguishment time were considered, and a discharge rate and time calculated to ensure the lowest possible fire control time to prevent the fire from melting through the fuselage or causing an explosion of the fuel tanks. The quantities required were divided into the following two components:

- Q_1 – the quantity required to obtain a 1-minute control time in the PCA;
- Q_2 – the quantity required for continued control of the fire after the first minute or for complete extinguishment of the fire, or both.

Q_2 is a factor of Q_1 dependent on the following variables: the aircraft size, effectiveness of agent selected, time required to achieve PCA fire control and time required to maintain the controlled area fire free or to extinguish the fire.

There are two significant issues with the critical area concept and the quantity of extinguishing agents that are recommended. The first is the PCA is only two-thirds of the length of the aircraft, so if the fire does spread beyond this it is accepted there will not be enough water. The second is there is no allowance for additional water to fight any fire that may be in the interior of the aircraft.

NFPA, while supportive of the PCA, allow for more water on their vehicles for the purpose of Q_1 and Q_2 in their standards. This is based on the fact their calculations of Q_1 are based on the maximum length of an aircraft's fuselage within each category, while ICAO Q_1 is based on the average length within each category. As Q_2 is a factor of Q_1, this is also higher for NFPA compared to ICAO. Scheffey *et al*. (2012: 30) argue that ‘a margin of safety exists in the ICAO requirement only if the largest aircraft in any category is less than the midpoint of the category range.’

In addition, the NFPA also make an allowance for extra water to be used in the case of an interior fire in an aircraft, an amount termed Q_3. The NFPA argue that information from recent incidents shows that water for interior fire-fighting operations, based on the need for handlines to be used, is also necessary (Scheffey *et al*., 2012). An amount of Q_3 has been included in NFPA 403 since the 1998 edition, yet is still not included in ICAO SARPs, the CASA MOS or the CAA CAP 168.

CASA and CAA follow the ICAO SARPs in amounts of fire fighting agents for Performance Levels A and B. The FAA regulations Title 14 CFR Part 139 require much lower amounts of extinguishing agent than both the ICAO and NFPA standards. Advisory Circular 150/5210-6D acknowledges the discrepancy between Part 139 and the NFPA 403, and while it references NFPA 403 in providing guidance in the quantity of extinguishing agent it notes that “Part 139 takes precedence and that NFPA 403 may, in some cases, exceed part 139 requirements” (FAA, 2004). Table 5 shows the minimum quantities of water and discharge rates for the various regulatory authorities.

Table 5 Minimum water quantities and discharge rates

CASA/ ICAO/ NFPA/ CAA category	FAA	CASA/ICAO/ CAA		NFPA			FAA	
		Water[a] (L)	Rate (L/m)	Water[a] (L)	Rate (L/m)	Water[b] (L)	Water[a] (L)	Rate[c] (L/m)
5	A	5400	3000	5700	3257	10450	380	
6	B	7900	4000	9400	4700	14150	5680	3785
7	C	12100	5300	13700	5983	18450	11355	4540
8	D	18200	7200	20000	7937	29450	15140	4540
9	E	24300	9000	26750	9907	36200	22710	4540
10	E	32300	11200	35100	12103	54000	22710	4540

Source: CASA, 2005; ICAO, 2018a; NFPA, 2018; CAA, 2019; Certification of Airports, 2004
Notes: a - $Q_1 + Q_2$ amounts
b - Total includes Q_3 amount, used by NFPA only
c - Maximum discharge rate for a range of water carried

4.6 ARFFS staffing

Neither CASA, the ICAO, the FAS nor the CAA provide staffing numbers that need to be followed in their respective standards. The CASA MOS requires that during hours of operation and while any other aircraft movements that require use of a licensed aerodrome are occurring, sufficient trained personnel are to be detailed and readily available to staff the rescue and fire fighting vehicles and to operate the equipment at the discharge rates appropriate to the aerodrome category. In addition, ASA Operational Procedure (ASA, 2017) provides minimum fire crew numbers necessary for the various aerodrome categories.

The ICAO recommends a Task Resource Analysis (TRA) be completed to determine the appropriate number of personnel to deliver an effective ARFFS to deal with an aircraft incident or accident (Recommendation 9.2.45). The TRA is a qualitative risk-based approach, which includes a Workload Assessment that focuses on possible worst-case scenarios to identify the minimum number of trained personnel required to undertake the necessary tasks in real time before external services can attend the airport and provide assistance. The ICAO SARPs make specific note that if ARFF personnel are required to attend road traffic and structural incidents in addition to aircraft incidents, this must be considered when introducing appropriate procedures.

There are six phases to the TRA outlined in the Airport Services Manual (ICAO, 2015). This starts with an airport operator being clear as to the aims and objectives of the ARFFS and the tasks personnel must carry out. Next, a selection of representative realistic accidents that may occur at the airport are identified. Third, identification of the types of aircraft commonly in use at the airport is required. The fourth phase involves considering the probable location for the most realistic accident type that may occur, considering the location, environment, runway and taxiway, aircraft movements, infrastructure and boundary. Fifth is to combine the accident type with the aircraft identified and the location to build a complete accident scenario. Finally, a TRA facilitator with experienced airport supervisors and fire fighters, carry out the task and resource analysis using a series of simulations. The principal objective of the TRA is to identify in real time and in sequential order the minimum number of ARFF personnel required at any one time to carry out the requirements of the ARFF service.

The CAA require a TRA to be completed and the minimum level of staffing and supervisory levels resulting from the analysis should be detailed in the aerodrome manual. Their TRA allows for achieving the Principal Objective; safe and effective operation of all vehicles and equipment; continuous agent application at the appropriate rates; sufficient supervisory grades that can implement an Incident Command System; and the effective achievement of ARFF elements of the aerodrome emergency plan. The TRA process is outlined in an information paper CAP 1150 (CAA, 2014), and closely follows the ICAO method.

Table 6 Minimum ARFFS vehicle and staffing levels

Airport Category	ARFF Personnel		ARFF Vehicles	
	NFPA	AA	NFPA	AA
1	2	-	1	-
2	2	-	1	-
3	2	-	1	-
4	3	-	1	-
5	6	1+2	2	1
6	9	1+4	2	2
7	9	2+4	2	2
8	12	2+6	3	3
9	15	2+8	4	3
10	15	3+11	4	4

Source: ASA (2017, Table 1), NFPA 403, 2018 Edition, Table 8.1.2.1. Note that the NFPA standard is being consolidated into new draft, NFPA 460.

The NFPA standard is that staffing levels shall be established through a TRA based on the needs and demands of the airport. The TRA and Workload Assessment are used to examine the effectiveness of staffing levels and to analyse two levels of ARFF staffing, a minimum level and an optimum level. The NFPA also provide a minimum number of ARFF-trained personnel that are required to be readily available to respond to an incident, based on the minimum response times and extinguishing agent discharge rates and quantities required. The staffing levels determined by the TRA shall not be lower than the values specified in the NFPA standards, as in Table 6, which also shows that the minimum fire crew staffing for Australian airports for the different airport categories, as set out in the ASA Operations Manual.

In evidence to a Senate inquiry on the Performance of Airservices Australia (Commonwealth of Australia, 2018), the ASA Chief Fire Officer stated that TRA is not included in the Australian regulatory framework. Instead, crew numbers are based on an out-of-date methodology rather than the TRA approach recommended by the ICAO (Commonwealth of Australia, 2019b).

Each of the four largest airports in Australia, Sydney, Melbourne, Brisbane, and Perth, have a Domestic Response Vehicle (DRV) attached to the stations. In the case of Brisbane and Perth, the three persons assigned to the DRV previously were included in the 14 staff required for Category 10 coverage in the Airservices Operations Manual. However, when the DRV was called out to respond to a job, for example a first aid call, the station was only able to cater for Category 9 coverage. This was the subject of a series of questions to ASA at a Senate Inquiry into the performance of Airservices Australia (Commonwealth of Australia, 2018), following incidences where this occurred in November at both Brisbane and Perth. At the time these two airports were supporting Category 10 coverage yet had on a few occasions been reduced to Category 9 coverage when the DRV was called to an incident. Following a Senate hearing into the provision of rescue, fire fighting and emergency response at Australian airports in March 2019 (Commonwealth of Australia, 2019b), Brisbane and Perth airports were reclassified to Category 9 on the ASA website.

In the US, there is a personnel requirement for fire fighters stipulated by the Occupational Safety and Health Administration (OHSA) policy 29 CFR 1910.134, known as the ‘two-in, two-out’ rule. This rule requires that for a fire in a confined space, a team of two fire fighters may enter the space if there is a safety team outside, consisting of at least another two fire fighters. This has been accepted procedure in the US and is included in NFPA 1710, a comprehensive organised approach to defining levels of service, deployment capabilities and staffing levels for fire departments (NFPA, 2016). Further, the National Institute of Standards and Technology (NIST) conducted a series of full-scale fire experiments to determine the impact of crew size, among other things, on fire fighter safety and effectiveness and found a quantitative basis for the use of four-person crews in low-hazard response, like that outlined in NFPA 1710 (Barowy *et al*., 2010).

The NFPA’s response strategy to ARFFS operations is to not only respond to the fire and commence fire suppression, but also to aid in rescue operations. As an aircraft is a confined space, the ‘two-in, two-out’ rule is applicable to their standards. The US Department of Defense also uphold the ‘two-in, two-out’ rule for its ARFFS personnel.

There is no mention of ‘two-in, two-out’ in CASA, CAA or ICAO documentation. Yet in Australia, CASR 139.710 Functions of ARFFS states:

The functions of an ARFFS for an aerodrome are:

a) to rescue persons and property from an aircraft that has crashed or caught fire during landing or take-off; and
b) to control and extinguish, and to protect persons and property threatened by, a fire on the aerodrome, whether or not in an aircraft.

Hence, in the first case CASR's response strategy is like that of the NFPA and so entry to an aircraft on fire is considered part of the core function of ARFFS personnel. In the second of the functions, ARFFS personnel are required to respond to structure fires and non-aircraft fires on the aerodrome, and thus may be required to enter structures and confined spaces.

Domestic Response Vehicles (DRVs) are utilised at the four largest Australian airports. These vehicles are generally the first to respond to non-aviation incidents on the airport, including alarms and emergency medical response calls, and to structure fires, non-aircraft fires and fuel spillages. However, these vehicles are staffed by only three personnel. Hence, if the incident a DRV was responding to required entry to a structure (confined space), they would not be able to follow the 'two-in, two-out' principle until back-up arrived. Thus, they would be putting themselves and the public using the airport facilities at greater risk.

4.7 Equipment

Along with the appropriate amount of extinguishing agent, the proper allocation of vehicles and appropriate crewing numbers, the equipment used by an ARFFS is important in allowing them to fully carry out their duty of responding to an aircraft incident. Among these are the handlines, monitors and turrets provided on ARFFS vehicles. Monitors and turrets are specialised equipment required on ARFFS vehicles as the speed with which the water is required to be discharged in an aircraft fire is too high for hand-held hoses. Hence, when urban brigades are suggested as substitutes for ARFFS, a minimum would be that they have this equipment. Further, specialised equipment such as high reach extendable turrets (HRETs) and low-level high-performance monitors can give fire fighters greater control in their fire fighting activities.

HRETs, in particular, are important in allowing fire fighters to attack a fire from a high position and have been particularly successful in controlling internal fires to allow for safe rescue operations. HRETs are not required as part of the ICAO SARPs, but they are mentioned in the Airport Services Manual as providing fire fighters with greater flexibility in how they direct the foam stream. HRETs are defined as 'a device, permanently mounted with a power-operated boom or booms, designed to supply a large-capacity, mobile, elevated water stream or other fire extinguishing agents, or both' (ICAO, 2015: 8-8). The advantage is that, as the turret is extendable, it places the nozzle in front of and below the operator, providing them with a clearer view of the application of the agent, and reducing the amount of foam overspray.

Further, HRETs may incorporate penetrating technology that allows the operator to deliver extinguishment agent through an adjustable nozzle in and around the aircraft and into the passenger compartment. They can also use skin-piercing nozzles to penetrate the fuselage. This allows operators to inject water while occupants are evacuating and/or fire fighters are entering. In addition, HRETs can facilitate fire attack on upper decks of multi-deck aircraft, such as the B747 and A380. This increases fire fighter safety as it reduces their need to rely on ladders to conduct interior fire suppression or rescue on these aircraft.

The NFPA makes an allowance for airports to specify HRET equipment in ARFFS vehicles. The NFPA contends that use of a HRET has the greatest chance of success in rapidly cooling the interior cabin of an aircraft that is on fire to save non-ambulatory occupants (Scheffey *et al*., 2012). Kreckie (2011) argues that due to the diversity in age, health and physical condition of passenger demographics, there is a percentage of passengers on every flight who would be unable to evacuate an aircraft in an emergency without assistance. Scheffey *et al*. (2012) cite an evaluation of fire fighting technologies for improving occupant survivability in post-crash fires. The study looked at accidents over the past 25 years and concluded that the HRET had the potential to save approximately 12 lives per year worldwide (with a 90-percentile estimate range of 5 to 17 lives per year). Further, the authors cite a study on indirect interior fire fighting where it was found that in 15 of 84 accidents, a HRET could have been used to save lives, with an estimate of 371 potential lives saved (200 of these were in the one accident). The main advantage found of the HRET was the pace with which it can be implemented, above that of a manned fire attack. Scheffey *et al*. (2012) also cite a study that identified limitations in the use of HRET technology, such as not being able to be used on the section of fuselage obstructed by the wing; it may fix an ARFF vehicle to a position potentially filled with fuel; and it raises the centre of gravity of the ARFF vehicle increasing the potential for rollover. The authors also argue the use of the technology should be pre-planned and trained.

The FAA also makes allowance for airports to specify the provision of HRET equipment in ARFF vehicles. The FAA has conducted its own testing of the HRET technology. In one such test they found the HRET extinguished the burn area on average 53 per cent faster than a roof-mounted turret, under the same conditions. The FAA (2010) lists a range of advantages of the use of the HRET, but also recommend hands-on training and practical experience to understand its capabilities and limitations.

The CAA also recommend the use of HRETs and recommend simulation training should include specialist equipment such as HRETs. Further, operation of water pumps, monitors and HRETs comprise a standard Unit in the framework for competency of ARFF personnel (CAA, 2017).

Australian ARFFS vehicles are not equipped with HRET technology. This is despite the almost universal acceptance of their superiority in controlling post-crash fires and the fact the technology is not new and has been in use for decades. By 2008, 650 ARFFS vehicles around the world had been fitted with HRET technology (Rosenkrans, 2008).

4.8 Response times

Having required response times assists airports and ARFFS in planning the number and locations of fire stations required at an airport. Response times are measured from the time of the initial call to the ARFFS, to the time the first responding vehicle(s) is in a position to apply foam at a rate of at least 50 per cent of the discharge rate specified for the category of airport.

The CASA MOS outlines the operational directive of the ARFFS must be to achieve response times no more than three minutes to the end of each runway in optimum conditions. However, the operational objective is for the ARFFS to achieve a two minute response time to the end of each runway and a three minute response time to any part of the movement area. This aligns with the ICAO SARPs, where the standard is three minutes to any point of each operational runway, and the recommendation is two minutes; while it is three minutes to any other part of the movement area. Optimum conditions include good visibility, daytime, no precipitation, and normal route being free of surface contamination. In less than optimum conditions the ICAO recommendation is to meet the operational objective as nearly as possible.

CASA also stipulates other vehicles required to deliver the amount of extinguishing agent must arrive to provide continuous agent application at the required rate. ICAO, on the other hand, say that these follow-up vehicles must arrive no more than four minutes after the initial call, with a recommendation of three minutes.

Interestingly, NFPA is slightly more relaxed with its response times than the ICAO SARPS. The 2014 edition of NFPA 403 increased the required response time of the first-arriving ARFFS vehicle to reach any point on the operational runway and begin agent application from two minutes to three minutes. Further, the response time of the first-arriving ARFFS vehicle to any part of the movement area is four minutes, as it is to reach any passenger boarding areas. Secondary vehicles must arrive such that Q_2 is able to be applied 30 seconds after Q_1 has started being applied and Q_3 after a further three and a half minutes.

The FAA's requirements are slightly different again. The response time is 3 minutes from the time of the alarm to the time the first ARFFS vehicle reaches the midpoint of the farthest runway from its assigned post, or any other point of comparable distance, and begin application of extinguishing agent. All other vehicles must reach the same point within four minutes.

The CAA's response time requirements are identical to that stipulated by CASA. That is, the standard is three minutes to any point of each operational runway, but the recommendation is two minutes, in optimum visibility and surface conditions. The standard response time is three minutes to any other part of the movement area. CAA also stipulates that other vehicles required to deliver amounts of extinguishing agents should arrive no more than one minute after the first responding vehicle so as to be able to provide continuous agent application.

PART 2

CASA Policy Proposal PP 2101AS – Analysis and Critique

5. Overview of the CASA proposals

5.1 Broad concerns with the proposed changes

CASA released its draft *Policy Proposal PP2101AS - Proposed changes to aerodrome rescue and firefighting services regulations (new Part 176)* in November 2021. The 43-page document addresses the 'regulatory issues' arising from the 'review of the aerodrome rescue and firefighting services (ARFFS) ruleset' (CASA, 2021: 2) and considers policy changes which would create a "new … ARFFS ruleset".

In Section 6, we respond to each of the 'six broad policy areas' that form the basis for the 'proposed regulatory changes' in detail. In this Section we introduce some broader issues that allow us to place the more detailed analysis into a wider context.

CASA's proposals follow the completion of the Senate Committee Enquiry in 2019 (Commonwealth of Australia, 2019a, b). However, CASA adopt only some of the recommendations made in the Senate Report and misses the opportunity to implement some of the important considerations that relate to adopting world's best practice as outlined in the National Fire Protection Association standards on the provision of ARFFS.

CASA propose transitioning the existing Subpart 139.H into Part 176 as 'as a standalone ARFFS regulation Part', a shift that will have serious ramifications for aerodrome safety in Australia.

The prescriptive, rules-based approach that the ICAO SARP introduced to define best-practice in international aviation reflected a need to preserve public safety, prevent loss of life, and protect valuable infrastructure. Referring to it as 'inflexible' or 'red tape' misses the point. The goal is to minimise risk and provide certainty. The rules cannot necessarily prevent a disastrous accident in all circumstances. But they reduce the risk of such an incident occurring because of different operators adopting different interpretations within an outcomes-based approach.

The rules maintain standards and prevent a race-to-the-bottom regarding public safety. We have seen the consequences of self-regulation models in the financial sector, for example, where unregulated behaviour within an outcomes-based environment led to a near total collapse of the global financial system.

The rules-based approach minimised misinterpretation and provides a consistent framework for the industry to operate within. If a flexible approach is taken, then safety standards can easily become compromised because of different interpretations by the operators. There is substantial evidence that when sectors self-regulate some players cut corners to reduce costs and increase profitability.

The problem is articulated in Section 3.3 of CASA (2021) where the 'Impacts on Industry' are discussed. We understand that the airline operators 'have consistently raised concerns that the high establishment and ongoing costs of providing ARFFS are difficult to justify alongside advanced, preventative safety measures in air traffic control and aircraft avionics' (CASA, 2021: 35).

The dynamic in all these instances of deregulation is the trade-off between private business profitability and the relevant public good (in this case, public safety). Whenever this sort of trade-off is observed there is an overwhelming case to be made for prescriptive, rules-based regulation. The propensity to compromise the public interest in pursuit of private profitability is clearly evidenced across a spectrum of sectors – most recently, aged care, gambling, banking, insurance, superannuation, etc.

Moving to broad-based, outcomes-based regulative models pushes the incentive structure towards that propensity. While there are some trivial changes to the regulative framework that CASA propose which will not result in such a compromise, in general, the proposals are not supported by the evidence presented or available in the broader literature.

Australia should endeavour as far as is possible to reduce the differences between its regulative approach and the ICAO SARPS, thus bringing our practice in line with international standards, rather than propose changes that further differentiate our approach from those standards.

This is a sector that should avoid falling into prioritising cost-cutting and tilting the field towards higher profitability. Public safety is too important to be compromised in this way.

Any restrictions on the ARFFS capacity to respond to an incident threatening life, property, or environment on or in the vicinity of an aerodrome is reducing the level of safety currently provided and considered necessarily within the international protocols. The primary goal of the regulative environment is to maintain safety levels at the highest possible standards commensurate with the vast resource base available to a wealthy country such as Australia. While private business profitability is not unimportant, it can never be elevated above those safety concerns or be used to justify reductions in standards or reductions in ARFFS capacity.

In relation to the legitimate role of the ARFFS, unless an aerodrome has declared a local standby or full emergency, in which case the ARFFS would prioritise the aviation response, available emergency resources must be allowed the flexibility and discretion to respond to all incidents where there is a risk to life, property or environment. This discretion should be left with the senior officers managing the ARFFS to allocate available emergency response resources accordingly. In Part 1, we showed that immediate emergency intervention saves lives and reduces any probability of escalation to broader fields.

As discussed in Part 1, ICAO standards categorise aerodromes according to the fire extinguishing requirements of the largest aircraft using the aerodrome. The categories are intended to ensure that the ARFFS in place are of an adequate scale.

Working procedures are already in place that are invoked if ARFFS resources are temporarily required to attend to a non-aviation incident. There is a provision within the ICAO Annexe 14 which is termed the 'Remission Factor'. Chapter 2, Section 2.3.9 of the ICAO Doc 9137-AN/898, *Airport Services Manual, Part 1 – Rescue and Firefighting* introduces the 'remission factor', which we considered in Part 1.

5.2 The assertion of a cost-benefit of reduced ARFFS

In Part 1, it was demonstrated that only a small proportion (less than 15 per cent) of Australia's 190 CASA certified airports have ARFFS, which stands in stark contrast to the ICAO standard that requires that *all* certified airports maintain the capability to extinguish an aircraft on fire and rescue its occupants in an emergency on or near an airport, and to be at the crash site and applying fire suppressing agent in a maximum of three minutes. Other developed nations comparable to Australia, while not fully compliant themselves, provide superior ARFF coverage, and thus demonstrate far closer adherence to ICAO standards than Australia.

The CASA proposal to solely rely on passenger thresholds triggering a risk analysis, which will widen the gap between Australian and ICAO standards, is based on the view that this approach delivers an acceptable net benefit because the cost savings are significant, and the likelihood of a major disaster is negligible.

In part, the Government appeals to innovations in technology and processes as is evidenced in DIRD (2015: 11-18):

> The increased use of modern, safer aircraft and extension of larger aircraft to regional centres with more safety redundancies can reduce the likelihood of an aircraft accident that would require an ARFFS.
>
> ...it needs to be recognised that there are other infrastructure, technology and service measures that in the first place can be used to reduce the very low likelihood of an aviation accident before an ARFFS is required.
>
> These measures may include the establishment and enhancement of airspace management and air traffic control services and the availability of local fire services.
>
> There also continues to be improvements in modern aircraft safety, including better fire protection in the design of aircraft and changes in traffic levels that need to be taken into account.

It is true that aviation accidents involving fatalities have steadily fallen over the last several decades. A Report from the Centre of Full Employment and Equity (Quirk, 2016) provides more detailed analysis.

It remains the case that while Australia has had no large commercial jet crash fatalities, there will always be some degree of probability of a major civil aviation accident in Australia and we must always plan for that possibility.

5.3 The difficulties of using risk analysis in aviation

In general, CASA (2021) is continuing to tweak the methodology where a risk assessment is conducted of a given airport, once it has reached a threshold number of passenger movements, to determine if it should have a rescue firefighting service, or not, implying some will be justified in doing so and some will not.

The problem is that risk analysis in aviation is fraught. The next discussion is based on the analysis presented in the Centre of Full Employment and Equity Report (Quirk, 2016).

Risk assessments are a standard feature of commercial life, and we are used to significant decisions being made on their basis, as in allocating emergency services resources and determining the location of urban fire stations, etc. However, when we consider the nature of the risk we are attempting to assess in relation to a particular airport, we find that it is not conducive to statistical modelling, nor would other available methods be amenable to testing.

It would amount to little more than an unverifiable assertion as Goodwin and Wright, (2010: 356) note:

> we can use a rational process to assign an appropriate level of resources in anticipation of that event, even if this probability is very low. If we do not have a reliable estimate then we may assign an inappropriate level of resources.

To assess the relative need for an ARFF at one airport as opposed to another will require an estimate of the probability of an aviation accident occurring there and an estimate of the consequences should it occur. The worst-case *consequences* of an accident at a given airport can be reasonably anticipated, since we can know the passenger carrying capacity of the largest aircraft arriving there, and a significant research effort has been directed at modelling how different airfield features might affect an aircraft overshooting or veering off a runway, etc. (e.g., Ayres, *et al*., 2013; Kirkland *et al*., 2004). However, the possibility of estimating the *probability* of a commercial high-capacity regular passenger airline accident at a given airport is directly contradicted in the literature.

How do we assess the likelihood of a rare event? A major commercial jetliner accident at a specific Australian airport has never happened before. Thus, we consider that a rare event for assessment purposes. Safety management is about being prepared for an eventuality not because it happens frequently, but because of its potentially catastrophic consequences if it does. Reliable estimation of the statistical probability of a rare event is prevented by the absence of a sufficiently large and appropriate reference class (set of examples) on which to base probability calculations.

Hampson, *et al*., (2015: 62) note that:

> ... once we try to drill down to a more useful level of detail, such as would enable us to quantify the risk of a particular kind of accident, or an accident occurring in an individual airline or even country, or of an accident occurring within a given timeframe...
>
> [or even harder, at a given airport]
>
> ...such analysis becomes uninformative, because the absolute number of serious accidents over a year or even five years, when set against the number of passenger miles flown, is too small to support reliable inference.

Without prior examples of fatal jetliner accidents at a given airport, or indeed at any airport in Australia, on what basis could we determine the frequency at which they will occur in future, at one airport relative to another? Additionally, if an accident probability estimate was proposed for a given airport, how could its accuracy be subsequently checked? How would our general capability of assigning appropriate probabilities of accidents at airports be confirmed?

Predictability will be greater when we have data on a large set of similar events (that is, a large reference class) from which relative frequency information can be obtained. This will be the case when events are defined more generally — the greater the specificity of the definition, the smaller will be its reference class (Goodwin and Wright, 2010: 356).

Since reference classes only sample the past, and because rare events provide few examples to consider, factors that may cause future rare events may not even be present in the rare instances included in a reference sample, rendering previously collected data from other times and parts of the world outmoded for future predicting purposes.

Poorly calibrated (inaccurate) forecasts may also arise from erroneous modelling of the nature of the probability of rare events, because in the absence of measurable experience there is greater resort to assumptions about what should be considered, and if these are wrong, influenced perhaps by the worldview, ideology, emotional state, pet theories, self- interest, etc. of the estimator, they can have a profound effect on the result. Rare events that are unimaginable until they occur, such as two airliners flying into adjacent New York skyscrapers on the same September morning, are also not part of the reference set until they occur, yet before they occur, they evidently were to some extent probable since they occurred:

> their probabilities of occurrence (or even possibilities) are discounted due to sampling bias. The use of a reference class can therefore lead to poorly-calibrated forecasts for the occurrence of rare, high-impact, events (Goodwin and Wright, 2010: 356).

These biases and other subjective influences are not avoided by deferring to an 'expert':

> the common sense assumption of the veracity of expert judgment on the likelihood of rare, high-impact events is ill-founded. The lack of a reference class of prediction- outcome data for such rare events means that experts cannot learn from feedback, over time. It follows that bias in expert judgment is, likely to be prevalent – since solely heuristic processes can be utilised by experts in the generation of forecasts (Goodwin and Wright, 2010: 357).

Modern risk assessment strategies for estimating the probability of events with complex interrelated causes, as in the case of an aviation accident, attempt first to identify chain(s) of actual or possible causation, (Fault Trees and Event Trees), then estimate the probability of each discrete causal step. By aggregating the results, they seek to arrive at the probability of the event. The notion that this can get around the problem of the scarcity of samples available for aviation accident modelling is specifically refuted by Brooker (2011). Using the example of Bayesian Belief Networks, where clusters of experts are surveyed to arrive at an average estimate of factors contributing to an accident, the same issues that Goodwin and Wright identify continue to arise. What reference set are these experts relying on to make their judgements? Humans adopt simplifying heuristics to reduce complexity which can sometimes be very accurate and sometimes very wrong. Memorable events are more likely to be influential when estimating probabilities this way whereas:

> events that have never occurred, or only occurred in the distant past, may be assigned a de-facto probability of zero, or near-zero (Goodwin and Wright, 2010: 357).

The upshot is that these proposals that make it harder for an aerodrome to enjoy the safety of an active ARFFS are based on the implicit assumption of a zero probability of a major aviation accident - we can remove the safety net because the trapeze artist has never fallen in our experience.

There are two ways that we can deal with a rare and unpredictable event that can have catastrophic consequences:

- We can pretend it won't happen, or apply an ineffectual, tokenistic response, expose hundreds of people to an untimely and unpleasant death, and use some of the money saved to pay for a public relations campaign to repair the damage to our international reputation when our industry and government negligence is exposed; or
- We can accept the responsibility we have to protect the lives of everyone who flies to or around Australia to the best of our ability and accept a need for firefighters at

many airports who may ultimately never be called to attend a major aviation accident, though their presence will almost certainly save some lives every year.

Taleb (2010) demonstrates that when there is a possibility of a rare, predictable but catastrophic event, the best strategy for regulators is to accept a higher level of redundancy. Thus, to maximise survival odds, we should hold resources in reserve, which, in turn, means they may not currently be allocated in their most profitable immediate short-term use. Redundancy, which raises costs above the short-run minimum is found in all critical mission systems. Yet CASA appears to advance proposals that eschew this widely accepted principle.

We consider that national aviation and tourism make such an important contribution to the national economy and protecting our international reputation in aviation safety should be a high priority rather than expose that reputation to cost-cutting.

5.4 The way forward for aviation in Australia

In any review of this kind, the question of resourcing is significant. However, CASA are silent on the need for extra funding and the proposals are biased towards operating in a cost-cutting environment where concerns of safety are defined in 'cost' terms rather than human terms. We cannot find any reasonable basis for the assertion that ARFFS resources should be concentrated at the major airports with passengers at the smaller aerodromes ignored.

We also do not think it is appropriate to apply a privatised, competitive model to this sector. Where that approach has been applied (for example, the VET sector) dysfunction and failure has been widespread, which has considerably damaged our international reputation as a reliable supplier of first-class education. We argue below that where there is the possibility that an operator in the sector will prioritise profits over safety to glean short-term gains, the outcomes-based model of regulation preferred by CASA fails. In those instances, the only way to maximise safety is through the application of prescriptive, rules-based framework, which is in accord with the ICAO standards.

The CASA proposals do not increase safety in the Australian aviation sector and may diminish it.

We consider the redundancy principle, which essentially accepts the need for firefighters to be stationed at many airports where they may never be called to deal with a major aviation disaster is a preferred approach to safety than one that assumes such a disaster will never happen and therefore streamline the ARFFS coverage and effectiveness to the minimum that a public relations exercise can sell to the public.

In that regard, we consider the allocation of ARFFS to Australian airports to be woefully inadequate and unreasonably risks exposing the nation to major reputational damage as well as massive human and resource losses.

The way forward is to increase funding for ARFFS in Australia and to accept a transition to satisfying the ICAO standard at all certified airports, starting at Category 10 and moving as quickly as possible down to the smaller aerodromes.

This approach deals with the intrinsic inability to predict where or when an aviation accident will occur, by eventually covering all certified airports in keeping with our international obligations. It also allocates resources based on the things we can predict, namely the size of the emergency challenge we always face at any given airport.

6. The functions of ARFFS

The overwhelming impression one gains from reading the CASA Policy Proposal PP 2101AS (CASA, 2021) is that the emphasis is on cutting costs rather than improving safety in and around airports. In this proposal, CASA desires to limit the functions of the ARFFS to a narrow ambit concerned with 'aviation' incidents, which, of course, leaves a lot of ambiguity as to the limit of such an incident. Clearly, CASA thinks that dealing with non-aviation incidents, such as a fire in a building adjacent an aerodrome should not be dealt with by the ARFFS.

CASA (2021: 25) specifically proposes to 'Amend the function of the ARFFS', to 'better reflect the core functions of the ARFFS provider as the primary responder to aviation-related activities at an aerodrome'. It is asserted that this aim will be achieved by correcting 'identified inconsistencies between CASR Subpart 139.H and the Air Services Regulations 2019' (p.25). However, the use of the term 'core functions' appears to narrow the responsibilities and operations of the ARFFS capacity from what has been traditionally understood to be the functions, which in a practical sense would create unworkable demarcation issues because of the cost cutting that would result.

CASA (2021: 26) notes that it seeks to:

> Introduce new provisions that enable an ARFFS provider to deliver assistance outside its primary functions, i.e. non-aircraft and non-aviation related operations, or where an incident or circumstance that causes, or threatens to cause death or injury to persons, damage to property, harm to the environment or disruption to essential services, where such assistance is related to the function of providing rescue and firefighting services and does not impact upon the delivery of ARFFS in any way.

In terms of defining the functions of the ARFFS, we start by consulting the international standard. Chapter 9 of the ICAO Annexe 14 covers 'Aerodrome operational services, equipment and installations' and section '9.2 Rescue and firefighting' outlines the primary objectives of the ARRFS as follows (ICAO, 2018a6: 9-3, italics in original)

> *The principal objective of a rescue and firefighting service is to save lives in the event of an aircraft accident or incident occurring at, or in the immediate vicinity of, an aerodrome. The rescue and firefighting service is provided to create and maintain survivable conditions, to provide egress routes for occupants and to initiate the rescue of those occupants unable to make their escape without direct aid. The rescue may require the use of equipment and personnel other than those assessed primarily for rescue and firefighting purposes.*
>
> *The most important factors bearing on effective rescue in a survivable aircraft accident are: the training received, the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and firefighting purposes can be put into use.*

Accordingly, the ICAO obligations require a relatively broad vision of the activities and responsibilities of the ARFFS.

CASR 139.710 further defines these obligations:

> *(1) The functions of an ARFFS for an aerodrome are:*

(a) to rescue persons and property from an aircraft that has crashed or caught fire during landing or take-off; and

(b) to control and extinguish, and to protect persons and property threatened by, a fire on the aerodrome, whether or not in an aircraft.

(2) Nothing in subregulation (1) prevents the ARFFS provider for an aerodrome from performing fire control services or rescue services elsewhere than on an aerodrome, but the provider must give priority to operations mentioned in subregulation (1).

It is hard to see any conflict with these two renditions. The ICAO standard talks about incidents 'occurring at, or in the immediate vicinity of, an aerodrome' while, the CASR regulation adds a prioritisation to these spaces.

The stipulated sense of priority establishes an ordering of responsibilities. The ARFFS provider, has discretion within that ordering to engage in, for example, non-aviation related fire and rescue operations.

However, CASA (2021: 11) considers this discretion in the context of non-aviation developments 'on, and within the vicinity of aerodrome, challenges 'the notion of what should be considered an 'aerodrome' in relation to the function(s) and response area of ARFFS'.

In Section 2.2.4.1, CASA notes that the concept of an aerodrome is now somewhat fuzzy, given the non-aviation developments that have occurred within the aerodrome proximity (retail, hotels, commercial buildings, etc.). They suggest that broadening the ARFFS to serve these non-aviation functions 'has increasingly presented challenges in relation to Airservices response capacity' (CASA, 2021: 11).

It is not germane here to get into the nuances of the differences between an airport and an aerodrome. The ICAO consider and aerodrome to be 'a defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of aircraft.' An aerodrome may or may not be classified as an airport (for example, in relation to certification and licensing). But the difference is not germane here.

The reality is that the functions of the ARFFS have always been specified in terms of aviation space and the proximate vicinity of the space, which might include a local housing community, for example (see Annexe A). The difference that CASA is searching for in this proposal is aviation versus non-aviation, which raises further questions as to what the strict demarcation might be. For example, if a local housing estate or factory fire has the capacity to spread quickly to structures or equipment within the aerodrome precinct, is that a non-aviation incident? If a person has a heart attack within a terminal or in an airport carpark, does that constitute an aviation or non-aviation incident? The compelling point is that the ARFFS must currently prioritise its duties and that decision and ordering should be left to the OIC and their team at the aerodrome.

A further version of the functions of the ARFFS are articulated in the Air Services Regulations 2019 – REG 16 which states:

Functions related to providing rescue and fire fighting services

(1) In providing rescue and fire fighting services, AA has the following functions:

(a) to conduct operations to rescue people or property from, or to protect people or property threatened because of, an aircraft fire, aircraft accident or aircraft incident:

(i) at an aerodrome; or

(ii) in the vicinity of an aerodrome;

(b) to conduct operations to protect people or property threatened by a fire, accident or incident (other than an aircraft fire, aircraft accident or aircraft incident) in an area of an aerodrome connected with, or used for the purposes of, activities related to aviation;

(c) to conduct operations to control and extinguish a fire referred to in paragraph (a) or (b);

(d) to perform activities and provide services related to an operation or a circumstance mentioned in paragraph (a), (b) or (c).

Note 1: AA must perform its functions in accordance with the Act, including in a manner that is consistent with Australia's obligations under the Chicago Convention--see section 9 of the Act.

Note 2: Under Subpart 139.H of the Civil Aviation Safety Regulations 1998, an ARFFS (short for aerodrome rescue and fire-fighting service) provided by AA as an ARFFS provider must be in accordance with the requirements of that Subpart and the Manual of Standards for that Subpart.

Note 3: AA may also provide services and facilities in emergencies and other circumstances--see section 20.

(2) In carrying out its functions under this section, AA must give priority to operations that are conducted:

(a) at an aerodrome; or

(b) within 1000 metres of any boundary of an aerodrome.

Note that these functions are not functionally different to those outlined in the previous statements noted above. However, CASA argues that 'Whilst CASR 139.710 and the *Air Services Regulations 2019* encompass the ICAO SARPS, they also outline additional ARFFS functions' (CASA, 2021: 12). It is this conclusion that appears to motivate this policy proposal.

However, it is hard to see how the Section 3.1.1 proposals are an advance. The existing functions defined above prioritise the role of the ARFFS as the primary responder to aviation-related events.

In Annexe A, we present an evaluation of the current asset risk at Australian airports and the areas in the vicinity of those airports. The overwhelming conclusion is that if life, health, safety, property, or the environment are exposed to risk, the closest available emergency resources must be deployed. No other allocation rule makes sense in this context. Any proposed changes to the regulations must not restrict the ability of ARFFS to respond to emergency incidents.

CASA also proposes to rely on 'interface arrangements with State or Territory Fire Brigades' to deal with incidents within the vicinity of the aerodrome. The ARFFS officials are likely placed in an invidious position if there is a call for a non-aviation incident (however, we define that) and they assess the response of the State brigade is likely to be detrimental to safety.

Our enquiry suggests that the functions of the ARFFS should not be narrowed. Trying to restrict the functions of the ARFFS, a series of difficult demarcation issues arise, which cannot be efficiently solved by prescriptive rules. The overwhelming evidence supports the position that professional judgement exercised in an environment where officers understand the ordering of priorities is a more efficient way to organise and execute these services. Further, concern for the operational environment should be added to ensure that aerodrome operators and ARFFS officers handle fuel, chemical and foam spills appropriately.

CASA is also concerned about the increased challenges to 'response capacity' and proposes to 'introduce response area requirements when performing ARFFS functions, requiring an ARFFS provider to give priority to operations at an aerodrome, or within 1000 meters of any boundary of an aerodrome' (CASA, 2021: 26).

We found no evidence that aviation safety has been compromised because of the ARFFS in Australia operating within these constraints (see Part 1).

7. The ARFFS establishment criteria

The current ARFFS establishment criteria are specified in Regulation 139.755 (CASR, 1998) and in Chapter 2 of the accompanying Manual of Standards (MOS) Subpart 139.H (CASA, 2005). The regulations always prevail over the MOS if inconsistencies are present.

As we noted in Part 1, the establishment criteria applicable to Level 1 Category Airports are:

a) *an aerodrome from or to which an international passenger air service operates; and*
b) *any domestic aerodrome through which more than 350,000 passengers passed through on air transport flights during the previous financial year.*

The ARFFS may be considered for disestablishment if 'the number of annual passengers on air transport falls below 300,000 and remains below this level for a 12-month period' if safety considerations are satisfied.

In the case of Level 2 category aerodromes 'where the number of annual passengers on air transport is less than 350,000 may provide a level of ARFFS'.

The current criteria do not recognise some regional and remote aerodromes, that are used for international passenger operations, have lower total air transport passenger numbers and/or infrequent international passenger air service flights.

CASA proposes to reduce the current establishment criteria (CASA, 2021: 26)

> to be based on the total number of scheduled air transport passengers only

Which they say:

> would remove the current distinction between international and domestic passenger services, and retain passenger numbers as the regulated ARFFS establishment trigger.

CASA's proposal explicitly will also 'allow occasional or seasonal international passenger services at regional and remote aerodromes without imposing ARFFS requirements' (CASA, 2021: 26).

Even though the 2015 DIRD Policy Paper for Consultation led to a change in practice with respect to the establishment triggers, DIRD still considered the 'preferred approach to ARFFS Establishment/Disestablishment' recognised that the trigger should include both 'annual passenger levels at an airport' and 'receipt of scheduled international passenger air services' and the risk assessment process conducted by CASA:

> Would also determine the appropriate level of ARFFS categorisation which generally reflect the types of aircraft serviced by the airport

The proposal is clearly out of international kilter as noted in Part 1 and would add to Australia's non-compliance with the ICAO standards.

As we saw in Part 1, Canada, like Australia has passenger thresholds, above which ARFFS is required at an airport. However, their passenger threshold is 180,000, just over half of Australia's threshold. Further, New Zealand require certification at airports used by aircraft with a passenger capacity of 30 in regular passenger transport and where there are 700 movements in the busiest consecutive 3-month period.

The question that remains unanswered by Australia's regulators is why our standards are so different to Canada and New Zealand, for example, especially when the ICAO standard would suggest we have ARFFS at all certified airports.

Why does the 350,000 passenger threshold represent a safety improvement, when Canada only has 180,000? The plausible explanation for the difference lies in a cost-cutting agenda rather than have anything to do with safety enhancement.

As we noted in Part 1, the regulatory review conducted by the Department of Infrastructure and Regional Development in 2015 (DIRD, 2015) tried to increase the passenger movement threshold for trigger a CASA risk review to over 500,000 over a 12-month period thus making it harder for an Australian aerodrome to enjoy the safety of an ARFFS and by intent to reduce the safety coverage for aviation in Australia. Fortunately, the new Federal Minister returned the trigger thresholds to the previous levels of over 350,000 passenger movements in 2018.

The latest CASA proposal is just one of a long history of attempts to cut ARFFS to the Australian aviation sector.

The question that CASA needs to address in this regard is why targeting aerodromes where more passengers arrive and depart is a better approach than examining each aerodrome on a case-by-case basis for its risk profile, which may not be closely correlated with passenger movements. In Section 5, we argued that the CASA approach is intrinsically flawed and is based on a blind hope that no major disaster will befall our aviation industry. It defies the well-accepted redundancy principle.

8. The ARFFS establishment requirements

CASA (2021) recognises that there should be a clear process to introducing an ARFFS, once the ARFFS establishment criteria are triggered and that there should be legal penalties imposed if an aerodrome operator does not ensure an ARFFS is in operation once the requirements are met. This appears to a straightforward exercise in process and appears uncontroversial.

However, in this context, CASA (2021: 27) also proposes:

> to identify Airservices as the principal, but non-exclusive, provider of ARFFS in Australia … This proposed approach emphasises the legislative role of Airservices, whilst also providing flexibility for an aerodrome operator to either provide ARFFS, or engage an alternate ARFFS provider, subject to ARFFS approval requirements in either instance.

There are two issues that arise here:

- Irrespective of the way the ARFFS are supplied (contestable or not), there must be a funding model that ensures there is an adequate scale of provision. If that issue is not dealt with, we get locked into exercises where options are discussed which may not be relevant in a better funded environment.
- Once funding is adequate, what is the best way of ensuring the funding is delivered to provide first-class ARFFS?

While the Australian government considers the contestable supply of ARFFS to be preferable, the case is weak and relies on textbook assertions about economic efficiency and lowest-price provision to aerodromes, which would it is asserted result in lower airport charges for commercial airlines without compromise to safety.

The theory of contestable markets was introduced by Baumol et al., (1982) as the basis for regulatory policy reform. The theory asserts that it is not the number of firms that matter for minimum-cost pricing but the ease of entry. The theory asserts that if specific assumptions are met, then above-normal profits will be lower because firms would fear the entry of others intent on competing for a share of the excess profits.

The assumptions that are required to hold, in order to deliver the theoretical results, include: no technological disadvantage or product quality borne by an entrant; entry is free and exit is costless; and consumers alter consumption patterns immediately as price differentials form (no loyalty ties).

Baumol (1982: 4) noted that a contestable market is one where ‘any firm can leave without impediment, and in the process of departure can recoup any costs incurred in the entry process’. This means there is no risk in entry. This idea led to the concept of ‘hit-and-run entry’ where any ‘transient profit opportunity’ can be seized by an entrant who can ‘go in, and before prices change, collect their gains, and then depart without cost, should the climate grow hostile’.

Quite clearly, these assumptions made by proponents of contestable markets do not hold in the real world. Economist Mark Blaug wrote (1996: 594-595):

> Everyone admits that these beautiful theorems are mental exercises without the slightest possibility of ever being practically relevant: first-best optima are never actually observed and in a second-best world, it is not in general desirable to fulfil any of the first-best optimum conditions; in other words, piecemeal

> welfare policies may be based on good or bad qualitative judgements but they are not based on rigorous analytical judgements.

Earlier Lipsey and Lancaster (1956) had introduced the notion of second best, which showed that if the conditions of optimality did not hold, then there should be no presumption that some move towards them from a current state would deliver welfare gains. The second-best solution might look nothing like the first-best solution. While they were considering a perfectly competitive market, a similar logic is applicable to contestability theory, which asserts, without rigorous proof, that departures from the perfect situation do not preclude improvements if policy is directed at reducing the real-world departures from the optimal conditions.

Schwartz and Reynolds (1983), for example, argued that the claim that near contestability was a good approximation to perfect contestability was merely an unproven assertion. There have been many subsequent critiques of contestability as a guide to policy (Spence, 1983; Shepherd, 1984; Scherer, 1989; and Agliardi, 1990). Evendon and Williams (2000: 76) concluded that 'Contestability theory no longer holds widespread support amongst academic economics in the field of microeconomics policy because the assumptions have come to be regarded as implausible as a matter of logic or empirical evidence.'

The point is that while CASA might suppose that breaking the exclusivity of Airservices Australia in relation to the provision of ARFFS at Australian aerodromes, the theory that underpins this notion is largely inapplicable. Thus, we must make judgements based on the conditions on the ground rather than the textbook. Using these theoretical approaches to design regulatory policy is likely to be fraught.

It is likely that ARFFS provided by Airservices Australia will be more efficient and at lower cost than services supplied by smaller entrants in localised markets. This is because a single national provider can exploit scale economies in the crucial areas of skills development (training), rotational relief for staff, and the provision of career ladders. A localised operator at a single aerodrome is likely to encounter higher unit costs and may compromise safety as they struggle to make profits.

With the exception of specific arrangements that are applicable to the Norfolk Island Regional Council, the preferred way forward would appear to be maintaining Airservices Australia as the only CASA approved provider for all certified aerodromes in Australia.

There is nothing in the CASA briefing paper that justifies a departure from that position.

There is also the question of the way in which existing assets held by Airservices Australia are dealt with if contestability becomes the norm. There are many dangers involved where a new ARFFS provider uses their contract to pursue profits without the necessary investment in maintaining the equipment and vehicles. This concern is irrespective of whether the assets are transferred at fair value or leased.

There are many examples in other sectors, where after contestability has been introduced, new entrants pursue a short-run profit maximisation strategy which then leaves the assets stranded.

What about the competitive neutrality argument, where the incumbent government-owned provider is prevented from using that incumbency and public ownership to advantage in a tendering process?

The argument is always fraught. First, why shouldn't the best provider get the contract, irrespective of their ownership status.

Second, trying to compare a public enterprise to a private enterprise is flawed at the most elemental level because their objectives must be different. A private company owes a duty to its shareholders to maximise value and will ignore social costs and benefits unless the regulative framework force those concerns on the decision-making process. Australia does not have a good record in this regard. Think about the carbon using industries who overproduce in relation to social costs and benefits because the price of carbon is not part of their allocative decision-making.

Conversely, thinking of a public enterprise in terms of the same calculus – rate of return on capital, etc – that we apply to private corporations, is unsound. The goals of public enterprises should never be to 'make profit'. Rather, we want the public activities to advance net social benefits, which could mean in a strict economic sense that they would record accounting losses.

The idea of competitive neutrality is thus incommensurate and relies on us considering public enterprises as private corporations, an erroneous logic that will typically lead to poor allocation decisions being taken.

9. Graduated ARFFS services

It is recognised that the establishment of a new ARFFS requires considerable forward planning given the complexity that such a decision involves. In this context, there is a tension between the current establishment criteria and the practicalities of establishment. There are two sources of time lag involved:

1. The recognition of the trigger event and the subsequent risk analysis determining the establishment; and
2. The actual planning, construction, and creation of the service once establishment is recommended.

The problem then is that a qualifying airport, under the current rules, may experience some delay in having an adequate ARFFS. This problem, is in a sense, created by the approach that CASA has chosen to take, which is at odds with the international practice. By seeking to elevate cost-cutting above a more prudential approach to service provision, CASA has introduced a backward-looking regime, which creates these lags.

The CASA solution to the problem they have themselves created is to recommend a solution that further dilutes adherence to acceptable standards. They propose (CASA, 2021: 17):

> the initial establishment of an aerodrome-based aviation- related emergency response capability (i.e. not to full regulatory standards), which would focus on providing assistance during aviation-related emergencies and incidents at an aerodrome, pending the establishment of a full ARFFS

The temporal rules they propose whereby once a trigger event occurs, a series of steps which may include the creation of a graduated service before a full ARFFS is in place, only serve to reinforce the fact that they are prepared to allow an aerodrome to operate below the regulatory standards, even though that facility qualifies under the existing rules for a full ARFFS.

There are many problems with this approach. Obviously, some capacity is better than none where risk is involved. But scale is also a significant factor, and the overriding consideration always must be the effective delivery of safety recognising discontinuities in service delivery - the necessity of fixed costs in equipment and personnel at any scale.

The acceptance of a graduated approach also biases the function of the ARFFS to be narrow in conception. A small presence at an airport would have less degrees of freedom to deal with an emergency that may have several incident theatres.

Once we recognise that the timing problem is, in fact, a function of the rules themselves, a different approach to that advocated by CASA would be forthcoming. The CASA sequence is inadequate because it could easily compromise safety during the period the graduated service is in place, which could be up to 12 months.

If a forward-planning approach is taken, then the time lags can be shortened if not eliminated. Under this approach, an aerodrome operator would be compelled to have a fully compliant ARFFS in operation when the establishment criteria are met. But there is no reason for the establishment trigger for an ARFFS be the same as that used to trigger a graduated service.

Two examples can be given. First, if an aerodrome is developing a strategic plan to service international tourists as part of a regional development plan and it anticipates it might take a few years to work out the business plan, upgrade terminal and runway facilities, etc then a graduated service could be implemented as part of the capacity building so that when the international service begins a fully compliant ARFFS is in place.

Second, a graduated ARFFS establishment trigger might reasonably be set for aerodromes not taking international flights at passenger numbers considerably lower than 350,000, especially if the strategic plan of the aerodrome and the forward passenger estimates based on that plan suggest that the 350,000 threshold would be realistic in a year or so.

The temporal perspective offered in the CASA proposals is also ambiguous. When would a graduated service commence? It appears that an establishment trigger for an ARFFS must first be observed by the airport operator, who then has 3 months to provide a 'safety case' to CASA to establish an ARFFS.

The operator then has up to 12 months to establish either a graduated, non-compliant service or a full ARFFS. Should the graduated option be chosen, the operator has a further 12 months to establish a full ARFFS. The ambiguity lies in the time it takes CASA to respond to the safety case and conduct its risk analysis, but it appears that 27 months could elapse after a trigger event occurs before a compliant ARFFS is in place.

That means that more than 700,000 passengers and any n umber of international flight arrivals/departures would be less than fully protected against harm for more than two years and may be totally unprotected for 15 months.

That appears to be an unacceptable departure from Australia's obligations under the ICAO SARPs. We consider that extent of departure to be highly significant.

Further, following ICAO Annexe 14 9.2.1 SARP – 'Rescue and firefighting equipment and services shall be provided at an aerodrome' and the level and protection (9.2.3) 'shall be appropriate to the aerodrome category'. Even Category 1 aerodromes (those where the aeroplane overall length is less than 9 metres) should have some (graduated) firefighting capacity.

We recommend that CASA ensures that some form of professional firefighting capacity exists at all registered airports and that the necessary investment be made by government to achieve this goal, which will also bring Australia into line with the requirements outlined in the ICAO SARP.

10. Removal of prescriptive regulatory requirements

Aviation must be highly regulated because the operational risk is high and can generate catastrophic consequences in the case of an accident. There have been many layers of regulation (national, international) imposed on airport operators and airlines.

The traditional approach to regulation has been the prescriptive, rule-based framework which sets the rules that sector players must operate within and provide a path to achieving desired operational outcomes. The prescriptive approach thus includes strict definitions of what constitutes safe operations the processes required to be compliant. The rules are typically transparent, and the operators understand their responsibilities. In that sense, it was believed that the regulative approach delivered high levels of certainty in a highly uncertain environment.

However, recent developments in the aviation industry have mirrored the general shifts in regulative thinking over the last several decades where 'free market' approaches have gained dominance. We have seen the impacts of the 'deregulation', 'self-regulated' developments in labour markets, financial markets, and, increasingly in the aviation sector. We consider these developments to be more based on ideological zeal than firmly evidence based. The failure of the financial market model during the Global Financial Crisis is testament to the problems that self-regulation brings, when there is no guarantee that all the players in the sector will behave in accordance with the hopes of the regulator. The 'light touch' regulation of financial products and the reduction in regulatory oversight was a major contributory factor in the near collapse of the global financial system in 2008.

In Australia, CASA was formed as part of this new approach to regulation, where the regulative functions of the Civil Aviation Authority of Australia were split into safety (CASA) and air traffic control (AA). The short history of CASA shows that is has always been reluctant to adopt the existing ICAO SARPS (Australian Flying, 2016). As we noted in Part 1, Australia is non-compliant with those standards in many ways.

And, for the last 20 years or so, CASA has been increasingly pushing the aviation sector to self-regulate so that the relevant players manage their own risk. CASA's justification is that the prescriptive approach specified, for example in the 'Annex 14 SARPS, CASR Subpart 139.H and the MOS Subpart 139.H contain several requirements that are now considered to be unnecessarily prescriptive and additional to Annex 14 requirements' (CASA, 2021: 18). In general, it is argued that the rules-based approach stifles innovation and inflates costs in the sector, in addition, to being detrimental to business investment. Increasingly, CASA has granted 'exemptions' from the rules, which they claim has led them to believe that these rules can be removed permanently in favour of an outcomes-based approach.

The underlying idea of outcomes-based regulation is that the same end-goals are achieved in different ways, allowing operators to determine the processes and means to satisfy the regulator. Outcomes-based regulation shifts the focus from detailed prescriptive rules, to defining broad outcomes goals that are required. The logic of outcomes-based regulation is that the private firms are best placed to design processes and implement decisions within their own operating environments. There are also costs in trying to implement a 'one-size-fits-all' approach to a sector with diverse operations and functions. Thus, it is claimed that the regulator need only articulate the required outcomes and leave it to the businesses to work out how they will satisfy the regulator's requirements.

However, the rhetoric hides weaknesses with this approach. Prominent researcher Julia Black (2007: 3) notes that this approach is:

> ... criticised for not providing certainty; for creating an unpredictable regulatory regime in which regulators can act retrospectively; for allowing firms to 'backslide', and get away with the minimum level of conduct possible; and thus for providing inadequate protection to consumers or others.

The literature makes it clear that if there is any propensity among firms to adopt a minimisation strategy then a rules-based regulative model will be preferred (Baldwin, 1995).

The shift to outcomes-based and risk-based regulation as opposed to prescriptive rules-based regulation is one of the hallmarks of the deregulation era that has seen government diminish its oversight of industry. This shift has been justified by an appeal to enhanced flexibility and reduce business costs but there are many examples across many sectors where the reality has not matched the rhetoric. As noted above, the 'light touch' regulative approach, for example in the financial sector created the chaos that manifest as the Global Financial Crisis. There are many examples of self-managed regulation in utility which has led to underinvestment in maintenance and capital development and damaging breakdowns.

Further, for outcomes-based regulation to be effective, the regulator must be able to specify clear outcomes, which then allow the airport owners to be able to demonstrate achievement. One of the problems with this approach is that the outcome can be defined in many ways - narrow to broad, etc - which introduces uncertainty in design and measurement.

Are all the desired outcomes of the aviation safety system capable of such clear articulation, especially when the most disastrous are rarely encountered but always possible?

We know that if the ARFFS capacity is well-equipped and trained, it will be able to respond quickly to even the most dire emergency and minimise the likely costs. That certainty is lacking in an outcomes-based system.

Think back to the GFC. The British regulator, the UK Financial Service Authority (FSA), came under pressure from the national government and adopted a 'light touch' approach and moved towards a 'principles-based' regulative model incorporating outcomes-based regulation.

History tells us that this proved to be disastrous as the private players took advantage of the increased 'flexibility' to adopt rogue strategies which enriched some interests but brought the global financial system to the brink of collapse. It was only a return to a 'rules-based', prescriptive regime that prevented that collapse.

Black (2007: 18) notes that:

> Although heavy sanctioning can act as a deterrent to non-compliance in many cases ... the anticipated error costs for firms of "getting it wrong" are higher with respect to Principles than detailed rules ...

Is CASA sure that every airport owner it must deal with will not seek to minimise their regulatory compliance in pursuit of profit, especially as the important outcomes are difficult to specify and measure? For example, in the case of airport safety, which might involve a 'tail event', how can we measure that an airport owner is complying and achieving the objective? The absence of a major disaster is not a measurable event.

The outcomes approach is also subject to difficulties in reaching a united position of the achievement of a particular outcome. There is usually considerable room for ambiguity.

Further, outcomes-based approaches suffer from the typical problem of differentiating quality from quantity. An airport owner can satisfy the quantity outcomes (perhaps) but measuring the quality is more difficult.

We emphasise that the prescriptive, rules-based approach protects public safety in situations where different interpretations by aerodrome operators about training and equipment standards can create divergence in operating effectiveness. The priority must be public safety and any move to flexibility in the way the high-level standards are reached is likely to be detrimental.

As we noted in Section 5, there are many examples where business objectives (cost-cutting, profit-seeking) compromise the quality of service and in some cases lead to crises. While governments were able to bail out banks during the GFC and save the financial system from collapse, the same options are not available once an aviation disaster has occurred.

11. Modernisation of ARFFS standards.

CASA (2021) considers a number of requirements which previously were compliant with Annexe 14 SARPS and Subpart 139.H are effectively obsolete given developments in technology and equipment. They are effectively seeking to ratify the exemptions to these requirements that they have been granting and making the revised practices part of the permanent regulatory framework.

Tying in with our previous discussion, the proposed changes are part of their relentless push to broaden the outcome-based approach which they consider to be an expression of modernised regulation. The analysis in Section 7 (above) thus is also apposite here.

The danger of this approach is that certainty is lost, and the provision of safety then becomes dependent on the interpretations and decisions that a multitude of operators make, some of which may not reflect best practice but are rather driven by commercial, profit-seeking motives. In some sectors, that might not present the possibility of catastrophic outcomes. But in aviation, safety must be the paramount concern and a risk-averse, rules-based framework eliminates the possibility of operator flexibility leading to inadequate ARFFS responses.

CASA (2021: 31-33) propose changes to nine main areas and we consider each in turn.

3.1.6.1 Define the roles and responsibilities of the aerodrome and ARFFS provider in relation to the establishment and provision of ARFFS, including the provision of required facilities and infrastructure on the aerodrome.

CASA argues that the current regulations only specify that ARFFS must be provided for aerodromes that meet the establishment criteria. However, the regulations do not specify the roles and responsibility of the aerodrome operators in terms of considerations of the ARFFS facilities and infrastructure. There are several dimensions to the adequate provision of ARFFS capacity including:

- Access.
- Facilities for replenishing fire vehicles.
- Emergency roads.
- Gates.
- Communication equipment.
- Storage and training facilities.

These facility and infrastructure requirements should be reflected in any new aerodrome development and be required renovations of existing aerodrome infrastructure.

Research suggests that aerodrome operators typically do not take these issues into account. There are several examples that emerged in our enquiries where safety is compromised by diminished Australian regulations. One example relates to the drainage infrastructure (culverts, bridges, etc) at Australian aerodromes, which are not designed to support the axle loads imposed on them by ARFFS crash tenders. As a result, the ARFFS vehicles must utilise an alternative route which negatively impacts on response times to some areas of the aerodrome and thus compromises safety.

Another way in which safety is being compromised by inadequate regulatory requirements is in provision of fire hydrants for replenishing fire vehicles. An example is the ARFFS's limited ability to replenish extinguishing agent during an aviation incident. The Australian regulations currently require hydrants that are capable of achieving a benchmarked flow rate but the number of hydrants and their locations are not specified. Research has revealed that this limits the ARRFS ability to replenish vehicles after an initial fire attack. Regulations in the UK, for example, require international aerodromes to have water hydrants with appropriate flow adjacent to their runways and at 60 metre centres for the full length of the runways. The benefit provided to ARFFS capability and hence public safety at these locations is significant.

3.1.6.2 Allow the ARFFS Fire Station Communications Centre (FSCC) to use technology-based solutions, such as runway view cameras, to assist in the observation of all aircraft approaches and departures.

Currently, the rules require a FSCC to have 'clear vision of the runway and 'short final' approaches and all landings and take-offs must be observed by the FSCC operator. This obviously requires the infrastructure be in place to 'provide clear vision' of the relevant segments of the aerodrome. To augment these requirements, CASA want to use technology (closed-circuit television, etc) to 'enhance the view of all landings and take-offs' (CASA, 2021: 21).

At first blush, the proposal seems straightforward and should not be used at some future point for eliminating the physical presence of the FSCC infrastructure and operators. Technological devices may improve vision or provide ratifying confirmation of a visual observation, but it is hard to ever see them replacing the human element.

Further, the proposal is light on where the technology would be deployed. Would the CCTV cameras, for example, be used to 'enhance' the view that the FSCC control cabin already enjoys – that is, at the thresholds for landing and take-off, or would they be deployed elsewhere where the direct vision is less clear. For example, the main north-south runway at Sydney International Airport is 3,962 metres long (the longest in Australia). There are 11 airports with runways that exceed 3,000 metres. This would suggest many CCTV camera points would need to be installed.

Further, there must be a minimum camera standard with high-definition screen capability to ensure that the FSCC operator enjoys 'enhanced' vision rather than is forced to used CCTV technology that merely satisfies the requirement that some form of camera system is in place.

3.1.6.3 Amend the requirement for aerodrome fire alarms to terminate at the FSCC, reflecting a change in industry requirements (increasing use of Approved Fire Alarm Service Provider(s)) and the clarified role of ARFFS, i.e. aircraft and aviation-focused refer 2.2.3.1).

The paramount requirement of the ARFFS infrastructure is to minimise response times in the case of an emergency to maximise public safety. It is hard to understand how creating an organisational break in the chain of alarms is a modernisation, unless one equates modernisation with fashionable practices, such as outsourcing, which has more to do with ideological shifts than improvements in outcomes.

The justification provided by CASA (2021: 21) refers to 'flexibility to streamline infrastructure and communications requirements', which appears to be code for cost-cutting. However, in what way is it more flexible for the aerodrome to enter contractual relations with a AFASP and monitor compliance with that contract rather than maintain the current relationship with the ARFFS provider?

Further, how does it streamline communications and infrastructure if the alarm signal is diverted from one location to another?

One could also project, consistent with the earlier proposal to limit the ARFFS function, that this proposal allows the possibility of the state fire brigades becoming a competing emergency responder sourcing signal from the AFASP. Given the analysis in Part 1, we would consider this to be a diminution in standards, as the fire fighting skills required in the aviation setting are specialist.

3.1.6.4 Introduce minimum operational staffing requirements for aircraft-related incidents / accidents in accordance with aerodrome-specific requirements, as determined by the Task Resource Analysis (TRA), with minimum staffing levels to be approved by CASA.

The minimum number of ARFFS personnel that can respond in an efficient manner to maximise safety in the event of an emergency is a function of ICAO aerodrome category (which reflects the size of the largest aircraft using that aerodrome. The ICAO Air Services Manual also calls for staffing considerations to include the use of self-contained breathing apparatus (rescue teams) and appropriate incident command/management structures. Both impact minimum staffing required on the fireground in addition to vehicle numbers/personnel.

The ICAO recommends a minimum of one rescue and firefighting vehicle for aerodromes with ICAO index of 1 to 5, 2 vehicles for Index 6-7 aerodromes and 3 vehicles for 8-10 category aerodromes (ICAO, 2015).

In terms of Personnel, the ICAO Annex 14, 9.2.44 recommends that:

> During flight operations, sufficient trained and competent personnel should be designated to be readily available to ride the rescue and fire fighting vehicles and to operate the equipment at maximum capacity. These personnel should be deployed in a way that ensures that minimum response times can be achieved and that continuous agent application at the appropriate rate can be fully maintained. Consideration should also be given for personnel to use hand lines, ladders and other rescue and fire fighting equipment normally associated with aircraft rescue and fire fighting operations.

The specification of the minimum then becomes a technical exercise and there are no requirements in the CASR or MOS. ASA Australia (2017) produced an Operational Procedure statement in November 2017 which provided guidance on the minimum number of personnel required at category 5 to 10 aerodromes (see Table 6). Further guidance comes from research published by the National Fire Prevention Association (NFPA) which is an international organisation, which produces standards that are aimed at 'eliminating death, injury, property and economic loss due to fire, electrical and related hazards' (NFPA, 2022).

The National Fire Agency connects the minimum number of vehicles with the minimum required ARFF personnel at airports, in Chapter 8 of its standard NFPA 403 (NFPA, 2018), which are summarised in Table 6.

The NFPA state (2018: 15) that:

> Under no circumstances shall the minimum required staffing be less than those values.

The actual staffing levels above the minimum requirements will be 'established through a task resource analysis based on the needs and demands of the airport' (NFPA, 2018: 15).

The standards expressed in Airservices Australia (2017), that are summarised in Table 6, are well below the NFPA standards, the latter which are designed to deal effectively with extinguishing fires but also dealing with passenger and crew rescue at the same time. As noted above, ICAO Annex 14 (2018) clearly defines the role of the ARFFS to cover rescue and firefighting.

The specification of the minimum resource levels is also influenced by the reality that an ARFFS must, on certain occasions, attend 'structure' fires at the aerodrome or in its near vicinity.

The purpose of the NFPA 1710 standard (NFPA, 2020: 8):

> Is to specify the minimum criteria for addressing the effective and efficiency of the career public fire suppression operations, emergency medical service, and special operations delivery …

The NFPA (2020: 14) states that:

> The number of on-duty fire suppression members shall be sufficient to perform the necessary fire-fighting operations given the expected fire-fighting conditions … [and] … shall be determined through task analysis.

When it comes to suppression in the case of structure fires, the NFPA (2020: 14) is explicit:

> Fire companies whose primary functions are to pump and deliver water and perform basic fire fighting … shall be staffed with a minimum of four on-duty members.

The minimum staffing level rises to 5 then 6 where more adverse conditions are in place.

The other relevant concept which is found in the international context is the 'two-in, two-out' principle, where the minimum number of firefighters dealing with a structure fire is four. The principle provides safeguards for firefighters entering a burning structure who may encounter problems with their breathing apparatus, etc and require rescue capacity themselves.

This principle is clearly articulated in '1910.134(g)(4) Procedures for interior structural firefighting' of the US Occupational Safety and Health Standards (US Department of Labor, 2-22(OSHA) policy 29 CFR

> At least two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times …
>
> At least two employees are located outside the IDLH atmosphere …
>
> All employees engaged in interior structural firefighting use SCBAs.

An examination of current practices at Australian airports suggests that this minimum principle is not widely enforced. In 2019, the Australian Senate Standing Committees on Rural and Regional Affairs and Transport conducted 'An inquiry into the provision of rescue, firefighting and emergency response at Australian airports'. The final report (Commonwealth of Australia, 2019a, b) was tabled in Parliament on August 1, 2019. Chapter 4 considers the question of 'Staffing Levels within the ARFFS'.

The Report noted 'significant concerns were raised with regard to the level of staffing provided at ARFFS locations, against each aerodrome category' (Commonwealth of Australia, 2019a: 14). These concerns:

> related to insufficient staffing levels or reductions in staffing levels against airport category at certain airports; a lack of proper risk assessment and consultation prior to the implementation of significant ARFFS delivery changes; and the redeployment of firefighting crews to other, non-regulated activities.

The situation encountered by the Domestic Response Service (DRS) role of the ARFFS demonstrated that the 'two-in, two-out' principle was often violated by Airservices Australia. This problem bears on our discussion about the legitimate role of the ARFFS. The regulations provide for 3 firefighters on a Domestic Response Vehicle (DRV), instead of the desired minimum of 4.

Further, the Commonwealth of Australia (2019a: 44) reported that in the past, the ARFFS would resource 'its DRS with staff separate to those who were maintaining category requirements in order to 'reduce the risk of a domestic response (non-aviation) degrading the category coverage' But in the recent period, a hybrid model (merging the two functions) had evolved under pressure from staffing cuts which had created the phenomenon of 'cross-crewing', where the staffing cuts meant that the ARFFS could only meet its category requirements by merging the ARFF and DRV vehicles. In other words, the same crew would respond to either incident, 'but not both simultaneously' (Commonwealth of Australia, 2019a: 45). There were documented cases where a 'domestic response with the DRV, with three crew, would leave only 11 crew at an ARFFS station, below the 14 personnel required for a Category 10 response' (Commonwealth of Australia, 2019a, 45). So not only is the DRS understaffed according to well-defined international principles ('two-in, two-out') but the pressure to cross-crew also undermines the minimum standards to defend a category aerodrome.

The Commonwealth of Australia (2019a: viii) recommended that:

> The committee recommends that the Australian Government introduce legislation which stipulates the minimum Aviation Rescue Fire Fighting (ARFF) staffing level in accordance with airport category, at all Australian aerodromes where an ARFFS is provided. The legislated staffing levels should reflect the outcomes of the Task Resource Analysis at each aerodrome.

The relevance of the stipulation in the recommendation that the minimum numbers be 'legislated', as opposed to be embedded in regulations or operational procedures is important. Changes made to regulations or procedures by Ministers or delegated officials evade public scrutiny and can often be made to satisfy short-term political needs rather than being the outcome of proper analysis. The Senate Committee agreed with the submission from the UFUA that changes via legislation 'would be subject to a 'rigorous process of examination and investigation'' (Commonwealth of Australia, 2019a: 54).

The lesson is that while specifying minimum standards is not objectionable, the process must ensure the appropriate minimum staffing levels are in place, rather than levels which are incapable of fulfilling the stated responsibilities of the ARFFS.

Thorough Task and Resource Analysis (TRA) as specified by ICAO (2018) is clearly the most effective way to establish the minimum levels. As noted above the TRA should also (following NPFA 403) establish additional staffing levels where appropriate.

Further it is desirable that these standards be legislated rather than left to regulation or discretion of the aerodrome operator.

Australia's track record in this regard appears to be deficient when compared to international specification of these standards.

3.1.6.5 Introduce flexibility to allow the ARFFS provider to determine location-specific rescue (ancillary) equipment requirements, subject to CASA approval.

The ICAO (2018: 9-7) cover the issue of rescue equipment in Annex 14, 9.2.26. They recommend that:

> *Rescue equipment commensurate with the level of aircraft operations should be provided on the rescue and firefighting vehicle(s).*

What is the best way to determine this commensurability? We argued that the TRA was the most effective way to determine the minimum and additional staffing levels to meet the needs of aerodrome category. The evidence also suggests that the TRA, which includes a review of firefighting appliances and complementary equipment levels (types etc) is the best framework for determining location specific requirements.

ICAO (2015) also provides considerable guidance to the rescue equipment that is required to satisfy the aims of the ARFFS.

CASA is proposing that 'ARFFS providers would be required to determine and document location-specific operational and rescue equipment requirements, via a thorough assessment at each location to establish equipment requirements' (CASA, 2021: 32).

This appears consistent with the ICAO approach using a TRA to assess appropriate requirements. We note that the Commonwealth of Australia (2019: viii) recommended that any TRA 'undertaken by Airservices must involve appropriate consultation, via the direct engagement of Aviation Rescue Fire Fighting staff and officers at all stages of the TRA process. The consultation should be transparent, and the outcomes made publicly available as soon as is practicable.'

The degree of confidence that the sector should currently have in relation to the capacity of CASA and Airservices Australia to conduct these processes appropriately is conditioned by past performance.

The Senate enquiry, for example, reported 'a number of serious concerns … as to the performance of Airservices in its delivery of ARFFS across Australia's major airports' (Commonwealth of Australia, 2019: 23). Evidence was presented to show that Airservices had sought 'dispensations … from CASA to not comply with the Australian standard'. There were several other examples presented where the equipment standards had waned under Airservices management.

One of the stark examples reported by the Senate Committee was the use of 'rescue saws'. The CASA Manual of Standards, mandates 'power saws' among the ancillary equipment that 'must' be available for operational use (CASA, 2005, 13.1.1.3). The Committee heard that Airservices had decided 'to remove power saws from ARFFS operation' (Commonwealth of Australia, 2019: 26). They justified this violation of the MOS by claiming that 'We've got arrangements in place with the local fire service to bring their rescue saw' (Commonwealth of Australia, 2019: 26).

The problem here relates to response times. While it may be true that there haven't been many instances of power saw use in aviation incidents in Australia, the fact remains that if there was a need, waiting for a state brigade to receive a signal, travel to the airport, gain access to the runway, and execute the sawing process, would in many feasible scenarios result in loss of life.

It was interesting that CASA admitted to the Senate Committee that they knew about the Airservices decision and confirmed that it was 'a statutory requirement of the MOS that the ARFFS was equipped with a rescue saw' but had taken no action to enforce the standard other than entering a consultation with Airservices (Commonwealth of Australia, 2019a: 26).

The point here relates to the confidence that the public might have in maintaining safety with appropriately equipped ARFFS and reinforces that the TRA must be the product of broad consultation with experts in the fire field rather than be the outcome of administrative decisions prioritising cost cutting.

3.1.6.6 Update minimum qualification requirements for the ARFFS Officer in Charge (OIC) role and clarify OIC operational requirements, consistent with the functions of ARFFS and industry standards.

All the CASA proposals are interlinked and stem from their first desire to limit the function of the ARFFS to be an aerodrome emergency responder, even though all the accepted international and Australian standards recognise the need for the ARFFS to respond to non-aviation incidents around the vicinity of the aerodrome if human life or structures are in danger. While it is highly unlikely that a first arriving ARFFS officer, who would initially assume the role of incident command (IC), would retain the role as urban fire resources arrived on the scene. The IC would be then assumed by the arriving urban commanders. However, it remains clear that the ARFFS officer would have a strategic role to play in managing human resources and coordinating activity with the other agencies.

There are two aspects to this proposal:

1. The downgrading of formal minimum qualifications for an ARFFS Officer in Charge (OIC) from Advanced Diploma to the Diploma of Public Safety; and
2. The relocation of the OIC as part of the operational shift at the aerodrome, which has the potential to reduce the resources available on the fireground. and for which no coherent case has been made to justify such a reduction.

In terms of the first of these aspects, under the current CASR 1998 Regulation 139.773 1(a) and (b) an:

Officer in charge

(1) An ARFFS provider must appoint, as officer in charge of ARFFS operations for an aerodrome, a person who is based at the aerodrome and who holds:

(a) for an aerodrome categorised as Category 6 or above--an AFC Advanced Diploma that meets the standards in the Manual of Standards; or

(b) for an aerodrome categorised as Category 5 or below--an AFC Diploma that meets the standards in the Manual of Standards.

However, on May 29, 2020 (operational from June 1, 2020), CASA EX87/20 – Aerodrome Rescue and Fire Fighting Service Qualifications (Airservices Ausralia) Instrument 2020, provides an exemption from compliance and an Officer in Charge can now be appointed with a ‘prescribed Diploma qualification’.

The current CASA proposal is thus seeking to make this exemption permanent.

We note that a related matter was dealt with by the Fair Work Commission in 2020. FWC (2020a: 19) determined that 'the Commission has no jurisdiction to deal with the dispute and the UFU’s application must be dismissed'. This was because the FWC ruled that the mandating of qualifications as a criterion for appointment to the position of Local Operations Manager (LOM) was not part of the relevant industrial agreement. Legal technicalities aside and the fact that the Full Bench of the FWC later upheld an appeal to the original decision (FWC, 2020b), the matter came down to a technical dispute about wording of an enterprise agreement and whether the LOM position was defined or covered by the agreement.

It was not a ruling about any alignment between formal qualifications, competencies, and responsibilities that different positions in the ARFFS might be required to perform.

That alignment would appear to lie at the heart of this matter. The underlying rationale for CASA’s proposal to permanently downgrade the minimum qualification is unclear. While CASA (2021: 22) stated that the Australasian Fire and Emergency Service Authorities Council (AFAC) had verified that the ‘Diploma-level Public Safety (Firefighting Management) qualification’ was ‘appropriate to the OIC role’, there was no formal justification provided as to why the lower-standard curriculum is now preferred. One would expect some formal analysis from AFAC to be made available where the differences in the curricula between the Advanced Diploma and the Diploma were scrutinised and the subjects required aligned to actual roles performed within the ARFFS.

A plausible surmise is that CASA desires to reduce the role of the firefighters both in a discretionary management sense and the operational context. This would be an undesirable strategy given that it is now expected that dynamic organisations should develop their workforce skills to the highest level applicable, given the modern narrative is about lifelong learning.

Analysis of the aims, objectives and content of the different formal qualifications – Diploma and Advanced Diploma - is revealing.

Training.gov.au indicates that *PUA60519 Advanced Diploma of Public Safety (Firefighting Management)* is:

> designed for firefighting professionals performing senior management responsibilities such as developing and implementing strategic plans, performing policy reviews and undertaking stakeholder engagement with government and non-government agencies.
>
> The role of a firefighter at this level is to manage larger and/or complex emergency incidents, to protect lives and to prevent the destruction of property and the environment. To prevent incidents from occurring and to improve community safety, a firefighter’s duties may include managing community safety and education strategies or programs and managing fire safety strategies and programs to ensure adherence to local fire regulations.

> This qualification includes the units of competency required by firefighters to perform senior firefighting management activities both in the workplace and in dealing with a variety of hazards. It typically involves the management of human resources, equipment, services and contingency measures.

Compare that description with the design mission for *PUA50519 Diploma of Public Safety (Firefighting Management)*, which is CASA's proposed minimum:

> The PUA50519 Diploma of Public Safety (Firefighting Management) is designed for firefighting professionals undertaking a diverse range of management responsibilities. This will include the management of resources, personnel and stakeholders as well as the coordination of activities with other agencies.
>
> The role of a firefighter at this level is to manage emergency incidents, protect lives and prevent the destruction of property and the environment. To prevent incidents from occurring and to improve community safety a firefighter's duties may include conducting community education programs about fire and community safety and undertaking fire inspections of locations to verify adherence to local fire regulations.
>
> This qualification includes the units of competency required by firefighters to manage operations and a multi-team sector and to perform a range of related fire management activities. It typically involves the management of equipment, services and contingency measures.

The difference is clearly about the seniority of the role to be played. The Advanced Diploma is constructed around skill development that equips the student to perform 'senior management responsibilities' rather than obviously more junior management functions. Another distinguishing feature is the Advanced Diploma develops competency in managing 'human resources', in addition to resource management of 'equipment, services and contingency measures'. The Diploma only concentrates on the latter resources, avoiding mention of the 'human resources' element.

Another notable difference between the two qualifications is that in the Advanced Diploma students have the chance to undertake two units - *PUAOPE024 - Manage operations for a Level 3 incident* and *PUAOPE019 - Control a Level 3 incident*. These units are Group A electives and students must choose a minimum of 1 elective unit from this Group, within their 7 elective choices to add to the 4 core units, which make up the Advanced Diploma. Prior to the exemption (noted above) being granted, Airservices Australia, required an officer in charge to successfully complete *PUAOPE024*.

It is clear from the proposal, that the skill base of the OIC would be degraded under the CASA proposal. We see no substantive reason to justify that sort of deskilling in this industrial context. We need to explore this issue in more detail.

The Australasian Inter-Service Incident Management System (AIIMS) run by the National Council for Fire and Emergency Services (AFAC) 'is an integral part of emergency management doctrine for the fire and emergency services industry in Australia. The system enables Australian agencies to come together to resolve incidents through an integrated and effective response' (AFAC, 2022)

The AIIMS framework ensures there is an incident controller for every incident who is responsible and accountable for the management of the incident response. When an

Aerodrome Emergency Plan (AEP) is activated under the AIIMS, the Incident Control Function is assumed by a local police service commander.

Three incident levels are distinguished and we are concerned here with the difference between Level 2 and Level 3 incidents, because the relevant skill development necessary to deal with these two levels varies according to whether the OIC has the Diploma or the Advanced Diploma.

The AIIMS Manual, 4th Edition defines a Level 2 incident as perhaps being more complex than a Level 1 incident 'either in size, resources or risk' and are:

> characterised by the need for deployment of resources beyond the initial response or sectorisation of the incident or the establishment of functional sections due to the levels of complexity or a combination of the above.

For a typical Level 2 incident, the incident control (the OIC) is separated from the first response crew, which is relevant to CASA's proposal to consolidate the incident management function of the ARFFS at the crew level. Level 3 incidents 'are characterised by degrees of complexity that may require the establishment of divisions for the effective management of the incident'. Relating this back to the curriculum differences between the Advanced Diploma and the Diploma, we conclude that it is unlikely that a OIC with competencies confined to Level 2 incidents would be able to successfully manage a major incident that involved aviation and interact at senior level with other agencies in the case of non-aviation elements (structures, etc).

In other words, by reducing the minimum qualification, CASA is limiting the scope of the personnel, which accords with its other proposals to limit the ARFFS to aviation matters (mostly) and outsource functions

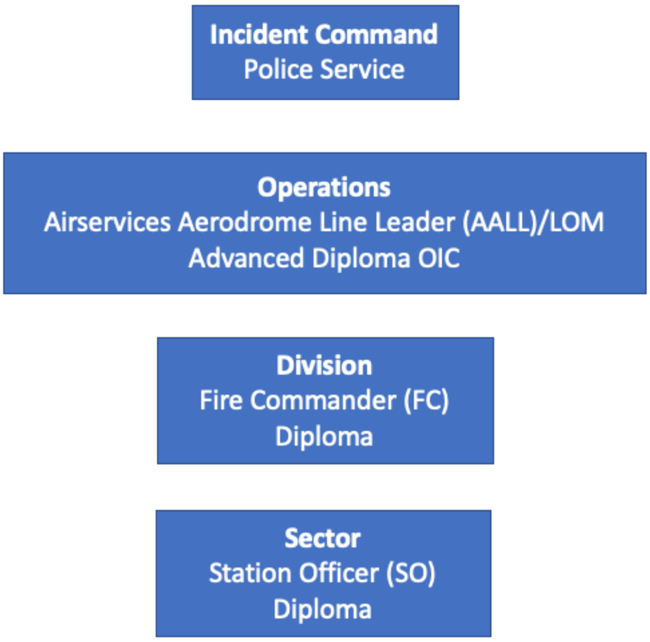
The second part of the proposal is to integrate the OIC into fire ground resources is related to this downgrading. There are both issues of communication within the Incident Control System (ICS) chain and resourcing that this part of the proposal raises.

Figure 2 summarises what has been the status quo in the ARFFS. It shows, for example, in the case of a Category 10 aerodrome, the position of the AALL/LOM assumes the Operations functional management role consistent with AIIMS principles, overseeing 3 officers on the fireground and 11 firefighters. The OIC must manage human resources and interact in a strategic manner with other agencies.

What CASA is proposing is to remove the AALL/LOM from the Incident Management Team (IMT) at the Fire Command Post (FCP) and for the role to become non-operational and purely administrative (line leader/contract manager).

The proposal is represented in Figure 3, where consistent with the current CASA exemption EX87/20, the FC would now be required to fulfill the operations function as a member of the IMT at the FCP. This would have the effect of removing a fire fighting resource from the fireground and reduce safety in the case of a major incident.

Figure 2 Current status quo



Category 10 Aerodrome	Fire Command Post:	1 LOM
	Fireground:	3 Officers + 11 Firefighters
	Total Personnel:	15

Figure 3 CASA 2021 proposal

Category 10 Aerodrome	Fire Command Post:	1 FC
	Fireground:	2 Officers + 11 Firefighters
	Total Personnel:	14

Our analysis of international best practice leads to the conclusion that in the case of a Level 3 incident where a Forward Control Post (FCP) has been established as part of the ICS, which is consistent with the AIIMS protocols, the OIC should be situated at the FCP and have the background competencies that are appropriate. We do not consider a case has been made to render this position in the ARFFS structure non-operational and serving mainly non-operational and administrative functions.

Second, the scale of the personnel on the fire ground should be determined by the TRA. If the OIC is included as part of the fire ground resource, then there is the potential for negative impacts on those staffing ratios. In effect, the operational team would be one person down and that could compromise not only the safety of the team but all its effectiveness in dealing with emergency situations.

3.1.6.7 Modernise ARFFS initial and recurrent training requirements to allow tailored competency-based ARFF training and skill demonstration, in accordance with contemporary training requirements.

The Senate Committee into 'The provision of rescue, firefighting and emergency response at Australian airports' found that there as evidence of (Commonwealth of Australia, 2019: 23-24):

> a lack of adequate and ongoing emergency vehicle driver training …
>
> a lack of suitable training and provision of equipment and suitable vehicles for water rescue services (WRS) and difficult terrain operations (DTO) …
>
> reduced or inadequate training opportunities, with training led by officers with no operational ARFFS experience …

The Committee heard of specific instances where Airservices had restricted key training exercises (for example, banning training on ladders above 2 metres), which was in response to the desire by Airservices to reduce the injury rate (and associated costs) during training. The response from the firefighters was to question the ban, indicating that the accident rate during training was minimal, and that the lack of training at the height that operational responses would need to be performed opened the responder to increased risk.

The purpose of formal training and skill development curricula is to develop necessary skills to perform in a productive, and, in this context, safe manner. We question the concept of 'contemporary training requirements'.

Australia has seen the consequences of outsourcing training to the private-for-profit VET providers in the competitive market. There has been a sequence of scandals involving VET students who neither gained the skills they desired and lost money in the process. Millions of dollars of federal government funding has been misappropriated within this sector (Farrell, 2019; Singhal, 2019). The Australian Competition and Consumer Commission (ACCC) found on providers had engaged in 'unconscionable conduct' and 'false and misleading representations' (ACCC, 2016). There are many examples of inadequate training programs being offered by decentralised third-party providers, which introduces dangers to a non-standardised system that is reliant on the discretion of the ARFFS provider, who may be motivated to reduce costs and increase profits (in the case of a private ARFFS provider being authorised at a civilian aerodrome).

There is also ambiguity as to whether the 4-yearly CASA Technical Training requirement will be retained.

In sum, we consider there are dangers to eliminating a centralised and formal training system for ARFFS personnel and replacing it with an ad hoc system, which will be at the discretion of the provider. That provider may sense a trade-off between profits (costs) and training outcomes and compromise the training system they introduce accordingly.

That compromise has certainly been a common problem of the defunding of TAFE and the rise of the private VET providers.

3.1.6.8 Introduce specific requirements in relation to foam testing, foam production and foam production systems to ensure foam production and foam performance.

CASA (2019: 33) argue that the 'current requirements … [do not] … contain specific requirements in relation to foam testing, foam production and in-service testing of foam production systems.' They desire 'to strengthen current requirements in relation to foam testing, foam performance and foam production'.

The Senate Committee into 'The provision of rescue, firefighting and emergency response at Australian airports' recommended that (Commonwealth of Australia, 2019: viii):

> The committee recommends that the Civil Aviation Safety Authority implement a testing program for the firefighting foams in use at Australian airports, in accordance with International Civil Aviation Organization guidelines. The testing should take place under conditions unique to Australia (such as higher

> ambient temperatures), to establish whether the foams operate effectively to extinguish aviation fires.

The Committee stated it 'was alarmed by the evidence regarding firefighting foams and the fact that the foams in use at Australian airports may not have been tested to Australian standards' (Commonwealth of Australia, 2019: 88). In this case the ICAO standard for foam testing 'may not be suitable for the conditions at local aerodromes' because of the 'higher ambient temperatures in Australia' (p.88).

The problem is this:

1. Fluorine-free firefighting foams are commonly used in the aviation context in Australia, whereas the PFAS foams (per- and poly-fluoroalkyl substances) may be better suited to our conditions.
2. Fluorine-containing foams such as the PFAS variety have now been found to have serious health and environmental risks, even though, in the Australian context they are more effective at extinguishing a fire. These risks not only pertain to the firefighters but also the public. The RAAF Williamtown PFAS contamination case which has caused uncertain health and environmental damage to the neighbouring communities is a recent example.
3. Fluorine-free foam (F3) is certified to ICAO standards but there is a view that they have not been tested in higher temperature settings such as those that are common in Australia.
4. A common view expressed to the Senate Committee was that F3 foams should be avoided in high-risk situations ('such as aerodrome rescue').

There is no doubt that all parties agree that the foam testing framework should consider the Australian conditions, which justifies a departure from the ICAO international standards.

However, it is questionable whether future environmental policy introduced by governments around the world will allow the use of PFAS agents. There is now extensive research being undertaken to investigate the negative consequences of the PFAS contaminations in Australia. The Australian PFAS Contamination Taskforce has, in liaison with the Department of Defence, identified around 27 Defence sites for investigations.

The Australian PFAS Management Program is also conducting assessments on sites where ARFFS have been provided. And state and territory governments are investigating the issue for state-owned sites.

Australia ratified the Stockholm Convention on Persistent Organic Pollutants in 2004. This is a UN initiative that came into force on May 17, 2004. PFAS is one of the identified persistent organic pollutants (POPS). As each new POP is identified a new ratification process is required. At present, Australia has not ratified the addition of PFAS to the list where controls are required.

The ratification of PFAS will require the establishment of a *National Standard for the Environmental Risk Management of Industrial Chemicals* (Commonwealth of Australia, 2022), which:

> will set a nationally consistent environmental management approach for the use and disposal of industrial chemicals, including PFAS.

The Commonwealth's current position is that it will consider ratifying PFAS under the Stockholm Convention if they believe that 'is in the national interest'. But since 2002, the Government has been reducing the use of PFAS foams and they report that:

> the biggest source of concentrated emissions of PFAS in Australia is from historical use of PFAS-containing fire-fighting foams, particularly at fire-fighting training grounds. Use of these fire-fighting foams has been significantly reduced and discontinued in most cases.

Airservices Australia began phasing out PFAS foams in 2003 and no civilian airports have used them since 2010.

Environmental policy in the future will likely prohibit the use of firefighting foams containing PFAS and foam products that are less environmentally damaging will be seen as the only viable option.

This raises further issues given that the lower performance foam requires greater volume to achieve a similar level of effectiveness to the PFAS products. It implies that ARFFS vehicles will need to have increased carrying capacity.

3.1.6.9 Permit the use of training foam, as a substitute for operational foam, during ARFFS training activities/exercises.

CASA proposes the use of training foam in recognition of 'Australia's environmental policy'. Technological advances have created non fluorochemical products that are biodegradable and mimic the properties of the actual firefighting foams. The technical details of these alternative foams are well-known and provide training grounds with a foam that minimises the impacts on the environment. They are capable of mixing with different water qualities work adequately with the range of streaming systems. They can control and extinguish fires.

Accordingly, it is suggested that the use of training foams, allows the trainee firefighters to become skilled in the use of the actual fireground equipment (valves, hoses, pressure gauges, etc) and to learn the range of techniques used in actual application of foam.

One of the issues that can arise with the use of training foams is the logistics of swapping foams from training applications to being ready for actual operational use. The use of training foams can cause problems for standard foam equipment.

The training foam should be flushed completely from the AFRRS vehicle and equipment, which then needs to be refilled with operational foam. This requirement is resource intensive and presents possible logistical problem, which need to be taken into account when considering the implications of this proposal.

Annexe A: Evaluating current asset risk at Australian airports

A.1 Valuing the at-risk assets – aircraft

There is a large literature detailing the methodology used in appraising the value of aircraft. Typically, this information is closely guarded by the companies and depends on fleet age, routes flown, proportion owned/leased, and related variables.

Specialist appraisal services work closely with airlines on a confidential basis to establish the value of their fleets. They gain access to essential information that is never released in the public sphere.

It is beyond the scope of this research to conduct such a detailed appraisal. However, reasonable estimates can be obtained of the value of aircraft assets from publicly available data reported in the Annual Reports of the airlines (see Table A.1).

In sum, there was around $16.2 billion tied up in aircraft assets across the four airline groups in 2019. That estimate will have changed somewhat given the rationalisations and downsizing that has occurred since the pandemic.

Table A.1 Value of aircraft assets by Australian-based airlines, 2019

	Rex	**Alliance**	**Qantas Group**	**Virgin Tigerair**
	2019	2019	2019	2019
	$m	$m	$m	$m
Total Assets	272.8	301.5	19,377.0	6,468.2
Property, plant and equipment	203.3	202.5	12,977.0	3,202.1
Aircraft, engines, spares	167.0	198.4	11,428.0	3,004.7
Capitalised leased assets			1,390.0	31.5
	Per cent	Per cent	Per cent	Per cent
Aircraft proportion of total PPE	82.19	98.0	88.1	93.8

Source: Various airlines Annual Reports, 2019.

A.2 Valuing the at-risk assets – airport infrastructure

It is hard estimating the assets at airports because of the way the privately-owned airports inflate so-called ‘intangible asset valuation’ items on their balance sheets. These items distort net equity valuations (and under report the rate of returns declared). However, the annual monitoring report published by the Australian Competition and Consumer Commission (ACCC, 2020) provides balance sheet data for the four largest airports – Melbourne, Sydney, Brisbane and Perth. Table A.2 shows only the reported values of property, plant and equipment as at June 30, 2019 for these airports.

Table A.2 Property, plant and equipment, balance sheet entry, major airports

	Melbourne	Sydney	Brisbane	Perth
	$ billion	$ billion	$ billion	$ billion
Total	3.1	3.5	3.5	1.4
Aeronautical services	2.4	2.3	2.8	1
Non-aeronautical services	0.7	1.2	0.7	0.4

Source: ACCC, 2020. Numbers are rounded up.

The Productivity Commission (2019), reporting on a submission from the Australian Airports Investors Group, noted that "airports' assets are large in scale, fixed and immobile, resulting in exposure to a broad range of risks", which includes damage from fire or some climate calamity.

Aeronautical assets "are assets that are directly used for the supply of aeronautical services. These include runways, taxiways, parking bays, aprons and terminal facilities" (ACCC, 2020: 23).

The conclusion is clear even if the estimates are approximate - the airports themselves have significant assets that are at risk from an adverse fire or other event. These are assets that the ARFFS personnel protect.

A.3 Valuing the at-risk assets – local neighbourhood

Australian airports are located by necessity in the busier areas of the country, with many cities growing around the airport over time. This often puts people, their homes, and businesses near the airport facilities. Many Australian airports also have at least some light industry that is located within a short distance to the airport boundaries. ARFFS are expected to mutually aid existing non-ARFFS fire services in times of need. It stands to reason then that the more densely populated the surrounding areas of the airport are, the more prone the ARFFS are to external call outs to assist in local fire fighting. This would pose additional burdens on ARFFS staff should their services be called upon to mutually aid local fire fighting services.

However, not all Australian airports are in densely populated areas. The more remote airports of Ayres Rock, Alice Springs, Karratha and Newman have very little residential, commercial or industry surrounding the airport. Hamilton Island has a small amount of residential area, as well as commercial business for the resort. Avalon airport is surrounded by a large amount of land and has little directly outside the main airport area. Whereas there is a recycling centre to the west and some commercial and residential areas to the south of Ballina Airport.

The airports of Hobart, Launceston, Cairns, Gold Coast, Mackay, Rockhampton, Coffs Harbour and Port Hedland are slightly more occupied with residential, commercial and light industry. It should be noted that residential areas frequently contain schools and other small to medium businesses. In Tasmania, Hobart Airport has an aerodrome to the north west and golf clubs to south west and the north east. There is a small amount of residential area to south west along with resorts. Whereas Launceston has a commercial and light industry area to the south west.

In Queensland, Cairns Airport has some commercial and residential areas to the south east, and a farm market to the north west. The Gold Coast Airport has a university to the east and a desalination plant and a hospital to the north west. The residential area is primarily located to the north and north west, and there are resorts along the eastern coastline. Mackay Airport has residential areas to the east, west and north. With commercial areas to the south west, along with industry and airport hotels. There is also a sporting complex which includes a helicopter business to the north. Rockhampton has a golf club to the south of the airport and its' main residential area to the east. Gladstone Airport has a densely populated residential area to the south with shopping centres and other businesses, and a golf club to the east. The main industrial area lies to the north of the airport. Finally, the airport at the Sunshine Coast is flanked on the east by resorts and commercial businesses. There is an additional commercial area to the south west, and an industrial area including a timber yard to the west. The main residential area for the Sunshine Coast lies to the south and south east.

The New South Wales airport in Coffs Harbour has a university, golf club, some commercial and residential areas within approximately one kilometre of the airport. Whereas the Western Australia airport in Port Hedland has a main residential area to the south west. There is some light residential and commercial area also to the east and some industrial area to the west of this airport.

Other airports such as Melbourne, Perth, Darwin, Canberra and Townsville are larger airports but are situated either on more land, or are geographically distanced from residential, commercial and industrial areas by water or land shape. Darwin, Canberra and Townsville additionally all have RAAF bases adjacent to the airport.

Melbourne Airport has a few surrounding businesses, airport hotels and a local golf club. The main residential area is to the south and south east. Commercial and light industry use the land to the south east along with many airport hotels. There is also a sawmill to the west of the airport. Darwin Airport has airport hotels around the airport. The north is densely residential with some commercial areas including schools, shopping centres, a sporting complex and the golf club. The CSIRO is to the east, along with a light industrial area. Light industry and commercial areas are to the south. The majority of the residential area is in the west and south west, and the commercial area is to the north west. Perth Airport is also close to both residential and commercial areas. There is an industrial area to the south east. Residential and commercial buildings are to the east and the west of the airport. These buildings consist of schools, shopping centres, airport hotels, and many logistics and transport services. The area around Canberra Airport consists of a golf course to the east, some commercial area to the south east, and there is there is a recycling centre to the south. The main commercial area is to the south west and north. The main residential area for Townsville lies at the south east of the airport and includes some commercial area. There is also commercial area to the south and industry to the west. The golf club lies to the north of Townsville Airport.

The airports for Sydney, Brisbane, Adelaide, and Broome have residential, commercial and / or industrial areas surrounding the airport in close proximity. Sydney Airport is located in a densely populated area. The southern aspect is mainly taken up with runways and water. Quite a number of business, schools and residential areas are within approximately one kilometre of the airport. Figures A.1 to A.4 show the number of business and residential premises within close proximity to the airport.

Figure A.1 Sydney Airport northern aspect

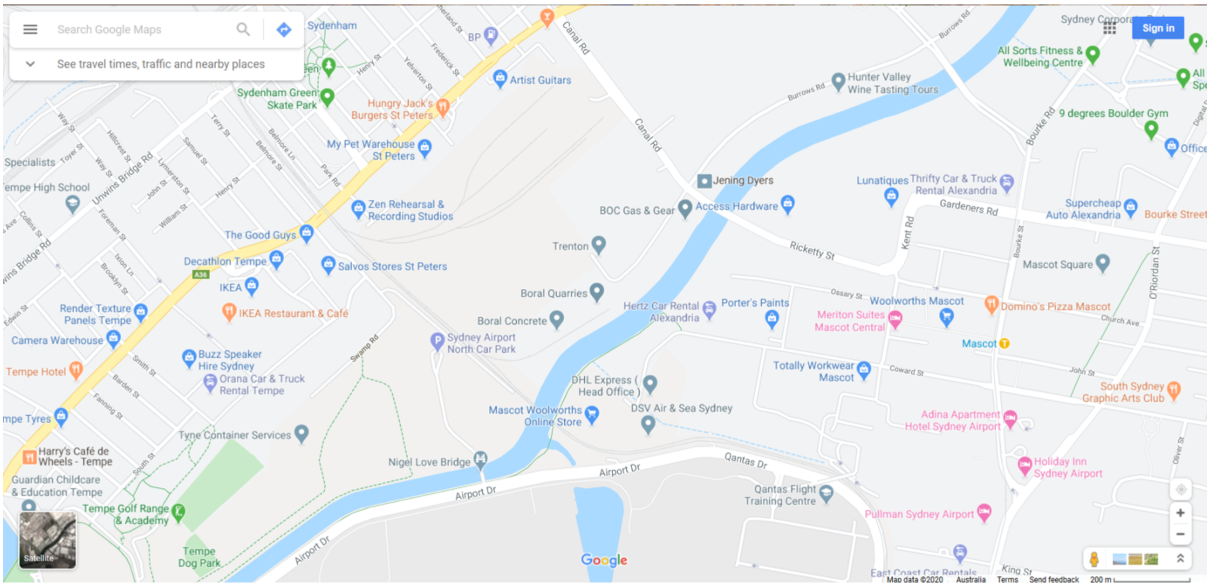


Figure A.2 Sydney Airport north eastern aspect

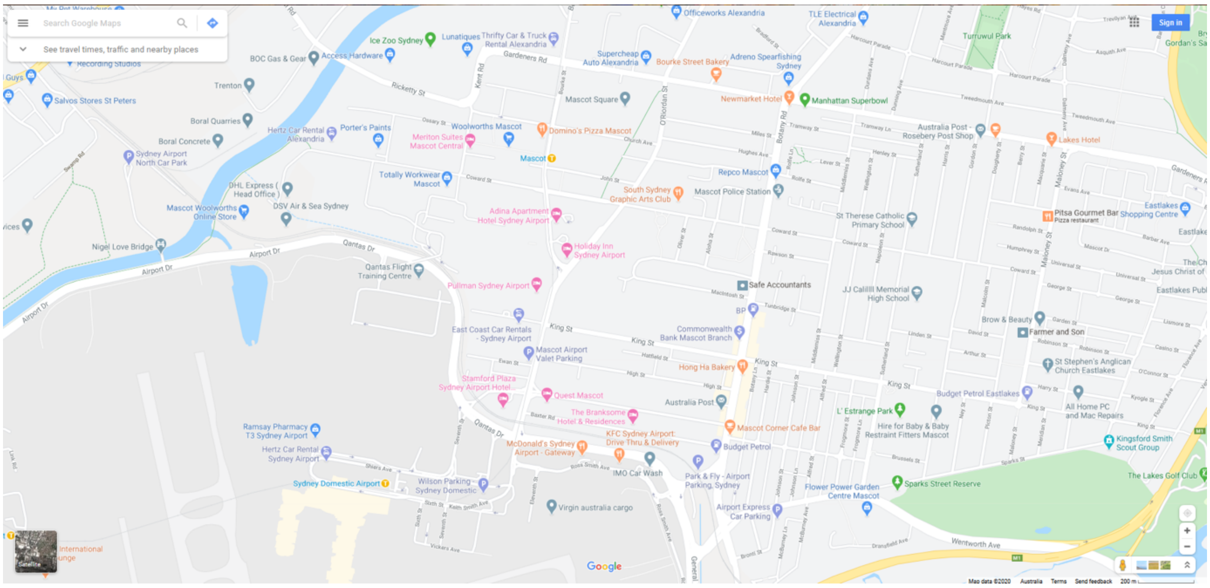


Figure A.3 Sydney Airport eastern aspect

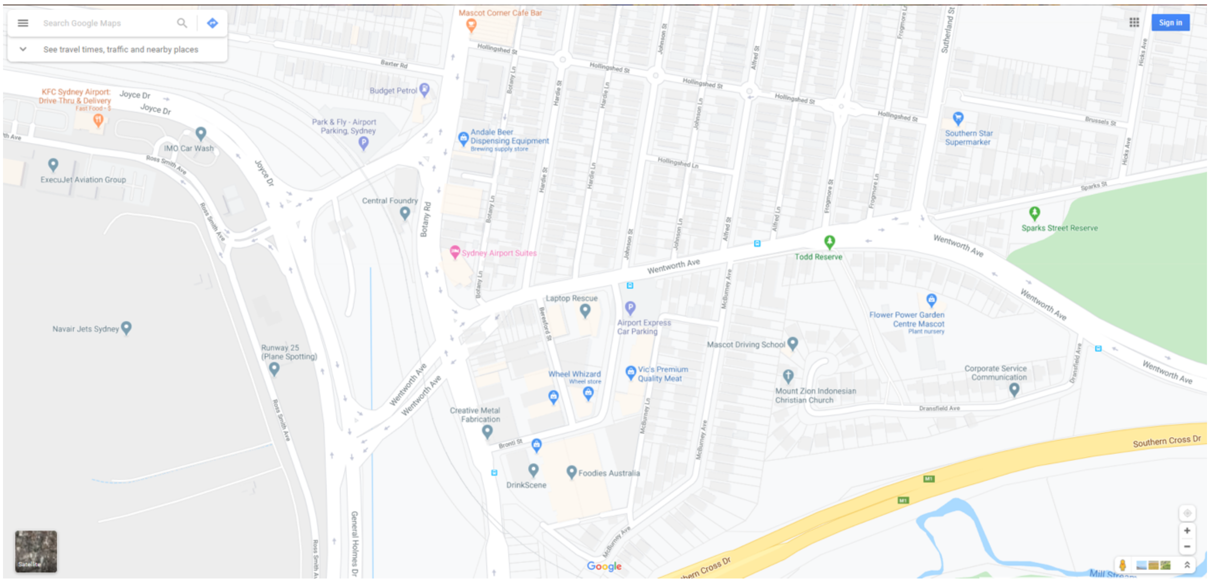
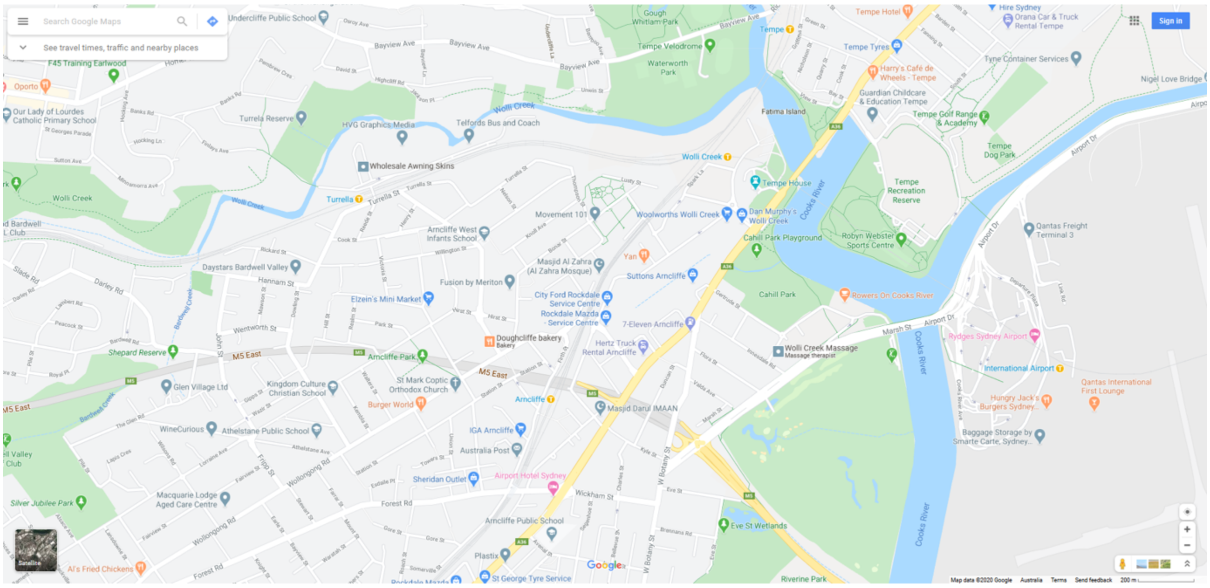


Figure A.4 Sydney Airport western aspect



Although Brisbane Airport is located on a large amount of land, there are still numerous business within the area and light industry around most of the airport. The area to the north is primarily water with no local business or housing. The main residential and commercial areas lie to the west and north west. This is also the where most of the airport hotels and the golf club are situated. There is a cruise terminal to the east and an oil refinery across the river. Figures A.5 to A.8 show the number of business, residential and industry in close proximity to Brisbane airport.

Figure A.5 Brisbane airport eastern aspect

Figure A.6 Brisbane airport southern aspect

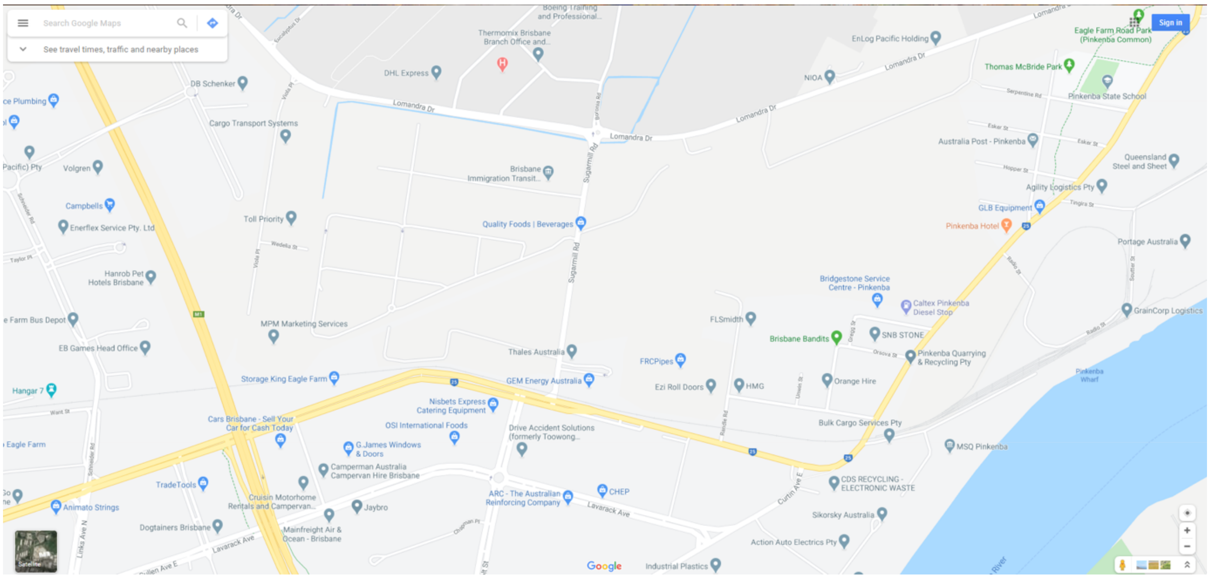


Figure A.7 Brisbane airport western aspect

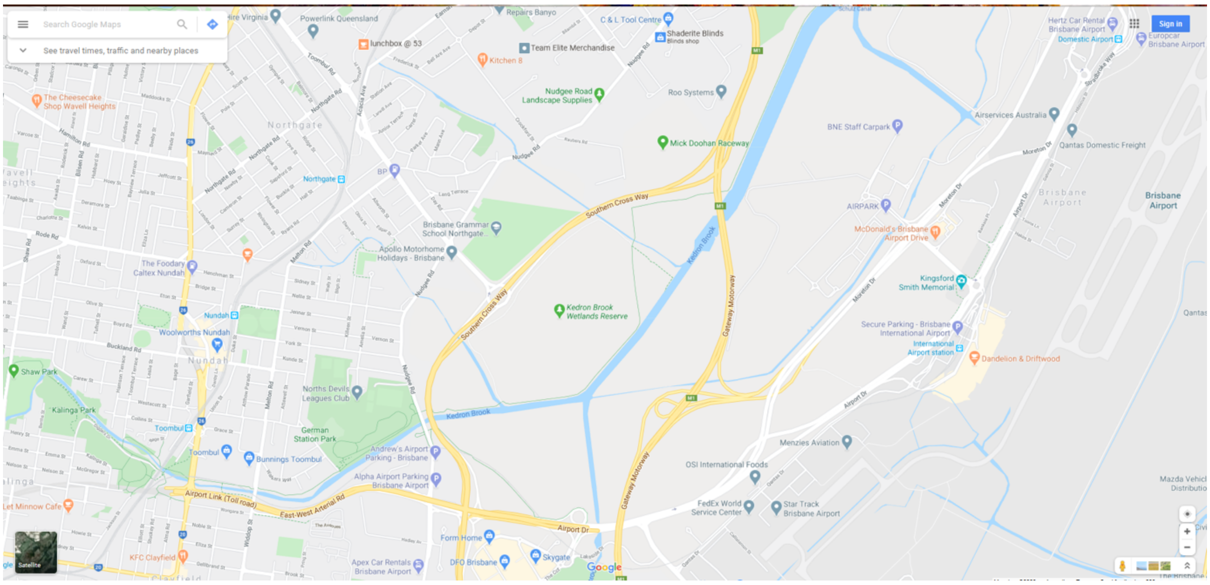
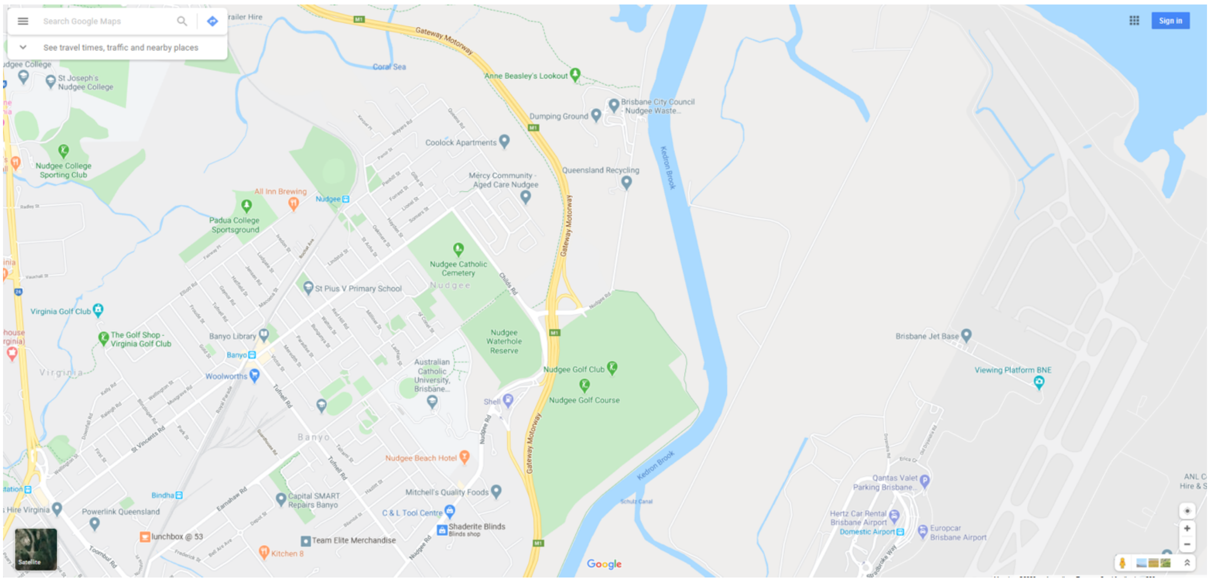


Figure A.8 Brisbane Airport north western aspect



Adelaide Airport is situated to the west of Adelaide city. The area is densely populated and the airport is surrounded on all sides by residential and commercial buildings. There are three golf courses that break up the residential and commercial areas to the north, south and south west of the airport. The area contains numerous businesses, schools, a university, a sailing club, and service stations. There is also a waste and recycling centre across the creek from the airport. Figures A.9 to A.13 show the surrounding areas of Adelaide airport in relation to residential, commercial and industrial use.

Figure A.9 Adelaide Airport and surrounds

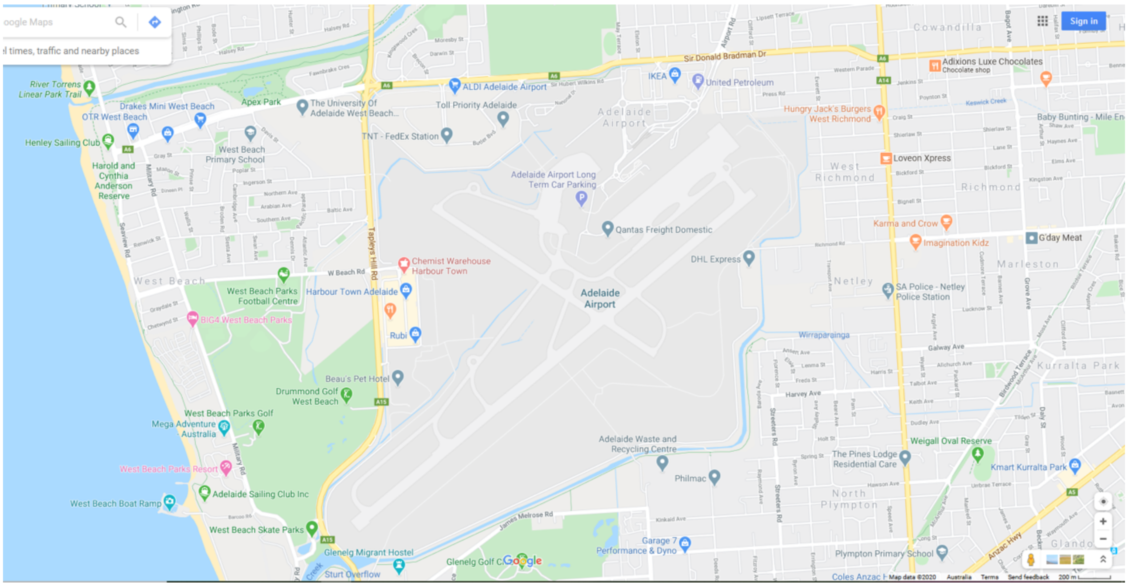


Figure A.10 Adelaide Airport northern aspect

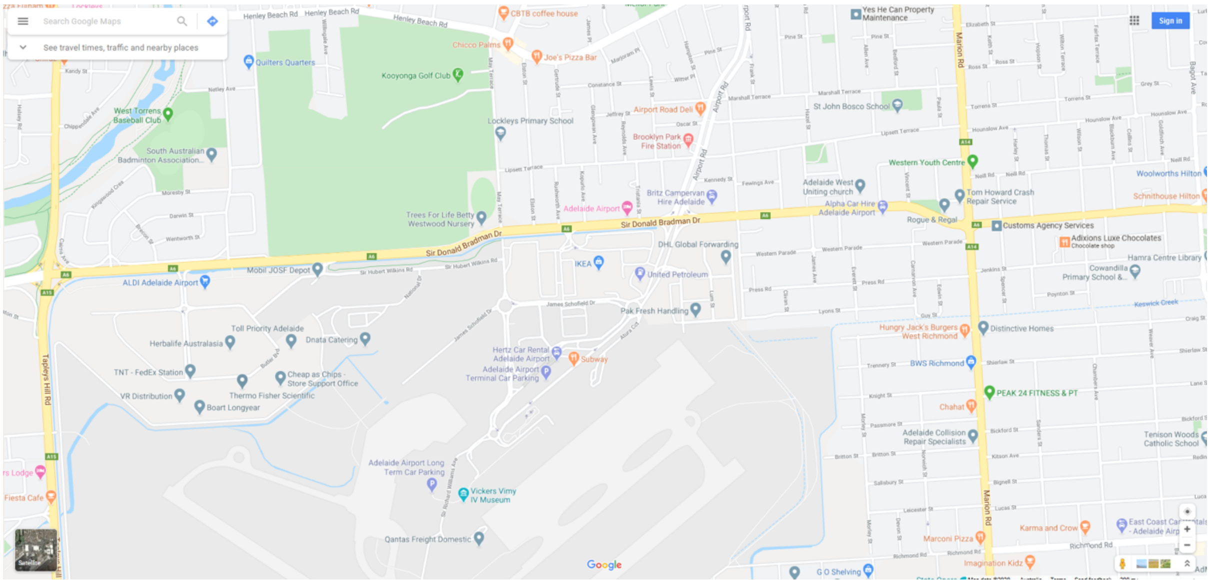


Figure A.11 Adelaide Airport western aspect

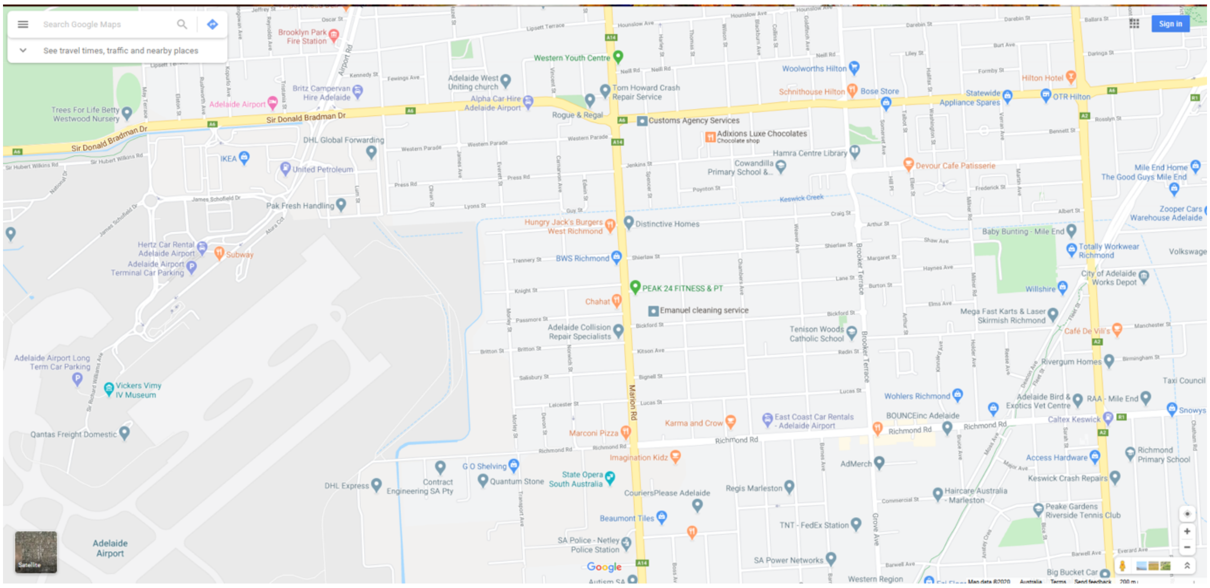


Figure A.12 Adelaide Airport southern aspect

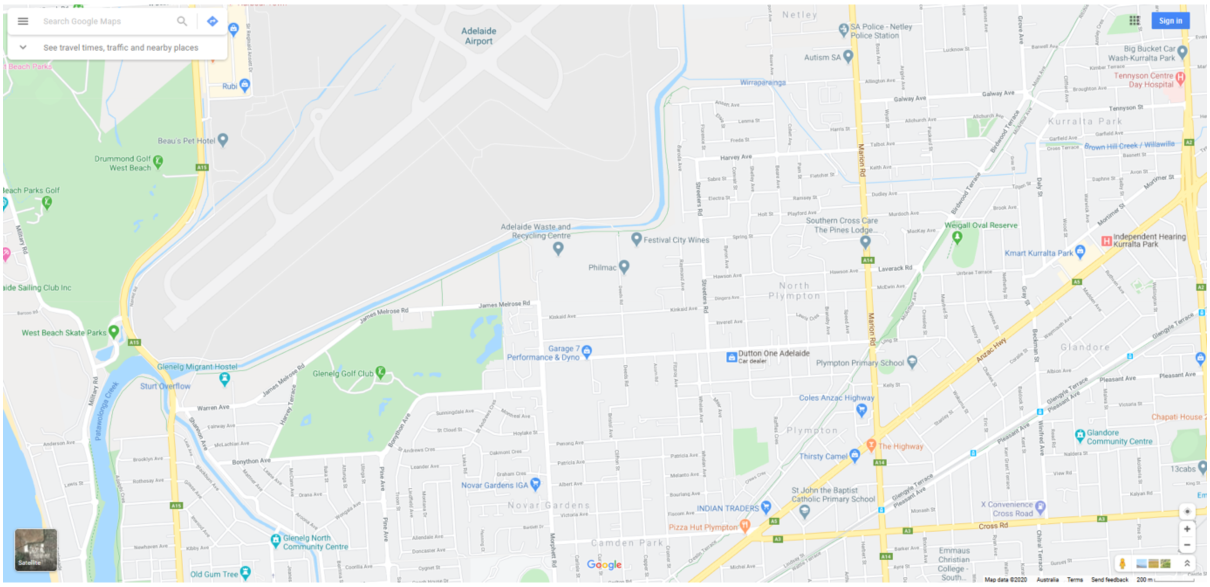
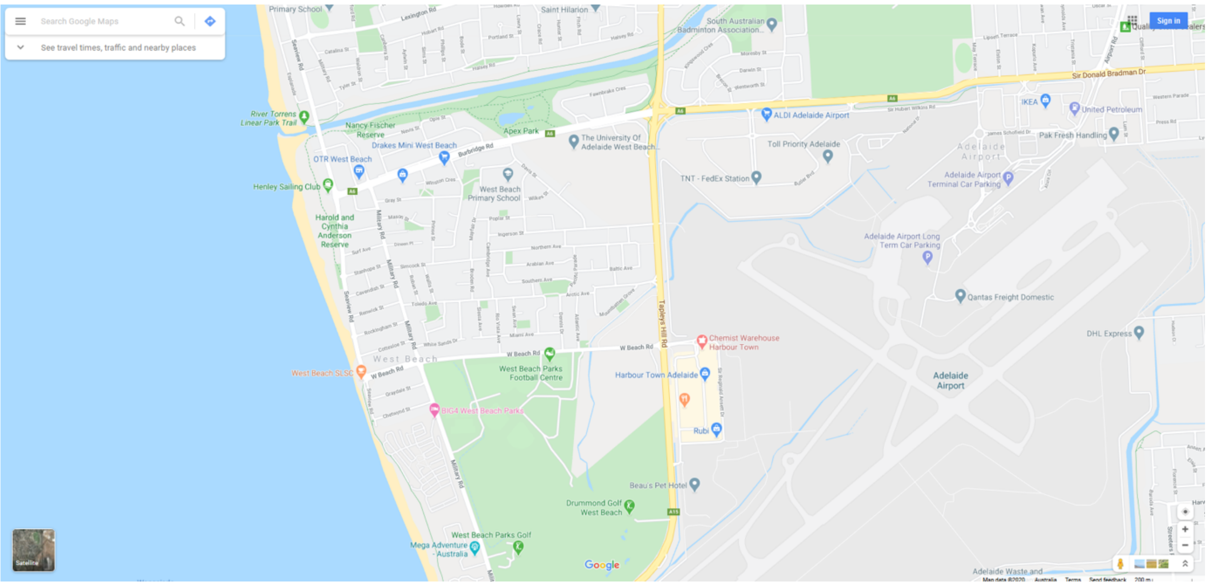


Figure A.13 Adelaide Airport eastern aspect



Broome Airport is located on a small strip of land and has water to the east and west of the airport. There is a great deal of residential housing on both the north and southern sides of the airport. Commercial businesses are prevalent in these areas as well as schools. Although there is little to the east and west due to water, there is a TAFE campus to the west and a business area to the south east of the airport. Figures A.14 and A.15 show the proximity of these areas in relation to Broome Airport.

Figure A.14 Broome northern aspect

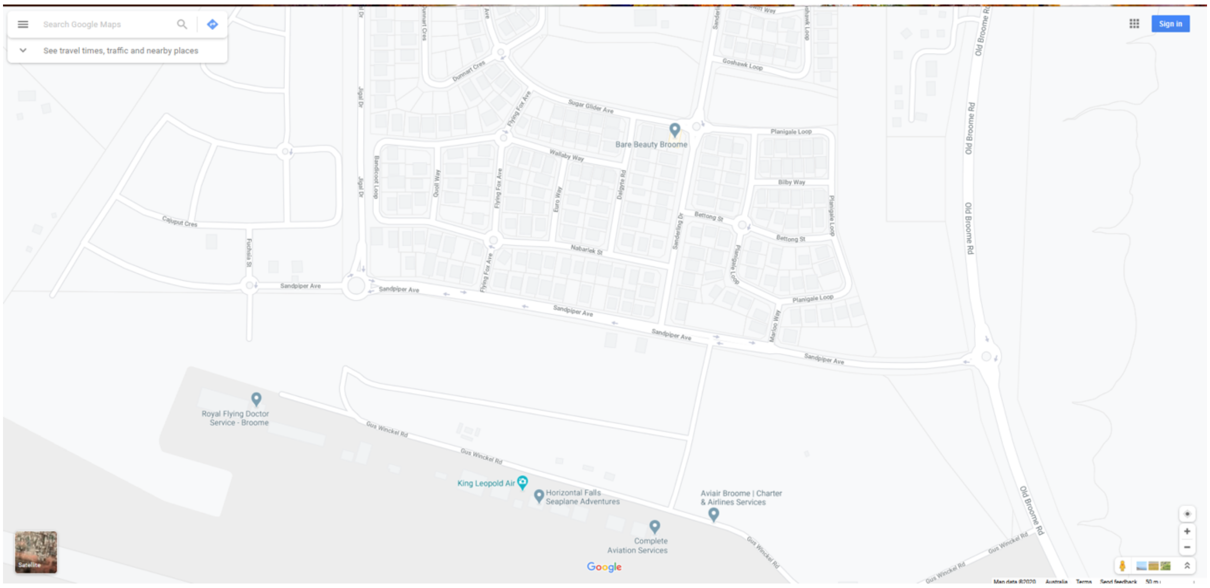
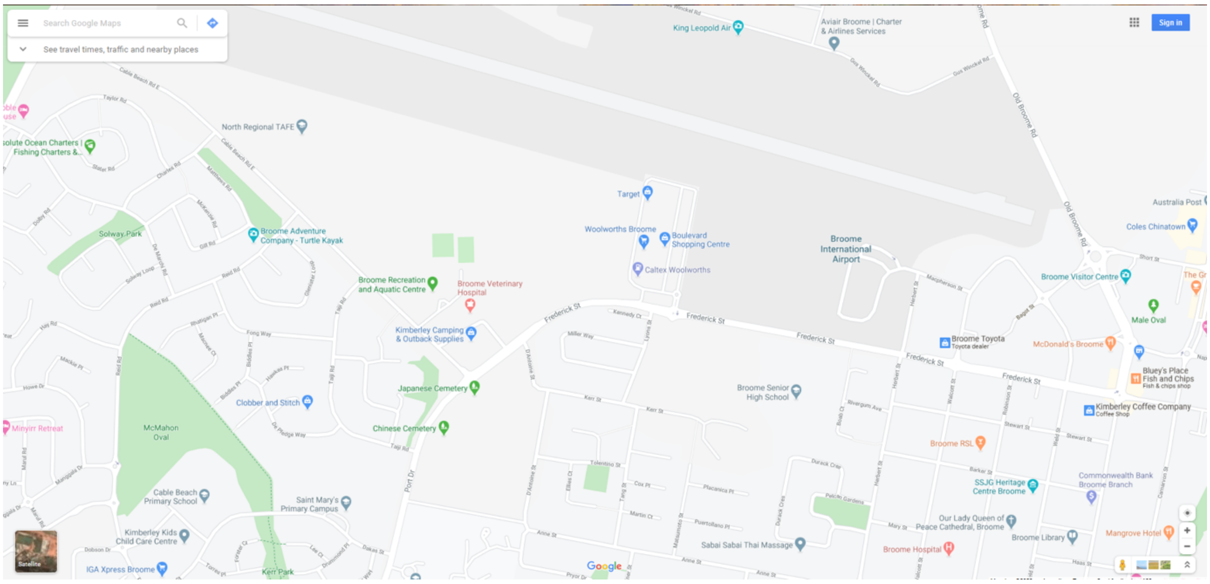


Figure A.15 Broome southern aspect



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[1] The author is Professor of Economics and Director of Centre of Full Employment and Equity at the University of Newcastle, Australia and Docent Professor of Global Political Economy, University of Helsinki, Finland.

CofFEE

Centre of Full Employment and Equity

Rescue, fire fighting and emergency response capacity at Australian airports during the COVID-19 pandemic

REPORT PREPARED FOR THE UNITED FIREFIGHTERS UNION OF AUSTRALIA

William Mitchell[1]
July 2020

Centre of Full Employment and Equity
University of Newcastle, Australia
Home Page: http://www.fullemployment.net
Email: coffee@newcastle.edu.au

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List of Abbreviations

ACCC	Australian Competition and Consumer Commission
AEP	Aerodrome Emergency Plan
AGA	Aerodromes and Ground Aids
AHJ	Authority having jurisdiction
AIP	Aeronautical Information Publication (Australia)
ANC	Air Navigation Commission
ANO	Air Navigation Order
ARFFS	Aviation Rescue and Fire Fighting Service
ASA	Airservices Australia
ASAP	Aviation Safety Advisory Panel (CASA)
ATSB	Australian Transport Safety Bureau
CAA	Civil Aviation Authority (UK)
CAP	Civil Aviation Publication (CAA document)
CASA	Civil Aviation Safety Authority (Australia)
CFR	Code of Federal Regulations (FAA)
CMA	Continuous Monitoring Approach
CSA	Comprehensive systems approach (ICAO now CMA)
DIRD	Department of Infrastructure and Regional Development (Australia)
DRV	Domestic Response Vehicle
EI	Effective Implementation score (from ICAO audit)
ERSA	Enroute Supplement Australia
F & R	Findings and Recommendations (ICAO audit)
FAA	Federal Aviation Authority (US)
GA	General Aviation (Australia)

HRET	High reach extendable turrets
ICAO	International Civil Aviation Organisation
ICVM	ICAO Coordinated Validation Mission
LTPA	Long Term Pricing Agreement (Australia)
MOS	Manual of Standards (CASA document)
MTOW	Maximum Take-Off Weight
NFPA	National Fire Protection Administration (US)
NIST	National Institute of Standards and Technology
NPAT	Net profit after tax
OSHA	Occupational Safety and Health Administration (US)
PCA	Practical Critical Area (ICAO)
PFC	Passenger Facility Charge (FAA US)
SARPs	Standards and Recommended Practices (ICAO document)
TCA	Theoretical Critical Area (ICAO)
TN	Terminal Navigation
TRA	Task Resource Analysis (ICAO)
USOAP	Universal Safety Oversight Audit Programme (ICAO)

Executive Summary

1. Introduction

In this Report, we extend the analysis by Mitchell and Flanagan (2019) to consider the risks facing airport assets while air traffic movements are limited into and out of Australian airports. This involves an assessment of the value of the airport and airline asset pool that is at risk, and the reasons that risk arises when flight frequencies are limited.

The report discusses the possible consequences of an adverse event in terms of the:

b. Short-run losses that might be endured (asset losses, etc).

c. The medium- to longer-term losses that might be endured by sectors such as tourism, in the event of a possible shutdown of an airport due to such an event.

It is reinforced by detailed geospatial analysis of the broader neighbourhood risks for many airports. Detailed case studies of the current situation and the at-risk assets at many of the key Australian airports is also provided.

2. Aviation Rescue and Fire Fighting Service (ARFFS) in Australia

ARFFS is a branch of fire fighting and rescue that deals specifically with fires and rescue situations arising from aviation incidents. ARFFS personnel respond to multiple types of incidents involving aircraft at and in the immediate vicinity surrounding airports, with their primary role to optimise the chance of survival of occupants of an aircraft that has crashed and to protect property and equipment from the effects of fire.

ARFFS respond to crashes, engine fires, fuel spills, first aid calls, motor vehicle accidents, hazmat incidents and other fires and alarms.

In Australia, ARFFS are required at airports that receive scheduled international passenger air services, or airports with over 350,000 passenger movements on scheduled passenger air services in a 12-month period. The obligation of airports to have ARFFS readily available is a requirement of the International Civil Aviation Organisation (ICAO), of which Australia is a signatory. ARFFS are provided at 27 of the 195 certified airports around Australia, with Airservices Australia (ASA) responsible for ARFFS at 26 of these. The Act stipulates that ASA must regard the safety of air navigation as the most important consideration. ASA has stipulated that ARFFS personnel must respond to incidents within a three-minute response time.

ARFFS are categorised according to the size of aircraft that use the airport. The different categories determine the resources provided to the ARFFS, including the number of vehicles, staffing levels and quantity of agent. As well as responding to aircraft incidents on or in the immediate vicinity of the airport, ARFFS personnel respond to a number of calls for a variety different reasons. ARFFS respond to aircraft incidents including crashes, engine fires and fuel spills, as well as emergency medical response (first aid) calls, motor vehicle accidents, hazmat incidents, other fires and alarms.

ARFFS require specialised equipment and training as the hazards facing ARFFS personnel are unique to the aviation industry. ASA have their own specialised training facility in Melbourne for this purpose.

ARFFS is specialised and cannot be substituted by standard fire fighting services.

3. Regulatory system of ARFFS provision

ARFFS is specified by international agencies such as ICAO as well as Australian bodies such as CASA.

The Civil Aviation Safety Regulations 1998 (CASR), made under the Civil Aviation Act 1988, set out the regulations for the civil aviation sector in Australia. The Civil Aviation Safety Authority (CASA) is responsible for issuing and enforcing the regulations. Section 9 of the Civil Aviation Act sets out CASA's functions: to maintain, enhance and promote the safety of civil aviation, with particular focus on preventing aviation accidents and incidents. Subpart 139.H of the CASR specifies the requirements for the provision of ARFFS. CASA publishes the Manual of Standards (MOS), which is a policy manual and the means by which CASA meets its responsibilities under the Act for promulgating aviation safety standards.

The CASR and MOS broadly align with international standards outlined by the ICAO. Differences between Australian and ICAO standards are published in the Aeronautical Information Publication, as required by ICAO. In addition, Australia is required to file a note of difference with ICAO. CASA has the authority to grant exemptions from provisions of the CASR under Subpart 11.F.

The Australian Transport and Safety Bureau (ATSB) is the prime industry in Australia for the independent investigation of civil aviation accidents, incidents and safety deficiencies. It is governed by a Commission which is separate from policy makers, industry operators and regulators and its' purpose is to investigate in line with the Transport Safety Investigation Act 2003 for "no blame" safety improvements.

ASA was established under the Air Services Act 1995. It is a corporate Commonwealth entity under the Public Governance, Performance and Accountability Act 2013 (ASA, 2018). ASA is responsible for providing safe, secure, efficient and environmentally responsible air navigation and Aviation Rescue and Fire Fighting Service. ASA provides terminal navigation (TN), ARFFS and en route navigation services at airports around Australia, for which it charges aircraft operators appropriate fees. Charges are set subject to notification to the Australian Competition and Consumer Commission (ACCC), which reviews ASA pricing every five years.

In 2015 the Australian Government asked the Department of Infrastructure and Regional Development (DIRD) to provide policy advice on potential improvements to the efficiency and clarity of ARFFS requirements. These changes were subsequently accepted in June 2018.

ARFFS is responsible for aviation related infrastructure.

Trigger events were defined which would instigate a CASA risk review to determine if establishment/ disestablishment was appropriate. Trigger events that would lead to the establishment of a service included an airport receiving scheduled international passenger services or when passenger movements on scheduled passenger air services exceeded 350,000 over a 12-month period. Disestablishment would follow if scheduled international air services were withdrawn or if passenger movements fell below 300,000 and persisted at that level for a 12-month period. Areas and facilities that are the responsibility of ARFFS include aviation-related infrastructure, which may be infrastructure identified in an agreement between an ARFFS and state / territory fire authority.

The ICAO was set up following the Convention on International Civil Aviation, also known as the Chicago Convention, signed in 1944. The ICAO sets out Standards and Recommended Practices (SARPs) for Aerodromes in Annex 14 to the Convention on International Civil Aviation, with Rescue and Fire Fighting at airports dealt with in Chapter 9.2 of Volume 1 of the Annex. It is a requirement by ICAO that Member States notify the ICAO of any differences between their national regulations and practices and the SARPs, particularly where such a difference is important for the safety of air navigation. ICAO monitor the implementation of the SARPs of Member States through the Universal Safety Oversight Audit Programme (USOAP).

The USOAP, set up by ICAO to monitor compliance with their SARPs, has evolved into a Continuous Monitoring Approach. The aim of the current approach is move to a systematic ongoing process of gathering safety information (ICAO, 2010).

4. International best practice of ARFFS

As well as the ICAO, the international, non-profit National Fire Protection Administration (NFPA) publishes standards related to all types of fire fighting. As with the ICAO, the NFPA develop and review their standards through a public process overseen by a Technical Committee or Panel. Many of the standards developed by the NFPA have been adopted at locations around the world, however they are not binding unless the Authority Having Jurisdiction (AHJ) has adopted them and committed to the particular standard. In practice the NFPA standards are more stringent than the ICAO standards in relation to ARFFS. CASA regulations closely align with ICAO SARPs. The Federal Aviation Authority (FAA), the authority responsible for regulation of all aspects of civil aviation in the United States, include requirements in their Code of Federal Regulations, which often reference the NFPA standards, but in practice are generally more relaxed. The Civil Aviation Authority (CAA), the United Kingdom's independent specialist aviation regulator, base their standards on the ICAO SARPs.

The process of 'remission' is not allowed by the more stringent guidelines set by the US NFPA but operates in some Australian airports.

Airports are categorised based on the length of the longest aeroplane (and their maximum fuselage width) to use the airport during the busiest consecutive three months of the preceding 12 months. If the longest aircraft to use the airport does not reach 700 movements it is not deemed the 'critical' aircraft and the category can be set one category below the designated category. This is known as remission and is allowed by CASA, ICAO, FAA and CAA, but not referenced by NFPA.

More Australian airports would require ARFFS if the guidelines used by the US, UK or New Zealand were adopted.

CASA only requires ARFFS at Level 1 airports, which are airports receiving scheduled international passenger air services or those above the threshold passenger numbers referred to above. All airports with ARFFS in Australia correspond to Category 6 or above. A survey of similar countries and their requirements for airports to be serviced with ARFFS found all other countries had less restrictive obligations than Australia, such that if Australia adopted any of the alternative systems, ARFFS would be required at many more airports around the country.

CASA and CAA follow the ICAO Recommendation on the minimum number of rescue and fire fighting vehicles required at an airport to provide adequate protection for each category. Airservices Australia (ASA) operations stipulate four vehicles for Category 10 aerodromes (ASA, 2017). NFPA standards require one more vehicle than the ICAO standard at the equivalent airport categories 5, 9 and 10.

NFPA allow for more extinguishing agent than CASA requirements.

The methodology for rescue and fire fighting at airports is based on the critical area concept. It is further broken down into the theoretical critical area (TCA) and the practical critical area (PCA). The TCA is the area within which it may be necessary to control the fire, while the PCA is representative of actual aircraft accident conditions, and is two-thirds of the TCA. Quantities of extinguishing agent are calculated to be sufficient to control the PCA (Q1) and complete extinguishment depending on the aircraft size (Q2). Not only do the NFPA use the maximum aircraft size as opposed to the average aircraft size (ICAO SARPs), they provide for extra water to be used for interior fire fighting (Q3). CASA follows the ICAO standards for quantity of agent (performance level B).

The ICAO and NFPA both recommend staffing levels to be determined by a Task Resource Analysis (TRA), a process where possible worst-case scenarios are simulated to determine resource requirements. In addition the NFPA recommends minimum trained personnel staffing levels. ASA use old methodology to determine staffing levels which is not endorsed by the ICAO and uses staffing levels below that recommended by the NFPA.

ASA use old methodology to determine their minimum staffing levels which is below the recommended level of the NFPA.

No ARFFS vehicles are fitted with HRET devices, considered best practice in other countries.

The equipment used by ARFFS is important in allowing them to fully carry out their duty of responding to an aircraft incident. Among these are the handlines, monitors and turrets provided on ARFFS vehicles. Monitors and turrets are essential to ARFFS fire fighting capacity and as such, when urban brigades are suggested as substitutes for ARFFS, a minimum would be that they have this equipment. Further, specialised equipment such as high reach extendable turrets (HRETs) and low-level high performance monitors can give fire fighters greater control in their fire fighting activities. HRETs allow for better positioning of the fire fighter in relation to the application of agent and may include technology to allow for the penetration of agent to cool the passenger compartment and piercing the fuselage. NFPA, FAA and CAA make allowance to specify for inclusion of HRET's on vehicles due to the effectiveness of this type of equipment, but state that such equipment needs specialised training. ARFFS vehicles are not fitted with HRET technology.

CASA use response times that align with the ICAO SARPs, specifically that the operational objective is two minutes to any point on the runway, and three minutes to any part of the movement area. The NFPA recommendation is slightly more relaxed at three and four minutes respectively. Response times assist airports and ARFFS in planning the number and locations of fire stations required at an airport.

The 2-3 minute response time cannot be met by standard urban fire crews.

5. The collapse of airline travel during the pandemic

The remaining Report concentrates on changes since the onset of the COVID-19 pandemic. Since February 2020, passenger movements have dramatically declined at all Australian airports from over 11 million to just over 350 thousand in April 2020.

Whilst there are less plane and passenger movements at this time, we argue that the demand for asset protection at our airports has not declined. Nor have the additional requirements of the ARFFS in their localities.

Asset protection and additional requirements of ARFFS personnel remain or have increased since the pandemic.

6. Government aid during the pandemic

Other governments have far exceeded Australia in their support of the airline industry.

Whilst the Australian government has pledged support of over $1.1 billion in initiatives to support the airline industry since the outbreak of the pandemic, globally, this only represents a tiny portion of support other nations are making to their airline industries.

Australia's contribution as a percentage of 2019 airline ticket revenue constitutes only 1.8 percent. This is far exceeded by the governments of France, USA, Japan and Germany (36.1, 32.7, 22.1 and 19.5 per cent respectively). In the Asia Pacific region Australia fares poorly on this front, with Singapore the standout, contributing 84.2 per cent of 2019 ticket revenue to its' airlines.

The Airports Council International (ACI) World has stated that unless airports are supported, especially in ARFFS, post pandemic services will be hindered.

Airports will play a crucial role in the post pandemic recovery for all nations. Ilia Lioutov, Airports Council International (ACI) World has stated that only supporting airlines during the pandemic is akin to ignoring the "elephant in the room", and states that if airports cannot staff essential services like ARFFS, regulations will not allow aircraft to take off or land at airports once the pandemic passes (Lioutov, 2020).

Whilst some governments like the USA and Norway have acknowledged the importance of maintaining airports during the pandemic, for the most part, global governments have not directly supported their airports and have instead implemented a range of aid usually directly to the airlines. There is a larger role that governments can play in the support of airports which could include: grants and subsidies; secured financing; loans at preferential rates; deferment of loan repayments contracted with government; and / or bank guarantees; government guarantees on loans contracted by airports with foreign lending agencies (Lioutov, 2020).

Government support for aviation and airports:

USA - USD 10 billion for airports.

Norway NOK 14.1 billion for aviation.

New Zealand NZD 600 million for aviation.

The USA has announced a USD10 billion airport grant program in April (U.S. Department of Transportation, 2020), with calls for an additional USD 13 billion ongoing at the time of writing this Report (International Airport Review, 2020). Norway has dedicated NOK 14.1 billion (Norwegian Ministry of Finance: 2020) to support their aviation industry which includes a NOK 4.3 billion grant for airports. Whilst, closer to home, New Zealand has pledged $600 million for it's aviation industry.

Other countries such as Canada have varied lease rents which are expected to provide relief for up to CAN 331.4 million (Department of Finance Canada: 2020). South Korea has also provided rent cuts and delayed charges (South Korean Ministry of Economy and Finance: 2020a, 2020b) Whilst France is planning to privatise many of it's airports (Barbière: 2020).

Support for airports has been raised in the European Parliament, and there is provision for this under their Regional State aid, but to date they have only suspended rules on airport slots (European Parliament, 2020a, 2020b). Similarly, in the UK, a package for the support of both airlines and airports, has not been approved to date (Parliament UK, 2020: Para 38).

7. Evaluating current asset risk at Australian airports

Grounded aircraft are not idle and still pose a number of fire and other safety risks.

The cessation of most airline travel has meant that major Australian airlines have been forced to park their planes at various locations. Whilst the aircraft are not flying, there is still a great deal of maintenance that needs to be performed on the grounded aircraft on a regular basis, including:

- They still need to be maintained and inspected by engineers regularly.
- Their engines need to be started on a regular basis.
- Engineers need to undertake continuous engine checks.
- They need to be moved around to avoid issues such as flat spots on tyres.
- Items such as flaps, rudders and other controlling equipment need to be regularly operated.
- They are still usually full of fuel to stabilise the craft against wind shifts and to allow regular maintenance based engine start-ups.
- They remain susceptible to weather events and wildlife and insect invasions.

The vast majority of Qantas Group aircraft is stored at Avalon, whereas Virgin Australia aircraft are stored at Sydney, Melbourne and Brisbane airports. The Asia Pacific Aircraft Storage (APAS) facility near Alice Springs, which is located adjacent to the main airport, and would be implicated if a major hazard occurred at the main facility, is also storing some Qantas planes. Given the Australian climate (lower humidity), some international airlines (for example, Singapore Airlines and Fiji Airways) are also using the APAS facility in Alice Springs.

Approx. $16.2bn of grounded aircraft is protected by ARFFS staff.

The risk is lower, but given the movements of the craft, and the possibility of fuel leaks, there is an on-going need to maintain a viable ARFFS capacity.

Whilst it is beyond the scope of this research to conduct a detailed appraisal of valuing aircraft assets, reasonable estimates can be obtained from publicly available data reported in the Annual Reports of the airlines. In sum, there is around $16.2 billion tied up in aircraft assets across the four airline groups that are mostly being parked around Australia at present.

Similarly it is hard to estimate the assets at airports because of the way the privately-owned airports inflate so-called 'intangible asset valuation' items on their balance sheets. However, the annual monitoring report published by the Australian Competition and Consumer Commission (ACCC, 2020) provides balance sheet data for the four largest airports – Melbourne, Sydney, Brisbane and Perth. It is estimated that total assets for Melbourne equal $3.1 billion, Sydney and Brisbane $3.5 billion each and Perth $1.4 billion. Even if the estimates are approximate - the airports themselves have significant assets that are at risk from an adverse fire or other event. These are assets that the ARFFS personnel protect.

Over $7bn in airport assets are protected by ARFFS staff just in Australia's 4 largest airports.

ARFFS mutual aid protects people, their homes and business around Australia's airports.

Australian airport locations often put people, their homes and businesses in close proximity to the airport facilities. Many Australian airports also have at least some light industry that is located within a short distance to the airport boundaries. ARFFS are expected to mutually aid existing non-ARFFS fire services in times of need. The more densely populated the surrounding areas of the airport are, the more prone the ARFFS are to external call outs to assist in local fire fighting. Whilst some airports are remote or geographically distant to the populations and business, Sydney, Brisbane, Adelaide and Broome are all situated with residential, commercial and or industrial areas surrounding the airport in close proximity and would pose additional burdens on ARFFS staff should their services be called upon to mutually aid local fire fighting services.

8. Case study analysis of the current situation at Australian airports

Most airports continue to have a significant amount of risk that is not related to the reduction of commercial flights into and out of the area. These have included: terminal upgrades including hot works; fuel farms; grounded aircraft maintenance; risk to emergency services aircraft, and on site and surrounding commercial business; as well as ADF activity and ammunition storage in close proximity. These risks demand that ARFFS remain at high levels to reduce the risk to people and property should an incident occur.

Case study techniques were employed including telephone calls to the airports, the main airlines, and discussions were held with key personnel with expertise in ARFFS operations in order to gauge the current situation at Australian airports. From this an inventory-type narrative was developed to describe what is happening on the ground at many airports covered and assess the diversity and scale of the assets that are in place.

Significant assets are at risk and require continued ARFFS protection.

Specialised training is needed to protect these assets.

The conclusion drawn from this extensive research is that while the flight frequencies have fallen temporarily, there are still significant assets that are at risk and require a continued ARFFS presence. Also that these services are not easily substituted for by existing firefighting capacity outside the ARFFS who do not have the required specialised training. The situation at individual airports is briefly described below. No information was received relating to recent conditions fort the airports of Gold Coast, Hamilton Island, Mackay, Sunshine Coast, Melbourne, Ayers Rock, Broome, Karratha, Newman and Hobart.

8.1 Sydney Airport

Sydney's Kingsford Smith Airport is Australia's busiest airport and is classified as Category 10 for ARFFS staffing levels. During COVID-19 restrictions, the airport is running at a Category 9 level with a Domestic Response Vehicle (DRV). The 94 ARFFS staff at Sydney Airport have been required to take leave (both accrued and annual) with some restrictions.

Sydney is one of the main storage areas for grounded aircraft with a count in June numbering 92 aircraft on runways, taxiways and aprons.

Over 90 aircraft are stored on runways, taxiways and aprons at Sydney Airport. The JUHI also stores 29 million litres of fuel.

In addition to grounded planes, Sydney Airport has the following assets: 500 rental cars; two train stations; car parks; terminal buildings; maintenance facilities for Qantas; Qantas Jet base with eight hangers, heliport; general aviation facilities and maintenance; Air Ambulance base; Joint User Hydrant Installation JUHI with a 29 million litre capacity.

8.2 Ballina Airport

Ballina Airport supports local fire fighters.

Ballina Airport is a Category 6 airport for ARFFS staffing. The airport is currently operating at a Category 5 level. ARFFS staff have been asked to both extinguish existing leave and stop overtime at Ballina Airport. The existing three crew setup has been reduced to two with surplus staff available to support the local area fire service which only has a retained fire fighting service.

Flights are scheduled to increase significantly in July and beyond, with both Jetstar and Qantas scheduling several flights per day, the airport is also expected to return to a Category 6 level at this time.

There are a number of assets on airport grounds and beyond including: a terminal building, café, shops, electrical sub-stations, offices, non directional beacon, rental cars, waste disposal plant, brewery and the Ballina industrial zone with factories including Elgas and BP. In addition, there are approximately eight hangers with multiple light aircraft for private and civilian aircraft and maintenance. There are also fuel farms for Avgas and Avtur which hold 52,000 litres of fuel each.

8.3 Coffs Harbour Airport

Coffs Harbour Airport is a major regional tourist hub. It currently provides Category 5 ARFFS staffing. The airport upgrades to Category 6 staffing levels for all flights of that size, which are currently two flights per day. Prior to COVID-19 restrictions, the airport operated at a Category 6 level and was close to the benchmark that would see it reclassified as Category 7.

There are no grounded aircraft using Coffs Harbour Airport.

A major regional tourist hub, safety concerns surround the lack of air traffic control tower on weekends in Coffs Harbour.

Other assets include: helicopter operations for rescue, police, defence and civilian charter operations; Air Ambulance; Australian Defence Force aircraft; fuel farm/storage unit with approximately 70,000 litres of stored and dispensed fuel; large gas storage and distribution centre.

Additional safety concerns surround the cessation of the air traffic control tower on weekends.

Regular firefighting assistance is given by Coffs Harbour NSW Fire and Rescue, who have a permanent staff of one officer and four firefighters and a response time to the airport of around seven minutes.

8.4 Brisbane Airport

Brisbane Airport is Australia's largest by area covering 2,700 hectares. It is classified as a Category 9 airport. Due to its size, Brisbane airport is currently hosting a large amount of grounded aircraft. During June, there were 74 commercial airliners in storage at Brisbane Airport. This is a large increase from the pre-COVID number of approximately 10 aircraft. Each plane carried significant fuel loads whilst grounded.

In addition to grounded aircraft, the airport has the following assets: shopping precinct, numerous training organisations (Boeing, Virgin, Aviation Australia, Life flight, Aider), two train stations, two childcare centres; numerous small business; Iseek Data Centre; Qantas and Virgin hangers (operating at reduced levels, valued at $100 million and $20 million respectively); hardware hub for the $1.2 billion OneSky; Air Traffic Services Centre (ATSC); domestic and international terminal buildings; Australian Aerospace [housing and building Australian Army and Navy attack and transport helicopters (Tiger and Taipan/NH90)]; Northrop Grumman (maintain RAAF A330 MRTT refuellers); NIOA (supplier and holder of weapons and explosives etc…); JUHI facility (approx. 4.3 million litres jet fuel.

Brisbane has over 70 grounded aircraft and is a base for a number of emergency services.

Brisbane Airport is home to the emergency service helicopter and fixed wing aircraft services through RACQ LifeFlight. Brisbane Airport is a major base for QGAir which operates aeromedical, cargo and passenger services for state government and Queensland police service. There has been no change to these service levels from COVID-19.

8.5 Cairns Airport

Cairns Airport is classified as Category 8 for ARFFS staffing levels and operated 24 hours a day seven days a week. The airport uses the remission factor for any Category 9 aircraft flights. Due to COVID-19 restrictions, ARFFS coverage has fluctuated between Category 7 (8:00 to 18:00) for passenger transports, and Category 5 (18:00 to 8:00) in which case, industry is notified, on 24-hour, 7 day a week basis. ARFFS staff leave has been used at this time to acquit targets. Excess staff have been used to cover unplanned leave. However staff are not replaced if they call in sick unless Category 5 is operational. Cairns Airport is also a diversion airport for international flights.

Cairns airport has many large freighter and smaller aircraft operating daily. QFES response time is over 3 times that recommend for aviation.

There are no grounded aircraft currently stored at Cairns airport.

Prior to COVID-19, Cairns was a very busy airport for both international and domestic flights. Aircraft continue to use Cairns Airport on a regular basis. Qantas B737 and Jetstar A320 operate one to two passenger flights per day. Freight movements also continue through the airport with Qantas freight B737 and BAE146 flights operating daily; A330-300 operating three times a week; and a 767 service operating weekly. Toll Cargo Metro Liners and 737 services operate on a daily basis. Smaller aircraft like the Fokker F100 (eight services) and Dash 8 Q400 (two to three services) also operate daily. Many other Category 4 or smaller aircraft continue to use the Airport.

Other airport assets include: The Royal Flying Doctors Service; QG Air; JUHI (currently holding 1.2 million litres); BP/ Vital fuel instillations (hold 8,4000 litres of Avgas and 170,000 litres Avtur with multiple tanker trucks); aircraft hangers or terminal and other buildings as follows below. All maintenance aircraft hangers have continued maintenance during the COVID-19 restrictions.

Aircraft Hangers

- Hawker aircraft maintenance hangar servicing Alliance F100 aircraft.
- Cobham aircraft maintenance hangar servicing Qantas link B717 aircraft.
- Aircraft turnaround servicing Qantas freight BAE146's and Dash 8 Q400.
- Skytrans maintenance hangar servicing Dash- 8 and other general aviation aircraft.
- Several smaller general aviation maintenance hangers.
- GBR and Nautilus Helicopter hangers.
- Airport Terminals and Buildings
- Two storey international and domestic terminal with 24 aircraft passenger loading bays.
- Buildings for airport catering (two), Boarder Force Australia, Department of Agriculture Quarantine (DAWR), Qantas Freight, air cadets, airport administration and central services.
- Rental car carport for AVIS, Thrifty, Eurocar, Budget and Hertz.

- Central Queensland University airports flight school

Queensland Fire and Emergency Services have two stations and an emergency control centre. The response time to the airport is 10 minutes.

8.6 Gladstone Airport

A town with a high industry presence, Gladstone relies on ARFFS to assist local fire fighting.

Gladstone Airport is classified as Category 6 for ARFFS staffing levels. This category is maintained whenever possible during the COVID-19 restrictions. The airport operates every day except Saturday with approximately six flights per day. The Category 6 level is maintained unless staff leave is taken, in which case, the level drops to Category 5.

There are currently no grounded aircraft at Gladstone Airport due to COVID-19 restrictions.

Other airport assets include: Royal Flying Doctors Service; large marine port helicopter and fuel farm (approx. 20-30,000 litres storage and distribution).

Additional risks include the high-power distribution lines feeding the rail operations that are west and east of the airport.

Gladstone itself is highly industrialised and only has a small local fire service presence. ARFFS staff are available to support the Queensland Fire and Emergency Services (QFES) at any major fire in Gladstone and surrounding industries under mutual aid agreements. The QFES has an approximate five-minute response time to the airport.

8.7 Rockhampton Airport

Terminal upgrades with hot works and close proximity to the Defence Forces, increase the current risk at Rockhampton.

Rockhampton Airport is classified as Category 6 for ARFFS staff levels. However, due to its proximity to the defence forces, it is regularly classified as Category 8 in order cover military exercises in the area. As a result of the COVID-19 restrictions, the airport is currently operating at a Category 5 level and is expanding to Category 6 staffing as required to cover two to three of the larger Category 6 aircraft coming into the airport. To cover the incoming Boeing 737-800 flights, the airport uses remission (Category 7) at a Category 6 level.

Other airport assets include: fuel farm (approx. 300,000 litres stored and dispensed); RACQ; LifeFlight; Royal Flying Doctors Service; and Air Ambulance.

Terminal upgrades, include hot works, are currently underway at Rockhampton Airport, which increases the fire safety risk.

The response time for the nearest QFES Fire Station is approximately five to six minutes to the gate, an escort is then required to the airside areas.

8.8 Townsville Airport

Townsville airport is a joint user airport with a civilian side and a military side operating at the facility. Both military and civilian aircraft use both runways. Air Traffic Control (ATC) is provided by the RAAF. ARFFS operations are provided by ASA through normal industry charges to the civilian aircraft and through a separate contractual arrangement to military aircraft.

The airport is considered a Category 7 for ARFFS coverage. It is 24 hours a day with the ability to increase to Category 8 when requested by the defence force. Although ASA wanted to reclassify the airport to a Category 5 level, the Category 7 level was maintained due to Defence Force contract commitments.

Due to COVID-19 restrictions, regular passenger transport aircraft movements have dropped to one or two flights a day. There has been some increase in F100 aircraft movements due to mining industry FIFO requirements. General aviation has been sporadic with some irregular light aircraft movements. Care flight, QES chopper, and cargo aircraft (BAE146, ATR40, ATR75, B737) movements continued almost as normal. Defence Category 8 aircraft (C17, KC30) operate at least weekly.

Ammunition and explosives from the adjoining RAAF base pose continued risk for Townsville Airport.

ARFFS respond to all Townsville Airport P/L buildings. This enables Queensland Fire and Emergency Services (QFES) to respond with one appliance to all alarms. In addition to airport incidents, ARFFS staff regularly attended other major fire and flood incidents outside the airport boundary over the last several years.

The assets of the airport are necessarily divided into civilian and defence as detailed below.

The civilian side:

- Townsville Airports Terminal (TAPL)
- Extensive rental car and long-term parking facility.
- Cargo handling precinct with three large buildings.
- Flying colours hangers.
- Approximately 16 other aircraft parking bays.
- Maintenance hangers for Alliance Airlines for F100s, LifeFlight lear jet 45's, Nautilus Aviation Euro copter EC120, Robinson R44's, Queensland Government Air (QGAir) rescue chopper- 2 AW139.
- There is an extensive general aviation (GA) apron where more than 20 aircraft are parked at any one time.
- Fuel storage installation (three 110,000 litre tanks of aviation turbine fuel (Avtur), and four 10,000 litre fuel tankers.)

The defence side of the airport has two defence squadrons located inside the airport boundary - RAAF 27 Squadron and 5th Aviation Regiment.

The RAAF 27 Squadron assets include:

- Accommodation blocks (three, three storey dormitory style buildings; 28 two storey blocks; combined mess and food storage area with three separate bar and dining areas.)

- Logistical storage facilities.
- Fuel bowsers and vehicle storage.
- Vehicle maintenance facility.
- 27 Squadron headquarters.
- RAAF medical / sick bay triage rooms, four, day bedrooms. Two 4x4 ambulances.
- Military apron with military passenger terminal.
- Air movements / cargo storage and loading facility.
- Large aircraft maintenance facility.
- 10 carport type open hangars / Explosive Ordinance Loading Aprons (OLA).
- Four open OLAs capable of parking C130J Hercules up to C17 Globe masters.
- Bomb preparation area with small revetment buildings.
- Heavy concrete and dirt covered building designed for storage of EOs.
- RAAF fuel farm with tanker on-loading and off-loading bowsers, as well as a pumping system.
- RAAF fuel tanker maintenance / storage facility (approx. ten 20,000 litre fuel tankers.)

5th Aviation assets include:

- 18 MRH90 helicopters stored in two humidity-controlled hangers.
- Seven Boeing CH47 Chinook helicopters stored in a hanger.
- Large maintenance hangar capable of housing four MRH90 helicopters.
- Large maintenance hangar capable of servicing four Boeing CH47 Chinook helicopters.
- MRH90 fully articulated simulator building.
- Boeing CH47 Chinook fully articulated simulator building.
- Two large two storey administration training buildings.

8.9 Avalon Airport

Avalon Airport is one of the major areas to store large aircraft which require daily maintenance.

Avalon is currently providing a Category 5 ARFFS. Prior to COVID-19, Avalon was classed as a Category 8 airport. However, the airport accepted aircraft up to Category 9 size and used the ICAO remission factor to meet regulations. Avalon is designated as an alternate airport for Melbourne.

Avalon Airport is currently one of the main airports in Australia to house the grounded aircraft due to falling passenger numbers. At June 2020 there are 36 aircraft stored at Avalon Airport. There are nine Boeing 787 Dreamliners, 14-15 Airbus A330, 7 Boeing 737 and between four to five Airbus A320 aircraft stored there. Grounded aircraft are worked on by engineers on a daily basis.

Additional airport assets include: Victorian Police Helicopter; Victorian Air Ambulance; Marine Ports helicopter; and a new helicopter base to house and operate multiple helicopters and aircraft.

Training by the ADF and Roulettes is regularly undertaken at Avalon.

The Defence Force, including the Roulettes regularly train at this airport conducting touch and go landings and circuit training for airport familiarisation.

Both terminals at Avalon are currently undergoing works to accommodate isolation measures post COVID-19, including regular hot works. The nearest CFA permanent fire station is Lara which has a 15- to 20-minute response time, followed by Geelong at 25 minutes.

8.10 Canberra Airport

The airport is classified as a Category 8 for ARFFS staffing levels, but due to COVID-19 restrictions, the airport is currently operating at a Category 7 level.

Canberra has seen an increase of both RAAF VIP and diplomatic flights since the pandemic.

The aircraft operating at the airport are mainly Category 5 and 6 aircraft, however there has been an increase in RAAF VIP flights in Canberra in this time. The RAAF Boeing 737, EEW and C E-7 Wedgetails and ASW P-8A Poseidon's have also been utilising the airport for touch and go training during the COVID-19 restrictions. Additionally, incoming and outgoing diplomatic flights up to and including Category 9 Boeing 777's have been operating at short notice.

There are currently no grounded aircraft stored at Canberra Airport.

Airport assets include: major terminal building; retail, building and office complexes; underground fuel system (approx. 750,000 litres of fuel stored and dispensed) and Boing 717 maintenance facility.

ACT Fire and Rescue Fishwick or Ainsleigh are the nearest fire stations with approximately an eight to nine-minute response time to the staging areas. An escort is then required to the airside areas.

8.11 Adelaide Airport

Adelaide Airport is the alternative airport for large Melbourne, Sydney and Perth flights.

Around 15 large aircraft are currently receiving maintenance.

Adelaide Airport is currently classed as Category 7 for ARFFS staffing during the day and drops to Category 5 during curfew. The original classification pre COVID-19 was Category 9. The 47 ARFFS staff at Adelaide Airport have been required to take leave (both accrued and annual). The airport operates as an alternate airport for flights to Melbourne, Sydney, and Perth.

Adelaide is the termination point for some airlines, who then house aircraft at this airport overnight. Up to 12 Boeing 737 and Airbus A320 aircraft are parked in Adelaide on most nights. Currently there are around 15 of this size aircraft permanently parked due to COVID-19 restrictions. These aircraft are undergoing maintenance and servicing involving regular movement to avoid tyre damage and are subject to start ups and Auxiliary Power Unit (APU) operations.

Air freight operations continue at Adelaide Airport. Boeing 737 and BAE 146 freighters land several times during curfew. Both aircraft are larger in size and risk than the Category 5 ARFFS operations provided.

Other airport assets include: Royal Flying Doctors Service; Air Ambulance; Med Star; SA Police; SA Ambulance; Surf Rescue; motor accident helicopters; Heli Star; Babcock aviation maintenance facilities; and Alliance and Cobham aviation maintenance facilities.

ARFFS has an obligation to provide a water rescue service during all periods to rescue passengers from any aircraft incidents or accidents that occur on approach or departure from Adelaide Airport.

Additional safety concerns also surround the large fuel farm (JUHI) and the current work to extend to the International Terminal. These works involve external construction crews and hot work permits which increases the risks of structural fires considerably.

8.12 Darwin Airport

Military activity with large aircraft continues at Darwin amid the pandemic.

Darwin Airport is classified as Category 8 for ARFFS staffing levels. Due to the COVID-19 restrictions, the airport is operating at a Category 6 level on weekends and some nights, whilst maintaining the Category 8 level for all other times. However, the NT has had no COVID-19 cases in over two months and their borders are due to open in July with an anticipated surge in air travel likely.

The RAAF are flying numerous Category 9 (Boeing B777 and Airbus A330s) aircraft into the airport which are MTT (Multi-Task Tankers) or US flights transporting marines to the base.

In addition to military activity at Darwin Airport, domestic flights are continuing with regular Category 7 flights, along with significant general aviation and regional flights.

Due to the humid climate, there are no grounded planes stored at Darwin airport.

Additional safety concerns include the four fuel farms; liquid oxygen storage and defence ordnance storage facility.

The Northern Territory Fire and Rescue Service has a response time of approximately four to five minutes. An escort is then required to the airside areas.

8.13 Alice Springs Airport

There are a large number of grounded planes stored at the Alice Springs facility including FlyScoot (Thailand), Singapore Airlines, Silk Air and Alliance.

8.14 Perth Airport

Reduced staffing levels in Perth have meant the loss of the DRV coverage.

Perth Airport is listed as a Category 9 airport for ARFFS staffing levels. This has been retained but with reduced staffing levels over this period, critically, with the loss of a domestic response vehicle (DRV). Staff have been forced to take leave over this period resulting in the airport operating at a Category 8 level when there are not enough staff.

In June there were approximately 65 grounded aircraft stored at Perth airport. A six-fold increase on pre pandemic numbers.

There is a 6-fold increase in stored aircraft at Perth since the pandemic.

Perth Airport assets include: four terminals, distribution centres for Coles and Woolworths, Direct Factory Outlet and Costco shopping precinct, office buildings, powerhouses and maintenance centres.

The airport stores a large amount of fuel in both the Joint User Hydrant Installation (JUHI) (upwards of two million litres of fuel) and the Rio Tinto base (10,000 litre diesel store).

8.15 Port Hedland Airport

Without ARFFS at Port Hedland, response times would be 5 times longer than the accepted 3 minutes.

Port Hedland Airport is listed as a Category 6 airport for ARFFS staffing levels. This level has been maintained during the COVID-19 restrictions. This reflects that there has been no change in weekly flights due to the mining industry. Weekend flights have reduced in frequency, which has resulted in there being no ARFFS staff coverage at the airport when there are no flights. However, with the return of domestic flights in WA, it is expected that normal levels of weekend operation will return soon.

There are no additional grounded aircraft parked at Port Hedland Airport. The airport does have general aviation aircraft and the occasional F100-737 parked overnight, but this is not due to any COVID-19 restrictions.

Airport assets include: terminal and temporary buildings for the current upgrade; NAV aids and tower and a freight shed; general aviation aircraft in their own hanger; Royal Flying Doctors Service hanger; School of the Air and RFDS buildings; and fuel farm.

There is also a fire station on site, but coverage is supplied by volunteers from the Department of Fire and Emergency Services. Whilst these brigades are strong, they have a 15- to 20-minute response time to the airport.

8.16 Launceston Airport

Launceston Airport is currently a Category 7 airport for ARFFS staffing levels. Airport operations have reduced to four flights into and out of Launceston per day, on Monday, Tuesday, Thursday and Friday during the pandemic. The airport can accommodate both Category 7 and 6 aircraft with B737-800 (Virgin), A320/321 (Jetstar) and Bombardier Dash 8 A400 (Qantas).

With both an on-site fuel farm and whiskey distillery, Launceston Airport stores a large amount of flammable fuel.

Airport assets include: services for security (as well as bio-security); airlines, retail outlets and car hire; aircraft hangers, including general aviation; Qantas and Virgin Freight; Tasmanian Aero Club with its' own fuel bowser; Sharp Airlines hanger and check in area; Royal Flying Doctors Service (multiple hangers and pilot dorm building); air traffic control tower; satellite ground station; power and back-up power storage area; meteorology weather building; VHF Omnidirectional Radio Range (VOR) unit and glide path; whiskey distillery; and fuel farm (approximately 5,000 litres of diesel, over 240,000 litres of Avtur, and over 46,000 litres of Avgas), with four tankers.

As well as the ARFFS station, there are volunteer fire brigades located at Evandale and Perth with a five-minute response time to the airport depending on volunteer response level and training for aircraft incidents. There is also the Tasmanian Fire Service which is located in Launceston, but with an estimated 15 to 20 minute response time.

9. A broader view of assets and risk – Australia's tourism capacity

An analysis by Mitchell and Flanagan (2019) demonstrated the importance of maintaining a reputation for air safety to the Australian tourist industry. As restrictions ease, domestic flight movements are starting to return to more normal levels. In due course, air traffic to regional destinations will return to strength and will become a pivotal part of the economic recovery for the nation. Whilst international tourism will take longer to recover due to border closures, when it does recover, it is reasonable to expect strong demand. It would be a significant setback to some of the regional areas that rely on their airports to bring tourists in for holidays if a major incident occurred as a result of a lack of ARFFS personnel on the ground.

Domestic tourism within Australia is strongly linked to air travel due to the sparse nature of the country and the ease and flexibility of travel, particularly between large cities, due to the advent of low-cost carriers. Even with international restrictions in place, we can expect the New Zealand-Australian routes to open relatively soon, which will provide a boost to many Australian tourism regions.

Tourist destinations are often determined by their natural resources, or the local culture and infrastructure. The air transport service afforded a tourist destination, in terms of timing and frequency of flights, as well as cost, will have a large impact on its tourist numbers. Further, the design and capacity of the airports and airport infrastructure at a location can determine the type of aircraft accommodated as well as the service provided once a tourist is on the ground, particularly in terms of transfers to their destination (for evidence, see Debbage and Alkaabi, 2008; Williams and Balaz, 2009; Bieger and Wittmer, 2006; Galambos et al., 2014).

Over 58% of interstate travel is by air.

Domestically, over 58.4 per cent of people travelling interstate in Australia travel by air transport (Tourism Research Australia 2019, Table 6). As such, aviation is a strategic priority for Tourism Australia in achieving their Tourism 2020 targets.

Away from the major cities the use, availability and affordability of air travel is a contentious issue. With both New South Wales and Western Australia holding inquiries into the cost of air travel (Standing Committee of State Development, 2014; Economics and Industry Standing Committee, 2017). There is also currently a Federal Government's Senate Standing Committee on Rural and Regional Affairs and Transport inquiry on the operation, regulation and funding of air service delivery to rural, regional and remote communities. The pandemic will focus their brief on the importance of keeping Australia's regional air capacity intact and ready to respond to increasing demand as the health crisis eases.

International travellers who are visiting friends and relatives, contribute greatly to the tourist market in Australia. Together, international travellers on holiday or visiting friends and relatives as their main purpose accounted for over three quarters of the 6.3 million international visitor arrivals for the period 1 July 2019 to 31 March 2020. Unsurprisingly the vast majority of international visitors come by air transport, highlighting the importance of the aviation industry to international tourism. While the pandemic has halted much of this traffic, we expect demand to be strong once health officials clear the way for renewed international travel.

Table 9.2 shows the modes of transport of domestic tourists for the year ending December 2019. Over 14 million Australian residents took a domestic flight for the purpose of an overnight holiday or visiting friends and relatives. This represents about half the total flights taken for this period. Air travel is proportionally more attractive to visitors who take a trip of two or more nights than just a single night, with over 30 per cent of holidaymakers and visitors to friends and relatives who stayed two or three nights, travelling by aeroplane.

Domestic tourism will be crucial to the revitalisation of the economy post pandemic.

Our airports need to retain their high safety record to allow for a quick return to business.

The economic benefits of tourism have long been established. Put in its simplest terms, a visitor or tourist who visits or stays outside their usual environment generates additional expenditure beyond that generated by local consumers who spend money in their usual environment.

As Australia begins the slow recovery from the pandemic, domestic tourism will become a crucial source of revitalisation, particularly in regions that have economies geared to providing holiday services.

The Tourism Satellite Account (TSA) was created to aggregate tourism-related contributions that are made across the different sectors of the economy. Some researchers suggest that the so-called 'indirect effects' of tourism, which are the flow-on effects that occur following changes in supply that result from spending of the tourism industry's receipts on goods and services from other industries, are highly significant. These inter-industry transactions occur in response to tourism consumption and produce additional spending in the economy. While there are differences of opinion about the best way to estimate the economic impact of tourism, the TSA approach is universally deployed and we use it here to provide an overview of the economic impacts of tourism in Australia.

In the 2018-19 financial year, tourism contributed $60.8 billion toward the country's GDP, which represents 3.1 per cent of total GDP or 3.4 per cent of real GDP (Austrade, 2019). This represented a real increase of 6 per cent on the previous year. This followed a 7.2 per cent increase in tourism's contribution to GDP in 2017-18. This contribution will increase in the short-run as the pandemic restrictions ease, given the mainly closed international border.

Poor airport safety will put the recovery of industries related to tourism such as accommodation, food services, transport, retail trade, the arts and recreation in jeopardy.

Tourism also provides around one in 19 jobs created in Australia and "cuts across a wide range of industries, including Accommodation, Food Services, Transport, Retail Trade and Arts and Recreation" (Austrade, 2019). These are the sectors that have been most damaged by the pandemic lockdowns and will be most advantaged once more travel freedoms are allowed.

A more accurate indicator of economic activity is gross value added (GVA), which excludes payments made through the taxation system. Under this measure, direct tourism was $55.9 billion in nominal price terms in 2018-19, which represents 3.3 per cent of total GVA (ABS, 2019b). The increase on the previous year's direct tourism GVA was 6.1 per cent (ABS, 2019b), as shown in Table 9.3. The largest contribution to the nation's GVA was through Air, water and other transport, closely followed by Accommodation, which both contributed over $6 billion each. Retail trade was next, contributing $6.3 billion. The number of jobs in the economy attributable to the tourism industry was just over 660,000 in 2018-19. Cafes, restaurants and takeaway food services contributed the most number of jobs, at 181,000; next was retail trade and accommodation. In terms of economic contribution to national GVA, tourism ranks behind mining, financial and insurance services, construction, health care and social assistance and professional, scientific and technical services (TRA, 2018: Table 15).

The indirect effects of tourism to gross value added, which include the flow-on effects of tourism demand in the chain of supply of goods and services to visitors, were estimated for 2018-19 to be $55.1 billion, or 2.9 per cent of national GVA.

Tasmania relies on the tourism industry proportionally more than any other state, with it making up 10.7 per cent of its total GVA and contributing 17.4 per cent of total jobs in the state. While Western Australia's tourism industry is the lowest proportionally of total GVA, it provides only slightly less jobs than the national average.

$4.9bn and 8,700 jobs – the economic contribution of core airport activities.

$30bn and 200,000 jobs – the total value added by airport activity.

In 2016-17 the Australian Airports Association estimated the total economic contribution of airport core activities, including direct and indirect effects, to be almost $4.9 billion, which supported over 8,700 jobs (Deloitte Access Economics 2018: 7). In 2016-17 the total value added was estimated at almost $30 billion, while supporting almost 200,000 full-time equivalent jobs. They estimate that across Australia, total tourism activity facilitated by the aviation sector contributes $32.2 billion, which is equivalent to 1.9 per cent of the total economy. Further, total tourism activity supports 339,700 jobs across Australia, or 1.8 per cent of total employment.

Despite the variation in the estimation methods of the economic contribution of tourists, the impact of tourists on the economy is significant.

Mitchell and Flanagan (2019) provide extensive evidence which demonstrates that Australia has an excellent record for airline safety. The relevant issue during this pandemic and in the period after flights resume more fully in this context, is what would be the impact on tourism if there was a major adverse event at an Australian airport due to a lack of available ARFFS personnel.

In fact, the research findings that apply to a potential air transport accident are also relevant to a broader incident at our airports arising, for example, from a fuel fire triggered by leaks and plane movement during the regular maintenance while the planes are parked. A major fire, for example, could damage essential airport infrastructure and require extensive restoration, which would probably involve years of planning and construction activity before normal services could resume. Any tourist activity in the vicinity that was dependent on that particular airport would be severely damaged.

A major fire that damages essential airport infrastructure could be devastating for the re-emerging post pandemic tourism industry and the Australian economy.

Using the Tourism Satellite Accounts, Mitchell and Flanagan (2019) found that the total reduction in direct GVA as a result of an air traffic accident for 2016-17 would have been of the order of $1,477 million and the total reduction in direct employment would have been 19,604 jobs. Including the flow-on effects of this reduction in tourism, Australia's Gross Value Added would decline by almost $2.8 billion, over 2.8 per cent of the total contribution of the tourism sector to GVA, with almost 30,000 job losses.

While the context is somewhat different at present, Australia needs all of its tourist infrastructure intact and ready to activate the strong demand that is anticipated as borders open within Australia and domestic tourism leads the recovery across regional Australia.

10. The cost of provision of ARFFS in Australia

There are 858 ARFFS personnel protecting 26 Australian Airports.

The 2018-19 Annual Report for Airservices Australia (ASA) indicates that as of June 30, 2019, its workforce numbered 3,584 persons overall, of which 858 make up the operational aviation rescue firefighters spread out over 26 Australian airports. In 2018-19, ASA recorded a $62.4 million net profit after tax (NPAT) and a rate of return on assets of 8.2 per cent. Overall, the 2019 results show that total expenses were $1,039,255 thousand and $644,538 was accounted for by "Employee Benefits" (62 per cent). The breakdown is shown in Table 10.1.

From analysis of the data on one airport from the 2016 financial year, it was found that the airport employed 86 full-time equivalent positions (103 total positions) in ARFFS. Consulting the Airservices Australia Enterprise Award 2016, gave us an approximate wages and salaries bill of around $5 million. At that time, the overall ARFFS employment was around 1,037 workers and ASA employment was 3,711 (as at June 30, 2017), so this particular airport accounted for around 10 per cent of the total ARFFS workforce in Australia. Overall, the ARFFS accounted for around 28 per cent of the total ASA workforce. It is clear that the ARFFS proportion in total ASA employment has declined substantially under their new model.

While not definitive, given the paucity of information, it is beyond question that the proportionalities involved – cost of maintaining the ARFFS personnel relative to the costs that could arise from an adverse incident – are all in favour of maintaining the ARFFS personnel.

Airservices Australia (ASA) is a government owned corporation, established by the Air Services Act 1995. ASA is funded through levies they place on their customers, specifically the airlines who use the airports where their services are utilised. They charge levies for each of their three main services:

- Enroute services;
- Terminal navigation (TN) services; and
- Aviation Rescue and Fire Fighting Service (ARFFS).

Whilst there is debate over the way ASA should charge for ARFFS (see Mitchell and Flanagan, 2019), It is clear from the data, that the incident rate is much lower where ARFFS personnel are stationed. The ARFFS is considered to be an essential service given the damage that a major air transport accident or other adverse incident would impose on Australia's reputation and economic activity.

ARFFS is an essential service given the damage a major air transport accident would do to Australia's reputation and economic activity.

In this regard the stakeholders of ARFFS operations are not simply the passengers and crew, but include all Australians through the imputed benefits we receive from having a safe airline industry and safe airports supported by world class ARFFS operations at airports. Not only does this increase our own safety when we travel to smaller regional airports, it increases the international reputation of Australia, increases the confidence in the airline industry and hence contributes to our tourism sector, a large contributor to our national income. Further, the nation benefits from having skilled and equipped emergency response capacity positioned at airports around the country, to assist in special circumstances and in times of national emergency, such as bushfires, floods and the like.

People are happy to pay for a safe travel. There is no political justification for not supporting ARFFS now and in the future.

The literature demonstrates that in normal times, the willingness to pay to reduce possible risks is well-defined among travellers (for example, Carlsson et al., 2004; Savage, 2011; Koo et al., 2015; Braithwaite, 2001). The inference from this literature is that the Federal government would have no political problems justifying supporting essential ARFFS at our airports during the pandemic and into the recovery to maintain a sense of security for airport users and future users and the sectors that will rely on a rapid return to scale of the airline travel industry.

11. Conclusion

In this Report, we have extended the earlier analysis of Mitchell and Flanagan (2019) by considering the risks facing airport assets while air traffic movements are limited into and out of Australian airports. This has involved an assessment of the value of the airport and airline asset pool that is at risk, and the reasons that risk arises when flight frequencies are limited.

The Report has discussed the possible consequences of an adverse event in terms of both short-run losses (eg. airport and other assets) and medium- to longer-term losses (eg. tourism) that might be endured in the event of a possible shutdown of an airport due to such an event. It was reinforced by detailed geospatial analysis of the broader neighbourhood risks for many airports and case studies of the current situation and the at-risk assets at many of the key Australian airports.

ARFFS operations are an essential service, not only at our Australian airports, but also for our local communities. At present, they provide protection of valuable grounded aircraft and surrounding buildings and communities. In the longer term, the continued protection by ARFFS allows for the Australian tourism industry to benefit from Australia's air safety record which will be pivotal to the economic recovery of Australia when the pandemic eases.

1. Introduction

1.1 Purpose of the Report

The Centre of Full Employment and Equity (CofFEE) was commissioned by the United Firefighters Union of Australia (UFUA) in May 2020 to provide a risk assessment of the fire vulnerabilities facing Australian airports during the COVID-19 pandemic and to assess the costs and benefits of sustaining airport fire fighting capacity while air traffic movements are limited.

The research report considers an array of issues pertaining to the fire fighting and emergency response by Aviation Rescue and Fire Fighting Service (ARFFS) and considers the requirements for this capacity in the face of the collapse of flight movements at Australian airports.

An earlier report prepared by the Centre for the UFUA to inform their submission to the Senate inquiry conducted in 2019 by the Rural and Regional Affairs and Transport References Committee provides detailed background information that is also relevant (Mitchell and Flanagan, 2019).

In particular, that study examined the current standards applicable to the provision of aerodrome rescue and fire fighting services relating to community safety and the emergency personnel safety and the standards for the provision of emergency response at Australian airports, including emergency medical response, and response to structure fires and other incidents.

It demonstrated that the degree of substitutability between the specialised aviation fire fighting capacity and conventional fire fighting capacity was limited and insufficient to maintain the current standards of asset risk management at Australian airports and their environs.

In this Report, we extend that analysis by considering the risks facing airport assets while air traffic movements are limited into and out of Australian airports. This involves an assessment of the value of the airport and airline asset pool that is at risk, and the reasons that risk arises when flight frequencies are limited.

The report discusses the possible consequences of an adverse event in terms of the:

a. Short-run losses that might be endured (asset losses, etc).
b. The medium- to longer-term losses that might be endured by sectors such as tourism, in the event of a possible shutdown of an airport due to such an event.

It is reinforced by detailed geospatial analysis of the broader neighbourhood risks for many airports.

Detailed case studies of the current situation and the at-risk assets at many of the key Australian airports is also provided.

1.2 Outline of the report

The report is structured as follows:

- Section 2 – provides an overview of the current system of Aviation Rescue and Fire Fighting Service (ARFFS) at Australian airports.
- Section 3 reviews the regulatory system governing ARFFS in Australia. It also looks at the international system of compliance to standards.
- Section 4 provides a detailed examination of the requirements of ARFFS operations and compares the Australian standards with international best practice.
- Section 5 describes the current collapse of airline travel during the pandemic with up-to-date flight frequency data.
- Section 6 analyses the extent of government aid to the aviation industry during the pandemic with international comparisons.
- Section 7 evaluates the current risk at Australian airports including assessments of broader neighbourhood risks for many airports.
- Section 8 conducts a detailed case study approach to assess the current situation and at-risk assets at Australian airports.
- Section 9 takes a broader view of assets and risk by examining Australia's tourism capacity.
- Section 10 considers the cost of provision of ARFFS operations in Australia.
- Finally, a conclusion summarises the key findings.

2. Aviation Rescue and Fire Fighting Service (ARFFS) in Australia

Aviation Rescue and Fire Fighting Service (ARFFS) is a branch of fire fighting and rescue that deals specifically with fires and rescue situations arising from aviation incidents. ARFFS personnel respond to multiple types of incidents involving aircraft at and in the immediate vicinity surrounding airports, with their primary role being to optimise the chance of survival of occupants of an aircraft that has crashed and to protect property and equipment from the effects of fire.

In Australia, the functions of ARFFS are defined in the Civil Aviation Safety Regulations as:

a) to rescue persons and property from an aircraft that has crashed or caught fire during landing or take off; and

b) to control and extinguish, and to protect persons and property threatened by, a fire on the aerodrome, whether or not in an aircraft.

There are a number of reasons special ARFFS are required to be readily available to deal with aviation incidents. The first is that the type of situation that arises from an aircraft incident is quite different to that which may face emergency responders to accidents involving other types of transport. Specifically, the large amount of fuel that can potentially ignite poses a very real and immediate danger in any aircraft incident. Second, the potential for mass fatalities is very real and hence the speed with which fire fighters must respond to an aircraft incident is of paramount importance. To this end, aviation fire fighters must be located within an airport or very nearby, to reduce the risk of catastrophe. Third, the apparatus and the personal protective equipment used by aviation fire fighters is very specialised and requires advanced training.

In Australia, ARFFS are required at airports that receive scheduled international passenger air services, or airports with over 350,000 passenger movements on scheduled passenger air services in a 12 month period. This means presently in Australia there are ARFFS at 27 of Australia's 195 certified airports. ARFFS are provided by Airservices Australia (ASA) at 26 of these. The Norfolk Island Regional Council is responsible for providing ARFFS at Norfolk Island International Airport and the Department of Defence is the provider at Newcastle Airport (which is also a RAAF Base, situated at Williamtown).

ASA is a government owned organisation established under the Air Services Act 1995. It has a range of functions outlined in the Act, including providing services and facilities for the safety, regularity and efficiency of air navigation; the promotion and fostering of civil aviation; and cooperation with the Australian Transport Safety Bureau in relation to investigations that relate to aircraft incidents. The services ASA provide include air traffic services; aeronautical information, radio navigation and telecommunications services; and Aviation Rescue and Fire Fighting Services. The Act stipulates that ASA must regard the safety of air navigation as the most important consideration.

The obligation of airports to have ARFFS readily available is a requirement of the International Civil Aviation Organisation (ICAO), of which Australia is a signatory. The ICAO was set up following the Convention on International Civil Aviation, also known as the Chicago Convention, in 1944. ARFFS in Australia was established in 1947 and has been provided predominantly by the Commonwealth government, through various entities acting under an authorising Act of Parliament. Sydney Airport's ARFFS is one of the oldest and longest continually running services in the world.

There are currently 27 ARFFS situated at airports around Australia. Deregulation and airport privatisation has seen the introduction of greater competition in the aviation industry and the push for lower cost fares, which has increased passenger numbers. Cost rationalisation has also seen the push to make the provision of aviation safety services, such as ARFFS, cost recoverable.

In July 1991 the Civil Aviation Authority, the regulatory authority at the time, announced it would remove ARFFS from capital city secondary airports, such as Bankstown, Essendon and Jandakot. In the years after, ARFFS have been provided on the basis of passenger numbers that use an airport. The latest increase in the provision of ARFFS occurred in 2014-15 when it was introduced at Coffs Harbour, Ballina, Gladstone and Newman airports. Figure 2.1 shows the locations of airports with current ARFFS.

Figure 2.1 Aviation Rescue and Fire Fighting Service services locations

Source: ASA website accessed 1 June 2020 https://www.airservicesaustralia.com/about/our-facilities/aviation-rescue-fire-fighting/

Currently, after a regulatory review in 2015-16, once airports pass the threshold for passenger numbers, or receive scheduled international passenger air services, a risk review is carried out to determine whether ARFFS is required (see Section 3). If it is deemed to be necessary, ARFFS is categorised according to the size of aircraft that use the airport (see Section 4). The different categories determine the resources provided to the ARFFS, including the number of vehicles, ancillary equipment and agent quantities. Whilst the ICAO Task Resource Analysis (TRA) determines the staffing level. The airports in Australia that fit into the various categories are shown in Table 2.1.

The primary purpose of ARFFS is to respond to aircraft incidents on or in the immediate vicinity of the airport. However, ARFFS personnel respond to a variety of calls for person or asset protection. Aircraft incidents include crashes, engine fires and fuel spills, while other incidents ARFFS personnel respond to include emergency medical response (first aid) calls, motor vehicle accidents, hazmat incidents, other fires and alarms. Importantly, they also support local fire brigades in mutual aid calls including bushfire emergencies.

Of significance for this Report, many Australian airports are embedded in localities where surrounding housing and industrial communities are vulnerable to a major event occurring, and ARFFS clearly provide first response capacity to attenuate that risk.

Table 2.1 ARFFS levels of service at Australian airports

Category 6	Category 7	Category 8	Category 9	Category 10
Ayers Rock	Alice Springs	Avalon	Adelaide	Melbourne
Ballina	Hamilton Island	Cairns	Brisbane	Sydney
Broome	Hobart	Canberra	Perth	
Coffs Harbour	Launceston	Darwin		
Gladstone	Mackay	Gold Coast		
Karratha	Sunshine Coast			
Newman	Townsville			
Port Hedland				
Rockhampton				

Source: ASA website, accessed 1 June 2020 https://www.airservicesaustralia.com/services/about-our-aviation-fire-service/ARFFS-levels-of-service/

The most recent data (2017-18) shows that ARFFS personnel responded to almost 7,000 calls nationally, over 450 of which were aircraft incidents (Table 2.2).

Quick response of ARFFS to incidents is of paramount importance in averting a catastrophe. Hence, their readiness (or preparedness) to attend an incident at a moment's notice is important and is recorded, as is their actual response time to an incident. In 2014-15 and 2015-16, the failure to achieve 100 per cent response time of three minutes on the aerodrome movement area was due to one incident in each year, both involving abnormal landings.

Table 2.2 ASA ARFFS national performance indicators, 2013-14 – 2018-19

Year	ARFFS Airports	Operational staff	Aircraft incidents	Total call responses	Readiness rate (%)	Response time rate (%)
2018-19	26	858	468	6700	99.9	NA
2017-18	26	843	452	6900	99.9	100
2016-17	26	877	430	NA	NA	100
2015-16	26	856	395	7000	99.94	99.78
2014-15	26	853	NA	6702	99.94	99.64
2013-14	22	669	NA	7200	99.9	NA

Source: Airservices Australia Annual Reports 2014-2019. NA - Not available

Specialised qualification and skills based recertification of ARFFS personnel is delivered at the Airservices Learning Academy in Melbourne. The training involves theory sessions and practical training scenarios conducted on a purpose-built hot fire training ground designed to simulate a full-size A380 aircraft fuselage. The Learning Academy is able to deliver Certificate II, III, IV, Diploma and Advanced Diploma qualifications as well as ongoing CASA regulated recertification, and aims to provide aviation fire fighters with the skills and knowledge they will need for the specialised and unique situations they will face, including response to aviation incidents, fireground management, operating breathing apparatus and other specialised equipment, and working as part of the team. On-the-job training continues at regular intervals.

3. Regulatory system of ARFFS provision

3.1 Civil Aviation Safety Authority (CASA)

The Civil Aviation Safety Regulations 1998 (CASR), made under the Civil Aviation Act 1988, set out the regulations for the civil aviation sector in Australia. The Civil Aviation Safety Authority (CASA) is responsible for issuing and enforcing the regulations. CASA was established in 1995 and is a corporate Commonwealth entity, under the Public Governance, Performance and Accountability Act 2013. Section 9 of the Civil Aviation Act sets out CASA's functions. CASA's stated purpose is to maintain, enhance and promote the safety of civil aviation, with particular focus on preventing aviation accidents and incidents. It is also responsible for fostering the efficient use of, and equitable access to, Australian-administered airspace. Section 9A of the Act makes clear the emphasis CASA places on safety:

In exercising its powers and performing its functions CASA must regard the safety of air navigation as the most important consideration (Civil Aviation Act 1988).

Among CASA's powers are to regulate aerodrome rescue and fire fighting services. Part 139 prescribes the requirements for aerodromes used in air transport operations. Subpart 139.H specifies the requirements for the provision of ARFFS. It also puts in place a safety framework, sets minimum service standards and sets establishment and disestablishment criteria for ARFFS.

The CASR sets out the purpose of ARFFS as to rescue persons and property from aircraft that have crashed or caught fire at or near an aerodrome. There is also the expectation ARFFS will respond to other fires at an aerodrome. Part 139.H details the requirements for ARFFS, defining minimum service standards including:

- criteria for establishment and disestablishment of ARFFS;
- provision of ARFFS outside of the criteria;
- interface arrangements with State or Territory fire brigades and other third party providers;
- quality control;
- ARFFS personnel recruitment;
- training establishments; and
- applicants organisation (CASA, 2019).

CASA publishes the Manual of Standards (MOS) (CASA, 2005), which is a policy manual and the means by which CASA meets its responsibilities under the Act for promulgating aviation safety standards. The MOS is a legislative instrument, which outlines detailed technical material (aviation safety standards) that are deemed necessary for the safety of air navigation in Australia. The responsibility for technical matters in the MOS is the responsibility of the National Operations and Standards Division (formerly the Aviation Safety Standards Division).

The CASR and MOS broadly align with international standards outlined by the International Civil Aviation Organisation (ICAO, see below), however there are some differences between them, some of which are in relation to the delivery of ARFFS at Australian airports. The MOS recognises this and sets out that "where there is a difference between a standard prescribed in ICAO documents and the MOS, the MOS standard shall prevail" (CASA, 2005, p. 1-2). Differences are published in the Aeronautical Information Publication, as required by ICAO.

CASA has the authority to grant exemptions from provisions of the CASR under Subpart 11.F. This can include an exemption from a requirement in the CASR to comply with the MOS, or some other referenced document. Most exemptions are granted through a process of application from a person or organisation and may be in relation to an aircraft or aeronautical product, an operation, or an authorisation. The process followed by CASA for exemptions is set out in Advisory Circular AC 11-02(2). CASA requires exemption applications three months prior to when they are required to commence, but exemptions can be made in exceptional circumstances where the application can be made in any reasonable way.

3.2 Australian Transport Safety Bureau (ATSB)

The Australian Transport Safety Bureau (ATSB) is the prime agency in Australia for the independent investigation of civil aviation accidents, incidents and safety deficiencies. It is governed by the Transport Safety Investigation Act 2003 and investigates for the purpose of "no blame" safety improvements, not for the purpose of taking administrative, regulatory or criminal action.

The ATSB is governed by a Commission, separate from policy makers, industry operators and regulators such as CASA. The ATSB follows Annex 13 to the Convention on International Civil Aviation (Chicago Convention), which prescribes international principles for aircraft accident and incident investigation, reflected in the Transport Safety Investigation Act. As the primary focus of the ATSB is the safety of the travelling public, the ATSB also investigates safety issues based on occurrence trends in the hope of averting a future accident (ATSB, 2019).

3.3 Airservices Australia (ASA)

Airservices Australia (ASA) was established under the Air Services Act 1995. It is a corporate Commonwealth entity under the Public Governance, Performance and Accountability Act 2013 (ASA, 2018). ASA is responsible for providing safe, secure, efficient and environmentally responsible air navigation and Aviation Rescue and Fire Fighting Service services.

Their functions under the Air Services Act include:

- providing facilities for the safe navigation of aircraft within Australian-administered airspace;
- promoting and fostering civil aviation in Australia and overseas; and
- providing air traffic services, aviation rescue fire fighting services, aeronautical information, radio navigation and telecommunications services.

ASA is governed by a Board whose members are appointed by the Minister for Infrastructure, Transport and Regional Development, consisting of eight members. The Board determines the objectives, strategies and policies of ASA, ensuring it fulfils its statutory functions.

ASA provides terminal navigation (TN), ARFFS and en route navigation services at airports around Australia, for which it charges aircraft operators appropriate charges. Charges are set subject to notification to the Australian Competition and Consumer Commission (ACCC), which reviews ASA pricing every five years.

Overall ASA had 3,584 employees in 2018-19, 858 of which were employed in Aviation Rescue and Fire Fighting Service at airports around the country (Airservices Australia, 2019).

3.4 Aviation Rescue and Fire Fighting Service Regulatory Policy Review

There have been a number of reviews and audits into the operation and regulations of the civil aviation industry over the years. These have come from within the industry, for example CASA post-implementation reviews, as well as from government itself in the form of safety reviews and as part of the national commission of audit. For an overview of relevant recent reviews into the industry and its effects on the regulation and provision of ARFFS, see Quirk (2016).

A 2015 Review by the Federal Department of Infrastructure and Regional Development (DIRD, 2015) proposed a number of regulatory changes, which were subsequently amended in June 2018.

Trigger events were defined which would instigate a CASA risk review to determine if establishment/disestablishment was appropriate. Trigger events that would lead to the establishment of a service included an airport receiving scheduled international passenger services or when passenger movements on scheduled passenger air services exceeded 350,000 over a 12-month period. Disestablishment would follow if scheduled international air services were withdrawn or if passenger movements fell below 300,000 and persisted at that level for a 12-month period.

Areas and facilities to be the responsibility of ARFFS were listed as aviation-related infrastructure, which may include infrastructure identified in an agreement between ARFFS and a state/territory fire authority. State and territory fire authorities are not required to hold separate CASA approval to assist an ARFFS provider in the provision of ARFFS.

3.5 International Civil Aviation Organisation (ICAO)

The International Civil Aviation Organisation (ICAO) was set up following the Convention on International Civil Aviation, also known as the Chicago Convention. The Convention, of which Australia is a signatory, was signed in December 1944 by 52 states and the ICAO came into being in April 1947. Later that year the ICAO became a specialised agency of the United Nations. The ICAO was originally created to promote the safe and efficient development of civil aviation around the world.

The ICAO sets out Standards and Recommended Practices (SARPs) for Aerodromes in Annex 14 to the Convention on International Civil Aviation. These standards were first adopted in May 1951. ICAO signatories (Member States) use these standards and recommendations to ensure their civil aviation operations and regulations conform to global norms. ICAO also monitors compliance of its signatories.

Rescue and fire fighting at airports is covered in Chapter 9.2 of Volume 1 of Annex 14. Annex 14, Chapter 9.2.1 and states that rescue and fire fighting equipment and services shall be provided at an aerodrome, and the level of protection provided shall be appropriate to the aerodrome category as determined by aeroplane length and fuselage width. The standards outline that "the principal objective of a rescue and fire fighting service is to save lives in the event of an aircraft accident or incident occurring at, or in the immediate vicinity of, an aerodrome." (ICAO, 2018, 9-3). The ICAO publishes an Airport Services Manual (Doc 9137-AN/898) which is meant to provide assistance to countries in the implementation of the specifications set out in Annex 14 (ICAO, 2015). In doing so it thereby also ensures the uniform application of the standards.

It is a requirement by ICAO that Member States notify the ICAO of any differences between their national regulations and practices and the Standards outlined in Annex 14. Differences are published in the Aeronautical Information Publication, as required by ICAO. However, this is not the case for differences resulting from MOS 139H Parts 1.2 found in Annex 14 chapter 9.2.3-9.2.7 "Level of protection to be provided". Further, Member States are invited to extend this practice to any differences between their own practices and Recommendations in Annex 14, particularly where such a difference is important for the safety of air navigation. Member States are then required to list any differences between their own regulations and practices and the ICAO SARPs through GEN 1.7 in the Aeronautical Information Service.

Part of the charter of the ICAO is to monitor the implementation of civil aviation safety in countries around the world. Member States are subject to oversight processes to monitor their adherence to ICAO standards, through the Universal Safety Oversight Audit Programme (USOAP). This was initiated in 1999 in response to concerns about the adequacy of aviation safety oversight around the world, which initially consisted of cyclical audits of a country's regulations. In 2010 the ICAO oversight function evolved to a Continuous Monitoring Approach (CMA), which is based on the concept of continuous monitoring and incorporating the analysis of safety risk factors. The aim of the current approach is to move to a systemic, ongoing process of gathering safety information (ICAO, 2010).

4. International best practice of ARFFS

4.1 Introduction

The Airport Services Manual (Doc 9137-AN/898) published by the International Civil Aviation Organisation (ICAO) states that the principal objective of an ARFFS:

> …is to save lives in the event of an aircraft accident or incident at, or in the immediate vicinity of, an airport. The ARFFS service is provided to create and maintain survivable conditions, to provide egress routes for occupants and to initiate the rescue of those occupants unable to make their escape without direct aid (ICAO, 2015, p. 1-1).

The document sets out proposals for how countries can best implement the international Standards and Recommended Practices (SARPs) outlined in Annex 14 to the Convention on International Civil Aviation.

The methodology for rescue and fire fighting at airports is based on the critical area concept. This was formed by the Rescue and Fire Fighting Panel that was first convened in 1970 and met subsequently in years since, with the concept adopted by the ICAO in 1976. Prior to this, the determination on the level of protection to be provided at airports was based on fuel load and passenger capacity of aircraft. The critical area concept is founded on the critical area to be protected in any post-accident fire that would permit the safe evacuation of aircraft passengers and crew, and is determined by the size of the aircraft. This concept provides the basis for ARFFS standards.

The ICAO publish their Standards in Annex 14 to the Convention on International Civil Aviation. While these are the international standard, countries publish their own standards and, as we have seen in the previous section, where these are different, need to make a notification to the ICAO.

As well as the ICAO, the international, non-profit National Fire Protection Administration (NFPA) publishes standards related to all types of fire fighting. The NFPA is a global, self-funded organisation which advocates for the elimination of death, injury, property and economic loss due to fire, electrical and related hazards. In particular NFPA 403, Standard for Aircraft Rescue and Fire Fighting Services at Airports, is the principal standard governing ARFFS. As with the ICAO, the NFPA develop and review their standards through a public process overseen by a Technical Committee or Panel. Many of the standards developed by the NFPA have been adopted at locations around the world, however they are not binding unless the Authority Having Jurisdiction (AHJ) has adopted them and committed to the particular standard. In practice the NFPA standards are more stringent than the ICAO standards in relation to ARFFS.

The Federal Aviation Administration (FAA) is the authority responsible for regulation of all aspects of civil aviation in the United States. Among their powers is the authorisation to certify airports, which they do for airports that receive scheduled air carrier services with aircraft having more than nine seats and unscheduled air carrier services with aircraft having more than 30 seats. The requirements for certification are set out in Title 14 Code of Federal Regulations (CFR) Part 139, Airport Certification. The requirements concerning Aviation Rescue and Fire Fighting Service are set out in Sections 139.315, 139.317 and 139.319. In addition, the FAA publish Advisory Circulars which contain research outcomes and recommendations of the various ARFFS requirements. Some of these include standards, but these standards can only have regulatory effect if referenced in a FFA regulation. CFR requirements are generally more relaxed than NFPA standards, but the Advisory Circulars often reference the NFPA standards as providing appropriate guidance.

The Civil Aviation Authority (CAA) is the United Kingdom's independent specialist aviation regulator.

They are a public corporation established by Parliament. Among their powers are to grant aerodrome licences according to the Air Navigation Order (ANO). The ANO requires that most public transport flights take place at a licenced aerodrome, or a Government aerodrome. Guidance to aerodrome operators is provided in policy document Civil Aviation Publication (CAP) 168 (CAA, 2019). Chapter 8 of CAP 168 provides the minimum requirements relating to ARFFS provision. The UK standards in general align fairly closely to ICAO SARPs.

In essence, ARFFS standards are provided to ensure rapid intervention to aircraft crashes in or near airports, to minimise loss of life, injury, aircraft, property and equipment. Kreckie (2011) argues the consensus standards of the NFPA are provided to indicate a 'best practice' in any number of categories. The standards of the various jurisdictions around the world, including the ICAO, provide a minimum standard that Kreckie (2011) argues has no correlation to 'world class'. Instead, regulations and standards provide a foundation for prudent emergency planning and a common sense approach. The following shows a comparison between the CASA standards and the standards set out by the ICAO, the NFPA, the FAA and the CAA.

4.2 Classification of airports

4.2.1 CASA classification

CASA divides airports into Level 1 and Level 2, as set out in the Manual of Standards (MOS) (CASA, 2005). Level 1 airports are defined as those:

- From or to which an international passenger air service operates; and
- Any domestic aerodrome through which more than 350,000 passengers passed through on air transport flights during the previous financial year.

Level 1 aerodromes are required to have ARFFS at a level appropriate as outlined below. The MOS stipulates that the level of protection provided must be in accordance with ICAO Standards, Chapter 9 of the Annex 14 to the Chicago Convention.

Level 2 aerodromes are defined as being where the number of annual passengers on air transport is less than 350,000. Level 2 aerodromes may provide a level of ARFFS, which will be subject to an audit if published in the Enroute Supplement Australia (ERSA) and form part of the Aerodrome Emergency Plan (AEP). The AEP must be in accordance with ICAO Standards, Chapter 9, of Annex 14 to the Chicago Convention. However, Level 2 airports are not required to have ARFFS.

There are 10 aerodrome categories in the MOS, with all Level 1 Australian airports with ARFFS classified at category 5 or above, as shown in Table 4.1. Note that Adelaide ARFFS operate at Category 5 for the curfew hours 23:00-06:00.

The airport category is based on the length of the longest aeroplane (and their maximum fuselage width) to use the airport during the busiest consecutive three months of the preceding 12 months. If the longest aircraft to use the airport does not reach 700 movements it is not deemed the 'critical' aircraft and the category can be set one category below the designated category in Table 4.1 (known as remission).

4.2.2 ICAO, NFPA, FAA, CAA classification

The classification of airports under the ICAO, NFPA and CAA standards are the same as under CASA. The benchmark of 700 movements during the busiest consecutive three months is also outlined in the ICAO Standards, meaning the ICAO permit remission, but is not specified by the NFPA. Remission is also allowable under the CAA. (Note: it is not used, nor is it used by the European Union Aviation Safety Agency (EASA)).

The FAA uses four classifications based on seating capacity for service type. Class I, II and III are for airports which receive aeroplanes with less than 31 scheduled passenger seats. Class IV is divided into five Indexes, based on aeroplane size as outlined in Table 4.1. Further, if there are five or more daily departures of air carrier aircraft in a single index group serving the airport, the longest index group is the index required for the airport. If there are less than five daily departures of the longest index group of air carrier, the next lower index is the index required for the airport.

Table 4.1 Airport category for rescue and fire fighting

Aerodrome category		**Aeroplane overall length**	**Max fuselage width**
CASA, ICAO, NFPA, CAA	FAA Index		Not FAA
1	A	0 up to but not including 9 m	2 m
2	A	9 m up to but not including 12 m	2 m
3	A	12 m up to but not including 18 m	3 m
4	A	18 m up to but not including 24 m	4 m
5	A	24 m up to but not including 28 m	4 m
6	B	28 m up to but not including 39 m	5 m
7	C	39 m up to but not including 49 m	5 m
8	D	49 m up to but not including 61 m	7 m
9	E	61 m up to but not including 76 m	7 m
10	E	76 m up to but not including 90 m	8 m

Source: CASA, 2005; ICAO, 2018; NFPA, 2018; CAA, 2019; Certification of Airports, 2004

The remission factor being applied at Australian airports is often in force at airports around the country. Cairns, Darwin and Gold Coast airports, for example, are Category 8 airports but regularly receive aircraft that are of Category 9 size. There was concern raised at a Senate hearing that Brisbane and Perth airports were classified as Category 10 airports but were infrequently unable to provide cover for that size aircraft if their Domestic Response Vehicle (DRV) was called out to an incident (Commonwealth of Australia, 2018). This was due to the fact the three crew on the DRV were included in the 14 crew needed to cover a Category 10 airport. Hence, when they were called to incidents, the remaining crew was down to 11. Following a Senate Inquiry hearing in March 2019, Brisbane and Perth airports were downgraded to Category 9.

4.3 Provision of ARFFS

ICAO Standard 9.2.1 states: "Rescue and fire fighting equipment and services shall be provided at an aerodrome." NFPA standards require airport management to be responsible for the provision of ARFFS at an airport (Standard 4.1.1). As seen already, CASA only requires ARFFS to be provided at airports in receipt of international passenger air services or where passenger movements through an airport are above 350,000 over a 12-month period. This means Australia has ARFFS at 27 airports, despite having 195 certified airports around the country.

In the US and UK, ARFFS are required at all certified (or licenced) airports. In the US, airports where scheduled flights with more than nine seats (or unscheduled flights with more than 30 seats) take-off or land, the airport is required to be certified. In the UK, CAP 168 prescribes "Rescue and fire fighting equipment and services shall be provided at an (licenced) aerodrome" (CAA, 2019, p. 364). There, aircraft whose total maximum weight is greater than 2,730 kg which are being used for commercial air transport of passengers or for instruction or tests for a pilot's licence, are required to use a licenced aerodrome.

In preparation for the Regulatory Policy Review into ARFFS in 2015-16 (see section 3.4), the Department of Infrastructure and Regional Development published a public consultation paper that, among other things, compared the levels of ARFFS provision at airports in comparable countries, including the US and UK as above, as well as Canada and New Zealand. In all four countries, airport operators are required to provide and to finance ARFFS as part of their licencing arrangements. Canada, like Australia has passenger thresholds, above which ARFFS is required at an airport, however, their passenger threshold is 180,000, just over half of Australia's threshold. New Zealand require certification at airports used by aircraft with a passenger capacity of 30 in regular passenger transport and where there are 700 movements in the busiest consecutive three month period.

Significantly, all these other countries have much lower requirements for providing ARFFS at airports than Australia. If Australia adopted the trigger used in any of those countries, many more airports around Australia would require ARFFS.

The requirement for passenger number thresholds to be passed for ARFFS to be implemented covers over 95 per cent of the flying public. However, it doesn't cover a large proportion of flights. Indeed, after successfully lobbying for the removal of ARFFS from secondary airports in the 1990s, most general and recreational aviation flights take-off and land at airports without ARFFS coverage. When counting by aircraft movements, rather than passenger movements, two of the top three, and five of the top ten airports in Australia do not have ARFFS.

4.4 Number of vehicles

CASA and CAA follow the ICAO Recommendation on the minimum number of rescue and fire fighting vehicles required at an airport to provide adequate protection for each category, as seen in Table 4.2.

Airservices Australia (ASA) operations stipulate four vehicles for Category 10 aerodromes (ASA, 2017). While this is an improvement on the three required previously, without being a MOS standard, it is much easier to reverse and require the much less safe three-vehicle requirement. The FAA allows flexibility in the number of vehicles for indexes B and C.

NFPA standards require one more vehicle than the ICAO standard at the equivalent airport categories 5, 9 and 10. In explaining this discrepancy the NFPA 403 points out the importance of having at least two fire fighting vehicles when dealing with transport-type aircraft, due to the need to rapidly cover any burning fuel spill to protect the aircraft and its occupants from radiated heat. Further, multiple vehicles allow attacking aircraft fires from more than one point, reduces the potential seriousness of vehicle breakdown, and minimises the out-of-service consequences when a vehicle is in need of routine maintenance or repairs (NFPA, 2018).

Table 4.2 Number of ARFFS vehicles

CASA/ICAO/ NFPA/CAA category	FAA Index	Number of Vehicles			
		ASA	ICAO/CAA	NFPA	FAA
4	A	1	1	1	1
5	A	1	1	2	1
6	B	2	2	2	1-2
7	C	2	2	2	2-3
8	D	3	3	3	3
9	E	3	3	4	3
10	E	4	3	4	3

Source: ASA, 2017; ICAO, 2018; NFPA, 2018; CAA, 2019; Certification of Airports, 2004

4.5 Quantity of agent

The critical area concept has the most direct effect in determining the standards for the quantity of agent that should be available to ARFFS. The purpose of the critical area concept is to serve as the basis for calculating the quantities of extinguishing agents necessary to achieve protection within an acceptable period of time. At the heart of the critical area concept is the objective to seek to control that area of the fire adjacent to the fuselage, thus safeguarding its integrity and maintaining tolerable conditions for occupants until evacuation is possible. The size of the critical area has been determined by experimental means.

The ICAO distinguish between the theoretical critical area (TCA) and the practical critical area (PCA). The TCA is the area within which it may be necessary to control the fire, while the PCA is representative of actual aircraft accident conditions. The TCA is a rectangle having as one dimension the overall length of the aircraft, with the width varying with the length and width of the fuselage, calculable with a mathematical formula. The PCA is two-thirds of the TCA.

Once the PCA is calculated, the control and extinguishment time are considered, and a discharge rate and time calculated to ensure the lowest possible fire control time, so as to prevent the fire from melting through the fuselage or causing an explosion of the fuel tanks.

The quantities required were divided into the following two components:

- Q1 – the quantity required to obtain a 1-minute control time in the PCA;
- Q2 – the quantity required for continued control of the fire after the first minute or for complete extinguishment of the fire, or both.

Q2 is a factor of Q1 dependent on the following variables: the aircraft size, effectiveness of agent selected, time required to achieve PCA fire control and time required to maintain the controlled area fire free or to extinguish the fire.

There are two significant issues with the critical area concept and the quantity of extinguishing agents that are recommended. The first is the PCA is only two-thirds of the length of the aircraft, so if the fire does spread beyond this, it is accepted there will not be enough water. The second is that there is no allowance for additional water to fight any fire that may be in the interior of the aircraft.

NFPA, while supportive of the PCA, allow for more water on their vehicles for the purpose of Q1 and Q2 in their standards. This is constructed on the fact their calculations of Q1 are based on the maximum length of an aircraft's fuselage within each category, while ICAO Q1 is based on the average length within each category. As Q2 is a factor of Q1, this is also higher for NFPA compared to ICAO. Scheffey et al. (2012, p. 30) argue that "a margin of safety exists in the ICAO requirement only if the largest aircraft in any category is less than the midpoint of the category range."

In addition, the NFPA also make an allowance for extra water to be used in the case of an interior fire of an aircraft, an amount termed Q3. The NFPA argue that information from recent incidents shows that water for interior fire fighting operations, based on the need for handlines to be used, is also necessary (Scheffey et al., 2012). An amount of Q3 has been included in NFPA 403 since the 1998 edition, yet is still not included in ICAO SARPs, the CASA MOS or the CAA CAP 168.

CASA and CAA follow the ICAO SARPs in amounts of fire fighting agents for Performance Levels A and B. The FAA regulations Title 14 CFR Part 139 require much lower amounts of extinguishing agent than both the ICAO and NFPA standards. Advisory Circular 150/5210-6D acknowledges the discrepancy between Part 139 and the NFPA 403, and while it references NFPA 403 in providing guidance in the quantity of extinguishing agent it notes that "Part 139 takes precedence and that NFPA 403 may, in some cases, exceed part 139 requirements" (FAA, 2004). The minimum quantities of water and the discharge rates for the various regulatory authorities are shown in Table 4.3.

Table 4.3 Minimum water quantities and discharge rates

CASA/ ICAO/ NFPA/ CAA category	FAA Index	CASA/ICAO/ CAA		NFPA			FAA	
		Water[a] (L)	Rate (L/min)	Water[a] (L)	Rate (L/min)	Water[b] (L)	Water[a] (L)	Rate[c] (L/min)
5	A	5400	3000	5700	3257	10450	380	
6	B	7900	4000	9400	4700	14150	5680	3785
7	C	12100	5300	13700	5983	18450	11355	4540
8	D	18200	7200	20000	7937	29450	15140	4540
9	E	24300	9000	26750	9907	36200	22710	4540
10	E	32300	11200	35100	12103	54000	22710	4540

Source: CASA, 2005; ICAO, 2018; NFPA, 2018; CAA, 2019; Certification of Airports, 2004

Notes: a Q1 + Q2 amounts

b Total includes Q3 amount, used by NFPA only

c Maximum discharge rate for a range of water carried

4.6 ARFFS staffing

CASA does not provide staffing numbers that need to be followed in the MOS, neither does the ICAO, the FAA or the CAA include these in their standards. The CASA MOS requires that during hours of operation and while any other aircraft movements that require use of a licensed aerodrome are occurring, sufficient trained personnel are to be detailed and readily available to staff the rescue and fire fighting vehicles and to operate the equipment at the discharge rates appropriate to the aerodrome category. In addition, ASA Operational Procedure (ASA, 2017) provides minimum fire crew numbers necessary for the various aerodrome categories.

The ICAO recommends a Task Resource Analysis (TRA) be completed to determine the appropriate number of personnel to deliver effective ARFFS to deal with an aircraft incident or accident (Recommendation 9.2.45). The TRA is a qualitative risk based approach, which includes a Workload Assessment that focuses on possible worst-case scenarios in order to identify the minimum number of trained personnel required to undertake the necessary tasks in real time before external services are able to attend the airport and provide assistance. The ICAO SARPs make specific note that if ARFFS personnel are required to attend road traffic and structural incidents in addition to aircraft incidents, this must be taken into account when introducing appropriate procedures.

There are six phases to the TRA outlined in the Airport Services Manual (ICAO, 2015). This starts with an airport operator being clear as to the aims and objectives of the ARFFS operations and the tasks personnel must carry out. Next, a selection of representative realistic accidents that may occur at the airport are identified. Third, identification of the types of aircraft commonly in use at the airport is required. The fourth phase involves considering the probable location for the most realistic accident type that may occur, taking into account the location, environment, runway and taxiway, aircraft movements, infrastructure and boundary. Fifth is to combine the accident type with the aircraft identified and the location to build a complete accident scenario. Finally, a TRA facilitator with experienced airport supervisors and fire fighters, carry out the task and resource analysis using a series of simulations. The principal objective of the TRA is to identify in real time and in sequential order the minimum number of ARFFS personnel required at any one time to carry out the requirements of ARFFS.

The CAA require a TRA to be completed and that the minimum level of staffing and supervisory levels resulting from the analysis, be detailed in the aerodrome manual. Their TRA allows for achieving the Principal Objective; safe and effective operation of all vehicles and equipment; continuous agent application at the appropriate rates; sufficient supervisory grades that can implement an Incident Command System; and the effective achievement of ARFFS elements of the aerodrome emergency plan. The TRA process is outlined in an information paper CAP 1150 (CAA, 2014), and closely follows the ICAO method.

The NFPA standard is that staffing levels shall be established through a TRA based on the needs and demands of the airport. The TRA and Workload Assessment are used to examine the effectiveness of staffing levels and to analyse two levels of ARFFS staffing, a minimum level and an optimum level. The NFPA also provide a minimum number of ARFFS-trained personnel that are required to be readily available to respond to an incident, based on the minimum response times, extinguishing agent discharge rates and quantities required. The staffing levels determined by the TRA shall not be lower than the values specified in the NFPA standards, as in Table 4.4. Also in Table 4.4 are the minimum fire crew staffing levels for Australian airports for the different airport categories, as set out in the ASA Operations Manual.

In evidence to a Senate inquiry on the Performance of Airservices Australia (Commonwealth of Australia, 2018), the ASA Chief Fire Officer stated that TRA is not included in the Australian regulatory framework.

Instead crew numbers are based on an out-of-date methodology rather than the TRA approach recommended by the ICAO, and as yet ASA has not performed a TRA at any location to determine crewing numbers (Commonwealth of Australia, 2019).

Table 4.4 NFPA minimum staffing levels and ASA current staffing levels

Airport category	Minimum NFPA Personnel	Minimum ASA Personnel
5	6	1 + 2
6	9	1 + 4
7	9	2 + 4
8	12	2 + 6
9	15	2 + 8
10	15	3 + 11

Source: NFPA (2018), ASA (2017)

Each of the four largest airports in Australia: Sydney, Melbourne, Brisbane and Perth, have a Domestic Response Vehicle (DRV) attached to the stations. In the case of Brisbane and Perth, the three persons assigned to the DRV previously were included in the 14 staff required for Category 10 coverage in the Airservices Operations Manual. However, when the DRV was called out to respond to a job, for example, a first aid call, the station was only able to cater for Category 9 coverage. This was the subject of a series of questions to ASA at a Senate Inquiry into the performance of Airservices Australia (Commonwealth of Australia, 2018), following incidences where this occurred in November at both Brisbane and Perth. At the time these two airports were supporting Category 10 coverage, yet had on a few occasions been reduced to Category 9 coverage when the DRV was called to an incident. Following a Senate hearing into the provision of rescue, fire fighting and emergency response at Australian airports in March 2019 (Commonwealth of Australia, 2019), Brisbane and Perth airports were reclassified to Category 9 on the ASA website.

In the US there is a personnel requirement for fire fighters stipulated by the Occupational Safety and Health Administration (OHSA) policy 29 CFR 1910.134, known as the 'two-in, two-out' rule. This rule requires that for a fire in a confined space, a team of two fire fighters may enter the space as long as there is a safety team outside, consisting of at least another two fire fighters. This has been accepted procedure in the US and is included in NFPA 1710, a comprehensive organised approach to defining levels of service, deployment capabilities and staffing levels for fire departments (NFPA, 2016). Further, the National Institute of Standards and Technology (NIST) conducted a series of full-scale fire experiments to determine the impact of crew size, among other things, on fire fighter safety and effectiveness and found a quantitative basis for the use of four-person crews in low-hazard response, similar to that outlined in NFPA 1710 (Barowy et al., 2010).

The NFPA's response strategy to ARFFS operations is to not only respond to the fire and commence fire suppression, but also to aid in rescue operations. As an aircraft is a confined space, the 'two-in, two-out' rule is applicable to their standards. The US Department of Defense also uphold the 'two-in, two-out' rule for its ARFFS personnel.

There is no mention of 'two-in, two-out' in CASA, CAA or ICAO documentation. Yet in Australia, CASR 139.710 Functions of ARFFSS states:

The functions of an ARFFSS for an aerodrome are:

a) to rescue persons and property from an aircraft that has crashed or caught fire during landing or take-off; and

b) to control and extinguish, and to protect persons and property threatened by, a fire on the aerodrome, whether or not in an aircraft.

Hence, in the first case CASR's response strategy is similar to that of the NFPA and so entry to an aircraft on fire is considered part of the core function of ARFFS personnel. In the second of the functions, ARFFS personnel are required to respond to structure fires and non-aircraft fires on the aerodrome, and thus may be required to enter structures and confined spaces.

Domestic Response Vehicles (DRVs) are utilised at the four largest Australian airports. These vehicles are generally the first to respond to non-aviation incidents on the airport, including alarms and emergency medical response calls, and also to structure fires, non-aircraft fires and fuel spillages. However, these vehicles are staffed by only three personnel. Hence, if the incident a DRV was responding to required entry to a structure (confined space), they would not be able to follow the 'two-in, two-out' principle until back-up arrived. Thus they would be putting themselves and the public using the airport facilities at greater risk.

4.7 Equipment

Along with the appropriate amount of extinguishing agent, the proper allocation of vehicles and appropriate crewing numbers, the equipment used by ARFFS is important in allowing them to fully carry out their duty of responding to an aircraft incident. Among these are the handlines, monitors and turrets provided on ARFFS vehicles. Monitors and turrets are specialised equipment required on ARFFS vehicles as the speed with which the water is required to be discharged in an aircraft fire is too high for hand-held hoses. Hence, when urban brigades are suggested as substitutes for ARFFS, a minimum would be that they have this equipment. Further, specialised equipment such as high reach extendable turrets (HRETs) and low-level high performance monitors can give fire fighters greater control in their fire fighting activities.

HRETs in particular, are important in allowing fire fighters to attack a fire from a high position and have been particularly successful in controlling internal fires to allow for safe rescue operations. HRETs are not required as part of the ICAO SARPs, but they are mentioned in the Airport Services Manual as providing fire fighters with greater flexibility in how they direct the foam stream. HRETs are defined as "a device, permanently mounted with a power-operated boom or booms, designed to supply a large-capacity, mobile, elevated water stream or other fire extinguishing agents, or both" (ICAO, 2015, p. 8-8). The advantage of these is that, as the turret is extendable, it places the nozzle in front of and below the operator, providing them with a clearer view of the application of the agent, and reducing the amount of foam overspray.

Further, HRETs may incorporate penetrating technology that allows the operator to deliver the extinguishing agent through an adjustable nozzle in and around the aircraft and into the passenger compartment. They can also use skin-piercing nozzles to penetrate the fuselage. This allows operators to inject water while occupants are evacuating and/or fire fighters are entering. In addition, HRETs are able to facilitate fire attack on upper decks of multi-deck aircraft, such as the B747 and A380. This increases fire fighter safety as it reduces their need to rely on ladders to conduct interior fire suppression or rescue on these aircraft.

The NFPA makes an allowance for airports to specify HRET equipment in ARFFS vehicles. The NFPA contends that use of a HRET has the greatest chance of success in rapidly cooling the interior cabin of an aircraft that is on fire in order to save non-ambulatory occupants (Scheffey et al., 2012). Kreckie (2011) argues that due to the diversity in age, health and physical condition of passenger demographics, there is a percentage of passengers on every flight who would be unable to evacuate an aircraft in an emergency without assistance. Scheffey et al. (2012) cite an evaluation of fire fighting technologies for improving occupant survivability in post-crash fires. The study looked at accidents over the past 25 years and concluded that the HRET had the potential to save approximately 12 lives per year worldwide (with a 90-percentile estimate range of five to 17 lives per year). Further, the authors cite a study on indirect interior fire fighting where it was found that in 15 of 84 accidents, a HRET could have been used to save lives, with an estimate of 371 potential lives saved (200 of these were in the one accident). The main advantage found of the HRET was the pace with which it can be implemented, above that of a manned fire attack. Scheffey et al. (2012) also cite a study that identified limitations in the use of HRET technology, such as not being able to be used on the section of fuselage obstructed by the wing; it may fix an ARFFS vehicle to a position potentially filled with fuel; and it raises the centre of gravity of the ARFFS vehicle increasing the potential for rollover. The authors also argue the use of the technology should be pre-planned and trained.

The FAA also makes allowance for airports to specify the provision of HRET equipment in ARFFS vehicles. The FAA has conducted its own testing of the HRET technology. In one such test they found the HRET extinguished the burn area on average 53 per cent faster than a roof-mounted turret, under the same conditions. The FAA (2010) lists a range of advantages of the use of the HRET, but also recommend hands-on training and practical experience so as to understand its capabilities and limitations.

The CAA also recommend the use of HRETs and recommend simulation training should include specialist equipment such as HRETs. Further, operation of water pumps, monitors and HRETs comprise a standard unit in the framework for competency of ARFFS personnel (CAA, 2017).

Australian ARFFS vehicles are not equipped with HRET technology. This is despite the almost universal acceptance of their superiority in controlling post-crash fires and the fact the technology is not new and has been in use for decades. By 2008, 650 ARFFS vehicles around the world had been fitted with HRET technology (Rosenkrans, 2008).

4.8 Response times

Having required response times assists airports and ARFFS in planning the number and locations of fire stations required at an airport. Response times are measured from the time of the initial call to ARFFS, to the time the first responding vehicle(s) is in a position to apply foam at a rate of at least 50 per cent of the discharge rate specified for the category of airport.

The CASA MOS outlines the operational directive of ARFFS must be to achieve response times no more than three minutes to the end of each runway in optimum conditions. However, the operational objective is for ARFFS to achieve a two minute response time to the end of each runway and a three minute response time to any part of the movement area. This aligns with the ICAO SARPs, where the standard is three minutes to any point of each operational runway, and the recommendation is two minutes; while it is three minutes to any other part of the movement area. Optimum conditions include good visibility, daytime, no precipitation and normal route being free of surface contamination. In less than optimum conditions the ICAO recommendation is to meet the operational objective as nearly as possible.

CASA also stipulates other vehicles required to deliver the amount of extinguishing agent must arrive so as to provide continuous agent application at the required rate. ICAO, on the other hand, say that these follow-up vehicles must arrive no more than four minutes after the initial call, with a recommendation of three minutes.

Interestingly, NFPA is slightly more relaxed with its response times than the ICAO SARPS. The 2014 edition of NFPA 403 increased the required response time of the first-arriving ARFFS vehicle to reach any point on the operational runway and begin agent application from two minutes to three minutes. Further, the response time of the first-arriving ARFFS vehicle to any part of the movement area is four minutes, as it is to reach any passenger boarding areas. Secondary vehicles must arrive such that Q2 is able to be applied 30 seconds after Q1 has started being applied and Q3 after a further three and a half minutes.

The FAA's requirements are slightly different again. The response time is three minutes from the time of the alarm to the time the first ARFFS vehicle reaches the midpoint of the farthest runway from its assigned post, or any other point of comparable distance, and begin application of extinguishing agent. All other vehicles must reach the same point within four minutes.

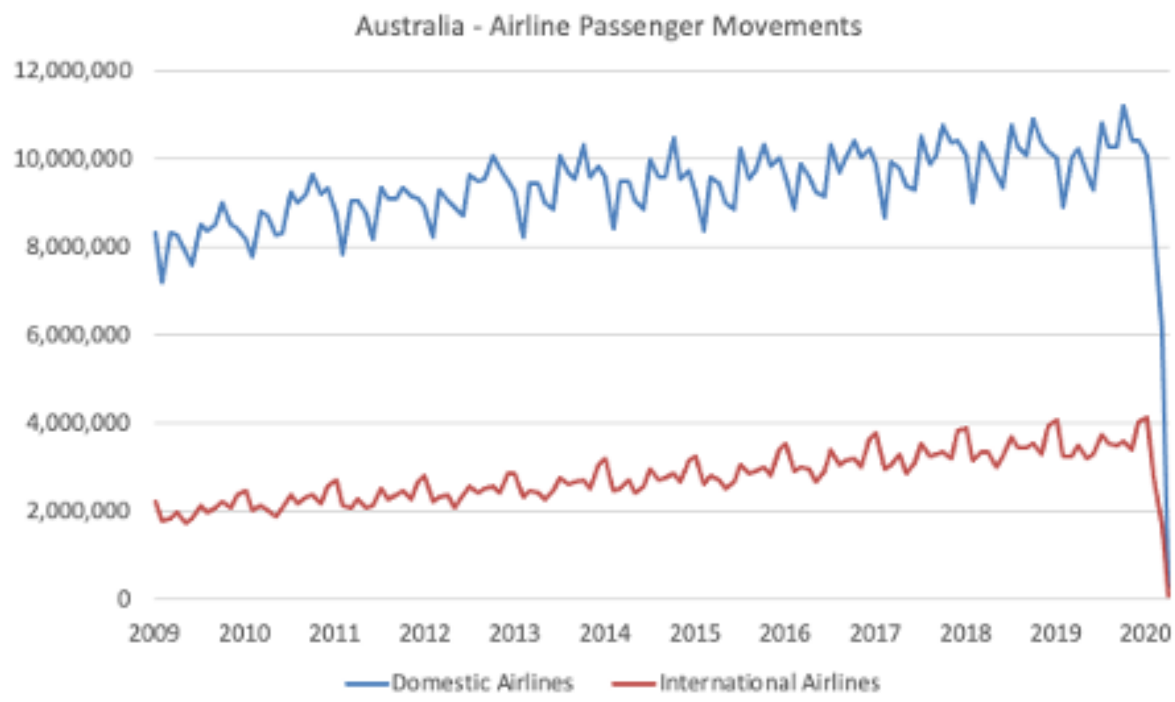
The CAA's response time requirements are identical to that stipulated by CASA. That is, the standard is three minutes to any point of each operational runway, but the recommendation is two minutes, in optimum visibility and surface conditions. The standard response time is three minutes to any other part of the movement area. CAA also stipulates that other vehicles required to deliver amounts of extinguishing agents should arrive no more than one minute after the first responding vehicle so as to be able to provide continuous agent application.

5. The collapse of airline travel during the pandemic

The discussion to date has reflected the state of affairs in normal times, where airline movements have been increasing over time at Australian airports. With the onset of the COVID-19 pandemic, airline travel has ground to a halt in Australia, both in the domestic and international sectors.

Figure 5.1 shows the scale of the collapse in Australian aviation since March 2020. In February 2020, total passenger movements were 11,461,723. In March the figure had declined to 7,817,619 and by April only 350,510 movements were recorded for all airlines inbound and outbound.

Figure 5.1 Airline Passenger Movements, Australia, January 2009 to April 2020



Source: BITRE (2020), Airport Traffic Data.

The issue we consider in the remaining part of this Report is whether this dramatic decline in movements fundamentally alters the need for ARFFS at Australian airports.

We will conclude that while there are significantly less traffic movements, the fact remains that the demand for asset protection at our airports from calamity has not diminished. Valuable assets (both planes and infrastructure) are still vulnerable and we demonstrated that the additional functions the ARFFS performs in the locality remain relevant.

And with tourism to regional destinations likely to be a major source of economic growth as the lockdown is eased, the last thing these regions need is for a key airport to be compromised through lack of ARFFS protection. There is too much at stake for the nation to take a myopic view of the investment in the ARFFS capacity around Australia.

6. Government aid to the aviation sector during the pandemic

6.1 Government aid to airlines

At the onset of the pandemic, the Australian government announced several initiatives to support the airline industry.

This support included:

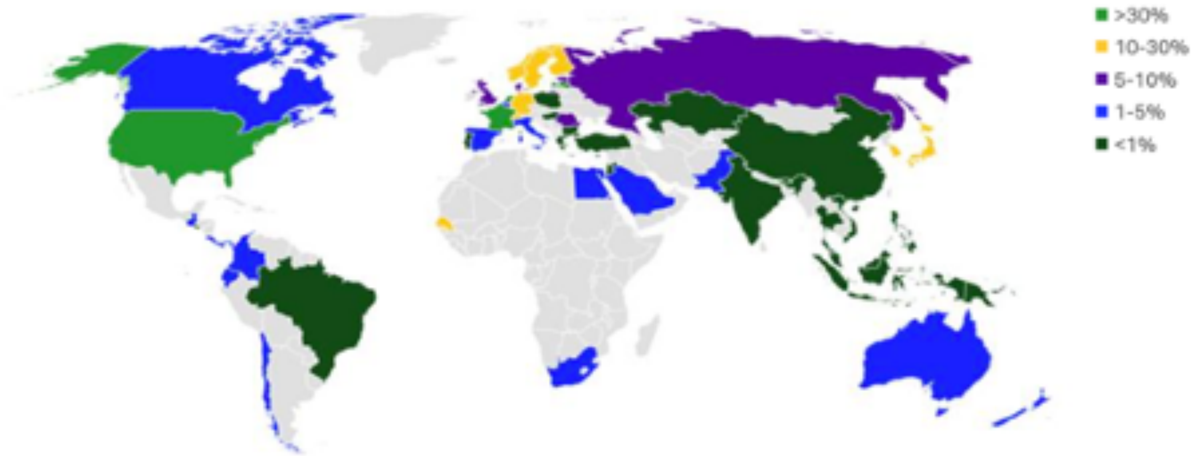
- $715 million waiver of fuel excise and government charges backdated to February 1, 2020.
- $198 million to ensure flights to regional communities could continue.
- $100 million in the form of direct grants to smaller regional airlines.
- $165 million to Qantas and Virgin Australia to maintain key domestic routes for 2 months.
- The JobKeeper wage subsidy is also available to the airline industry.
- $100 million through the International Freight Assistance Mechanism (IFAM) to maintain viable inbound and outbound freight movements.

Despite both major Australian airlines announcing major employment losses and significant changes to their operations (aircraft, routes, etc.), the support provided by the Australian government has been alarmingly low when considered in the global context.

Data from the International Air Transport Association (IATA) allows us to compare the Australia government to other countries and shows that support varies widely across regions as of May 2020.

Figure 6.1 shows the vast differences in government support for the airline industry during the pandemic across the globe. Australian airlines fare very badly in this metric.

Figure 6.1 Total amount of government aid as percent of airline ticket revenue, 2019

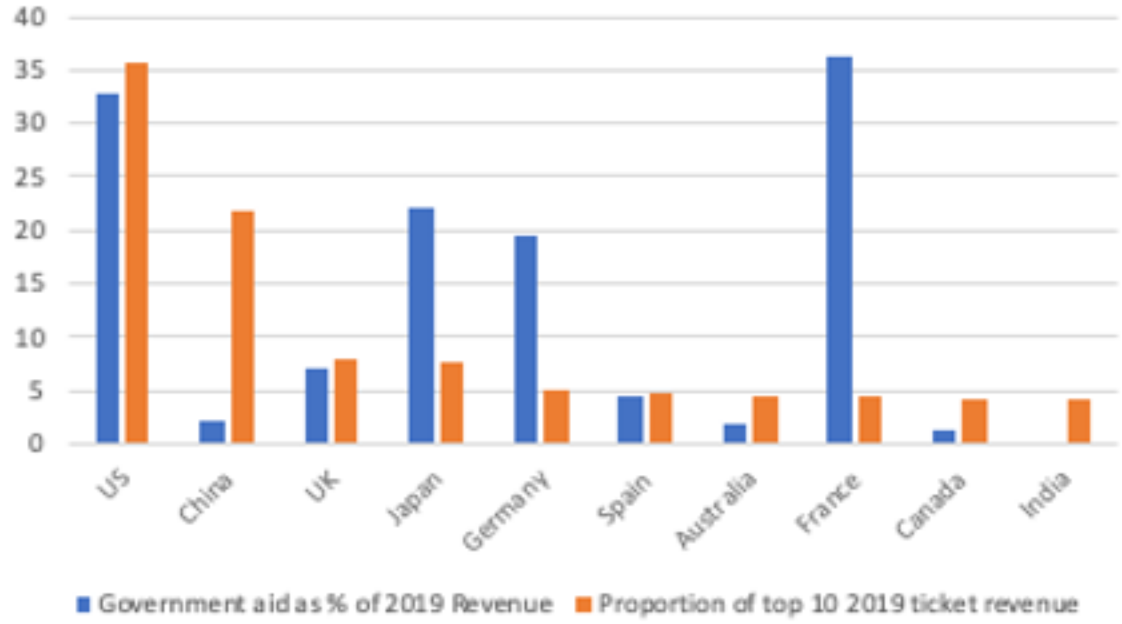


Source: Pearce, B. (2020) COVID-19 Government financial aid for airlines, IATA, May.

Figure 6.2 compares the government aid in percentage terms for the top 10 airline markets in 2019 ranked by ticket revenues. The ticket revenues for each market are expressed as a proportion of the top 10.

In order of generosity, the French government support was 36.1 per cent of 2019 ticket revenue, US 32.7 per cent, Japan 22.1 per cent, and Germany 19.5 per cent all have clearly disproportionately supported their airlines. The support provided by the Australian government was only 1.8 per cent of 2019 ticket revenue.

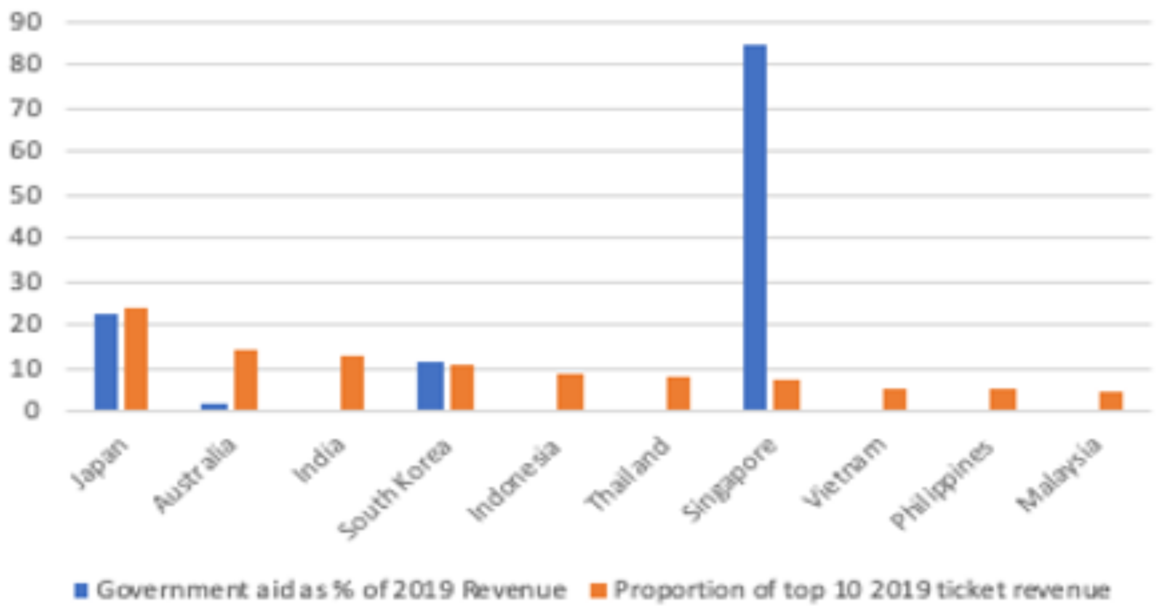
Figure 6.2 Government aid to airlines in top 10 markets for 2019.



Source: Pearce, B. (2020) COVID-19 Government financial aid for airlines, IATA, May.

For the Asia-Pacific region, the Singaporean government has clearly recognised the importance of its airline industry and has provided aid to the value of 84.2 per cent of 2019 ticket revenue for its airlines.

Figure 6.2 Government aid to airlines in top 10 markets for 2019.



Source: Pearce, B. (2020) COVID-19 Government financial aid for airlines, IATA, May.

6.2 Government aid to airports

Whilst many governments around the world have pledged support for failing airlines during the pandemic, attention is now being drawn to airports, and the role they will play in the economic recovery once the pandemic passes.

Ilia Lioutov, Airports Council International (ACI) World, calls airports the "elephant in the room" and has stated that only supporting airlines during the pandemic is myopic, and that governments need to also offer support to airports.

> Airports have an equal role to play in the prospective recovery. Imagine, for instance, that airports are not able to staff aircraft rescue and fire-fighting (ARFF) services. … airlines will not be able to land nor take off aircraft from the ground, as scheduled passenger flights can be operated only if firefighters and equipment on location are ready for duty. (Lioutov, 2020).

Surely, the importance for the full retention of ARFFS operations and the maintenance of their specialised skills, could not be more emphasised than this. Indeed, the Airports Council International considers safety to be the "number one priority for airports, the aviation community and the travelling public" (International Airport Review, 2020). ARFFS are a key component to the safety of all travelers and other users of the airport system.

Whilst a common response by some governments, Lioutov states that eliminating airport charges is a utopian idea that will not get aviation anywhere (2020). He sees a larger role for governments to play now in order to secure a full recovery of the aviation industry as a whole. This could include: grants and subsidies; secured financing; loans at preferential rates; deferment of loan repayments contracted with government; and/or bank guarantees; government guarantees on loans contracted by airports with foreign lending agencies. These measures would go a long way he argues, to cover airport operating costs, especially wages (Lioutov, 2020).

We will now briefly examine what some governments are doing to support their airports in a global context.

6.2.1 USA

In April, the US Department of Transportation announced USD 10 billion to commercial and general aviation airports derived from the Coronavirus Aid, Relief, and Economic Security (CARES) Act Airport Grant Program. These funds are "available for airport capital expenditures, airport operating expenses including payroll and utilities, and airport debt payments" (U.S. Department of Transportation, 2020).

In June, the President Kevin. M. Burke, and CEO of the Airports Council International – North America (ACI-NA) testified at the US Congress House Subcommittee on Transportation and Maritime Security that the government needed to ensure that airports could continue to "provide for the health, safety and security of employees and tenants" echoing the need for airports to remain viable amidst substantial decreases in airport use and increased costs relating to cleaning and other precautionary measures relating to COVID-19. Burke stated that an additional USD 13 billion in emergency assistance was needed for airports to meet operating costs and current debt servicing obligations (International Airport Review, 2020).

6.2.2 Canada

The Canadian government has waived lease rents from March until the end of 2020 for the 21 National Airport System airport authorities. It is expected that this will provide relief of up CAN $331.4 million (Department of Finance Canada: 2020).

6.2.3 UK

In the UK, there have been calls for support of airports, however, whilst the UK Chancellor of the Exchequer was considering a support package for both airlines and airports in mid March, as of June, there had not been a package that supported airports directly, with most support going to individual companies (Parliament UK, 2020: Para 38).

6.2.4 Norway

The Norwegian government has introduced a number of measures for their airports including the suspension air passenger taxes from until October 31; NOK 1 billion in funds to purchase domestic air routes where there is currently no operation; and a NOK 4.3 billion grant to Avinor AS, which operates most of the civil airports in Norway. The total estimated amount of support to the aviation sector is NOK 14.1 billion (Norwegian Ministry of Finance: 2020). It is estimated by the Airport Operators Association that the Norwegian government will "fully compensate airports for the loss of airport charges" (Airport Operators Association, 2020: 6).

6.2.5 European Union

In March, the European Parliament temporarily suspended rules on airport slots that had obliged airlines to use the take off and landing spots at airports or they would lose them for the following year (European Parliament, 2020a). Whilst there is scope under the EU's Regional State aid for airports (European Parliament, 2020b), there has been no direct aid allocated for airports to date.

6.2.6 France

The French government has released a range of measures to support aviation during the pandemic. Most measures relate to airlines and creating a greener airline industry post pandemic. In March it was reported that the Prime Minister, Édouard Philippe's government had launched several privatisations including "Aéroports de Paris, the airport authority that owns and manages fourteen civil airports in the Paris area" (Barbière: 2020).

6.2.7 New Zealand

In March, the New Zealand government has pledged NZD 600 million for the support of the aviation industry as a whole to protect supply chains (Robertson, 2020). This support was for airports and airlines (Air New Zealand excluded); aviation support services; non aviation services; as well as an international air freight capacity scheme (New Zealand Ministry of Transport, 2020). This was followed by an additional NZD 900 million in April in the form of a low interest loan to Air New Zealand (Treasury New Zealand: 2020).

6.2.8 South Korea

Whilst there has been no direct aid to airports in South Korea, the South Korea government has provided a rent cut for airport tenants for up to "50 percent for SMEs and small merchants, and a 20 percent new cut for large businesses for up to six months from March to August" (South Korean Ministry of Economy and Finance: 2020a). The government has also deferred the payment of airport service changes and has postponed the withdrawing traffic rights and airport slots on low cost airlines until the end of the year (South Korean Ministry of Economy and Finance: 2020b).

7. Evaluating current asset risk at Australian airports

7.1 Where have all the aircraft gone?

As a result of the cessation of most airline travel and movements, the major Australian airlines have been forced to park their planes at various locations. Civium, the global provider of air industry data, has estimated that in April 2020 there were more than 16,000 aircraft parked in various locations around the globe (Kotoky et al., 2020). There are evocative images published in the media on a regular basis now of rows of planes parked in various configurations at all the major airports in the world.

The storage requirements introduce new challenges for the airlines:

- They still need to be maintained and inspected by engineers regularly.
- Their engines need to be started on a regular basis.
- Engineers need to undertake continuous engine checks.
- They need to be moved around to avoid issues such as flat spots on tyres.
- Items such as flaps, rudders and other controlling equipment need to be regularly operated.
- They are still usually full of fuel to stabilise the craft against wind shifts and to allow regular maintenance based engine start-ups.
- They remain susceptible to weather events and wildlife and insect invasions.

Kotoky *et al.* (2020) note that the aircraft:

> …need plenty of work and attention while in storage, from maintenance of hydraulics and flight-control systems to protection against insects and wildlife … Even when parked on runways, planes are often loaded with fuel to keep them from rocking in the wind and to ensure tanks stay lubricated.

Qantas (2020) also describes the challenges that the airline faces in parking their fleet for an extended period.

Data for Australian airlines is difficult to obtain, but of the 314 Qantas Group aircraft described in their 2019 inventory (273 owned and 41 leased) (Qantas Airlines, 2019) the vast majority of planes are parked at various Australian airports (mostly at Avalon in Victoria). Virgin Australia Group (2019) have an operating fleet of 133 and they have also parked the majority at various Australian locations (Sydney, Melbourne, and Brisbane). We consulted the CASA Aircraft Register to verify numbers, but achieving an exact estimate is not possible from the public records.

The Asia Pacific Aircraft Storage (APAS) facility near Alice Springs, which is located adjacent to the main airport, and would be implicated if a major hazard occurred at the main facility, is also storing some Qantas planes. Given the Australian climate (lower humidity), some international airlines (for example, Singapore Airlines and Fiji Airways) are also using the APAS facility in Alice Springs.

Thus, apart from the existing infrastructure that remains in situ at all airports - buildings, landing equipment and such – there are millions of dollars of aircraft assets located at different airports around Australia which still carry risk of hazard, irrespective of their operational status.

The risk is lower, but given the movements of the craft, and the possibility of fuel leaks, there is an on-going need to maintain a viable ARFFS capacity.

7.2 Valuing the at-risk assets – aircraft

There is a large literature detailing the methodology used in appraising the value of aircraft. Typically, this information is closely guarded by the companies and depends on fleet age, routes flown, proportion owned/leased, and related variables.

Specialist appraisal services work closely with airlines on a confidential basis to establish the value of their fleets. They gain access to essential information that is never released in the public sphere.

It is beyond the scope of this research to conduct such a detailed appraisal. However, reasonable estimates can be obtained of the value of aircraft assets from publicly available data reported in the Annual Reports of the airlines (see Table 7.1).

In sum, there is around $16.2 billion tied up in aircraft assets across the four airline groups that are mostly being parked around Australia at present.

Table 7.1 Value of aircraft assets by Australian-based airlines, 2019

	Rex	Alliance	Qantas Group	Virgin Tigerair
	2019	2019	2019	2019
	$m	$m	$m	$m
Total Assets	272.8	301.5	19,377.0	6,468.2
Property, plant and equipment	203.3	202.5	12,977.0	3,202.1
Aircraft, engines, spares	167.0	198.4	11,428.0	3,004.7
Capitalised leased assets			1,390.0	31.5
	Per cent	Per cent	Per cent	Per cent
Aircraft proportion of total PPE	82.19	98.0	88.1	93.8

Source: Various airlines Annual Reports, 2019.

7.3 Valuing the at-risk assets – airport infrastructure

It is hard estimating the assets at airports because of the way the privately-owned airports inflate so-called 'intangible asset valuation' items on their balance sheets. These items distort net equity valuations (and under report the rate of returns declared). However, the annual monitoring report published by the Australian Competition and Consumer Commission (ACCC, 2020) provides balance sheet data for the four largest airports – Melbourne, Sydney, Brisbane and Perth.

Table 7.2 shows only the reported values of property, plant and equipment as at June 30, 2019 for these airports.

Table 7.2 Property, plant and equipment, balance sheet entry, major airports

	Melbourne	Sydney	Brisbane	Perth
	$ billion	$ billion	$ billion	$ billion
Total	3.1	3.5	3.5	1.4
Aeronautical services	2.4	2.3	2.8	1
Non-aeronautical services	0.7	1.2	0.7	0.4

Source: ACCC, 2020. Numbers are rounded up.

The Productivity Commission (2019), reporting on a submission from the Australian Airports Investors Group, noted that "airports' assets are large in scale, fixed and immobile, resulting in exposure to a broad range of risks", which includes damage from fire or some climate calamity.

Aeronautical assets "are assets that are directly used for the supply of aeronautical services. These include runways, taxiways, parking bays, aprons and terminal facilities" (ACCC, 2020: 23).

The conclusion is clear even if the estimates are approximate - the airports themselves have significant assets that are at risk from an adverse fire or other event. These are assets that the ARFFS personnel protect.

7.4 Valuing the at-risk assets – local neighbourhood

Australian airports are located by necessity in the busier areas of the country, with many cities growing in size around the airport over time. This often puts people, their homes and businesses in close proximity to the airport facilities. Many Australian airports also have at least some light industry that is located within a short distance to the airport boundaries. ARFFS are expected to mutually aid existing non-ARFFS fire services in times of need. It stands to reason then that the more densely populated the surrounding areas of the airport are, the more prone the ARFFS are to external call outs to assist in local fire fighting. This would pose additional burdens on ARFFS staff should their services be called upon to mutually aid local fire fighting services.

However, not all Australian airports are in densely populated areas. The more remote airports of Ayres Rock, Alice Springs, Karratha and Newman have very little residential, commercial or industry surrounding the airport. Hamilton Island has a small amount of residential area, as well as commercial business for the resort. Avalon airport is surrounded by a large amount of land and has little directly outside the main airport area. Whereas there is a recycling centre to the west and some commercial and residential areas to the south of Ballina Airport.

The airports of Hobart, Launceston, Cairns, Gold Coast, Mackay, Rockhampton, Coffs Harbour and Port Hedland are slightly more occupied with residential, commercial and light industry. It should be noted that residential areas frequently contain schools and other small to medium businesses. In Tasmania, Hobart Airport has an aerodrome to the north west and golf clubs to south west and the north east. There is a small amount of residential area to south west along with resorts. Whereas Launceston has a commercial and light industry area to the south west.

In Queensland, Cairns Airport has some commercial and residential areas to the south east, and a farm market to the north west. The Gold Coast Airport has a university to the east and a desalination plant and a hospital to the north west. The residential area is primarily located to the north and north west, and there are resorts along the eastern coastline. Mackay Airport has residential areas to the east, west and north. With commercial areas to the south west, along with industry and airport hotels. There is also a sporting complex which includes a helicopter business to the north. Rockhampton has a golf club to the south of the airport and its' main residential area to the east. Gladstone Airport has a densely populated residential area to the south with shopping centres and other businesses, and a golf club to the east. The main industrial area lies to the north of the airport. Finally, the airport at the Sunshine Coast is flanked on the east by resorts and commercial businesses. There is an additional commercial area to the south west, and an industrial area including a timber yard to the west. The main residential area for the Sunshine Coast lies to the south and south east.

The New South Wales airport in Coffs Harbour has a university, golf club, some commercial and residential areas within approximately one kilometre of the airport. Whereas the Western Australia airport in Port Hedland has a main residential area to the south west. There is some light residential and commercial area also to the east and some industrial area to the west of this airport.

Other airports such as Melbourne, Perth, Darwin, Canberra and Townsville are larger airports but are situated either on more land, or are geographically distanced from residential, commercial and industrial areas by water or land shape. Darwin, Canberra and Townsville additionally all have RAAF bases adjacent to the airport.

Melbourne Airport has a few surrounding businesses, airport hotels and a local golf club. The main residential area is to the south and south east. Commercial and light industry use the land to the south east along with many airport hotels. There is also a sawmill to the west of the airport. Darwin Airport has airport hotels around the airport. The north is densely residential with some commercial areas including schools, shopping centres, a sporting complex and the golf club. The CSIRO is to the east, along with a light industrial area. Light industry and commercial areas are to the south. The majority of the residential area is in the west and south west, and the commercial area is to the north west. Perth Airport is also close to both residential and commercial areas. There is an industrial area to the south east. Residential and commercial buildings are to the east and the west of the airport. These buildings consist of schools, shopping centres, airport hotels, and many logistics and transport services. The area around Canberra Airport consists of a golf course to the east, some commercial area to the south east, and there is there is a recycling centre to the south. The main commercial area is to the south west and north. The main residential area for Townsville lies at the south east of the airport and includes some commercial area. There is also commercial area to the south and industry to the west. The golf club lies to the north of Townsville Airport.

The airports for Sydney, Brisbane, Adelaide, and Broome have residential, commercial and / or industrial areas surrounding the airport in close proximity. Sydney Airport is located in a densely populated area. The southern aspect is mainly taken up with runways and water. Quite a number of business, schools and residential areas are within approximately one kilometre of the airport. Figures 7.1 to 7.4 show the number of business and residential premises within close proximity to the airport.

Figure 7.1 Sydney Airport northern aspect

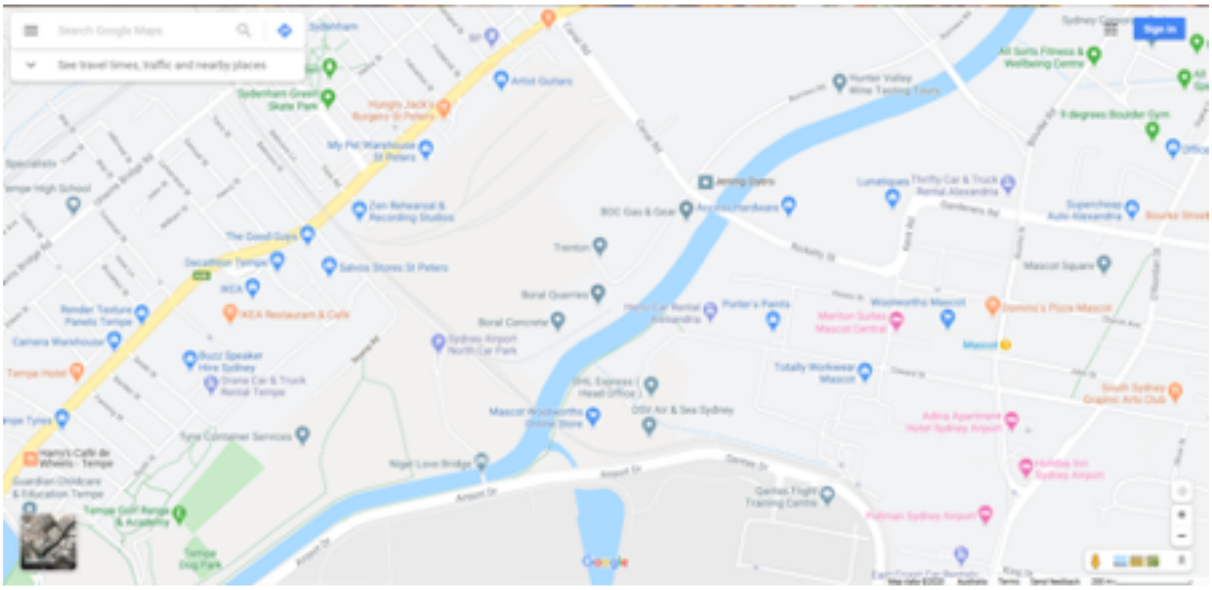


Figure 7.2 Sydney Airport north eastern aspect

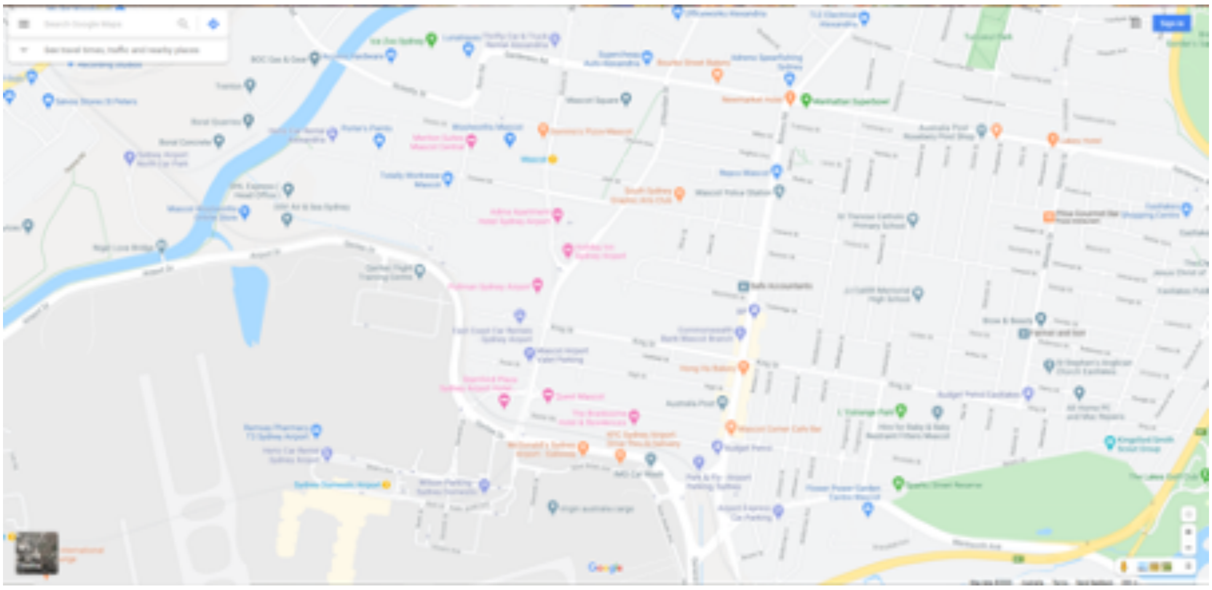


Figure 7.3 Sydney Airport eastern aspect

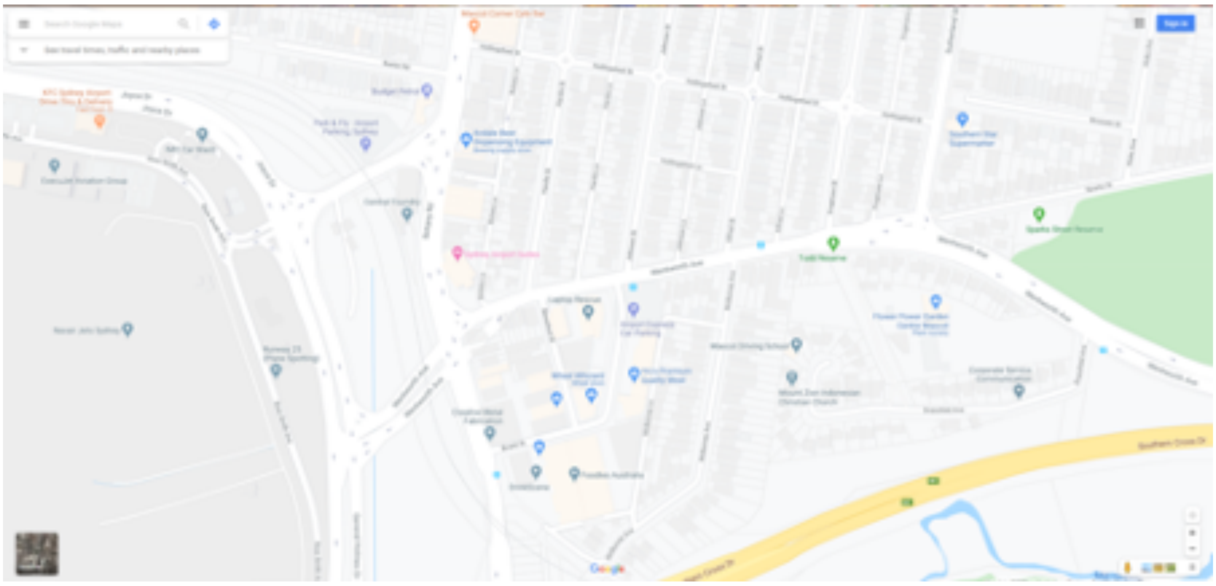


Figure 7.4 Sydney Airport western aspect

Although Brisbane Airport is located on a large amount of land, there are still numerous business within the area and light industry around most of the airport. The area to the north is primarily water with no local business or housing. The main residential and commercial areas lie to the west and north west. This is also the where most of the airport hotels and the golf club are situated. There is a cruise terminal to the east and an oil refinery across the river. Figures 7.5 to 7.8 show the number of business, residential and industry in close proximity to Brisbane airport.

Figure 7.5 Brisbane airport eastern aspect

Figure 7.6 Brisbane airport southern aspect

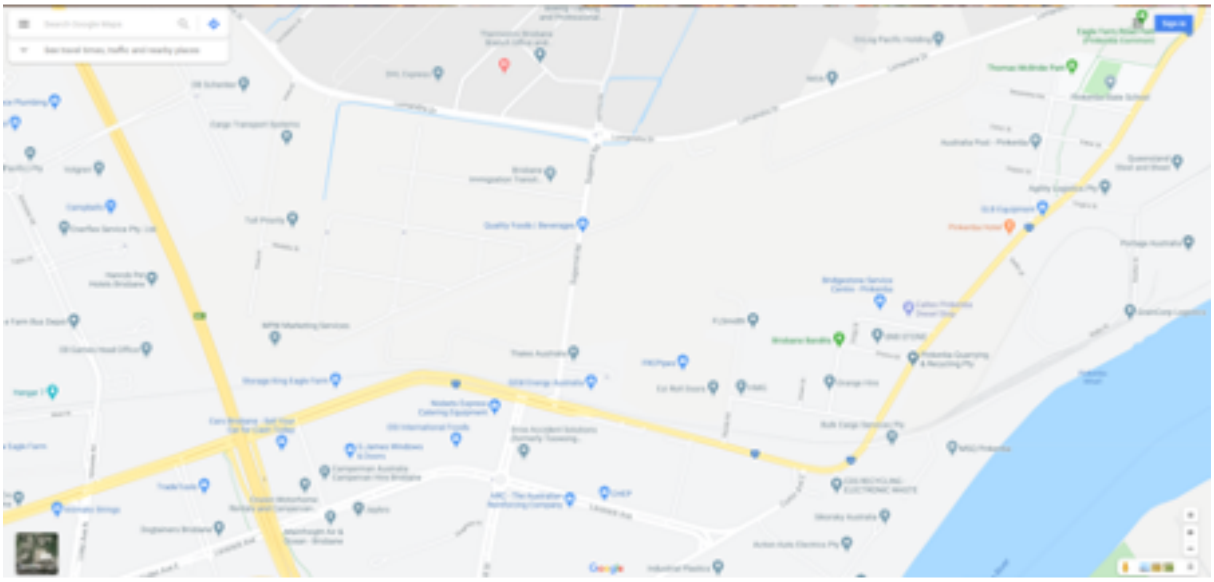


Figure 7.7 Brisbane airport western aspect

Figure 7.8 Brisbane Airport north western aspect

Adelaide Airport is situated to the west of Adelaide city. The area is densely populated and the airport is surrounded on all sides by residential and commercial buildings. There are three golf courses that break up the residential and commercial areas to the north, south and south west of the airport. The area contains numerous businesses, schools, a university, a sailing club, and service stations. There is also a waste and recycling centre across the creek from the airport. Figures 7.9 to 7.13 show the surrounding areas of Adelaide airport in relation to residential, commercial and industrial use.

Figure 7.9 Adelaide Airport and surrounds

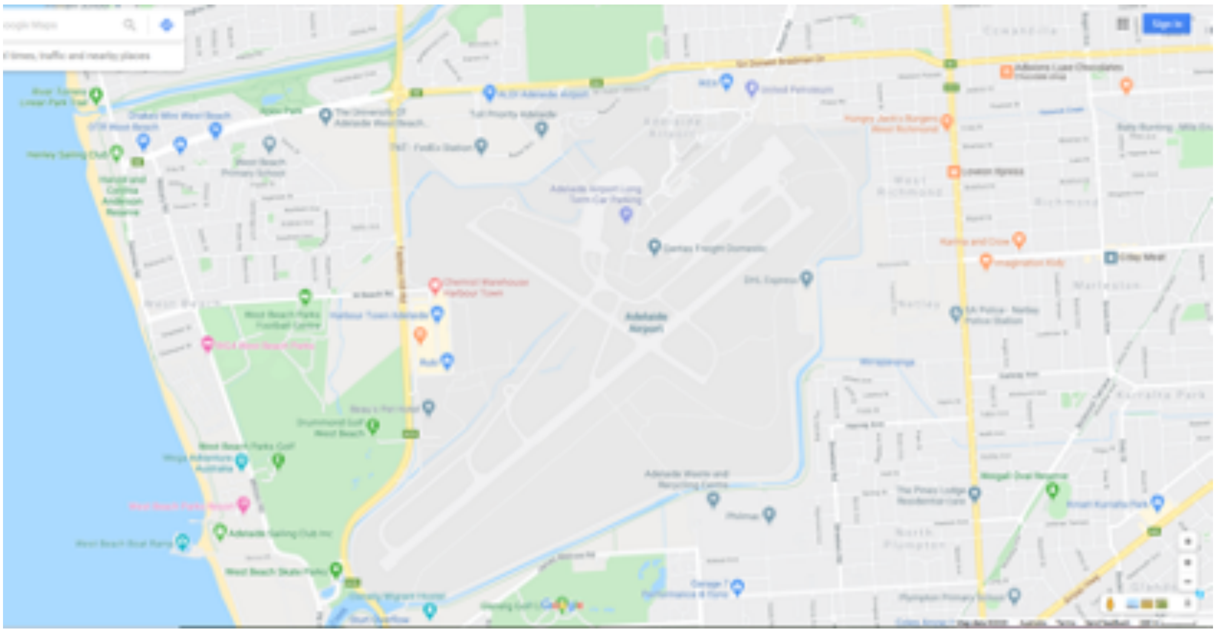


Figure 7.10 Adelaide Airport northern aspect

Figure 7.11 Adelaide Airport western aspect

Figure 7.12 Adelaide Airport southern aspect

Figure 7.13 Adelaide Airport eastern aspect

Broome Airport is located on a small strip of land and has water to the east and west of the airport. There is a great deal of residential housing on both the north and southern sides of the airport. Commercial businesses are prevalent in these areas as well as schools. Although there is little to the east and west due to water, there is a TAFE campus to the west and a business area to the south east of the airport. Figures 7.14 and 7.15 show the close proximity of these areas in relation to Broome Airport.

Figure 7.14 Broome northern aspect

Figure 7.15 Broome southern aspect

8. Case study analysis of the current situation and at-risk assets at Australian airports

Most airports continue to have a significant amount of risk that is not related to the reduction of commercial flights into and out of the area. These have included: terminal upgrades including hot works; fuel farms; grounded aircraft maintenance; risk to emergency services aircraft, and on site and surrounding commercial business; as well as Australian Defence Force activity and ammunition storage in close proximity. These risks demand that ARFFS remain at high levels to reduce the risk to people and property should an incident occur.

To gauge the current situation at Australian airports, case study techniques were employed. Telephone calls were made to the airports themselves, the main airlines, and discussions were held with key personnel with expertise in ARFFS operations.

We were able to develop an inventory-type narrative to describe what is happening on the ground at many airports covered and assess the diversity and scale of the assets that are in place.

The conclusion drawn from this extensive research is that while the flight frequencies have fallen temporarily, there are still significant assets that are at risk and require a continued ARFFS presence.

We also concluded that these services are not easily substituted for by existing firefighting capacity outside the ARFFS who do not have the required specialised training.

Table 8.1 summarises the ARFFS levels of service at Australian airports due to the COVID-19 situation.

Table 8.1 ARFFS levels of service at Australian airports due to COVID-19

Airport	Original	New	Comments
NSW			
Sydney	10	9	94 staff in total in shifts. Staff asked to take leave.
Ballina	6	5	3 existing crews blended to 2. Operating at Cat. 6 when required. Staff asked to extinguish leave by end of August and eliminate overtime.
Coffs Harbour	6	5	Was to be reclassified as Cat. 7
QLD			
Brisbane	9	9	No change
Cairns	8	5-7	Original classification increases to Cat. 9 by remission for those planes. New classification varies between Cat. 7 (8am – 6pm) and Cat. 5 (6pm-8am)
Gladstone	6	6	Drops to Cat. 5 if not enough staff.
Gold Coast	8		No information
Hamilton Island	7		No information
Mackay	7		No information

Table 8.1 cont.

Airport	Original	New	Comments
Rockhampton	6	5	Original classification increases to Cat. 8 due to defence force movements. New classification increases to Cat. 6 for Cat. 6 planes and increases to Cat. 7 by remission when needed.
Sunshine Coast	7	NC	No information
Townsville	7	7	Increases to Cat. 8 due to defence force movements. ASA wanted to reduce to Cat. 5.
VIC			
Melbourne	10	NC	No information
Avalon	8	5	Increases to Cat. 9 by remission. Currently staffed at Cat. 6 due to leave balances.
ACT			
Canberra	8	7	Increased RAAF VIP flights and diplomatic flights.
SA			
Adelaide	9	5-7	Cat. 7 during day and Cat. 5 at curfew.
NT			
Darwin	8	6-8	Drops to Cat. 6 on weekends and some nights, but Cat.8 at other times.
Ayers Rock	6	NC	No information
Alice Springs	7	NC	
WA			
Perth	9	NC	No change in category but are operating with limited staff levels due as staff have been forced to take leave often leaving no DRV available and staff at Category 8 level, especially overnight.
Broome	6	NC	No information
Karratha	6	NC	No information
Newman	6	NC	No information
Port Hedland	6	NC	No change in category primarily due to large mining fly-in fly-out workforce. Reduced weekend flights and no ARFFS staff if no flights.
TAS			
Hobart	7	NC	No information
Launceston	7	NC	No change to category but only 4 flights to and from airport on Monday, Tuesday, Thursday and Friday.

Note: Only Adelaide Airport is listed as changing category on ASA website.

8.1 Sydney Airport

Sydney's Kingsford Smith Airport is Australia's busiest airport and is classified as Category 10 for ARFFS staffing levels. During COVID-19 restrictions, the airport is running at a Category 9 level with a Domestic Response Vehicle (DRV).

The 94 ARFFS staff at Sydney Airport have been required to take leave (both accrued and annual) with some restrictions. All ARFFS staff have been required to expire all recreation leave accrued up to the 31st March, and total recreation leave tallies recorded on that date must be acquitted to zero before 31st August 2020. There are no mutual shift changes allowed and the usual short meeting between crews prior to taking over the duties of the shift (hand over, take over) are suspended.

Sydney is one of the main storage areas for grounded aircraft with a count in June numbering 92 aircraft on runways, taxiways and aprons. In addition to aircraft, there are also at least 500 rental cars parked at the airport.

The airport has two train stations (domestic and international); two multi-level car parks and terminal buildings. Qantas has major maintenance facilities at The Qantas Jet base including eight hangers. Sydney Airport houses a heliport, as well as general aviation facilities and maintenance. The airport also is a base for the Air Ambulance.

ARFFS staff look after over 4000 fire detection monitoring installations in the three terminals and are part of the Botany Bay Response for Marine Incidents with two 7.8m Catamaran Rescue Boats.

Sydney airport also houses the Joint User Hydrant Installation (JUHI). This is a system that designed to move fuel, including Jet A1 fuel from Kurnell to the airport via pipelines and tanker systems. It is stored at the airport and transported to the hydrant carts and refuellers and then onto the aircraft. Sydney JUHI operates 24 hours a day, all year and has a storage capacity of 29.0 million litres of Jet A1 fuel.

The Sydney JUHI has five Jet A1 storage tanks with a total capacity of 29 million litres. There are 1.3 million litres of Jet A1 fuel stored underground in the hydrant system at any point in time. It has 10 hydrant pumps with a total capacity of 45,000 litres per minute with 1,000 kPa used to pressurise the hydrant line. There is approximately 10 km of underground pipelines (reticulation hydrant network) connecting the storage tanks to the international and domestic terminals and freight bays, and approximately 190 hydrant points at the aprons of the international and domestic terminal aircraft bays. There are also hydrant connections and service pits.

Under normal operations, there is approximately 9-10 million litres of Jet A1 fuel used at Sydney Airport per day and 750,000 litres of Jet A1 fuel being transported around the airport per hour.

Sydney JUHI is monitored by the ARFFS fire control centre. All fuel hydrant vehicles are equipped with an emergency stop button that will shut off the vehicle immediately ceasing fuel supply. Additionally, every bay at the airport is equipped with an emergency stop button that will shut down the entire bay. There are also multiple alarm points that operate a "Man Down Alarm".

8.2 Ballina Airport

Ballina Airport is a Category 6 airport for ARFFS staffing. However, in line with "Road Map to a Covid free Airservices" the airport is operating at a Category 5 level with minimum staffing and extra staff on standby for when Category 6 aircraft are scheduled. This will return to permanent Category 6 staffing on 1st July.

All staff have been asked by management to use existing leave by the end of August. With the onset of the COVID-19 restrictions, the existing three crews have blended into two, resulting in several significant roster changes. The existing seven day notice on roster changes has been waived during the restriction period in contradiction to the Certified Agreement. This move, whilst causing severe disruption to for many staff, has allowed ASA to eliminate overtime. Surplus staff were used to cover services for local infrastructure and the town of Ballina. It is expected that the original three crew roster will return in July.

Whilst Qantas, Jetstar, Rex and Fly Pelican all operate flights into and out of Ballina Airport, flights have reduced dramatically with the result of the COVID-19 restrictions. However, flights are scheduled to increase significantly in July and beyond, with both Jetstar and Qantas having several flights per day.

Ballina Airport has a number of assets including a terminal building, café, shops, electrical sub-stations, Ballina Byron Gateway Airport council offices, airport reporting offices and a non directional beacon. In addition, there are approximately eight hangers with multiple light aircraft for White Star Aviation, Black Swan Aircraft maintenance, Ballina Aero Club and private hangers for civilian aircraft. Hundreds rental cars, waste disposal plant, brewery and the Ballina industrial zone with factories including Elgas and BP are protected by ARFFS and are just outside of the airport. There are also fuel farms for Avgas and Avtur which hold 52,000 litres of fuel each.

There is no full time fire service available for Ballina Shire, with the fire service made up of retained fire fighters. As a result, response times are varied based on the availability of staff and distance from fire station. ARFFS fire fighters have assisted the retained fire service in the past with local area and bush fires.

8.3 Coffs Harbour Airport

Coffs Harbour Airport is a major regional tourist hub. It currently provides Category 5 ARFFS staffing. The airport upgrades to Category 6 staffing levels for all flights of that size, which is currently two flights per day. Prior to COVID-19 restrictions, the airport operated at a Category 6 level and was close to the benchmark that would see it reclassified as Category 7.

There are a significant number of helicopter operations out of this airport including rescue, police, defence and civilian charter operations. Air Ambulance operate regular services at least twice a day and continue after the ARFFS closing time. Additionally, Australian Defence Force aircraft as large as C130 Hercules use the airport on a regular basis.

There are no grounded aircraft currently parked at this airport. However, the airport has a significant fuel farm/storage unit with approximately 70,000 litres of stored and dispensed fuel. In addition, there is a large gas storage and distribution centre located at the end of one of the runways, which stores and provides gas for the Mid Coast NSW. ARFFS staff are responsible to respond to any fire or emergency in this area.

Additional safety concerns surround the cessation of the air traffic control tower (operated by ASA) on weekends. During these periods, the airport is operated from the Common Traffic Advisory Frequency (CTAF) VHF radio mode. This move has been criticised by several pilots and airlines.

Regular firefighting assistance is given by Coffs Harbour NSW Fire and Rescue, who have a permanent staff of one officer and four firefighters and a response time to the airport of around seven minutes. Once at the airport, they require an escort. There is a two-crew backup of retained firefighters on call via pager with response times of approximately 20 minutes to the airport.

8.4 Brisbane Airport

Brisbane Airport is Australia's largest by area covering 2,700 hectares. It is classified as a Category 9 airport. It includes a major shopping precinct, numerous training organisations (Boeing, Virgin, Aviation Australia, Life flight, Aider), two train stations, two childcare centres and numerous small business. It also houses the Iseek Data Centre which is one of the largest data storage facilities in the country. The Centre is currently expanding to support data requirements of the Queensland government. The data centre is still operating during this period.

Both Qantas and Virgin have hangers at Brisbane Airport. Both the Qantas and Virgin hangers are operating at reduced levels over the restriction period. The hangers are valued at $100 million and $20 million respectively.

The airport is one of the main hardware hubs for the $1.2 billion OneSky air navigation project. The Air Traffic Services Centre (ATSC) controls airspace for most of Australia and is located at Brisbane Airport. Both OneSky and the ATSC are still operational during the COVID-19 restrictions.

Both the domestic and international terminal buildings are operating at reduced levels since the travel restrictions have been put into place. The domestic building is over half a kilometre long and three stories high; whereas the international building is over 850m long, four stories high.

Brisbane Airport is home to Australian Aerospace which houses and builds the Australian Army and Navy attack and transport helicopters (Tiger and Taipan/NH90). Northrop Grumman also maintain the RAAF A330 MRTT refuellers in Brisbane.

In addition to defence, NIOA is a 6,600m2 facility that supplies and holds contingency stock of weapons, ammunition, explosives and weapon systems for multiple police forces and the Australian Defence Force. These services are still operating during the restrictions.

As well as commercial and defence activities, Brisbane Airport is home to the emergency service helicopter and fixed wing aircraft services through RACQ LifeFlight. Brisbane Airport is a major base for QGAir which operates aeromedical, cargo and passenger services for state government and Queensland police service. There has been no change to these service levels from COVID-19.

Due to its size, Brisbane airport is currently hosting a large amount of grounded aircraft. During June, there were 74 commercial airliners in storage at Brisbane Airport. This is a large increase from the pre-COVID number of approximately 10 aircraft. Each plane carries significant fuel loads whilst grounded at Brisbane airport.

In addition to fuel stored in aircraft, the airport JUHI facility stores approximately 4.3 million litres jet fuel.

8.5 Cairns Airport

Cairns Airport is classified as Category 8 for ARFFS staffing levels and operats 24 hours a day seven days a week. The airport uses the remission factor for any Category 9 aircraft flights. Due to COVID-19 restrictions, ARFFS coverage has fluctuated between Category 7 (8:00 to 18:00) for passenger transports, and Category 5 (18:00 to 8:00) in which case, industry is notified, on 24-hour, 7 day a week basis. ARFFS staff leave has been used at this time to acquit targets. Excess staff have been used to cover unplanned leave. However staff are not replaced if they call in sick unless Category 5 is operational.

Prior to COVID-19, Cairns was a very busy airport for both international and domestic flights. The airport regularly received B787-800, A330-200/300, B737, 717, 777 A320/21s. Cathy Pacific and Air New Zealand had regular flights. As did Qantas and Jetstar. During peak season, many additional international airlines would utilise Cairns Airport.

Aircraft continue to use Cairns Airport on a regular basis. Qantas B737 and Jetstar A320 operate one to two passenger flights per day. Freight movements also continue through the airport with Qantas freight B737 and BAE146 flights operating daily; A330-300 operating three times a week; and a 767 service operating weekly. Toll Cargo Metro Liners and 737 services operate on a daily basis. Smaller aircraft like the Fokker F100 (eight services) and Dash 8 Q400 (two to three services) also operate daily. Many other Category 4 or smaller aircraft continue to use the Airport.

Cairns Airport is also a diversion airport for international flights. As a result, ARFFS need to be available for these flights, with emergency diversion occurring at odd hours between 6pm and 6am. In the past these have included B747, B787-900, B777 and A330 aircraft.

The airport also operates the emergency services of The Royal Flying Doctors Service and QG Air.

Cairns Airport is refuelled by the Joint User Hydrant Installation (JUHI). The system is capable of holding 3.2 million litres of Avtur and is able to pump to the apron for aircraft refuelling. It is currently holding 1.2 million litres due to maintenance that has been ongoing through the restrictions. The BP/ Vital fuel instillations behind the fire station hold 8,4000 litres of Avgas and 170,000 litres Avtur with multiple tanker trucks to service general aviation.

Queensland Fire and Emergency Services have two stations and an emergency control centre. The response time to the airport is 10 minutes.

In addition to airport call outs, Cairns ARFFS have assisted the Cairns community in several mutual aid calls over the years including: Cairns Boiling Liquid Expanding Vapour Explosion (BLEVE), ship fires; recyclers fire; train derailments and motor vehicle accidents.

Cairns airport has a number of assets which can be further classified under either aircraft hangers or terminal and other buildings as follows below. All maintenance aircraft hangers have continued maintenance during the COVID-19 restrictions.

Aircraft Hangers

- Hawker aircraft maintenance hangar servicing Alliance F100 aircraft.
- Cobham aircraft maintenance hangar servicing Qantas link B717 aircraft.
- Aircraft turnaround servicing Qantas freight BAE146's and Dash 8 Q400.
- Skytrans maintenance hangar servicing Dash- 8 and other general aviation aircraft.
- Several smaller general aviation maintenance hangers.
- GBR and Nautilus Helicopter hangers.

Airport Terminals and Buildings

- Two storey international and domestic terminal with 24 aircraft passenger loading bays.
- Buildings for airport catering (two), Boarder Force Australia, Department of Agriculture Quarantine (DAWR), Qantas Freight, air cadets, airport administration and central services.
- Rental car carport for AVIS, Thrifty, Europcar, Budget and Hertz.
- Central Queensland University airports flight school

8.6 Gladstone Airport

Gladstone Airport is classified as Category 6 for ARFFS staffing levels. This category is maintained whenever possible during the COVID-19 restrictions. The airport operates every day except Saturday with approximately six flights per day. The Category 6 level is maintained unless staff leave is taken, in which case, the level drops to Category 5.

Gladstone Airport operates the Royal Flying Doctors Service with flights several times a day and overnight. The airport also houses a large helicopter that services the marine port to transport marine pilots to shipping in the area. The marine transport facility operates on a regular basis.

There are currently no grounded aircraft at Gladstone Airport due to COVID-19 restrictions.

There is a small fuel farm with around 20-30,000 litres storage and distribution. Additional risks include the high-power distribution lines feeding the rail operations that are west and east of the airport.

Gladstone itself is highly industrialised and only has a small local fire service presence. ARFFS staff are available to support the Queensland Fire and Emergency Services (QFES) at any major fire in Gladstone and surrounding industries under mutual aid agreements. The QFES has an approximate five-minute response time to the airport. The QFES however, have a very large response area and are frequently called out to other calls which increase this response time.

8.7 Rockhampton Airport

Rockhampton Airport is classified as Category 6 for ARFFS staff levels. However, due to its proximity to the defence forces, it is regularly classified as Category 8 in order cover military exercises in the area.

As a result of the COVID-19 restrictions, the airport is currently operating at a Category 5 level and is expanding to Category 6 staffing as required to cover two to three of the larger Category 6 aircraft coming into the airport. To cover the incoming Boeing 737-800 flights, the airport uses remission (Category 7) at a Category 6 level.

Terminal upgrades, include hot works, are currently underway at Rockhampton Airport, which increases the fire safety risk. Rockhampton has a significant fuel farm with approximately 300,000 litres of fuel stored and dispensed.

Rockhampton Airport has air traffic control and is a base for emergency services with the RACQ LifeFlight helicopter, the Royal Flying Doctors Service (RFDS) and Air Ambulance operating regularly. RFDS and Air Ambulance conduct around five to six flights per day and continue into the night.

The response time for the nearest QFES Fire Station is approximately five to six minutes to the gate, an escort is then required to the airside areas.

8.8 Townsville Airport

Townsville airport is a joint user airport with a civilian side and a military side operating at the facility. Both military and civilian aircraft use both runways. Air Traffic Control (ATC) is provided by the RAAF. ARFFS are provided by ASA through normal industry charges to the civilian aircraft and through a separate contractual arrangement to military aircraft.

The airport is considered a Category 7 for ARFFS coverage. It is 24 hours a day with the ability to increase to Category 8 when requested by the defence force. The defence contract requires a Fire Control Centre (FCC) to be staffed at all times due to the surveillance of the Base Fire Indicator Panel and several firefighting foam deluge suppression systems in 5th aviation hangers. The contract covers the provision of a domestic response capability and defines a response time of six minutes to anywhere on the RAAF base. Although ASA wanted to reclassify the airport to a Category 5 level, the Category 7 level was maintained due to Defence Force contract commitments.

Due to COVID-19 restrictions, regular passenger transport aircraft movements have dropped to one or two flights a day. There has been some increase in F100 aircraft movements due to mining industry FIFO requirements. General aviation has been sporadic with some irregular light aircraft movements. Care flight, QES chopper, and cargo aircraft (BAE146, ATR40, ATR75, B737) movements continued almost as normal. Defence Category 8 aircraft (C17, KC30) operate at least weekly.

ARFFS respond to all Townsville Airport P/L buildings. This enables Queensland Fire and Emergency Services (QFES) to respond with one appliance to all alarms.

There have been two incidents (April and May) during the COVID-19 period requiring ARFFS personnel and or equipment. The first was an electrical fault at the RAAF medical building and the second a helicopter crash on take-off.

The ARFFS have regularly attended other major fire and flood incidents outside the airport boundary over the last several years.

The civilian side of the airport has a number of assets including:

- Townsville Airports Terminal (TAPL) has four aerobridges. Three aerobridges regularly service domestic arrivals and departures of B737, B717, A320, A321 aircraft. These are used up to twice daily. One aerobridge is connected to a separate international arrivals and departure part of the terminal building which has the ability to service larger aircraft such as B747, A340, A330. This is currently not in use for commercial international flights, but is used for international charter flights by the Australian Defence Force to deploy personnel overseas.
- Extensive rental car and long-term parking facility.

- Cargo handling precinct with three large buildings operated by Toll and Qantas Freight. This has continued to operate throughout the lockdown.
- Flying colours hangers large enough to maintain and paint B737, A320, F100.
- Approximately 16 other aircraft parking bays located on the civilian apron where both passenger and cargo loading, and offloading occurs. Dash 8- 300 and 400s, F100s operated by Alliance Airlines, Cargo Aerospatiale ATR 40 and ATR 75s operated by Toll, BAE125s cargo, B737 cargo.
- Maintenance hangers for Alliance Airlines for F100s, LifeFlight lear jet 45's, Nautilus Aviation Euro copter EC120, Robinson R44's, Queensland Government Air (QGAir) rescue chopper- 2 AW139.
- There is an extensive general aviation (GA) apron where more than 20 aircraft are parked at any one time: Cessna Caravans, CT110, CT175 used for charter and pilot training; Beechcraft 1900 operated by the Queensland Police for prisoner transfers; and Robinson 22 / 44, AS350 Squirrel helicopters operated by Townsville Helicopters used for charter flights as well as pilot training.
- Fuel storage installation approximately 100m from airport fence with three 110,000 litre tanks of aviation turbine fuel (Avtur), and four 10,000 litre fuel tankers.

The defence side of the airport has two defence squadrons located inside the airport boundary. The RAAF 27 Squadron is mainly a training and logistical deployment group. As well, as the 5th Aviation Regiment provides is a large military helicopter training, storage and maintenance facility.

The RAAF 27 Squadron assets include:

- Accommodation blocks (three, three storey dormitory style buildings with shared kitchen and bathrooms on each storey; 28 two storey blocks with four self-contained one-bedroom apartments on each level; combined mess and food storage area with three separate bar and dining areas.)
- Logistical storage facilities (defence transport and excavation vehicles; small to large tents, marquees, inflatable buildings; other specialised deployment equipment; administration building).
- Fuel bowsers and vehicle storage.
- Vehicle maintenance facility capable of servicing large semi-trailers and excavation equipment. Also including battery servicing / storage.
- 27 Squadron headquarters including administration and deployment training amphitheatre.
- RAAF medical / sick bay triage rooms, four, day bedrooms. Two 4x4 ambulances.
- Military apron with military passenger terminal.
- Air movements / cargo storage and loading facility.
- Large aircraft maintenance facility built to maintain Caribou aircraft no longer in service.
- 10 carport type open hangars / Explosive Ordinance Loading Aprons (OLA) capable of storing two F/A 18 Hornets. These are for aircraft from other visiting RAAF squadrons / other defence forces to deploy to for training, or strategic reasons.
- Four open OLAs capable of parking C130J Hercules up to C17 Globe masters (Visiting).

- Bomb preparation area with small revetment buildings used to arm and prepare explosive ordinance (EO) ready for loading onto aircraft for use.
- Heavy concrete and dirt covered building designed for storage of EOs. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6 explosive classes. Often used during exercises. Also used as strategic storage.
- RAAF fuel farm with tanker on-loading and off-loading bowsers, as well as a pumping system to supply underground fuel hydrant system at the military apron on the other side of the runway. Estimated at least 400,000 litres storage in multiple tanks covered by concrete and blue metal.
- RAAF fuel tanker maintenance / storage facility. Stores and maintains approximately ten 20,000 litre fuel tankers.

5th Aviation assets include:

- 18 MRH90 helicopters stored in two humidity-controlled hangers.
- Seven Boeing CH47 Chinook helicopters stored in a hanger.
- Large maintenance hangar capable of housing four MRH90 helicopters.
- Large maintenance hangar capable of servicing four Boeing CH47 Chinook helicopters.
- MRH90 fully articulated simulator building.
- Boeing CH47 Chinook fully articulated simulator building.
- Two large two storey administration training buildings.

8.9 Avalon Airport

Avalon is currently providing a Category 5 ARFFS. Prior to COVID-19, Avalon was classed as a Category 8 airport. However, the airport accepted aircraft up to Category 9 size and used the ICAO remission factor to meet regulations.

Avalon is designated as an alternate airport for Melbourne. Avalon Airport has requested that ARFFS operations be provided to cover Emirates Category 9 flights that have nominated Avalon as an alternate airport.

Avalon Airport houses emergency helicopter services for the Victorian Police and has regular medical flights with the Victorian Air Ambulance. The airport is also a helicopter base for the Marine Ports and transports marine pilots to large ships in the area to assist entering the port.

In addition to helicopter services, the Defence Force, including the Roulettes regularly train at this airport conducting touch and go landings and circuit training for airport familiarisation.

As well as the existing plane and helicopter facilities, there is a new helicopter base that will house and operate multiple helicopters and aircraft. This facility has stated that ARFFS are within a three to five-minute response time to ensure protection.

Both terminals at Avalon are currently undergoing works to accommodate isolation measures post COVID-19, including regular hot works. The nearest CFA permanent fire station is Lara which has a 15- to 20-minute response time, followed by Geelong at 25 minutes.

Avalon Airport is currently one of the main airports in Australia to house the grounded aircraft due to falling passenger numbers. At June 2020 there are 36 aircraft stored at Avalon Airport. There are nine Boeing 787 Dreamliners, 14-15 Airbus A330, seven Boeing 737 and between four and five Airbus A320 aircraft stored there.

Grounded aircraft are worked on by engineers on a daily basis, including the starting and running Auxiliary Power Units (APU's). Aircraft are towed to alternate positions regularly to prevent tyre damage, and routine maintenance is conducted on the airframes and engines.

8.10 Canberra Airport

Canberra Airport has a major terminal building protected by ARFFS as well as substantial retail, building and office complexes. The airport is classified as a Category 8 for ARFFS staffing levels, but due to COVID-19 restrictions, the airport is currently operating at a Category 7 level.

The aircraft operating at the airport are mainly Category 5 and 6 aircraft, however there has been an increase in RAAF VIP flights in Canberra in this time. The RAAF Boeing 737, EEW and C E-7 Wedgetails and ASW P-8A Poseidon's have also been utilising the airport for touch and go training during the COVID-19 restrictions. Additionally, incoming and outgoing diplomatic flights up to and including Category 9 Boeing 777's have been operating at short notice.

There are currently no grounded aircraft stored at Canberra Airport.

Canberra Airport has an underground fuel system with over 750,000 litres of fuel stored and dispensed. There is also a Boing 717 maintenance facility operating at this airport.

ACT Fire and Rescue Fishwick or Ainsleigh are the nearest fire stations with approximately an eight to nine-minute response time to the staging areas. An escort is then required to the airside areas.

8.11 Adelaide Airport

Adelaide Airport is currently classed as Category 7 for ARFFS staffing during the day and drops to Category 5 during curfew. Category 5 staffing has been reduced by one fire fighter. The original classification pre COVID-19 was Category 9. The 47 ARFFS staff at Adelaide Airport have been required to take leave (both accrued and annual).

Adelaide is the termination point for some airlines, who then house aircraft at this airport overnight. Up to 12 Boeing 737 and Airbus A320 aircraft are parked in Adelaide on most nights. Currently there are around 15 of this size aircraft permanently parked due to COVID-19 restrictions. These aircraft are undergoing maintenance and servicing involving regular movement to avoid tyre damage and are subject to start ups and Auxiliary Power Unit (APU) operations.

The airport operates as an alternate airport for flights to Melbourne, Sydney, and Perth. It is estimated that around 60 to 80 very large aircraft nominate Adelaide as their preferred airport if a diversion is required for an emergency or weather conditions. Japan Airlines will sometimes insist on using Adelaide Airport as an alternative, and ARFFS are upgraded to Category 7 during the overflight period. Under ICAO conditions, airports are required to have Category 7 staffing for airports to accept Category 9 aircraft diversions.

In addition to standard commercial aircraft movements, Adelaide houses other functions that have not ceased due to COVID-19 restrictions and downturn in passenger numbers. Air freight operations continue at Adelaide Airport with services running through Toll Air Freight during the night. Boeing 737 and BAE 146 freighters land several times during curfew. Both aircraft are larger in size and risk than the Category 5 ARFFS operations provided.

Emergency services continues to operate as normal at Adelaide Airport. The airport is home to a large Royal Flying Doctors Service (RFDS) base with RFDS, Air Ambulance and Med Star flying regularly, regardless of curfew limitations. SA Police, SA Ambulance, Surf Rescue, Motor Accident helicopters all operate 24/7 emergency response helicopter services from Adelaide. In addition, Heli Star and Babcock aviation provide service, storage and maintenance to a significant fleet of helicopters. Alliance and Cobham aviation maintain large maintenance facilities at this airport as well.

ARFFS has an obligation to provide a water rescue service during all periods to rescue passengers from any aircraft incidents or accidents that occur on approach or departure from Adelaide Airport.

Additional safety concerns also surround the large fuel farm (JUHI) and the current work to extend to the International Terminal. These works involve external construction crews and hot work permits which increases the risks of structural fires considerably.

8.12 Darwin Airport

Darwin Airport is classified as Category 8 for ARFFS staffing levels. Due to the COVID-19 restrictions, the airport is operating at a Category 6 level on weekends and some nights, whilst maintaining the Category 8 level for all other times. However, the NT has had no COVID-19 cases in over two months and their borders are due to open in July with an anticipated surge in air travel likely.

The defence force is also present in the Darwin Airport area, with a defence force contract with ASA. The RAAF are flying numerous Category 9 (Boeing B777 and Airbus A330s) aircraft into the airport which are MTT (Multi-Task Tankers) or US flights transporting marines to the base.

In addition to military activity at Darwin Airport, domestic flights are continuing with regular Category 7 flights. Additionally, the significant general aviation and regional flights out of Darwin have not diminished during this time with Air North Operations consistently flying in and out of the facility.

Due to the humid climate, there are no grounded planes stored at Darwin airport.

Additional safety concerns include the four fuel farms (two for domestic / general aviation and two for RAAF) for its two major terminals. There is also a significant liquid oxygen storage and defence ordnance storage facility. Both of these storage facilities are a significant risk to the airport and firefighters.

The Northern Territory Fire and Rescue Service has a response time of approximately four to five minutes. An escort is then required to the airside areas.

8.13 Alice Springs Airport

There are a large number of grounded planes stored at the Alice Springs facility including FlyScoot (Thailand), Singapore Airlines, Silk Air and Alliance.

8.14 Perth Airport

Perth Airport is listed as a Category 9 airport for ARFFS staffing levels which it has retained during the COVID-19 restrictions. However, the airport is running at reduced staffing levels, with eight fire fighters (usually 10 to 11) and two officers (usually three) and no domestic response vehicle operator. Staff have been forced to take leave over this period.

Additional measures over the pandemic have included no early marks, no overtime, strict start and finish times so that locker rooms and trucks can be cleaned / sterilised, different incoming and outgoing staff areas so that staff do not come into contact with other crews. Handovers are done at a distance and is a reduced process. The domestic response vehicle is dropped if there is not enough staff (often when the airport operates at a Category 8 level overnight). However, training is continuing as usual.

The number of grounded planes stored at Perth Airport has increased dramatically over this period. Prior to the restrictions, there would only be approximately 10 planes stored, however, in June there were approximately 65 and at times 75 grounded aircraft stored at the airport.

Perth Airport has four terminals, a Joint User Hydrant Installation (JUHI) with upwards of two million litres of fuel. The mining company Rio Tinto has their Perth operations base at the airport, which contains a 10,000 litre diesel store.

Additional assets include distribution centres for Coles and Woolworths, Direct Factory Outlet and Costco shopping precinct. Airservices have buildings on site including the administration offices, Alpha Building, powerhouses and a technical maintenance centre.

8.15 Port Hedland Airport

Port Hedland Airport is listed as a Category 6 airport for ARFFS staffing levels. This level has been maintained during the COVID-19 restrictions. This reflects that there has been no change in weekly flights due to the mining industry. Weekend flights have reduced in frequency, which has resulted in there being no ARFFS staff coverage at the airport when there are no flights. However, with the return of domestic flights in WA, it is expected that normal levels of weekend operation will return soon.

There are no additional grounded aircraft parked at Port Hedland Airport. The airport does have general aviation aircraft and the occasional F100-737 parked overnight, but this is not due to any COVID-19 restrictions.

The airport infrastructure consists of terminal and temporary buildings for the current upgrade to the terminal building; NAV aids and tower and a freight shed. It also houses general aviation aircraft in their own hanger. The Royal Flying Doctors Service have their own hanger and the School of the Air and RFDS also have dedicated buildings on site. Port Hedland Airport also houses a fuel farm and fuel storage facility.

There is also a fire station on site, but coverage is supplied by volunteers from the Department of Fire and Emergency Services. Whilst these brigades are strong, they have a 15- to 20-minute response time to the airport.

8.16 Launceston

Launceston Airport is currently a Category 7 airport for ARFFS staffing levels. Airport operations have reduced to four flights into and out of Launceston per day, on Monday, Tuesday, Thursday and Friday during the pandemic. The airport can accommodate both Category 7 and 6 aircraft with B737-800 (Virgin), A320/321 (Jetstar) and Bombardier Dash 8 A400 (Qantas).

The airport terminal building houses a number of staff including services for security (as well as bio-security), airlines, retail outlets and car hire. Launceston Airport has a number of aircraft hangers, including general aviation, Qantas and Virgin Freight, Tasmanian Aero Club with its' own fuel bowser, and Sharp Airlines which has its own hanger and check in area. These hangers hold a variety of aircraft from large B737-300 freighters to light aircraft. Sharp Airlines have six Metroliner aircraft in their hanger, with maintenance crews on site.

The airport is used by the Royal Flying Doctors Service which has multiple hangers for King Air Beechcraft BE20 aircraft, and pilot dorm building with one to 10 people during daytime hours. There is also an air traffic control tower which operates between 5.45am and 10pm.

There are number of other users of the airport site including a satellite ground station, power and back-up power storage area, meteorology weather building, VHF Omnidirectional Radio Range (VOR) unit and glide path. Launceston Airport also has a whiskey distillery in one of its hangers holding thousands of litres of alcohol, offering group tours to the public.

There is an onsite fuel farm at the airport that holds 5,000 litres of diesel, over 240,000 litres of Avtur, and over 46,000 litres of Avgas. With up to four tankers in the area at any time.

As well as the ARFFS station, there are volunteer fire brigades located at Evandale and Perth with a five-minute response time to the airport depending on volunteer response level and training for aircraft incidents. There is also the Tasmanian Fire Service which is located in Launceston, but with an estimated 15 to 20 minute response time.

9. A broader view of assets and risk – Australia's tourism capacity

In an earlier study (Mitchell and Flanagan, 2019) an extensive analysis was conducted to assess the potential impact on tourism of an aviation accident at an Australian airport. The analysis demonstrated the importance of maintaining a reputation for air safety to the Australian tourist industry.

The context at present is of course different. Domestic flight movements are limited although they are beginning to return to more normal levels as the States and Territories open up their borders again and the health risk from the pandemic is reduced. Examination of data on the Sydney-Melbourne route makes it clear that there are now more flights each day and passenger loads are increasing although that recovery may stall depending on containment of the suburban hotspots in late June. In due course, air travel to regional destinations will return to strength and will become a pivotal part of the economic recovery for the nation.

Further, international travel into our tourist destinations will take longer to recover given the commitment by the federal government to border closure. But when it does recover, it is reasonable to expect strong demand. The current experience in Europe during the holiday season indicates that after rather severe constraints on international travel, the demand has been very strong for air routes to the traditional holiday destinations along the Mediterranean as the lockdown rules ease, particular in Britain.

It would be a significant setback to some of the regional areas that rely on their airports to bring tourists in for holidays if a major incident occurred as a result of a lack of ARFFS personnel on the ground.

9.1 Tourism and air travel

Tourism and air travel have become increasingly linked around the globe. Most nations have revised their international aviation policies to make international air travel less restrictive in order to encourage greater tourism (Forsyth, 2008). Domestic tourism within Australia is also strongly linked to air travel due to the sparse nature of the country and the ease and flexibility of travel, particularly between large cities, due to the advent of low-cost carriers. The revival of the domestic airline sectors will become increasingly important to Australia's recovery from the pandemic, given that the international border will remain mostly closed for the indefinite future. However, even with international restrictions in place, we can expect the New Zealand-Australian routes to open relatively soon, which will provide a boost to many Australian tourism regions.

Tourist destinations are often determined by their natural resources (for example, the quality of beaches), or the local culture and infrastructure (for example, entertainment venues). These are often interlinked where the natural resources or culture of a place lead to infrastructure being built to stimulate demand from tourists. The air transport service afforded a tourist destination, in terms of timing and frequency of flights, as well as cost, will have a large impact on its tourist numbers. Further, the design and capacity of the airports and airport infrastructure at a location can determine the type of aircraft accommodated as well as the service provided once a tourist is on the ground, particularly in terms of transfers to their destination (for evidence, see Debbage and Alkaabi, 2008; Williams and Balaz, 2009; Bieger and Wittmer, 2006; Galambos et al., 2014). Mitchell and Flanagan (2019) provide a comprehensive review of the literature supporting the intrinsic link between airline and airport capacity and the robustness of international and domestic tourism.

Tourism into and out of, as well as within Australia, is clearly dependent on the quality of our air transport system. Being an island country, visitors to Australia must come by either air travel or over the sea. Domestically, over 58.4 per cent of people travelling interstate in Australia travel by air transport (Tourism Research Australia 2019, Table 6). As such, aviation is a strategic priority for Tourism Australia in achieving their Tourism 2020 targets, in building the resilience and competitiveness of the tourism industry in Australia, and to grow its economic contribution. These plans include communicating with the public about regional airports and their accessibility, to encourage airlines to utilise regional airports and to capitalise on aviation opportunities. A key target of Tourism 2020 was increasing international and domestic aviation capacity to transport greater tourist numbers.

Away from the major cities the use, availability and affordability of air travel is a contentious issue. An inquiry into regional aviation services was held in the New South Wales parliament in 2014, where among other deliberations, there was much discussion on the cost of air travel in small aircraft to regional airports (Standing Committee of State Development, 2014). More recently in 2017 the Western Australia government held an inquiry into the pricing of regional air carriers (Economics and Industry Standing Committee, 2017). Currently, the Federal Government's Senate Standing Committee on Rural and Regional Affairs and Transport has set up an inquiry on the operation, regulation and funding of air service delivery to rural, regional and remote communities. Among their goals is to examine the social and economic impact of aviation services on regional Australia. It will report in November 2021. The pandemic will focus their brief on the importance of keeping Australia's regional air capacity intact and ready to respond to increasing demand as the health crisis eases.

Tourism has always been seen as an important industry to help grow regional economies. Governments and policymakers at all levels see opportunities in building on a region's natural, cultural and built environment to attract visitors and stimulate economic activity, alleviating regional disparities and creating new jobs. Visitors to a region spend money in the region, helping to pay for amenity and to sustain the community (Webster and Ivanov, 2014). The many government inquiries into the cost of regional air travel (see previous section) has been driven by the realisation that safe, reliable, affordable air travel is essential in allowing regions to fulfil their potential as tourist destinations. Tourism will become one of the key paths to regional economic recovery from the pandemic.

Table 9.1 shows the proportion of international visitors to Australia by both modes of transport over the past few years. A change in the layout of the incoming passenger card in July 2017 has meant proportionally more people have identified with selecting 'Visiting friends and relatives' (VFRs) as the main reason for their journey in 2017-18 (ABS, 2019a). International travellers who are visiting friends and relatives, while their motivation for coming to Australia may be different, contribute greatly to the tourist market in Australia. Together, international travellers on holiday or visiting friends and relatives as their main purpose accounted for over three quarters of the 6.3 million international visitor arrivals for the period 1 July 2019 to 31 March 2020. Unsurprisingly the vast majority of international visitors come by air transport, highlighting the importance of the aviation industry to international tourism.

While the pandemic has halted much of this traffic, we expect demand to be strong once health officials clear the way for renewed international travel.

Table 9.2 shows the modes of transport of domestic tourists for the year ending December 2019. Over 14 million Australian residents took a domestic flight for the purpose of an overnight holiday or visiting friends and relatives. This represents about half the total flights taken for this period. Air travel is proportionally more attractive to visitors who take a trip of two or more nights than just a single night, with over 30 per cent of holidaymakers and visitors to friends and relatives who stayed two or three nights, travelling by aeroplane.

Table 9.1 International visitor arrivals, by mode of transport, 2015-16 to 2019-20

Purpose of travel		2015-16		2016-17		2017-18		2018-19		2019-20[c]	
		No. ('000)	%	No. ('000)	%	No. ('000)	%	No. ('000)	%	No. ('000)	%
Holiday[a]	Air	3,903	47.3	4,343	48.4	4,271	44.7	4946.7	46.6	3036.0	47.7
	Sea	45	78.9	60	78.9	58	79.4	73.2	93.0	68.3	93.5
VFRa	Air	2,061	25.0	2,175	24.2	2,753	28.8	3502.1	33.0	1919.0	30.2
	Sea	6	10.5	9	11.8	9	12.3	4.2	5.4	3.6	5.0
Business	Air	617	7.5	633	7.0	704	7.4	806.9	7.6	438.8	6.9
	Sea	1	1.8	1	1.3	2	2.7	0.7	0.9	0.6	0.8
Education	Air	730	8.8	832	9.3	875	9.2	960.7	9.1	716.2	11.3
	Sea	1	1.8	2	2.6	2	2.7	0.2	0.3	0.3	0.4
Employment	Air	381	4.6	405	4.5	320	3.3	397.8	3.7	248.9	3.9
	Sea	2	3.5	2	2.6	1	1.4	0.3	0.4	0.3	0.4
Total[b]	Air	8,254	100.0	8,980	100.0	9,554	100.0	10614.2	100.0	6358.9	100.0
	Sea	57	100.0	76	100.0	73	100.0	78.7	100.0	73.1	100.0

Source: *DIBP Overseas Arrivals and Departures, accessed 2 June 2020 https://data.gov.au/data/dataset/overseas-arrivals-and-departures*

Notes: *a Changes to the layout of the incoming passenger card in July 2017 means for 2018 the proportion of people reporting VFR as the main reason for their journey was 4% higher and 4% lower for holidaymakers.*

b Total includes other reasons not listed in the table as well non-respondents

c 1 July 2019 to 31 March 2020

Table 9.2 Domestic travellers[a] by purpose and mode of travel, for different length of stay, year ending December 2019

Nights		Air		Self-drive		Other		Total[b]
		No. ('000)	%	No. ('000)	%	No. ('000)	%	No. ('000)
1	Holiday	5,593	13.9	32,578	81.2	1,757	4.4	**40,100**
	VFR	5,692	16.0	27,041	76.2	2,745	7.7	**35,482**
	Business	11,897	49.5	11,510	47.3	880	3.6	**24,349**
	Other	845	15.3	4,157	75.4	511	9.3	**5,513**
	Total	24,027	22.8	75,287	71.4	5,893	5.6	**105,444**
2	Holiday	842	29.0	2,387	82.1	296	10.2	**2,908**
	VFR	776	29.7	2,081	79.6	259	9.9	**2,614**
	Business	898	55.1	946	58.0	np		**1,630**
	Other	183	20.9	680	77.7	107	12.2	**875**
	Total	2,568	39.2	5,198	79.3	738	11.3	**6,555**
3	Holiday	456	33.7	1,110	81.9	208	15.4	**1,355**
	VFR	384	35.5	902	83.4	130	12.0	**1,081**
	Business	321	51.5	423	67.9	np		**623**
	Other	np		438	86.7	np		**505**
	Total	1,155	42.5	2,253	82.9	386	14.2	**2,717**
Total[c]	Holiday	7,309	15.8	37,783	81.7	2,497	5.4	**46,228**
	VFR	7,015	17.6	30,745	77.0	3,183	8.0	**39,944**
	Business	13,199	48.8	13,255	49.0	1,031	3.8	**27,041**
	Other	1,151	15.7	5,710	77.6	689	9.4	**7,354**
	Total	28,399	24.2	85,274	72.6	7,331	6.2	**117,448**

Source: Tourism Research Australia, National Visitor Survey 2019, Table 8

Notes: *a. All figures relate to Australian residents aged 15 years and over.*

b. Components may not add to total as overnight visitors may have utilized more than one mode of transport during their trip and total includes persons nor asked.

c. Total includes trips that had more than 3 stopovers.

np. Data is not publishable as the survey error is too high for most practical purposes.

Note: This data for 2018 has been revised to align with the latest ABS population projections and thus differs from previously published estimates. For further information refer to the fact sheet "Changes to the National Visitor Survey in 2019" on https://www.tra.gov.au/Domestic/national-visitor-survey-methodology. Caution should also be taken when comparing 2019 NVS estimates with those from earlier years. The move to 100% mobile interviewing has seen increases to 2019 NVS estimates thus having an upward influence on growth rates. For more information see https://www.tra.gov.au/Domestic/national-visitor-survey-methodology.

9.2 Economic benefits of tourism

The economic benefits of tourism have long been established. Put in its simplest terms, a visitor or tourist who visits or stays outside their usual environment generates additional expenditure beyond that generated by local consumers who spend money in their usual environment. Domestic tourism increases a country's total national spending just as other internal transactions do. The tourist destination will increase its gross regional product, which contributes to the nation's gross domestic product. International tourism acts as an export, improving a country's external sector balance.

As Australia begins the slow recovery from the pandemic, domestic tourism will become a crucial source of revitalisation, particularly in regions that have economies geared to providing holiday services.

Tourism contributes to and requires input from many sectors of the economy. Because of this the tourism industry does not fit nicely within the National Accounting statistical framework, conventionally used by countries to measure their economic activity. A number of different approaches have been suggested to overcome the difficulties that the standard framework has in estimating the economic impact of tourism.

The Tourism Satellite Account (TSA) was created to aggregate tourism-related contributions that are made across the different sectors of the economy. The TSA is a standard statistical framework developed by a conglomeration of authorities throughout the world, led by the United Nations World Tourism Organisation (UNWTO). Its purpose is to enable the generation of tourism economic data that is comparable with other economic statistics, by contrasting data from the demand-side of tourism, the purchase of goods and services by visitors, with data from the supply-side of the economy, the value of goods and services purchased by industries in response to visitor expenditure. This is set out in the Tourism Satellite Account: Recommended Methodological Framework 2008, known as TSA: RMF 2008 (UNWTO et al., 2010).

Some researchers suggest that the so-called 'indirect effects' of tourism, which are the flow-on effects that occur following changes in supply that result from spending of the tourism industry's receipts on goods and services from other industries, are highly significant. These inter-industry transactions occur in response to tourism consumption and produce additional spending in the economy. For example, when a visitor purchases a meal from a hotel, the hotel purchases vegetables and meat from a food supplier, the food supplier purchases these from a farming company and the farming company purchases labour and transport to deliver the produce to market (for example, see TRA, 2014; Smeral, 2006; Galambos et al., 2014; WTTC, 2018). Other measurement techniques have been discussed – computable general equilibrium approaches (Forsyth, 2006), input-output (Frechtling, 2012; Dwyer, Forsyth and Spurr, 2006) for the indirect and induced impacts of tourism for countries around the world (WTTC, 2018).

9.3 Economic impact of tourism on Australian economy

While there are differences of opinion about the best way to estimate the economic impact of tourism, the TSA approach is universally deployed and we use it here to provide an overview of the economic impacts of tourism in Australia.

In the 2018-19 financial year, tourism contributed $60.8 billion toward the country's GDP, which represents 3.1 per cent of total GDP or 3.4 per cent of real GDP (Austrade, 2019). This represented a real increase of 6 per cent on the previous year. This followed a 7.2 per cent increase in tourism's contribution to GDP in 2017-18.

Austrade (2019) notes that:

> Domestic tourism has driven growth – In the last decade, more than two-thirds of the growth in tourism GDP came from domestic tourists. Domestic tourism now accounts for 71% of all tourism GDP.
>
> This contribution will increase in the short-run as the pandemic restrictions ease, given the mainly closed international border.

Tourism also provides around one in 19 jobs created in Australia and "cuts across a wide range of industries, including Accommodation, Food Services, Transport, Retail Trade and Arts and Recreation" (Austrade, 2019). These are the sectors that have been most damaged by the pandemic lockdowns and will be most advantaged once more travel freedoms are allowed.

A more accurate indicator of economic activity is gross value added (GVA), which excludes payments made through the taxation system. Under this measure, direct tourism was $55.9 billion in nominal price terms in 2018-19, which represents 3.3 per cent of total GVA (ABS, 2019b). The increase on the previous year's direct tourism GVA was 6.1 per cent (ABS, 2019b), as shown in Table 9.3. The largest contribution to the nation's GVA was through Air, water and other transport, closely followed by Accommodation, which both contributed over $6 billion each. Retail trade was next, contributing $6.3 billion. The number of jobs in the economy attributable to the tourism industry was just over 660,000 in 20118-19. Cafes, restaurants and takeaway food services contributed the most number of jobs, at 181,000; next was retail trade and accommodation. In terms of economic contribution to national GVA, tourism ranks behind mining, financial and insurance services, construction, health care and social assistance and professional, scientific and technical services (STSA 2019: Table 15).

Table 9.3 Direct tourism gross value added (current prices) and employment by tourism related industry[a], 2014-15 to 2018-19

	2014-15		2015-16		2016-17		2017-18		2018-2019	
	GVA ($m)	Emp ('000)	GVA ($m)	Emp ('000)	GVA ($m)	Emp ('000)	GVA ($m)	Emp ('000)	GVA ($m)	Emp ('000)
Tourism characteristic industries										
Accommodation	6,137	84.2	6,269	83.5	6,206	84.9	6,477	85.4	6,738	86.1
Ownership of dwellings	3,388		3,493		3,622		3,766		3,909	
Cafes, restaurants and takeaway food outlets	4,699	148.0	5,071	157.5	5,358	167.2	5,667	177.3	6,032	181.0
Clubs, pubs, taverns and bars	2,916	33.2	3,129	33.6	3,272	35.8	3,454	37.1	3,663	39.8
Rail transport	410	2.2	435	2.6	445	2.7	482	2.7	515	2.9
Taxi transport	527		556		627		628		665	
Other road transport	654		691		707		765		814	
Road transport and transport equipment rental[b]		22.4		23.7		24.4		25.3		26.5
Air, water and other transport	5,958	37.4	6,676	36.2	7,020	38.9	7,622	41.1	8,294	42.0
Transport equipment rental	934		977		998		1,034		1,056	
Travel agency and information centre services	4,336	40.4	4,585	38.3	4,860	42.6	5,211	43.5	5,593	44.8
Cultural services	650	15.1	704	14.9	749	14.6	810	16.5	862	20.0
Casinos and other gambling services	610	3.1	661	3.0	690	3.1	728	3.1	768	3.1
Sports and recreation activities	762	23.8	804	25.0	835	24.0	904	26.5	961	29.0
Sub total	**31,980**	**410**	**34,052**	**418**	**35,390**	**438**	**37,549**	**459**	**39,870**	**475**

Table 9.3 cont.

	2014-15		2015-16		2016-17		2017-18		2018-2019	
	GVA ($m)	Emp ('000)	GVA ($m)	Emp ('000)	GVA ($m)	Emp ('000)	GVA ($m)	Emp ('000)	GVA ($m)	Emp ('000)
Tourism connected industries										
Automotive fuel retailing	556		577		587		624		654	
Other retail trade	5,441	100.2	5,642	104.4	5,714	103.2	6,075	107.2	6,372	109.7
Education and training	3,476	45.7	4,005	49.9	4,708	55.5	5,563	57.9	5,946	59.6
Sub total	**9,473**	**145.9**	**10,224**	**154.3**	**11,010**	**158.7**	**12,262**	**165.1**	**12,973**	**169.3**
All other industries	2,500	19.7	2,588	20.2	2,729	20.5	2,937	21.0	3,096	21.4
Total Direct Tourism	**43,953**	**574.1**	**46,864**	**580.7**	**49,128**	**598.2**	**52,748**	**644.5**	**55,939**	**666.0**

Source: ABS Cat 5249.0 Australian National Accounts: Tourism Satellite Account, 2018-19 Tables 4 and 13.

Notes:

a Tourism employed persons by industry is derived by multiplying 'employed persons in each industry at the national level' by the proportion of value added attributable to tourism for that corresponding industry.

b Road transport and transport equipment rental appears in Employment data but not in GVA data.

The indirect effects of tourism to gross value added, which include the flow-on effects of tourism demand in the chain of supply of goods and services to visitors, were estimated for 2018-19 to be $55.1 billion, or 2.9 per cent of national GVA. This represents a multiplier for the tourism industry overall of 1.95 and brings total tourism effects to 6.1 per cent of national GVA. The total jobs contributed as a result of tourism was over 1,035,000 for 2018-19, giving a jobs multiplier of 1.55.

Table 9.4 shows the breakdown for each state and the whole of Australia of direct and indirect effects for both GVA and employment and the proportion of total tourism effects of each state's GVA and employment totals for 2018-19.

Tasmania relies on the tourism industry proportionally more than any other state, with it making up 10.7 per cent of its total GVA and contributing 17.4 per cent of total jobs in the state. Tasmania has a tourism GVA multiplier of 2.05 and a jobs multiplier of 2.01. The Northern Territory also relies heavily on the tourism industry, with it contributing 9.2 per cent of the territory's total GVA and 11.8 per cent of its jobs. While Western Australia's tourism industry is the lowest proportionally of total GVA, it provides only slightly less jobs than the national average.

Table 9.4 Direct and indirect tourism effects GVA and employment, by state, 2018-19

	Direct		**Indirect**		**Total**		**Total Tourism GVA as % of total GVA**	**Total Tourism Emp as % of total Emp**
	GVA ($m)	Emp[a] ('000)	GVA ($m)	Emp[a] ('000)	GVA ($m)	Emp[a] ('000)		
NSW	17,051	191.8	16,964	104.4	34,015	296.2	5.9	7.3
VIC	13,536	180	13,079	83.3	26,615	263.3	6.2	7.8
QLD	12,705	145.4	12,614	88.9	25,319	234.3	7.3	9.3
SA	3,287	40.5	3,243	23.2	6,530	63.7	6.4	7.5
WA	5,547	66.6	5,389	34.3	10,936	100.9	4.0	7.5
TAS	1,599	22.3	1,643	20.9	3,242	43.2	10.7	17.4
NT	1,062	8.4	1,115	7.2	2,177	15.6	9.2	11.8
ACT	1,151	11	1,089	7.6	2,240	18.6	5.9	8.2
AUS	**55,938**	**665.9**	**55,135**	**369.9**	**111,074**	**1,035.8**	**6.1**	**8.1**

Source: Tourism Research Australia, State Tourism Satellite Accounts Tables 1, 9, 11, 13 14 and 2018-19 Report, accessed 9 June 2020, available at: https://www.tra.gov.au/economic-analysis/economic-value/state-tourism-satellite-account/state-tourism-satellite-account

Notes: a Full-time equivalent

In 2018, the Australian Airports Association engaged Deloitte Access Economics to estimate the economic and social contribution of the airport industry specifically, to the Australian economy and society (Deloitte Access Economics, 2018). Their analysis draws on the National Accounts as well as the State Tourism Satellite Account, produced by Tourism Research Australia. They use their own regional input-output model to assist in the allocation of effects to the various regions and airports.

They first estimated the economic contribution of airport core activities, which comprise the central operation of an airport facility, including its runway infrastructure, terminals and aviation safety and security. In 2016-17 they estimated the total economic contribution of airport core activities, including direct and indirect effects, to be almost $4.9 billion, which supported over 8,700 jobs (Deloitte Access Economics 2018: 7).

More appropriately, they estimated the contribution of the broader airport precinct. This includes the core activities, but also takes account of the much larger range of activities that occur in the airport precinct through other businesses, such as airlines, retail, immigration and customs as well as companies operating on the airport precinct. This gives a better measure of the overall direct contribution an airport makes to the economy. In 2016-17 the total value added was estimated at almost $30 billion, while supporting almost 200,000 full-time equivalent jobs, as shown in Table 9.5.

Table 9.5 Economic contribution of airport precinct activities, 2016-17

	Direct		Indirect		Total	
	GVA ($m)	Emp[a] ('000)	GVA ($m)	Emp[a] ('000)	GVA ($m)	Emp[a] ('000)
Major airports	15,388	97.2	12,500	86.3	27,888	183.5
Major regional airports	943	6.1	424	4.2	1,366	10.3
Regional airports	318	2.4	124	1.1	443	3.6
Remote airports	25	0.2	22	0.2	47	0.3
Total	16,673	105.9	13,070	91.8	29,744	197.7

Source: Deloitte Access Economics, 2018. Note: a - Full-time equivalent

The report also makes the link between airports and Australia's tourism industry, saying the tourism industry is heavily reliant on the aviation sector. They argue airports play a pivotal role in facilitating international and domestic tourist travel, and that the relationship between airports and economic activity extends beyond the confines of the airport precinct. To capture the size of tourism facilitated by airports, they focus on the expenditure by tourists who travel by air.

They estimate that across Australia, total tourism activity facilitated by the aviation sector contributes $32.2 billion, which is equivalent to 1.9 per cent of the total economy. Further, total tourism activity supports 339,700 jobs across Australia, or 1.8 per cent of total employment.

Despite the variation in the estimation methods of the economic contribution of tourists, the impact of tourists on the economy is significant.

9.4 The economic loss to Australia from an adverse event at an Australian airport

Mitchell and Flanagan (2019) provide extensive evidence which demonstrates that Australia has an excellent record for airline safety. In over 50 years of jet aircraft operations no lives have been lost and the majority of air transport operations proceed without incident. They also provide an extensive review of the literature that links the perception of air safety to the demand for air travel. The most recent survey commissioned by CASA on public attitudes to aviation safety in Australia found that 75 per cent of Australians were very or completely confident about arriving safely if travelling on a commercial flight within Australia, with just three per cent saying they were not confident (Galaxy Research, 2014).

The relevant issue during this pandemic and in the period after flights resume more fully in this context, is what would be the impact on tourism if there was a major adverse event at an Australian airport due to a lack of available ARFFS personnel. Thus, it is less about the risk of a potential air transport accident, which is the usual context for these discussions, and more about other risks that continue to be present, with the limited flight activity.

In fact, the research findings that apply to a potential air transport accident are also relevant to a broader incident at our airports arising, for example, from a fuel fire triggered by leaks and plane movement during the regular maintenance while the planes are parked.

The problem is clear. A major fire, for example, could damage essential airport infrastructure and require extensive restoration, which would probably involve years of planning and construction activity before normal services could resume.

Any tourist activity in the vicinity that was dependent on that particular airport would be severely damaged.

After examining air disasters at Madrid-Barajas airport (the Spanair crash in 2008), Mitchell and Flanagan (2019) analysed the implications of a major event at an Australian airport. They reported that for around two years, passenger travel through the Madrid airport was down by some six per cent.

While ARFFS in Australia would not stop an accident like the one at Madrid airport in 2008 from happening, they are the best source of protection if an accident or other adverse event (for example, fire) was to occur.

Mitchell and Flanagan (2019) used the Tourism Satellite Accounts technique and available ABS data to estimate the predicted reduction in tourism Gross Value Added (GVA) and thus the reduction in total GVA for Australia, given a reduction in people flying after an aviation accident. They found that the total reduction in direct GVA as a result of an air traffic accident for 2016-17 would have been of the order of $1,477 million and the total reduction in direct employment would have been 19,604 jobs. Including the flow-on effects of this reduction in tourism, Australia's Gross Value Added would decline by almost $2.8 billion, over 2.8 per cent of the total contribution of the tourism sector to GVA, with almost 30,000 job losses.

While the context is somewhat different at present, as noted above, Australia needs all of its tourist infrastructure intact and ready to activate the strong demand that is anticipated as borders open within Australia and domestic tourism leads the recovery across regional Australia.

It would seem to be a small insurance premium to maintain all existing ARFFS operational capacity to ensure no major incident occurs at any of our airports given the likely costs of such an incident to tourism and the wider economy.

10. The cost of provision of ARFFS in Australia

10.1 ARFFS employee costs

The 2018-19 Annual Report for Airservices Australia (ASA) indicates that as of June 30, 2019, its workforce numbered 3,584 persons overall, of which 858 make up the operational aviation rescue firefighters spread out over 27 Australian airports. Without knowing the ranks or full-time equivalents, the ARFFS personnel make up 23.9 per cent of the total ASA workforce.

In 2018-19, ASA recorded a $62.4 million net profit after tax (NPAT) and a rate of return on assets of 8.2 per cent. The Annual Report summarises their performance as being "efficient and commercial".

Airservices Australia does not provide a breakdown of staffing costs into their five broad operational areas in their financial statements. Thus, we do not know the total staffing cost of the Aviation Rescue Fire Fighting Service (ARFFS) division.

Overall, the 2019 results show that total expenses were $1,039,255 thousand and $644,538 was accounted for by "Employee Benefits" (62 per cent). The breakdown is shown in Table 10.1.

Table 10.1 Airservices Australia, Employee Expenses, 2019, $000s

	$000s
Wages and salaries	441,935
Superannuation	49,507
Leave and other entitlements	138,863
Separation and Redundancies - other	542
Employee benefits (excluding defined benefit superannuation expense)	**630,847**
Defined benefit superannuation expense	13,691
Total employee benefits	**644,538**

Source: Airservices Australia Annual Report 2018-19

We were able to analyse some data (occupational structure including pay scale level and FTE fractions) for one airport from the 2016 financial year. This airport employed 86 full-time equivalent positions (103 total positions) in the ARFFS. Consulting the Airservices Australia Enterprise Award 2016, allowed us to approximate the total minimum annual wages and salaries bill at around $5 million. At that time, the overall ARFFS employment was around 1,037 workers and ASA employment was 3,711 (as at June 30, 2017), so this particular airport accounted for around 10 per cent of the total ARFFS workforce in Australia. Overall, the ARFFS accounted for around 28 per cent of the total ASA workforce. It is clear that the ARFFS proportion in total ASA employment has declined substantially under their new model.

But this simple arithmetic for the one airport can be extrapolated up to gain some idea of what the overall ARFFS wages and salaries bill would be in 2019 in the absence of publicly-available information.

While none of this is definitive, given the paucity of information, it is beyond question that the proportionalities involved – cost of maintaining the ARFFS personnel relative to the costs that could arise from an adverse incident – are all in favour of maintaining the ARFFS personnel.

Given what is at stake, the cost of maintaining ARFFS intact, pale into insignificance.

10.2 Justifying crisis support for Airservices Australia

Airservices Australia (ASA) is a government owned corporation, established by the Air Services Act 1995. It is designated as a corporate Government entity. ASA have many functions as outlined in the Air Services Act, including providing facilities for safe navigation of aircraft, promoting and fostering civil aviation in Australia, and providing air traffic and Aviation Rescue and Fire Fighting Services.

ASA is funded through levies they place on their customers, specifically the airlines who use the airports where their services are utilised. They charge levies for each of their three main services:

- Enroute services;
- Terminal navigation (TN) services; and
- Aviation Rescue and Fire Fighting Service (ARFFS).

Mitchell and Flanagan (2019) provide a detailed analysis of the pricing methodology used by the ASA and the regulative environment in which ASA operates in liaison with the airlines. There is an extensive debate about the way ASA should charge for ARFFS operations. While ASA has increasingly moved to a user-pays system of charging, in line with general trends in the economy, the fact remains that many essential services have to be subsidised across the regional space due to the inability of regions to afford them. It is clear from the data, that the incident rate is much lower where ARFFS personnel are stationed.

The ARFFS is considered to be an essential service given the damage that a major air transport accident or other adverse incident would impose on Australia's reputation and economic activity.

In this regard the stakeholders of ARFFS operations are not simply the passengers and crew who fly into and out of airports around the nation, but include all Australians through the imputed benefits we receive from having a safe airline industry and safe airports supported by world class ARFFS operations at airports. Not only does this increase our own safety when we travel to smaller regional airports, it increases the international reputation of Australia, increases the confidence in the airline industry and hence contributes to our tourism sector, a large contributor to our national income. Further, the nation benefits from having skilled and equipped emergency response capacity positioned at airports around the country, to assist in special circumstances and in times of national emergency, such as bushfires, floods and the like.

Obviously, in the current context, the capacity of the airlines to pay the normal charges is limited given passenger numbers are so low and non-existent in some locations. In that sense, the degree of subsidy from government has to increase to maintain the integrity of the essential services that protect our airports.

The literature demonstrates that in normal times, the willingness to pay to reduce possible risks is well-defined among travellers (for example, Carlsson et al., 2004; Savage, 2011; Koo et al., 2015; Braithwaite, 2001).

The inference from this literature is that the Federal government would have no political problems justifying supporting essential ARFFS operations at our airports during the pandemic and into the recovery to maintain a sense of security for airport users and future users and the sectors that will rely on a rapid return to scale of the airline travel industry.

Australians understand that these are extraordinary times, and the more we can maintain the essential economic infrastructure while we traverse the health crisis, the better.

11. Conclusion

In this research report we have considered an array of issues pertaining to the fire fighting and emergency response by Aviation Rescue and Fire Fighting Service (ARFFS) and considered the requirements for this capacity in the face of the collapse of flight movements at Australian airports due to the COVID-19 pandemic and resulting travel restrictions.

In this Report, we have extend the earlier analysis of Mitchell and Flanagan (2019) by considering the risks facing airport assets while air traffic movements are limited into and out of Australian airports. This has involved an assessment of the value of the airport and airline asset pool that is at risk, and the reasons that risk arises when flight frequencies are limited.

The Report has discussed the possible consequences of an adverse event in terms of both short-run losses and medium- to longer-term losses that might be endured in the event of a possible shutdown of an airport due to such an event. It was reinforced by detailed geospatial analysis of the broader neighbourhood risks for many airports and case studies of the current situation and the at-risk assets at many of the key Australian airports.

The primary purpose of ARFFS is to respond to aircraft incidents on or in the immediate vicinity of the airport. ARFFS is provided at 27 airports around Australia, 26 of which are provided by Airservices Australia (ASA). ASA must provide ARFFS compliant with a number of both national and international standards provided by entities such as the Civil Aviation Safety Regulations (CASR), the Civil Aviation Safety Authority (CASA) and the Standards and Recommended Practices (SARPs) for Aerodromes by the International Civil Aviation Organisation (ICAO).

Comparison with countries such as the US and UK, has shown that if Australia adopted these guidelines, more Australian airports would require ARFFS. This suggests that our airports are already under-protected in ARFFS. This is particularly noticeable in the areas of amount of extinguishing agent and staffing levels. Whilst a Task Resource Analysis (TRA) is recommended by ICAO to establish staff levels, Australia does not rely on this method. Vehicles whilst following the number recommended by ICAO, are not equipped with HRET technology which is considered best practice. Despite these deviations, ARFFS in Australia are meeting the ICAO SARP recommendation on response times of two to three minutes.

With the onset of the pandemic, total passenger movements declined to 350,510 in April. While there are significantly less traffic movements, the fact remains that the demand for asset protection at our airports from calamity has not diminished. Valuable assets (both planes and infrastructure) are still vulnerable and we demonstrated that the additional functions the ARFFS performs in the locality remain relevant.

Aside from asset protection, the number of grounded aircraft pose additional risks at Australian airports as aircraft still require regular maintenance and specialised storage. They are still moved, maintained and started on a regular basis. They are usually full of fuel in order to stabilize them against wind shifts and remain susceptible to weather events and wildlife and insect invasions. Thus, there are millions of dollars of aircraft assets located at different airports around Australia which still carry risk of hazard, irrespective of their operational status. The risk is lower, but given the movements of the craft, and the possibility of fuel leaks, there is an on-going need to maintain a viable ARFFS capacity.

Australian airport locations often put people, their homes and businesses in close proximity to the airport facilities. ARFFS personnel respond to a variety of calls for person or asset protection (eg. crashes, engine fires, fuel spills, first aid calls, motor vehicle accidents, hazmat incidents, other fires and alarms). Importantly, they also support local fire brigades in mutual aid calls and of significance for this Report, many Australian airports are embedded in localities where surrounding housing and industrial communities are vulnerable to a major event occurring, and ARFFS clearly provides first response capacity to attenuate that risk. This particular risk has not diminished due to reduction in air travel movements.

The conclusion drawn from case studies of Australian airports is that while the flight frequencies have fallen temporarily, there are still significant assets that are at risk and require a continued ARFFS presence. These services are not easily substituted for by existing firefighting capacity outside the ARFFS who do not have the required specialised training.

Despite both major Australian airlines announcing substantial employment losses and significant changes to their operations (aircraft, routes, etc.), the support provided by the Australian government has been alarmingly low when considered in the global context. The support provided by the Australian government was only 1.8 per cent of 2019 ticket revenue, well behind other countries such as France, USA, Japan and Germany. When looking at support for airports, countries such as the USA and Norway far exceed other countries in their direct support for airports and essential services such as ARFFS.

Tourism provides large benefits for the country, and is one of the main contributors to GDP. When Australia's tourism industry returns, it will become a pivotal part of the economic recovery for the nation. For this reason, Australian airports need to be properly protected by ARFFS operations to ensure that our airports are fully functional as soon as possible when travel restrictions are lifted. Additionally, the consequences of a major aviation accident where the response was inadequate would have a lasting effect on the reputation of Australia. Not only do Australians benefit from safer travel, they benefit from the tourism benefits garnered through an international reputation as a safe place to travel. Further, Australians benefit from having an extra emergency response capacity available to assist in times of national emergency.

The ARFFS is considered to be an essential service given the damage that a major air transport accident or other adverse incident would impose on Australia's reputation and economic activity. Given what is at stake, the cost of maintaining ARFFS intact, pale into insignificance. It is recommended that the subsidy from government has to increase to maintain the integrity of the essential services that protect our airports.

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[1] *The author is Professor of Economics and Director of the Centre of Full Employment and Equity at the University of Newcastle, Australia.*