Question on notice no. 256

Portfolio question number: SQ23-004022

2023-24 Budget estimates

Rural and Regional Affairs and Transport Committee, Infrastructure, Transport, Regional Development, Communications and the Arts Portfolio

Senator Anthony Sheldon: asked the Airservices Australia on 16 June 2023—

(1.In Senate Estimates Question on Notice response # SQ22-000410, taken on notice from a question asked at Budget Estimates on 4 April 2022, Airservices Australia said:

"The TRA process is expected to be completed by the end of 2022. All documentation will be able to be shared at that time."

Has the TRA process been completed, and if so, when, and what findings and outcomes have resulted?

2.As promised in April 2022, will Airservices now share "all documentation" with respect to the TRAs?
Answer —
Please find answer attached.

Rural and Regional Affairs and Transport

QUESTION ON NOTICE

Budget Estimates 2023 - 2024

Infrastructure, Transport, Regional Development, Communications and the Arts

Committee Question Number: 256

Departmental Question Number: SQ23-004022

Division/Agency Name: Agency - Airservices Australia

Hansard Reference: Written (16 June 2023)

Topic: AIRSERVICES - Documentation related to TRA process

Senator Tony Sheldon asked:

1. In Senate Estimates Question on Notice response # SQ22-000410, taken on notice from a question asked at Budget Estimates on 4 April 2022, Airservices Australia said:

"The TRA process is expected to be completed by the end of 2022. All documentation will be able to be shared at that time."

Has the TRA process been completed, and if so, when, and what findings and outcomes have resulted?

2. As promised in April 2022, will Airservices now share "all documentation" with respect to the TRAs?

Answer:

1. Airservices commenced a Task Resource Analysis (TRA) of its Aviation Rescue Fire Fighting Service (ARFFS) capabilities across all locations in 2020. There were delays due to the pandemic. An overview of work completed, key findings and attached documents is provided below.

   The TRA was undertaken in three phases:

   - Phase 1 (completed in late 2021): data collection workshops conducted at all 27 ARFFS locations involving our operational teams and observers from the United Firefighters Union (UFU) and the Civil Aviation Safety Authority (CASA). This step provided Airservices with insights into areas where our operational response faced challenges, referred to as 'pinch points', especially in extreme accident scenarios. Consequently, we were able to identify 185 pinch points across all category levels of service.
   - Phase 2 (completed in 2022): established the Mitigation Strategies Working Group (MSWG) to resolve the 185 pinch points identified in Phase 1 comprised of representatives from Airservices and the UFU. The outputs of the MSWG were as follows:

    - 62 pinch points were prioritised for resolution within the next 12-18 months, including some necessitating consultation under the ARFFS Enterprise Agreement
    - 66 pinch points were not supported or validated after detailed analysis
    - 57 pinch points were identified as already being addressed under existing projects.

- Phase 3 (underway): implementation of the following outcomes to address these pinch points:
    - Adjusting staffing levels at our Category 6 locations, with recruitment already in progress to add more staff by the end of 2024, resulting in a permanent increase of 28 ARFFS officers.
    - Investment in upgrading Airservices entire ARFFS fleet, beginning with the acquisition of four plug-in hybrid electric fire fighting vehicles for Western Sydney International Airport, and planned replacement of the existing fleet over the coming decade. The new fleet will be equipped with High Reach Extendable Turrets (HRET) to significantly enhance firefighter safety and improve survivability conditions in worst-case scenarios.
    - Advancement in firefighting technologies such as breathing apparatus telemetry technology, new personal protective equipment (PPE), and virtual reality training to ensure our firefighters' safety and enhance our operational delivery.
    - Construction of robust contingency plans for effectively handling unforeseen emergencies including clarification of roles and responsibilities of ARFFS, heat stress management and the like.
    - Improvements in equipment like breathing apparatus, gas detectors, hoses, and branches, and procedural enhancements.

2. Given the magnitude of material developed for and as part of the 2020 TRA, Airservices has attached a comprehensive suite of documents including the methodology, analysis and outcomes of the TRA, including:
    - TRA Overview
    - TRA Methodology and Reports
    - TRA Risk Assessments for all Categories (Categories 5, 6, 7, 8 and 9).

    Airservices is implementing the outcomes of the TRA. The operating environment in which the TRA was conducted continues to evolve significantly post COVID as aviation recovers and as a consequence of our ongoing investment in new technology including vehicle fleet and equipment. Given these changes, Airservices is conducting a revalidation of the TRA process to ensure it accurately reflects current ARFFS capability and operating requirements while also applying lessons learnt from its pilot TRA implementation. The TRA revalidation activity will commence in Q4 2023 and conclude in Q4 2024.

    Should any further information be required, Airservices would be pleased to provide a briefing and answer any questions.

Attachments:

A: TRA Overview

B: TRA Methodology and Reports

- B.1 TRA Methodology
- B.2 TRA Phase 1
- B.2 TRA Phase 2
- B.2 TRA Phase 3
- B.3 Mitigation Strategies Data

C: TRA Risk Assessments for all Categories

- C.1 TRA CAT 5 Risk Assessment
- C.2 TRA CAT 6 Risk Assessment
- C.3 TRA CAT 7 Risk Assessment
- C.4 TRA CAT 8 Risk Assessment
- C.5 TRA CAT 9 Risk Assessment

Attachment A (SQ23-004022)

Task Resource Analysis (TRA) Overview

Background

Airservices provides an Aviation Rescue and Fire Fighting Service (ARFFS) that meets all regulated and legislated requirements. The Civil Aviation Safety Authority (CASA) Manual of Standards (MOS) Part 139H contains the requirements and considerations for ARFFS providers to determine minimum staffing numbers. The ARFFS Operations Manual defines the minimum staffing levels necessary to perform our functional requirement, as approved by CASA.

In 2018/19, Airservices developed an initial Task Resource Analysis (TRA) methodology entirely consistent with the International Civil Aviation Organization (ICAO) guidance material published in Airport Services Manual Part 1. In 2020, Airservices launched a TRA for all categories of aerodromes which was progressively undertaken over three phases with implementation currently underway.

TRA versus Operational Risk Assessment

As per the ICAO guidance material, the TRA was conducted to evaluate Airservices ARFFS capability against a theoretical incident scenario. It is a tool designed to capture data for all tasks (including vehicles, quantities of foam, equipment, minimum staffing levels etc.) to be provided for a particular ARFFS Category level for a particular scenario. It is a useful desktop activity to pressure test the capability and identify opportunities for improvement. It is important to note that while the TRA does include a risk assessment process, it is limited by the scenario chosen and does not consider likelihood, rather focussing entirely on the consequence of the event/incident and identifying pinch points. The TRA is therefore not a formal risk assessment for an ARFFS category as required by Airservices Safety Management System (SMS) which adopts the International Standard for Risk Management, ISO 31000. Formal risk assessments for each individual ARFFS location are captured in Airservices Operational Risk Assessments (ORAs) and approved by the Civil Aviation Safety Authority (CASA).

TRA implementation

While CASA has not mandated the use of TRA in Australia, Airservices proactively undertook a TRA of its ARFFS capabilities across all locations. This forward-thinking analysis aimed to identify opportunities to optimise ARFFS capability and is a valuable tool to aid decision-making when considering current and future challenges.

Airservices has defined the TRA in three phases:

- Phase 1 (completed in late 2021) - data collection workshops conducted at all 27 ARFFS locations involving our operational teams and observers from the United Firefighters Union (UFU) and CASA. This step provided Airservices with insights into areas where our operational response faced challenges, referred to as 'pinch points', especially in extreme accident scenarios. Consequently, we were able to identify 185 pinch points across all category levels of service.
- Phase 2 (completed in 2022) - established the Mitigation Strategies Working Group (MSWG) to resolve the 185 pinch points identified in Phase 1 comprised of representatives from Airservices and the UFU. The outputs of the MSWG were as follows:
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    - 66 pinch points were not supported or validated after detailed analysis
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    - Adjusting staffing levels at our Category 6 locations, with recruitment already in progress to add more staff by the end of 2024, resulting in a permanent increase of 28 ARFFS officers.

Attachment A (SQ23-004022)

Task Resource Analysis (TRA) Overview

- Investment in upgrading Airservices entire ARFFS fleet, beginning with the acquisition of four plug-in hybrid electric fire fighting vehicles for Western Sydney International Airport, and planned replacement of the existing fleet over the coming decade. The new fleet will be equipped with High Reach Extendable Turrets (HRET) to significantly enhance firefighter safety and improve survivability conditions in worst-case scenarios.
- Advancement in firefighting technologies such as breathing apparatus telemetry technology, new personal protective equipment (PPE), and virtual reality training to ensure our firefighters' safety and enhance our operational delivery.
- Construction of robust contingency plans for effectively handling unforeseen emergencies including clarification of roles and responsibilities of ARFFS, heat stress management and the like.
- Improvements in equipment like breathing apparatus, gas detectors, hoses, and branches, and procedural enhancements.

Airservices notes that some identified improvements such as a clear definition of function of ARFFS and the primacy of aviation responses are highlighted in the proposed *Civil Aviation Safety Regulation Part 176* changes.

The TRA process will need to be undertaken periodically to ensure it reflects the contemporary environment in which ARFFS is being provided.

At the time the TRA commenced, Airservices was operating in a unique operational environment driven by the pandemic and significant reductions in air traffic. This resulted in a reduction in category levels at a number of aerodromes (for example, there were no category 10 aerodromes) which influenced how the TRA was conducted. Since this time, we have also seen a change in technology with ARFFS considering the modernising of its fleet of vehicles, including hybrid-electric capability.

Airservices will need to undertake a revalidation of the TRA outcomes to ensure they accurately reflect the operational capability required now that we have transitioned from the pandemic environment to business as usual. As this was Airservices first attempt at a TRA, there were numerous lessons learnt that will help refine and improve the process. Airservices will engage an independent third party to assist with this revalidation work and include the same stakeholders as per the original TRA. The TRA revalidation activity will be conducted over six phases commencing in Q4 2023 and concluding in Q4 2024.

Aviation Rescue Fire Fighting Service

Task Resource Analysis Methodology

Version: 2.0

Effective: 06 FEB 2020

Prepared: [redacted]

I declare that the TRA system design descr bed within this document:

- has been prepared in accordance with International Civil Aviation Organisation (ICAO) guidance material in relation to the development of task resource analysis (TRA)
- is sufficient for the development of robust TRA in order to support a determined staffing model

Endorsed: [redacted]

I am satisfied that, following review of this methodology, that the information descr bed herein, when correctly executed and documented, will act to support a determined level of staffing to ensure the safe and effective provision of ARFFS functions.

Approved: [redacted]

Upon review of this methodology, I approve this methodology for use.

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For Official Use Only

Change summary

Version	Date	Change description
0.1	14 MAY 2018	Initial draft development. [redacted].
0.2	22 MAY 2018	Update to version 0.1 post feedback from TRA operational reference group review in Canberra on 16 MAY 2018.
0.3	13 JUN 2018	Update to formatting and layout of draft plan by [redacted]
0.4	22 JUN 2018	Update post review feedback from [redacted]
0.5	22 FEB 2019	Update post validation workshops in Melbourne (2018) and subsequent pinch-point and risk assessment process improvement.
1.0	21 MAY 2019	Signed version 1.0
1.1	17 JULY 2019	Updated to include the use of a baseline commencement point for each location specific TRA in accordance with categories.
2.0	11 DEC 2019	Updated post end of stage 1 (TRA testing) review workshop

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1 Purpose

This document outlines a methodology in relation to Task Resource Analysis (TRA). When implemented, the documented outcomes of this methodology will be sufficient to produce a supported and robust task resource analysis (TRA) relevant to each ARFFS location. In complying with the design of this methodology, the documented outcomes will act to inform and support the staffing model utilised by Airservices ARFFS.

Airservices ARFFS regards the safety of its operations and the safety of its staff as its most important consideration. Analysis and assessment undertaken in accordance with this methodology will apply the concept of 'safety by design', ensuring that as a result of this work – safe systems of work can be demonstrated whilst ensuring the risk to operations is managed to as low as reasonably practicable.

Note: within this plan the terms *staffing levels, staffing arrangements, riding strength* and *staffing models* have been used interchangeably to reflect the collective number of staff necessary to provide an approved ARFFS.

2 Scope

The scope of this TRA methodology covers all ARFFS locations and may act to inform the Airservices ARFFS Operations Manual as to the method in which staffing numbers are determined and supported.

The TRA seeks to identify the minimum number of staff required to undertake identified *tasks* in real time **before** sufficient supporting external services arrive (so that ARFFS is no longer reliant upon its own resources)[1]. The *tasks* are those aligned with the fulfilment of the functional requirement/s of the ARFFS as prescribed in the relevant Australian legislation[2]. These assessments will be made on the basis of a probable and credible worst case scenario which has been developed consistent with International Civil Aviation Organisation (ICAO) guidelines as well as current peer-reviewed literature relating to accident scenarios for risk assessment[3][4][5].

Relative to each aircraft being assessed (within an applicable category-band), at least two (different) levels of ARFFS staffing must be assessed by TRA. Such comparative assessments will support subsequent operational risk assessment, informing the selection of a staffing model that ensures operational risk is managed to a level that is as-low-as-reasonably-practicable (ALARP).

Should Airservices elect to pursue a change resulting from the TRA process, the change cannot be implemented until:

- The change has been assessed through the safety change process described in the Airservices Safety Management System, and
- CASA has approved amendment of the ARFFS Operations Manual to reflect the change.

[1] ICAO Airport Services Manual Part 1 (2015) – section 10.5.1.

[2] Civil Aviation Safety Regulations 1998 section 139.710.

[3] Worst maximum credible accidental scenarios (WMCAS) - A new methodology to identify accident scenarios for risk assessment.

[4] A Criterion for Developing Credible Accident Scenarios for Risk Assessment

[5] DOT/FAA/AR-09/58 Evaluating the decomposition products generated inside an intact fuselage during a simulated post-crash fuel fire – section 1.2.

3 Background

Airservices staffing levels are approved by the Civil Aviation Safety Authority (CASA) and are defined in the ARFFS Operations Manual. These approved staffing levels are then enforced as a minimum standard across the service. Staffing levels are aligned with category of service provision.

The notion of staffing is underpinned by the functional requirement for the ARFFS. Certain functions are expected to be achieved by the ARFFS, and, when conducted; enhance the safety (survivability) of an aviation accident or incident (or other emergency on aerodrome)[6]. Therefore ARFFS staffing is directly related to the functions (which it is required to perform) in accordance with the relevant legislation.

The connection between staffing, functions and the availability of external services to support the ARFFS is critical to the successful determination of minimum staffing numbers.

ICAO Annex 14 volume 1 (Aerodromes) prescribes certain standards and recommended practices which inform how subscriber (or contracting) states should develop domestic law in relation to the provision of an ARFFS. ICAO *standard*s are specifications to which contracting states will conform. ICAO *recommended practices* are desirable in the interests of safety and (to which) contracting states will endeavour to conform. The relevant ICAO recommended practices[7] which relate to staffing, include:

1. 9.2.44 Recommendation. — 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 firefighting equipment normally associated with aircraft rescue and firefighting operations.
2. 9.2.45 Recommendation. — In determining the minimum number of rescue and firefighting personnel required, a **task resource analysis** should be completed and the level of staffing documented in the Aerodrome Manual.

The ICAO Airport Services Manual Part 1 2015 (ASM) provides guidance on the stages that should be considered when conducting a TRA to determine the minimum number of staff required to respond effectively to an airport aircraft accident[8].

It should be noted that the Australian regulatory framework does not specifically refer to ‘task resource analysis’ and does not require an ARFFS provider to establish staffing levels based solely on ICAO TRA methodology. The Australian regulations require a service provider to determine the number of trained staff necessary to operate the equipment and vehicles aligned with the category of service provided. Such a determination will ultimately be approved as a component of a service provider’s operations manual. TRA is one method which could be utilised to make this determination, however it is not the only method with which approval can be obtained.

[6] ICAO Annex 14 Vol 1 – Section 9.2 (Introductory note)
[7] ICAO Annex 14 Vol 1 – Section 9.2.44 and 9.2.45
[8] ICAO Airport Services Manual Part 1 (2015) – section 10.5 (inclusive of all sub sections)

The Australian Civil Aviation Safety Regulations 1998 (CASR) require staffing levels to comply with the following:

> **139.835 Number of operating personnel**
>
> (1) During any period announced in ERSA as a period during which ARFFS is available at an aerodrome, there must be enough trained personnel available at the aerodrome to operate the equipment and vehicles required to provide the service at full capacity.
>
> (2) Those personnel must be stationed at places that allow the ARFFS to respond to an emergency at least as quickly as required by the applicable standards and requirements.

As previously mentioned, Airservices current staffing levels (which are approved by CASA in accordance with the relevant Operations Manual) were formulated with earlier conceptual staffing models utilising risk assessment along with an early concept of resourcing modelling (category 10).

4 Benefits

A TRA seeks to provide a consistent methodology from which assessments can be made and repeated in relation to the achievement of certain tasks, given a known scenario and available resources. A TRA is not designed to determine a previously unknown number of staff required for the provision of an ARFFS – rather it provides a framework from which informed assessment can be made relative to the inputs. These inputs include the available level of staffing, as well as vehicles, agent, equipment and other associated resources.

The TRA process permits assessment and intelligence to be drawn relative to the data assessed, and highlights particular situations, which may produce circumstances whereby events are difficult or unable to be achieved. Such situations are referred to as *pinch-points.*

Once established, a TRA acts to inform and support why a particular level of staffing is acceptable based upon the minimum level of staffing which the TRA has determined. Such an assessment acts as an operational baseline, and much like an operational risk assessment, it exists to provide a steady-state assessment of current staffing from which future changes can be assessed and measured. Such (future) change could comprise regulatory change (functions), equipment or vehicles. In such situations, the TRA acts to inform and guide the change, and upon implementation of the change, will be updated accordingly – so as to always reflect the current operating environment.

There are a number of beneficial reasons which support the adoption of the ICAO TRA methodology for the determination of supported staffing numbers, these include:

1. Adoption of industry best practice – the ICAO TRA methodology has been adopted and utilised by most leading ARFFS providers globally
2. Supported evidence base – the ICAO TRA methodology, when completed and documented, provides a reliable and supported evidence base in order to demonstrate the adequacy of the staffing numbers used within Airservices ARFFS.
3. Location specific - the ICAO TRA methodology provides a framework which is informed by and responds to location specific data and information.

4. Strategic change management tool – once established, the ICAO TRA methodology provides a data-set and framework from which proposed changes can be assessed. The methodology is designed to be sensitive and responsive to changes – acting as a baseline, the TRA can assess and support operationally related changes, such as the introduction of new technologies, with a determination of impact to staffing.
5. Standardised, uniform system. Currently a number of different documented assessments act to inform and comprise the current approved staffing model. The adoption of the ICAO TRA methodology will permit a single standardised process relevant to all ARFFS locations in Australia.

5 Dependencies

In order to undertake a TRA, certain data must be input in order to produce meaningful and reliable outputs. This input data comprises a variety of areas, inclusive of regulatory requirements, locational specific details as well as foundational operational process doctrine - inclusive of the technology and equipment utilised to achieve operational objectives.

As such, there are a number of input dependencies which have been identified relevant to the completion of a TRA. These dependencies comprise known elements which may be subject to change in the short to medium term and have a direct impact upon any TRA completed.

In order to advance a TRA – each of the following dependencies must be understood within an operational context. As such, the dependencies listed will have a direct relationship upon the commencements of certain elements within the proposed design approach.

Known dependencies include:

1 Location specific data which includes but is not restricted to:

- response times
- available appliances and extinguishing agent and replenishment arrangements
- provision of specialist equipment
- pre-determined attendance (Airport Emergency Plan & local, regional and State Disaster Management Plans)
- local incident command arrangements
- known aerodrome changes

2 The new (2019) CABA procedures

6 Assumptions

Certain assumptions have been identified as necessary in order to advance the TRA process. These assumptions acknowledge an accepted position in relation to certain elements which may have an impact upon how the TRA process is practically applied.

Identified assumptions include:

1. The TRA will only make assessment of the resources necessary for the provision of the regulated function.

   The TRA will undertake its assessment based solely upon the resources aligned with the execution of the regulated function/s. As such, it will provide an assessment which demonstrates the minimum number of staffing aligned with the necessary vehicles and equipment. The TRA will not assess resources, vehicles and equipment which is in excess of the minimum requirements.

2. Each assessment will be made relevant to the **largest aircraft type within the applicable category band for (each) category a location is approved to provide.** In doing-so, a baseline can be established for each category whilst ensuring the probable and credible worst-case scenarios[9] for a given location are assessed.

[9] ICAO Airport Services Manual Part 1 (2015) – section 10.5.2.

7 Task Resource Analysis Methodology

7.1 Stakeholder Engagement

Stakeholder engagement has been undertaken in the development of this methodology.

The following stakeholders have been identified relevant to internal and external involvement respectively.

Internal Stakeholder	Engagement
Safety and Assurance	Provision of regulatory compliance advice (regulatory performance)
ARFFS Operations	Provide direct input into the TRA process in order to generate reliable, robust outputs. A variety of nominated operational staff participated in a methodology development workshop in Adelaide 2018. A variety of nominated operational staff participated in a methodology validation workshop in Melbourne Dec 2018. Support the TRA process on a location by location basis.
ARFFS Training Establishment	Support the development and review of the TRA model. Provide specialist advice in relation to the practical application of ARFFS standards.

External Stakeholder	Engagement
Civil Aviation Safety Authority	Maintaining an awareness and understanding of the processes and actions being undertaken to share knowledge associated with TRA in preparation for eventual inclusion into Australian domestic law. Completion of surveillance activity during the testing / trialling of the TRA at Canberra. Observation Melbourne Dec 2018 workshop.
United Fire Fighters Union – Aviation Branch	Provision of a UFU representative for involvement in a three day validation workshop in Melbourne Dec 2018. Ongoing engagement of this representative post the workshop (in accordance with the broader working-group engagement) Involvement (attendance and active participation) with station testing/trialling of TRAs

	Involvement (attendance and active participation) with end of stage 1 (TRA trialling/testing) review meeting to finalise methodology.
International ARFFS providers	Review of numerous international ARFFS completed TRAs. Review of international (non-ICAO TRA related literature)
Others	Participation as required by an external observer (academic body) or any other organisation, entity or person who may support or assist TRA process.

7.2 TRA Model Design

The TRA model will define how the ICAO TRA methodology will be utilised applicable to Airservices ARFFS requirements. It will comprise the guidance material along with assessment tools necessary to complete a TRA relevant for a particular location.

7.2.1 Design Approach

The principal design approach is to align the TRA model with ICAO ASM part 1 section 10.5 (Task Resource Analysis).

In doing-so, the outcome supported by the design approach will be sufficient to comply with the requirements of CASR 139.835 (inclusive of associated requirements in the relevant Manual of Standards).

The task resource analysis design approach consists of three primary parts, these being:

1. Task analysis and workload assessment
2. Pinch-point analysis and risk assessment
3. Determination of a minimum staffing model

Refer to figure 1 for further details in relation to the design approach.

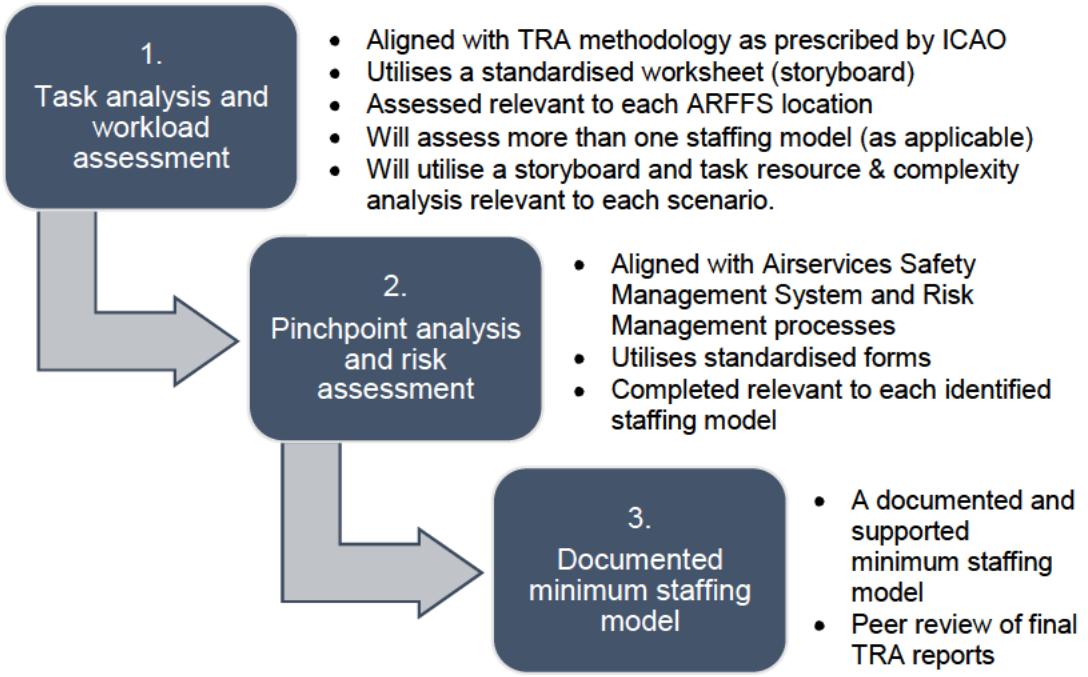


Figure 1 – Task resource analysis model design overview

7.2.1.1 Design principles

Certain design principles have been identified as essential to ensure the quality and accuracy of the analysis undertaken. These design principles have informed the design approach as well as the activities and tools applicable to each stage of the TRA. Refer to figure 2 for details.

01 Risk Approach A qualitative (and where applicable, quantitative) risk based approach will be utilised. Risk assessments undertaken will be done so in accordance with the Airservices SMS	**02 Credibility** Each analysis will focus on probable and credible worst case scenarios applicable to a particular location. Claims made within the assessments will be validated.	**03 Applicability** The Australian context and operating environment will inform the analysis. CASR 139.710 will drive the functional assessment.
04 Location Specific Locational specific characteristics will inform the analysis. Proposed staffing model/s will be designed in accordance with locations – not just category determination.	**05 Compliant** Compliance with ICAO guidance will be maintained– for example: At least two levels of staffing will be subjected to analysis relevant to each location.	**06 Adequacy** The outcome of the analysis will be sufficient to demonstrate the adequacy of proposed staffing model relevant to each location assessed.

Figure 2 - Design principles

7.2.2 Design activities

The following activities have been completed in support of the ARFFS TRA Methodology.

7.2.2.1 TRA model development

A model (consistent with information contained within section 7.2 of this report) has been developed, documented and tested so as to deliver the outcomes of a TRA when applied to a particular ARFFS location.

7.2.2.2 TRA model validation

During a 3 day workshop in Melbourne (Dec 18), ARFFS representatives, a Health and Safety Representative (HSR) and a Union representative tested and reviewed version 1 of the methodology (model) to validate it in accordance with the design principles and ARFFS foundational operating doctrine (standard operating procedures, aviation firefighting manuals etc.). The Melbourne workshop also validated a number of different scenarios at different Category levels. This scenario evaluation has provided a foundation of multiple scenarios from which the primary assessment scenario has been developed.

The outcome of the TRA model validation indicated that it is effective in achieving its purpose – however a range of system improvements were identified (and subsequently applied to later versions of the methodology document).

7.2.2.3 Model review

Utilising feedback from the model validation process, as well as other specialists inputs (where applicable), the model has been reviewed and updated accordingly. This has resulted in the current TRA methodology defined within this report.

7.2.2.4 Confirmation of the assessment tasks

The list of tasks which comprise the ARFFS TRA methodology have been confirmed, these being:

1. Meet required response time
2. Control the external fire
3. Protect escape slides and exit routes
4. Assist in the self-evacuation of the aircraft
5. Create a survivable situation
6. Rescue trapped personnel
7. Maintain post fire security/control
8. Preserve evidence

These tasks form the basis of the task analysis and workload assessment form (refer to annexure A) and provide the structure from which situationally specific activities are defined relative to the assessment scenario.

7.2.2.5 Probable and credible worst case scenario confirmation

Multiple scenarios have been assessed in the development of this methodology. During the Melbourne workshop (Dec 2018) and subsequent station level testing and trialling of the TRA – numerous scenarios have been utilised. These include:

- A320 rejects take-off overshooting runway coming to a stop in RESA. There is a significant fire under the fuselage of the aircraft. Air Traffic Control activation of

crash-alarm and contact FCC advising of incident details and declaring full emergency.

- 737-800 declares full emergency - aircraft approaching runway 05, reports fire in cargo hold. Fire is contained to the cargo hold.
- 787-8 full emergency - departing runway 23, experiences severe starboard engine fire, rejects take-off and comes to rest on the threshold of runway 05.
- 777-300ER - Crash alarm activated by ATC. Undercarriage collapse on landing. Port-side Engine detached / large fine under fuselage.
- A380-800 - Crash alarm activated by ATC. Undercarriage collapse on landing. Aircraft has made contact with runway and has skidded into the RESA - FOD rupture fuel tank. Very large ground-fire. When pilot advises smoke is entering the cabin.
- A320 – wheel fire post landing and taxiing from runway.
- A 777-300 ER / 737-800 / A320 / A380 (applied using various aircraft types at difference aerodromes) operating on a scheduled passenger flight undertakes a 'go-around' and on second attempt to land, crashes on the runway – sliding along the runway, coming to a rest near the end of the runway. Number 1 engine has detached from the aircraft just prior to coming to a rest. Persons trapped – requiring rescue.

In total, 10 different assessments have been undertaken. In completing these assessments, it became apparent that only the worst plausible and credible scenario would act to drive the determination of the minimum staffing number. All other scenarios (which may be less demanding upon resources) would reflect situations which were not without complexity, but comparatively, would not place the demands upon resources that the worst maximum and credible required. As such, and in order to effectively manage the workload associated with undertaking TRAs at all of the ARFFS locations, the worst credible and plausible scenario must be defined to permit consistent and reliable application. A variation in scenario type could result in inconsistencies where such are not genuinely required.

Therefore, and as a derivative of the multiple scenarios assessed to date, a standard scenario will form the basis of all baseline TRAs (which will be subsequently assessed at each location).

The design of the worst plausible and credible scenario is further complicated by the existence of non-survivable aviation accidents. Such accidents maintain characteristics that exceed human tolerances or maintain little to no ability for the outcome to be affected by the ARFFS[10][11].

[10] DOT/FAA/AR-11/29 - Methodologies for Calculating Firefighting Agent Quantities Needed to Combat Aircraft Crash Fires, page 99.
[11] DOT/FAA/AR-11/27 - Analysis of Suppression Effects on Aviation Fuel Fires Around an Aircraft, page 51.

A 'scenario descriptor' will be prepared for each TRA which will provide detailed information and scenario narrative, contextualised for the location where the assessment is being undertaken. The 'scenario descriptor' will follow a **standardised assessment scenario and** is designed to align with the definition of a survivable accident, this being:

> *"An accident in which the forces transmitted to the occupant(s) through the seat and restraint system do not exceed the limits of human tolerance to abrupt accelerations and in which the structure in the occupants' immediate environment remains substantially intact to the extent that a livable volume is provided for the occupants through the crash sequence."*[12]

The worst plausible and credible scenario is further informed by technical analysis of the decomposition products generated inside an intact fuselage during a simulated post-crash fuel fire[13]. This report informed that:

> *"Based on a consideration of past accidents, experimental studies, and fuselage design, it is apparent that the fuselage rupture or opening represents the worst-case condition and provides the most significant opportunity for fire to enter the cabin."*

As such, the determined worst plausible scenario will include:

1. *External fire with a valid reason supporting its establishment*
2. *Internal fire with a valid reason supporting its establishment*
3. *Persons who have become incapacitated and require rescue from inside the aircraft.*

The **standard assessment scenario** is:

> ***Whilst landing, an <aircraft> experiences failure of its landing gear – collapsing onto the runway and sliding along the runway, coming to rest in the runway end safety area (RESA).***
>
> ***Number 1 engine has detached from the aircraft (due to impact with runway) just prior to the aircraft coming to rest in the RESA. Fuel leaks from the port main-plane engine pillar, resulting in a large ground fire.***
>
> ***The large ground fire is not immersing the aircraft; however, the proximity of the fire is such that sufficient radiant heat[14] is applied to the fuselage causing subsequent failure and fire penetration[15]. The outer skin is penetrated (at) 60 seconds after the fire commences[16], with penetration of the insulation layers occurring 120 seconds after the penetration of the outer skin (3 minutes standardised approach)[17].***
>
> ***The aircraft will maintain passenger holding of 100% of the allocated seating availability, with the addition of 2 flight crew and the appropriate number of cabin crew aligned with the 1:50 allocation rule when applied to the number of passengers (rounding up as applicable[18]).***
>
> ***Evacuation commences upon the aircraft coming to a rest in the RESA. Evacuation is undertaken relative to the starboard side only – taking 90 seconds for all persons who***

[12] DOT/FAA/AR-11/29, page 33.
[13] DOT/FAA/AR-09/58, page 1 (section 1.2)
[14] The isoflux of 9.59 kW/m^2 is met, this reflecting the maximum distance (coupled with the associated fuel fire heat flux) from an aircraft where a fire could cause interior ignition due to thermal radiation. DOT/FAA/AR-11/29, page 59.
[15] DOT/FAA/AR-09/58, page 41
[16] DOT/FAA/AR-09/58, page 1 (section 1.2)
[17] DOT/FAA/AR-11/29, page 33.
[18] Emergency evacuation of commercial passenger aeroplanes section 7.1

are able to evacuate the aircraft to do so, and subsequently be located outside the aircraft (moving away from the aircraft)[19].

A certain number of casualties will be unable to evacuate, representing those that require locating and subsequent assessment for rescue and/or extrication (or in the event of deceased, preservation in-situ - as applicable). The persons remaining on the aircraft will be 14% of the total number of persons originally located on the aircraft. This number has been derived consistent with the analysis undertaken in appendix A and reflects those that may be deceased, incapacitated or otherwise trapped. Further information in relation to the location and specific detail of the casualties will be included within the location specific scenario descriptor.

Were evacuation not to commence (doors/exits not opened) flash-over conditions would develop within a further 60 seconds post the penetration of the insulation layers (that is – flash-over conditions prevail at 240 seconds from fire establishment). However, as openings exist in the fuselage and/or application of agent to the interior of the aircraft has commenced,[20] such a situation will not prevail for this scenario.

The fuel leak associated with the detached engine continues to leak for a specified period (compounding priorities) between ongoing-external commitments whilst internal operations are undertaken. The fuel leak will cease flowing at the 15 minute mark.

Note: the aircraft assessed will be the largest regular passenger aircraft available within the applicable category band.

Further details relating to the scenario are contained within the relevant **location specific scenario descriptor** which are developed and distributed for consideration during a TRA facilitated workshop.

7.2.2.6 Documentation of the TRA methodology

This document has been prepared to record the method in which the ARFFS TRA methodology has been developed ready for implementation.

7.2.2.7 Scenario location

An essential phase requirement of the TRA is to determine the probable location for the accident. Given the nature of the defined worst plausible scenario, detailed review of accident location has been undertaken in order to support the consistent identification of the probable location.

The following information has been utilised to support the location assessment:

- Australian Transport Safety Bureau worldwide review of commercial jet aircraft runway excursion, identifying:
    - The high statistical probability of a survivable (non-fatal) aircraft accident or incident (excursion, overshoot or veer-off) occurring immediately on or within the area extending out from a threshold[21].
- Detailed analysis by the United States Federal Aviation Administration identifying the high probability of ‘over-run’ locations[22].

[19] EASA CS 25.810 (evacuation requirements)
[20] DOT/FAA/AR-11/29, page 6.
[21] ATSB Transport Safety Report AR-2008-018(1) – Runway Excursions (Part 1) page 8, 11
[22] DOT/FAA/AR-11/29 – Page 36, C-1, C-2.

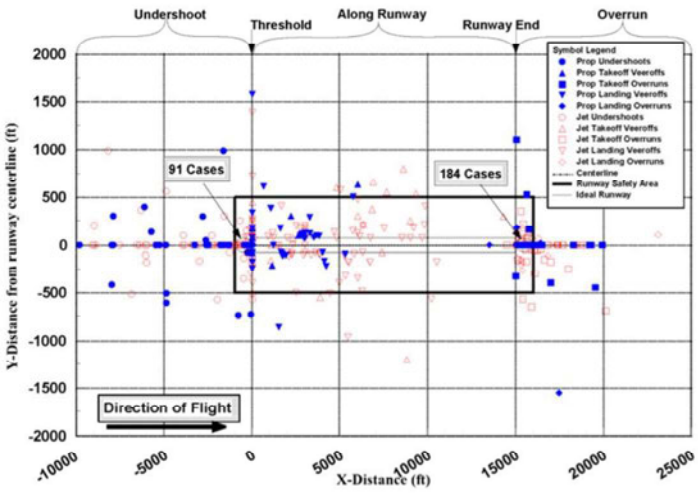


Figure C-1. Location of Landing and Takeoff Accidents

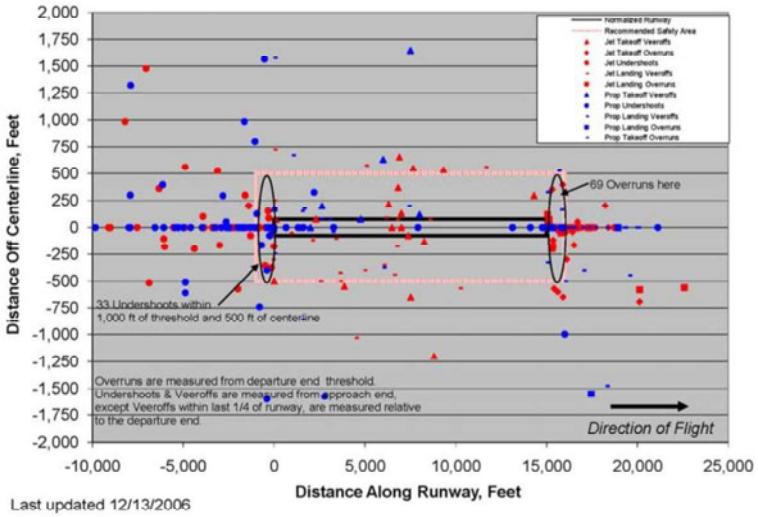


Figure C-2. Air Line Pilots Association, International Compilation of Overruns, Undershoots and Veeroffs Damage Level—Destroyed

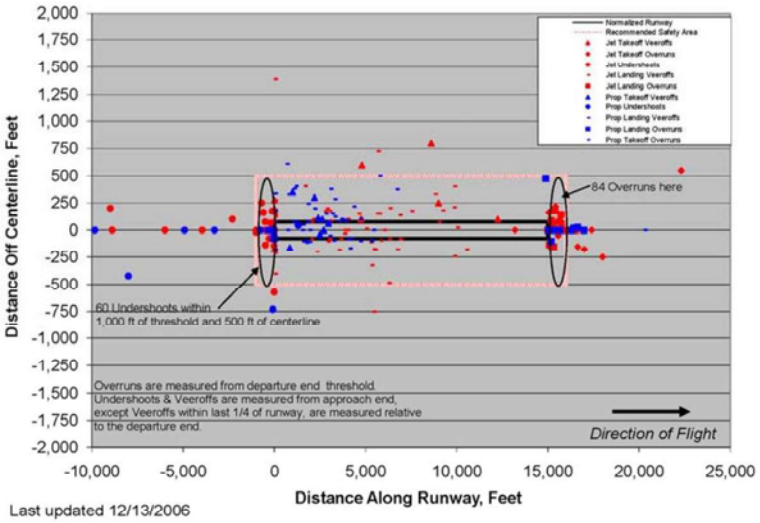


Figure C-3. Air Line Pilots Association, International Compilation of Overruns, Undershoots and Veeroffs Damage Level—Substantial

- NFPA 403:2018 identifying the high probability of incident location in congruence with the defined scenario.

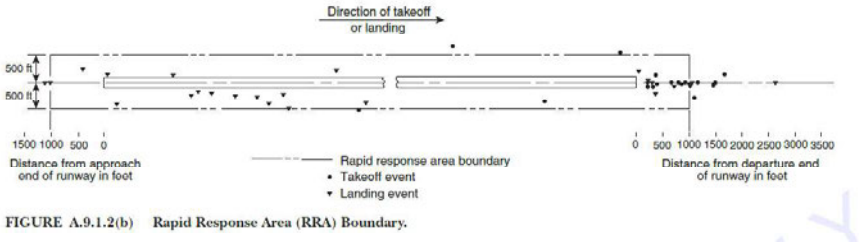


FIGURE A.9.1.2(b) Rapid Response Area (RRA) Boundary.

Figure 3 - Event location plot extracted from NFPA 403:2018.

Based upon the location data analysed, and the detail of the scenario – the incident location will be the runway end safety area (RESA) relevant to the most commonly used runway/approach arrangements for a given aerodromes runway orientation.

7.3 TRA Stages (1 to 3)

The TRA model has three defined stages (refer to figure 1). Each of these stages will now be explained in detail.

7.3.1.1 Stage 1 – Task analysis and workload assessment (storyboard)

The task resource & complexity assessment storyboard is the first stage of the TRA process. It will be undertaken as a baseline (initially) and applied to each location for assessment. It is inclusive of six individual phases.

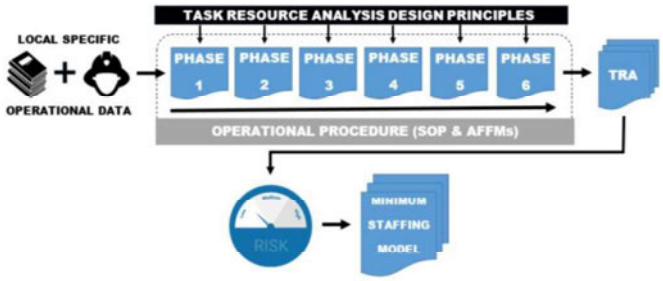


Figure 4 - Overview of TRA process Stage 1 (comprising 6 discreet phases which are applied to each ARFFS location)

PHASE 1

Document the aim, objectives and tasks of the ARFFS.

PHASE 2

Determine the most probable and credible worst case scenarios.

PHASE 3

Identify the types of aircraft flying at the location.

PHASE 4

Confirm the most probable location for the most realistic accident type that may occur.

PHASE 5

Document the complete accident scenario using the scenario from phase 2, the type of aircraft from phase 3 and the location from phase 4.

PHASE 6

Develop a storyboard relevant to the documented scenario. The storyboard will provide the operational narrative, detailing the practical activities undertaken on the fire-ground.

The storyboard will align the progress of activities with identified tasks, indicating when each relevant task has been achieved.

Information from the storyboard will permit the identification of 'pinch points' associated with tasks and activities distilled from the storyboard/operational narrative.

For all identified 'pinch points' a supporting mitigation assessment will be undertaken. The mitigation assessment will offer detailed examination of the 'pinch point' and provide necessary mitigation strategies.

The task analysis and workload assessment will continue to be undertaken until a stage is achieved at which sufficient supporting resources have arrived on-scene to support the ARFFS[23]. Such a determination will vary from location to location and be informed by the local availability of supporting services.

Upon completion of the task analysis and workload assessment and associated pinch-point assessments – a determination can be made as to the ability for the objectives (as per phase 1) to be achieved. This will support the completion of an operational risk assessment (stage 2) based upon the available data.

7.3.1.2 Stage 2 – Risk assessment

Risk assessment will be utilised to qualitatively assess the different staffing levels (options) available in order to identify staffing solutions which seeks to manage operational risk to as low as reasonably practicable. As such – a single location may have two or more staffing models which have been determined as sufficient to achieve operational objectives, however the process of risk assessment will be overlaid to provide further assessment in support of determining the most suitable outcome.

Each risk assessment undertaken will utilise the Airservices risk management framework.

Upon the completion of stage one, an operational risk assessment will be undertaken relevant to the task analysis and workload assessment supported by the associated pinch-point analysis. This risk assessment will determine an outcome which can be compared with the risk acceptance levels associated with the Airservices risk management standard.

The risk assessment will provide an outcome consistent with the (Airservices risk standard) tolerability acceptance criteria. Base on this criteria the riding strength will be adjusted by **minus one or plus one resource**, and the complete TRA assessment undertaken again. This cycle of adjustment should continue until the minimum riding strength is determined based upon the acceptability of the determined level of operational risk.

7.3.1.3 Stage 3 – Development of a minimum staffing model

Inclusive of information obtained from stage 1 and 2 – relevant to each ARFFS location assessed, the minimum level of staffing will be identified.

This determined minimum level of staffing may be utilised to inform or modify the approved minimum staffing number in accordance with the ARFFS Operations Manual (subject to the requirements in section 2 being met).

[23] The time applicable to the arrival of supporting services is not the time taken for such resources to arrive at a staging location / access gate. The time and quality of supporting resources will be assessed based upon the genuine ability to be operationally utilised by the ARFFS.

7.3.1.4 Documenting the outcome

Upon completion, each approved level of category provided by ARFFS will have a base-line assessment which has been subsequently applied at each location to permit the input of location specific information and pinch point analysis. The TRA will follow a standard format and be inclusive of location specific assessment tools. Annexure A, B and C provide samples of the documented outcomes.

In addition to this methodology document, an ARFFS procedure will be published to provide context and define the maintenance requirements applicable to each locations TRA.

7.3.2 Implementation

7.3.2.1 Method of implementation

Airservices ARFFS implementation of TRA process is complex, primarily due to magnitude of assessments required in order to complete a given locations TRA. The TRA must make assessment of the largest aircraft type within each category band applicable to every level of category a given location may provide – with each TRA comprising of (at least) two assessments using different staffing numbers. For a location that provides category 10, this necessitates assessment of category 5, 6, 7, 8, 9 and 10.

The reason for making assessment relative to every category that a location can provide is directly derived from the ICAO guidance material relating to the completion of TRA[24] as well as the obligation in Australia to ensure the correct level of category is provided at all times[25]. Temporary variation to category is supported by the ARFFS operations manual, however, this can only be undertaken when a location understands the specification of each category they may be expected to provide. An inability to know the relevant specification will prevent the ability for the correct level to be provided – including any regressed level due to unforeseen equipment/vehicle failures or staff unavailability/illness etc.

The TRA assessment process must commence at the lowest level of category that can be provided at the location, and then sequentially assess higher categories after the lower category assessment is complete. This is essential to ensure capability and resources are correctly informed relative to lower categories – preventing inconsistencies in approach, which could result from commencing at a higher category initially. Therefore, a location that may provide category 5, 6 and 7 must commence TRA assessments at category 5, then 6 and finally 7.

A TRA is not complete until all required TRAs (comprising at least two varied levels of staffing) relevant to all levels of category that can be provided at a location have been documented consistent with this methodology.

[24] ICAO Airport Services Manual – Part 1 2015, section 10.5.7.3.
[25] Manual of Standards 139H – section 3.1.2.2

7.3.2.2 Data and information inputs

In order to implement the TRA methodology defined within this document, certain implementation activities must be undertaken utilising sufficient local staff and other participants to provide a valid and robust outcome.

1) Initial baseline task analysis and workload assessment for the category being assessed.
    a) A range of pre-implementation data is required prior to a TRA assessment being undertaken, this includes:
        i) Aircraft data relevant to the aerodrome
        ii) Local supporting services anticipated capability and response time/s
        iii) Specific locational characteristics (aerodrome specific)
2) A TRA workshop is undertaken to assess the baseline task analysis and workload assessment.
3) Pinch-point analysis and risk assessment is undertaken (this can be combined with the task analysis and workload assessment workshop).
4) Adjustment requirements in increments (+1 or -1) as determined by the risk assessment are undertaken, and the TRA process is reapplied in full (this can be combined with the task analysis and workload assessment workshop).
5) The records of the assessment are reviewed and finalised
6) The records approved and published

8 Reference list

Civil Aviation Authority (UK). (January 2014). *delivering an effective Airport Rescue and Fire Fighting Service (RFFS)* (1 ed.). London: CAA.

Civil Aviation Safety Authority. (2005). *MOS Part 139H—Standards Applicable to the Provision of Aerodrome Rescue and Fire Fighting Services* (1.2 ed.). Canberra.

Civil Aviation Safety Authority. (2018). *Civil Aviation Safety Regulations 1998 - Volume 4 subpart 139.H* (Compilation No 78 ed.).

Faisal Khan, S. A. (2002). A Criterion for Developing Credible Accident Scenarios for Risk Assessment. *Journal of Loss Prevention in the Process Industries , 15(6)*, 467-475.

International Civil Aviation Organisation. (2015). Airport Services Manual - Part 1. Montréal: ICAO.

International Civil Aviation Organisation. (2018). Annex 14 to the Convention on International Civil Aviation - Aerodrome Volume 1 Eight Edition. Montréal: ICAO.

National Fire Protection Association (NFPA). (2018). 403 Standard for Aircraft Rescue and Fire-Fighting Services at Airports. Massachusetts: NFPA.

Royal Aeronautical Society (UK). (2018). *Emergency evacuation of commercial passenger aeroplanes.* London, UK: Royal Aeronautical Society (RAeS).

U.S. Federal Aviation Administration. (2011). *Evaluating the decomposition products generated inside an intact fuselage during a simulated postcrash fuel fire.* Springfield, Virginia, U.S.: U.S. Department of transport.

U.S. Federal Aviation Administration. (2012). *Methodologies for calculating firefighting agent quantities needed to combat aircraft crash fires.* Sprngfield, Virginia, U.S.: U.S. Department of Transport.

Zhang, F., Zhao, G., Wang, Z., Yuan, J., & Cheng, Y. (2017). Worst maximum credible accidental scenarios (WMCAS) - A new methodology to identify accident scenarios for risk assessment. *Journal of Loss Prevention in the Process Industries, 48*, 87(14).

9 Appendix A – Casualties unable to evacuate / remaining on aircraft

It is acknowledged, given the worst plausible and credible nature of the scenario being assessed, that a certain number of casualties may not be able to evacuate the aircraft. Such casualties represent the obligation for ARFFS to undertake operations internal of the aircraft via the application of firefighting agent so as to reduce the risk posed by fire followed by casualty identification/location and assessment (in preparation for rescue, extraction and/or leaving in-situ).

The determination of the number of casualties requiring 'rescue and/or extraction' is problematic, primarily due to the direct relationship between survivability and the efficacy of ARFFS intervention as well as other factors. That is, in the event that ARFFS are unable to execute effective internal operations and/or rescue – casualties that may have been able to survive may no longer survive due to the threats imposed by the fire and the associated atmosphere. Similarly, the ARFFS can initiate effective internal operations and/or rescue, only to identify the casualties located inside the aircraft have subsequently died due to the inability of the casualties to withstand the impact and/or forces associated with the emergency. That is to say, the casualties were already deceased independent of ARFFS intervention.

Careful consideration of available incident data has been undertaken, using two different data sets. The purpose of this analysis was to identify the number of fatalities associated with certain aircraft emergencies. Doing so provides a statistical basis for the determination of the number of casualties who (as a minimum) will require locating, assessment and eventual extraction.

It is difficult to determine the number of persons who may be trapped and/or incapacitated but otherwise able to survive – as such data is not directly recorded or easily accessible within incident reporting databases. It is acknowledged that incident reports do contain specific information relating to successful ARFFS rescues, and this information will be further utilised to support the identification of the number of casualties who may be able to survive and require rescue.

Whilst further analysis is undertaken, the following data sets have supported the identification of 14 percent (of the total available person on-board the aircraft at the time of the incident) being unable to evacuate and therefore remaining on the aircraft. This may be attributable to incapacitation, entrapment or death. Such conditions are unknown until initial casualty assessment is undertaken.

14% has been identified as the average between the percentages determined relevant to each data set analysed.

- Data set 1 comprises 36 comparatively recent aircraft emergencies from which an assessment of the total fatalities compared to the total number of persons on-board is undertaken. This assessment indicates a value of 11% (6898 total persons on-board / 756 fatalities).
- Data set 2 comprises 26 comparatively recent aircraft emergencies that have been extracted from the FAA aircraft incident database. These incidents have been identified due to highly suitable characteristics consistent with those of the assessment scenario – including the penetration of fire into the fuselage, evacuation being undertaken, passenger aircraft and occurring within the vicinity of the runway. This assessment indicates a value of 17.24%.

9.1 Data-set 1 (Royal Aeronautical society UK)

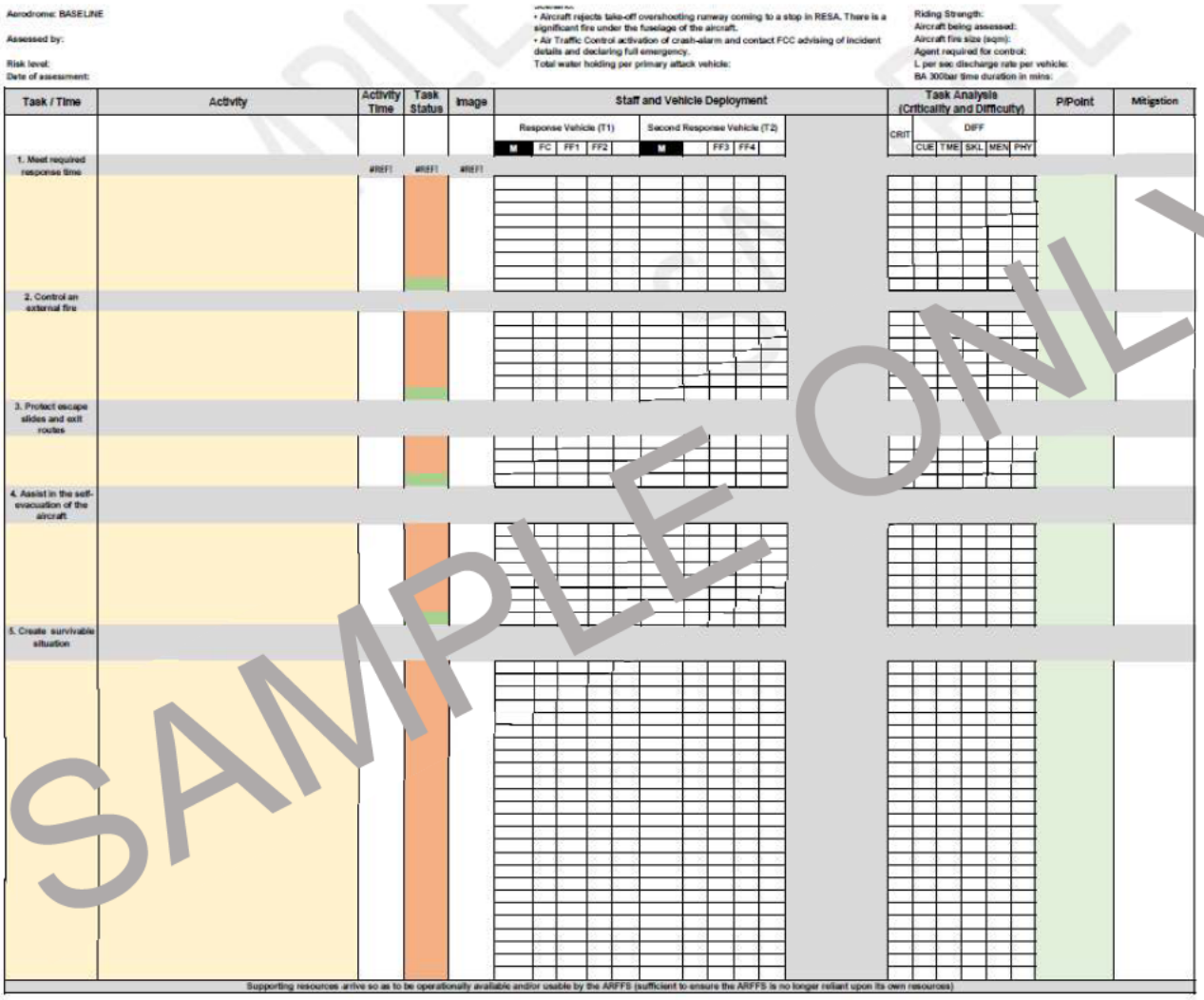
Date: *Day/Month/ Year.*	Location:	Operator and Flight Number:	Aeroplane:	Number of Passengers and Crew on board:	Number of Passenger and Crew fatalities:	Accident Investigation Agency:	Accident Report Number and Date:
02/05/1970.	St. Croix, US Virgin Islands.	Overseas National Airways. Flight No: 980.	McDonnell Douglas DC-9.	Passengers: 57. Crew: 6.	Passengers: 22. Crew: 1.	US, NTSB.	NTSB /AAR-71-8. 31 March 1971.
20/12/1972. *	Chicago, USA. (Ground collision.)	North Central Airlines. Flight No: 575.	McDonnell Douglas DC-9.	Passengers: 41. Crew: 7.	Passengers: 10. Crew: Nil.	US, NTSB.	NTSB-AAR-73-15. * 5 July 1973.
20/12/1972. *	Chicago, USA. (Ground collision.)	Delta Airlines. Flight No: 954.	Convair CV-880.	Passengers : 86. Crew: 7.	Passengers: Nil. Crew: Nil.	US, NTSB.	As above.*
28/12/1978.	Portland, USA.	United Airlines Flight No: 173.	McDonnell Douglas DC-8.	Passengers: 181. Crew: 8.	Passengers: 8. Crew: 2.	US, NTSB.	NTSB-AAR-79-7. 7 June 1979.
19/08/1980.	Riyadh, Saudia Arabia.	Saudia Arabia Airlines. Flight No: 163.	Lockheed L1011-200 Tristar.	Passengers: 287. Crew: 14.	Passengers: 287. Crew: 14.	Presidency of Civil Aviation - Saudi Arabia.	Aircraft Accident Report. 16 January 1982.
02/06/1983.	Cincinnati (Covington), USA.	Air Canada. Flight No: 797.	McDonnell Douglas DC-9.	Passengers: 41. Crew: 5.	Passengers: 23. Crew: Nil.	US, NTSB.	NTSB/AAR-86-02 and 84-09. 31 January 1986.
22/03/1984.	Calgary, Canada.	Pacific Western Airlines. Flight No: 501..	Boeing 737-200.	Passengers: 114. Crew: 5.	Passengers: Nil. Crew: Nil.	Canadian Aviation Safety Board.	84-H40003. 24 February 1987.
22/08/1985.	Manchester, UK.	British Airtours. Flight No: 28M.	Boeing 737-200.	Passengers: 131. Crew: 6.	Passengers: 55. Crew: 2.	UK, AAIB.	AAIB 8/1988. 15 December 1988.
20/11/1985.	Lajes, Azores.	British Airways. Flight No: 256.	Boeing 747-100.	Passengers: 333. Crew: 18.	Passengers: Nil. Crew: Nil.	No agency identified.	No report identified.
28/02/1987.	Los Angeles, USA.	British Airways. Flight No: 282.	Boeing 747-200.	Passengers: 387. Crew: 17.	Passengers: Nil. Crew: Nil.	No agency identified.	No report identified.
08/01/1989.	Kegworth, UK.	British Midland. Flight No: 92.	Boeing 737-400.	Passengers: 118. Crew: 8.	Passengers: 47. Crew: Nil.	UK, AAIB.	AAIB 4/90. 25 August 1990.
10/03/1989.	Dryden, Canada.	Air Ontario. Flight No: 1363.	Fokker F28-100.	Passengers: 65. Crew: 4.	Passengers: 21. Crew: 3.	Canadian Commission of Inquiry.	Final Report. Date not identified.
19/07/1989.	Sioux City, USA.	United Airlines. Flight No: 232.	McDonnell Douglas DC-10.	Passengers: 279. Crew: 17.	Passengers: 110. Crew: 1.	US, NTSB	NTSB/AAR-90/06 1 November 1990
01/02/1991. **	Los Angles, USA. (Ground collision.)	USAir. Flight No: 1493.	Boeing 737-300.	Passengers: 89. Crew: 6.	Passengers: 20. Crew: 2.	US NTSB.	NTSB/AAR-91/08.** 22 October 1991.
01/02/1991. **	Los Angles, USA. (Ground collision.)	SkyWest Airlines. Flight No: 5569.	Fairchild Metroliner.	Passengers: 10, Crew: 2.	Passengers: 10. Crew: 2.	US, NTSB.	As above. **
20/02/1991.	Puerto Williams, Chile.	Lan Chile. Flight No: 1069.	BAe 146-200.	Passengers: 66. Crew: 7.	Total: 20. Not known if this includes crew.	Direccion General de Aeronuatica Civil Inspectoria General	33910225770. Date not identified.
30/07/1992.	New York, USA.	Trans World Airways. Flight No: 843.	Lockheed L1011-385 Tristar.	Passengers: 280. Crew: 12.	Passengers: Nil. Crew: Nil.	US, NTSB.	NTSB/AAR-93/04. 31 March 1993.
08/06/1995.	Atlanta, USA.	ValuJet Airlines. Flight No: 597.	McDonnell Douglas DC-9.	Passengers: 57 Crew: 5.	Passengers: Nil. Crew: Nil.	US, NTSB.	NTSB/AAR-96/03. 30 July 1996.

Date:	Location:	Operator and Flight Number:	Aeroplane Type:	Number of Passengers and Crew on board:	Number of Passenger and Crew fatalities:	Accident Investigation Agency:	Accident Report Number and Date:
14/09/1999.	Girona, Spain.	Britannia Airways. Flight No: 226A.	Boeing 757-200.	Passengers: 236. Crew: 9.	Passengers: Nil. Crew: Nil.	Comision de Investigacion de Accidentes e Incendentes de Aviacion Civil ,and UK, AAIB	A-504/1999. Bulletin SI/2000.
31/10/2000.	Taoyuan, Taiwan.	Singapore Airlines. Flight No: 006.	Boeing 747-400.	Passengers: 159. Crew: 20.	Passengers: 79. Crew: 4.	Aviation Safety Council, Taiwan. Rep. of China.	ASC-AAR-02-04-001. Copyright 2002.
27/02/2002.	London Stansted, UK.	Ryanair. Flight No: 296.	Boeing 737-800.	Passengers: 117. Crew: 7.	Passengers: Nil. Crew: Nil.	UK, AAIB.	Bulletin 7/2004. 2004.
02/08/2005.	Toronto, Canada.	Air France Flight No: 358.	Airbus A340-300.	Passengers: 297. Crew: 12.	Passengers: Nil. Crew: Nil.	Transportation Safety Board of Canada.	A05H0002. Date not identified.
17/01/2008.	London Heathrow, UK.	British Airways. Flight No: 38.	Boeing 777-200.	Passengers: 136. Crew: 16.	Passengers: Nil. Crew: Nil.	UK, AAIB.	AAIB 1/2010. 9 February 2010.
01/08/2008.	Ronaldsway, UK.	Flybe. Flight No: Not known.	Embraer ERJ190-200LR.	Passengers: 90. Crew: 5.	Passengers: Nil. Crew: Nil.	UK, AAIB.	Bulletin No: 6/2010 EW/C2008/01. September 2010.
15/01/2009.	New York. USA.	US Airways. Flight No: 1549.	Airbus A320-200.	Passengers: 150. Crew: 5.	Passengers: Nil. Crew: Nil.	US, NTSB.	NTSB/AAR-10/03. 4 May 2010.
25/02/2009.	Amsterdam, Netherlands.	Turkish Airlines. Flight No: 1951.	Boeing 737-800.	Passengers: 128. Crew: 7.	Passengers: 5. Crew: 4.	The Dutch Safety Board.	M2009LV0225_01. May 2010.
04/11/2010.	Singapore.	Qantas. Flight No: 32.	Airbus A380.	Passengers: 440. Crew: 29.	Passengers: Nil. Crew: Nil.	Australian Transport Safety Bureau.	AO-2010-89. 27 June 2013.
16/04/2012.	London Gatwick, UK.	Virgin Atlantic. Flight No: 27.	Airbus A330-300.	Passengers: 304. Crew: 13.	Passengers: Nil. Crew: Nil.	UK.AAIB.	AAIB 1/2014. 12 February 2014.
22/12/2012.	Nunavut, Canada.	Perimeter Aviation LP. Flight No: 993.	Fairchild SA227-AC Metro III.	Passengers: 7. Crew: 2.	Passengers: 1. Crew: Nil.	Transportation Safety Board of Canada.	A12Q0216. Date not identified.
06/07/2013.	San Francisco, USA.	Asiana Airlines. Flight No: 214.	Boeing 777-200.	Passengers: 291. Crew: 16.	Passengers: 3. Crew: Nil.	US, NTSB.	NTSB/AAR-14/01. 24 June 2014.
29/03/2015.	Halifax, Canada.	Air Canada Flight Number: 624.	Airbus A320-200.	Passengers: 133. Crew: 5.	Passengers: Nil. Crew: Nil.	Transportation Safety Board of Canada.	A15H0002. Date not identified.
08/09/2015.	Las Vegas, USA.	British Airways. Flight No: 2276.	Boeing 777-200.	Passengers: 157. Crew: 13.	Passengers: Nil. Crew: Nil.	US, NTSB.	Survival Factors DCA15FA185. 28 February 2017.
27/05/2016.	Tokyo, Japan.	Korean Air. Flight No: 2708.	Boeing 777-300.	Passengers: 302. Crew: 17.	Passengers: Nil. Crew: Nil.	No agency identified. Data based on media information.	Not identified.
26/06/2016	London Heathrow, UK	American Airlines Flight No: 731	Airbus A330-300	Passengers: 277 Crew: 12	Passengers: Nil. Crew: Nil.	UK, AAIB.	Bulletin No: 12/2017 EW/C20 16/06/02
27/06/2016.	Singapore.	Singapore Airlines. Flight No: 368.	Boeing 777-300.	Passengers: 222. Crew: 19.	Passengers: Nil. Crew: Nil.	Transport Investigation Bureau. Ministry of Transport, Singapore.	AIB/AAI/CAS.122. 27 February 2017.
03/08/2016.	Dubai, United Arab Emirates.	Emirates. Flight No: 521.	Boeing 777-300.	Passengers: 282. Crew: 18.	Passengers: Nil. Crew: Nil.	Emirates General Civil Aviation Authority.	Preliminary Report AAIS AIFN/008/2016. 5 September 2016.
13/01/2018.	Trabzon, Turkey.	Pegasus Airlines. Flight No: 8622.	Boeing 737-800.	Passengers: 162 Crew: 6.	Passengers: Nil. Crew: Nil.	No agency identified. Data based on media information.	Not identified.

9.2 Data-set 2 (FAA aircraft incident database using situational parameters)

REF	AC_TYPE	OPERATION	DATE	LOCATION	COUNTRY	RWAY_VICTY	TOT_ABORD	FAT_TOT	EVACUATION	EXITS
20130706A	B777-200ER	PASSENGER	6-Jul-13	SAN FRANCISCO INTL A/P, CALIFORNIA, U.S.A.	U.S.A.	YES	307	3	YES	DO/DNO/DOB
20061010A	BAE 146-200A	PASSENGER	10-Oct-06	STORD AIRPORT, SORSTOKKEN, NORWAY	NORWAY	YES	16	4	YES	DO/DNO/DOB
20060708A	A310-324	PASSENGER	8-Jul-06	IRKUTSK, SIBERIA, RUSSIA	RUSSIA	YES	203	125	YES	DO/DNO/DOB
20010115A	DHC8-300	PASSENGER	15-Jan-01	CHINMEN SHANGYI AP, CHINMEN ISLAND, TAIWAN	TAIWAN	YES	27	0	YES	DO/DNO
19990822A	MD11	PASSENGER	22-Aug-99	HONG KONG INTERNATIONAL AIRPORT, HONG KONG	HONG KONG	YES	315	3	YES	DO/DF
19990601A	MD82	PASSENGER	1-Jun-99	NATIONAL AIRPORT, LITTLE ROCK, ARKANSAS, U.S.A.	U.S.A.	YES	145	11	YES	DO/DOB/DF
19960613A	DC10-30	PASSENGER	13-Jun-96	FUKUOKA AIRPORT, JAPAN	JAPAN	YES	275	3	YES	DO/DNO/DF
19940321A	DC9-32	PASSENGER	21-Mar-94	VIGO AIRPORT, SPAIN	SPAIN	YES	116	0	YES	DO/DNO/DOB
19931124A	MD87	PASSENGER	24-Nov-93	COPENHAGEN AIRPORT KASTRUP, DENMARK	DENMARK	YES	85	0	YES	DO/DNO
19930914A	A320-211	PASSENGER	14-Sep-93	WARSAW, POLAND	POLAND	YES	70	2	YES	DO/DNO
19910201A	B737-300	PASSENGER	1-Feb-91	LOS ANGELES AIRPORT, CALIFORNIA, U.S.A.	U.S.A.	YES	89	22	YES	DO/DNO/DF
19880831B	B727-232	PASSENGER	31-Aug-88	DALLAS, FORT WORTH, TEXAS, U.S.A.	U.S.A.	YES	108	14	YES	DO/DF
19850822A	B737-236 Sr1	PASSENGER	22-Aug-85	MANCHESTER AIRPORT, U.K.	U.K.	YES	137	55	YES	DO/DNO/DF/DOB
19840830A	B737-200	PASSENGER	30-Aug-84	DOUALA AIRPORT, CAMEROON	CAMEROON	YES	118	2	YES	?
19840322A	B737-200	PASSENGER	22-Mar-84	CALGARY INTERNATIONAL AIRPORT, CANADA	CANADA	YES	119	0	YES	DO/DNO
19831207A	B727-200	PASSENGER	7-Dec-83	MADRID, SPAIN	SPAIN	YES	93	51	YES	?
19820913A	DC10-30CF	PASSENGER	13-Sep-82	MALAGA, SPAIN	SPAIN	YES	394	50	YES	DO/DNO
19791007A	DC8-62	PASSENGER	7-Oct-79	ATHENS, GREECE	GREECE	YES	154	14	YES	DO/DNO
19781217A	B737-200	PASSENGER	17-Dec-78	HYDERABAD, INDIA	INDIA	YES	132	1	YES	DO
19761116A	DC9-14	PASSENGER	16-Nov-76	STAPLETON INTERNATIONAL AIRPORT DENVER COLORADO, U.S.A.	U.S.A.	YES	86	0	YES	DO/DNO
19740315A	CARAVELLE 10B3	PASSENGER	15-Mar-74	TEHERAN, IRAN	IRAN	YES	96	15	YES	DO/DNO
19730122A	B707-3D3C	PASSENGER	22-Jan-73	KANO AIRPORT, NIGERIA	NIGERIA	YES	202	176	YES	DO/DNO
19721220A	DC9-31	PASSENGER	20-Dec-72	CHICAGO, ILLINOIS, U.S.A.	U.S.A.	YES	45	10	YES	DO
19720418A	VC10	PASSENGER	18-Apr-72	ADDIS ABABA, ETHIOPIA	ETHIOPIA	YES	107	43	YES	DNO
19680408A	B707-465	PASSENGER	8-Apr-68	HEATHROW AIRPORT, LONDON, U.K.	U.K.	YES	127	5	YES	DO/DNO
19670216A	L188	PASSENGER	16-Feb-67	MENADO AIRPORT, INDONESIA	INDONESIA	YES	92	22	YES	DO/DNO/DF
							3658	631		
							17.24986331			

10 Annexure A – Task analysis and workload assessment



SAMPLE ONLY

11 Annexure B – Pinch-point analysis

Pinch-point analysis and mitigation assessment 1

Parent TRA and pinch point identifier	Baseline CAT 6	PP-1
Persons involved in the pinch-point assessment	Person 2 / Position	Person 6 / Position
	Person 3 / Position	Person 7 / Position
	Person 4 / Position	Person 8 / Position
	Person 5 / Position	Person 9 / Position

1. Description of the pinch-point

During the initial 3 minute response, the FC undertakes a number of activities including: Call information received, commence size-up, confirm AEP implemented, communicate with ACT, establish initial action plan and direct vehicle positioning.

2. Impact of the pinch-point in relation to associated task(s)

A number of time critical activities being undertaken within a small time period / FC may require overlapping of activities in order to achieve in the available timeframe.

3. Potential pinch-point causation

Multiple activities required to be undertaken at the same time or within a small time period.

Mitigation assessment

4. Does the pinch-point require mitigation?

No - as per Fire Commander competency attainement in ICS and initial incident size-up and initial action plan development.

What can be done in order to mitigate (reduce the impact of or remove/eliminate)?

Not required due to pinch-point not requiring mitigation.

6. What is the agreed mitigation method in relation to the identified pinch-point

N/A

SAMPLE ONLY

12 Annexure C –Risk assessment

Riding strength assessed:	1+4	Facilitator: Person 1 / Position
Persons involved in the risk assessment:	Person 2 / Position	Person 6 / Position
	Person 3 / Position	Person 7 / Position
	Person 4 / Position	Person 8 / Position
	Person 5 / Position	Person 9 / Position
1. Context		
For the purpose of this risk assessment, the context is established in relation to the execution of the ARFFS functional objectives in accordance with the scenario defined in the TRA worksheet		
2. Defined operational hazard (to be assessed)		
Reduced ability for the ARFFS to execute statutory functions and achieve the stated risk objectives (as per Phase 1 of this TRA) given the pre-defined vehicles, equipment, procedures and staffing relative to the incident scenario defined in the TRA worksheet.		
3. Existing controls		
All defined controls within the applicable Operational Risk Assessment apply to this risk assessment.		
4. Consideration of 'pinch-points' and associated mitigation assessments		
PP1 - this pinch point did not require mitigation		
5. Determine consequence and likelihood in accordance with situational context		
Worst credible consequence of hazard realised (extent of reduced ability)		**Likelihood of defined operational hazard occurring (inclusive of incident likelihood)**
Catastrophic		Expected
Major		Likely
Moderate		Possible
Minor		Unlikely
Insignificant		Rare
5. Assessed Risk Level		
NEGLIGIBLE CLASSIFICATION		

SAMPLE ONLY

Project Report

Task Resources Analysis – Phase 1: Data Gathering

Version 1.0

Effective 10 January 2022

End of Project Report Approval

	Name & Title	Signature	Date
Prepared by:	TRA Implementation Lead – [redacted] TRA Implementation Lead – [redacted]	[redacted]	10/12/2021
Endorsed: Program Manager	[redacted] – ARFF Service Change	[redacted]	
Approved: Project Sponsor	[redacted] – Service Improvement	[redacted]	

[redacted]

Change summary

Version	Date	Change description
0.1	17 November 2021	Initial Draft
0.2	20 November 2021	Sponsor Review [redacted] Feedback changes incorporated
1.0	10 January 2022	Final

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1 Executive Summary

Airservices meets all requirements of current legislation regarding the provision of aviation rescue and firefighting services. Aviation Rescue Fire Fighting Service (ARFFS) Operations Manual defines the minimum staffing levels necessary to perform our functional requirement. The minimum number of staff, aligning with category of service provision, is specified within organisational standards.

At the beginning of 2019, Airservices embarked on a task resource analysis of ARFFS resources. This was in response to the 2015 Aviation Safety Regulation Review. It was recommended that ARFFS providers use the Task Resource Analysis (TRA) methodology, as prescribed by the International Civil Aviation Organization (ICAO), to determine suitable staffing levels.

Airservices developed a TRA methodology to identify the minimum number of staff required to meet our functional requirements as per Civil Aviation Safety Regulations (CASR) 139.710. Location specific and operational data was used to create a desk top scenario consisting of a credible worst-case incident within a probable location on the aerodrome. The methodology sought input from local operational staff at all ARFFS locations, to define the limitations (pinch-points) and mitigation strategies for tasks relating to fire ground operations. With an understanding of these pinch points and mitigation strategies, risk assessments were undertaken to evaluate current and alternate staffing models.

This first phase of TRA generated staff and non-staff related solutions to operational pinch points, in addition to levels of risk associated with alternate staffing models. Phase 2 of the TRA is to systematically review and prioritise outputs from the TRA workshops. Phase 3 will be the scoping of priority projects for implementation from those defined in phase 2.

2 Purpose

2.1 Project Management

This document seeks to capture the performance of the delivered TRA project in comparison to the original plans and intentions. This includes:

- comparing actual outcomes to the original objectives.
- reviewing delivered scope against the original scope statement.
- assessing the effectiveness of the project approach.
- assessing the project management approaches and outcomes.
- providing a summary of the project variations that occurred through the life of the project.

2.2 Project Approach, Outcomes and Future Opportunities

In addition to the project management aspect of TRA as outlined in the above section 2.1, this report will also capture the TRA:

- Project approach
- Outcomes
- Challenges
- Opportunities

3 Background

Airservices minimum staffing levels are approved by CASA and are defined in the ARFFS Operations Manual. These staffing levels are the minimum standard applied across the service and align with category of service provision. The notion of staffing is underpinned by the functional requirement for the ARFFS. Certain functions are expected to be performed by the ARFFS, and when achieved enhance the safety (survivability) of an aviation accident or incident. Therefore, ARFFS staffing is directly related to the functions in accordance with the relevant legislation.

At the beginning of 2019, Airservices embarked on a task resource analysis of ARFFS resources. This was in response to the 2015 Aviation Safety Regulation Review which raised concerns regarding insufficient staff levels. Following is the Senate committee's recommendation:

> *Recommendation Four - 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.*

Airservices developed an initial TRA methodology in consultation with internal and external stakeholders. The methodology provided a framework to support the determination of the minimum number of staff necessary for the ARFFS to achieve its operational objectives based on a probable scenario. The methodology was tested at selected locations to evaluate its application.

During the development stage, a level 2 CASA surveillance activity was carried out on the TRA testing, in which a safety observation was made:

> *Future TRA activities and/or incident scenarios must include the risk/hazard associated with rescuing passengers from the fuselage of a crashed aircraft where an internal fire or exposure to an external fire compromises passenger safety. While CASR 139.710(1)(a) does not delineate external or internal aircraft fire, the ARFFS must anticipate the potential risk/hazard associated with controlling and extinguishing an internal fire while rescuing passengers from a crashed aircraft.*

Internal firefighting is not explicitly required through the CASR 139.710 or the associated Manual of Standards, although it is a recognised component of rescue in fire situations, where possible (according to fire ground risk assessments). ICAO guidance identifies:

> *"The term rescue must be taken to include protection of the routes followed by occupants of the aircraft who are able to escape from the aircraft", "While the rescue of all occupants may be considered as the primary objective, the overall requirement is to create conditions in which survival is possible and in which rescue operations may be conducted"*
>
> *"The saving of those occupants unable to make their escape without direct aid may be a long and arduous task, involving the use of specialized equipment and personnel other than those primarily provided for RFF purposes."*

From this CASA surveillance activity, the methodology was revised to incorporate the most probable and credible worst-case scenario inclusive of internal fire and rescue. Further details can be found in the Aviation Rescue Fire Fighting Service - Task Resource Analysis Methodology.

To determine the minimum staffing requirements for each category based on the agreed methodology, TRA workshops were undertaken at each of the 27 ARFFS

locations around Australia. This implementation, or data gathering phase of TRA, commenced in March 2021, and concluded in November 2021.

Airservices is one of the World's largest ARFFS providers. Therefore, a key challenge to the TRA was the required consistent approach to applying the methodology, consultation, and data collection across all twenty-seven locations. International guidance on conducting TRA at this scale was limited, as most ARFFS providers only manage a single aerodrome, and therefore only conduct a single TRA.

Ensuring a reliable approach to delivering TRA across all stations and all categories presented some challenges, which are discussed below. However, rich, and consistent information was gathered, which may be used to assist in determining minimum staffing requirements, as well as increase ARFFS capability. In particular, the TRA produced two sets of data:

1. Various levels of risk associated with the current and alternate staffing models by category.
2. Strategies (not relating to additional staff) to partially or completely mitigate operational limitations identified within the TRA.

4 Scope

The scope of the TRA project was to identify the minimum number of staff per category band, at each location, to meet the functional requirements of ARFFS. These functional requirements were defined in the *Civil Aviation Safety Regulations 1998*:

> *139.710 Functions of ARFFS*
>
> *(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.*

This phase of the project was a data gathering activity, to define multiple staffing levels, that were then risk assessed. The *ICAO's Airport Services Manual Part 1 2015* provides broad guidance in relation to aerodrome operators carrying out a TRA. The ICAO document was adhered to in the development of the Airservices methodology. Greater detail in relation to the storyboard was incorporated into the Airservices TRA, when compared with examples provided by ICAO. This resulted in a more robust, repeatable, data driven methodology.

All Airservices ARFFS stations undertook a TRA workshop at the highest level of category they provide. The approved Airservices methodology provided the guidelines in which to deliver the TRA workshops, inclusive of:

- Dependencies and assumptions
- Scenario parameters
- Storyboard development including timeframes, pinch point, and mitigation assessments
- Risk assessment guidance

The minimum standard for resourcing (staff, agent, and vehicles) are defined in *AFFM-09 Category* and were followed to develop the storyboard for the baseline category TRA (see Table 1). All relevant ARFFS Standard Operating Procedures and Aviation Fire Fighting Manuals (AFFMs) were applied in developing the storyboard and adhered to during the critical analysis of the storyboard by the workshop participants.

Table 1 - Minimum Agent and Vehicle Requirements for ARFFS Category

Aerodrome Category	Water (Litres)	Water/Foam Discharge (l/m)	Vehicles	Staff (Officer + Firefighter)
5	5400	3000	1	1+2
6	7900	4000	2	1+4
7	12 100	5300	2	2+4
8	18 200	7200	3	2+6
9	24 300	9000	3	2+8

Reference: *AFFM-09 Category*

Agent utilised in the TRA storyboard was based on the concepts of Q1 and Q2 as per *AFFM-09 Category*. Q1 is the quantity of agent required to be available to establish a 1-minute control time of the practical critical area. The quantity of agent to maintain control and/or extinguish the remaining fire is referred to as Q2.

As per the CASA surveillance activity in 2019, the TRA was required to have taskings associated with rescuing passengers where an internal fire compromises passenger safety. Therefore, a quantity of agent was allocated for controlling and extinguishing an internal aircraft fire. There is a no direction within Australian legislation, or ICAO Standards and Recommended Practices, regulating the amounts of agent required for internal aircraft firefighting. As such this agent level was sourced from the *National Fire Protection Agency 403 – Standard for Aircraft Rescue & Firefighting Services at Airports*.

The aggregate of Q1, Q2 and internal agent made up the agent requirement for each category assessed and can be seen in Table 2. These figures are based on agent requirements for the largest aircraft within each category band.

Table 2 – TRA Agent Quantities

Aerodrome Category	Q1	Q2	Internal Agent	Total
5	3271	2453	4750	10 756
6	4690	4690	4750	14 130
7	5865	7566	4750	18 181
8	7705	11 712	9450	28 867
9	9895	16 684	9450	35 948

The scope of the TRA output was the determination of the minimum level of staff needed to perform the functional requirements of ARFFS. No out-of-scope elements were prescribed as such. Data from TRA participants beyond staffing was captured and can be found in Appendix A.

5 TRA Project Management

5.1 Project Objective/s

Table 3 details the objectives stated in the original TRA Program Plan.

Table 3 - Project Objective Achievements

Objective/s	Achieved/Not Achieved/Partially Achieved & Comments
To identify the minimum number of staff required to complete tasks in real time before sufficient supporting external services arrive (so that ARFFS is no longer reliant upon its own resources)	Achieved- As per the TRA methodology section 7.3.1.2 Stage 2 – Risk Assessment. refer to Section 5.13 for risk assessment outcomes
TRA conducted at all ARFFS locations for each category they provide.	Not achieved – TRA were conducted at each station for the highest level of category that is provided. Initial TRA workshops suggested a commonality of risk outcomes. Broadly comparable locations presented commonality of risk. Therefore, undertaking workshops at each location for each category, would not produce differing outcomes.

5.2 Project Scope

Table 4 details the agreed scope items stated in the original project management plan, and the delivered scope.

Table 4 - Project Scope Achievements

Scope Item	Delivered/Not Delivered/Partially Delivered & Comments
All ARFFS operational locations.	Delivered – All ARFFs location completed at least one TRA at their highest category level.
A TRA dataset which Airservices can then seek to utilise and/or apply as necessary to update or change the ARFFS Operations Manual	Delivered: - A data set that provides risk assessments for various resourcing options for each station until a determination of risk was deemed medium or low. - A detailed list of limitation (pinch points) in achieving fireground tasks. - A detailed list of mitigation strategies to reduce or remove pinch points.

5.3 Project Performance

The project management plan forecast a completion date of 31/03/2022. The actual completion date was 16 December 2021.

Table 5 below summarises achievement of major milestones throughout the project compared to the original project management plan:

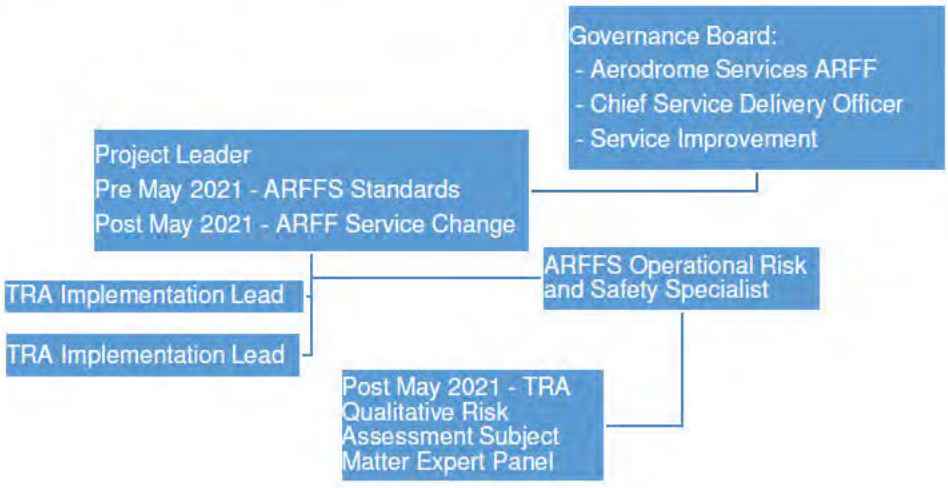
Table 5 - Project Performance

Milestone	Baseline Date	Actual Date	Comments
TRA Implementation Leads operational	31/03/2021	22/03/2021	Nil
All category baseline storyboard	31/03/2021	Category 5 – 31/03/2021 Category 6 – 29/04/2021 Category 7 – 01/07/2021 Category 8 – 13/08/2021 Category 9 – 03/09/2021 Category 10 – 17/11/2021	Delay in TRA Implementation Lead secondments resulted in an inability to create all baselines prior to commencement of workshops. Baselines were completed prior to each category band workshops. This alteration provided benefits (refer to Section 9 Lessons Learned)
Completion of all TRA Workshops	31/03/2022	Category 5 – 02/05/2021 Category 6 – 04/08/2021 Category 7 – 15/10/2021 Category 8 – 22/11/2021 Category 9 – 23/11/2021	Category 10 workshops were not required as Airservices no longer provide Cat 10 service.
Completion of TRA end of project report	31/03/2022	31/12/2021	Nil

5.4 Project Management Structure

The project management structure changed during the delivery of the project (refer to Figure 1). The structure was effective in providing direction and reporting at key stages during the project. Support and input from all levels was sufficient and consistent across the life of the project.

Figure 1 – Project Management Structure



5.5 Change Control

Change control was managed informally and as required. A formal change control log was not established to capture change and associated reasoning (refer to Section 9 for lessons learned). Below are the main change events that occurred during the project delivery.

- Reporting structure – March 2021
- Total number of TRA workshops to be delivered – April 2021
- Separation of the Risk Assessment from TRA workshops – May 2021
- Establishment of the TRA Qualitative Risk Assessment Subject Matter Expert Panel – May 2021

5.6 Risk Management

Risks were not identified as part of the initial TRA Project Plan (see Section 9 for lessons learned). There were several risks that presented during the project:

- Misinformation by some operational staff regarding the process and deliverables of the TRA Project.
- Workshop participants limited understanding of the risk assessment process and the application of Airservices Australia's Safety Management System.
- Delay in TRA risk assessment delivery due to the United Firefighters Union Aviation Branch (UFUA) Aviation Branch concern over transparency of process.
- Technical difficulties experienced by workshop participants using the online video platforms.
- An abnormal variance in risk assessment results from a limited number of stations providing the same category of service.

5.7 Quality Management

Quality management was undertaken for various components of the TRA Project. Table 6 details those areas.

Table 6 – Quality Management Components

Quality Management	Details	Effectiveness
Success Factors pre-workshop TRA training	Reviewed by TRA project team and Training Design and Development Specialist.	Effective
TRA scenario and storyboard documentation	TRA Implementation Leads undertook peer quality assurance reviews. Each draft TRA storyboard reviewed with ARFFS Standards.	Effective
Post-workshop Pinch Point and Mitigation Assessment Data	TRA Implementation Leads undertook peer quality assurance reviews.	Effective
Risk Assessment Data	As required the TRA Qualitative Risk Assessment Subject Matter Expert Panel reviewed risk assessment data.	Effective
Category summary reports	Quality Assurance reviews undertaken by all within the project team prior to delivery to the Governance Board	Effective

5.8 Communications Management

As per the TRA Project Plan, the Implementation Leads reported to the Project Leader in relation to the implementation progress against the national schedule. Weekly meetings were conducted to report on the progress of the workshop implementation, and to seek direction as issues evolved.

Staff communication in relation to TRA was undertaken in an informal manner as required. Misunderstandings regarding the purpose and outcomes of workshops was the main prompt for staff communications. An ad hoc brief was provided to Deputy Chief Fire Officers, who subsequently briefed direct reporting lines.

Communications with stakeholders, particularly operational staff, was an area that failed to meet the expectations of the communication plan. Communications was seen as an area for improvement (refer to Section 8 lessons learned).

5.9 Resource Management

The Project Plan detailed TRA workshops for all stations at every category they provide. Resourcing of only two TRA Implementation Leads, potentially, could not have completed the project within the required 12-month timeframe. With the change in delivery to only assess the highest category at each location, two TRA Implementation Leads was adequate to complete workshop facilitation. Online delivery of TRA workshops resulted in a low cost to deliver this project when compared with the TRA Project Plan. Financial resourcing was sufficient.

5.10 Hand-over Issues

Nil items relating to the delivery of the project.

5.11 Follow-on Actions

The following actions need to be completed in the future to ensure benefits of the project are maximised:

Table 7 – Follow on Actions

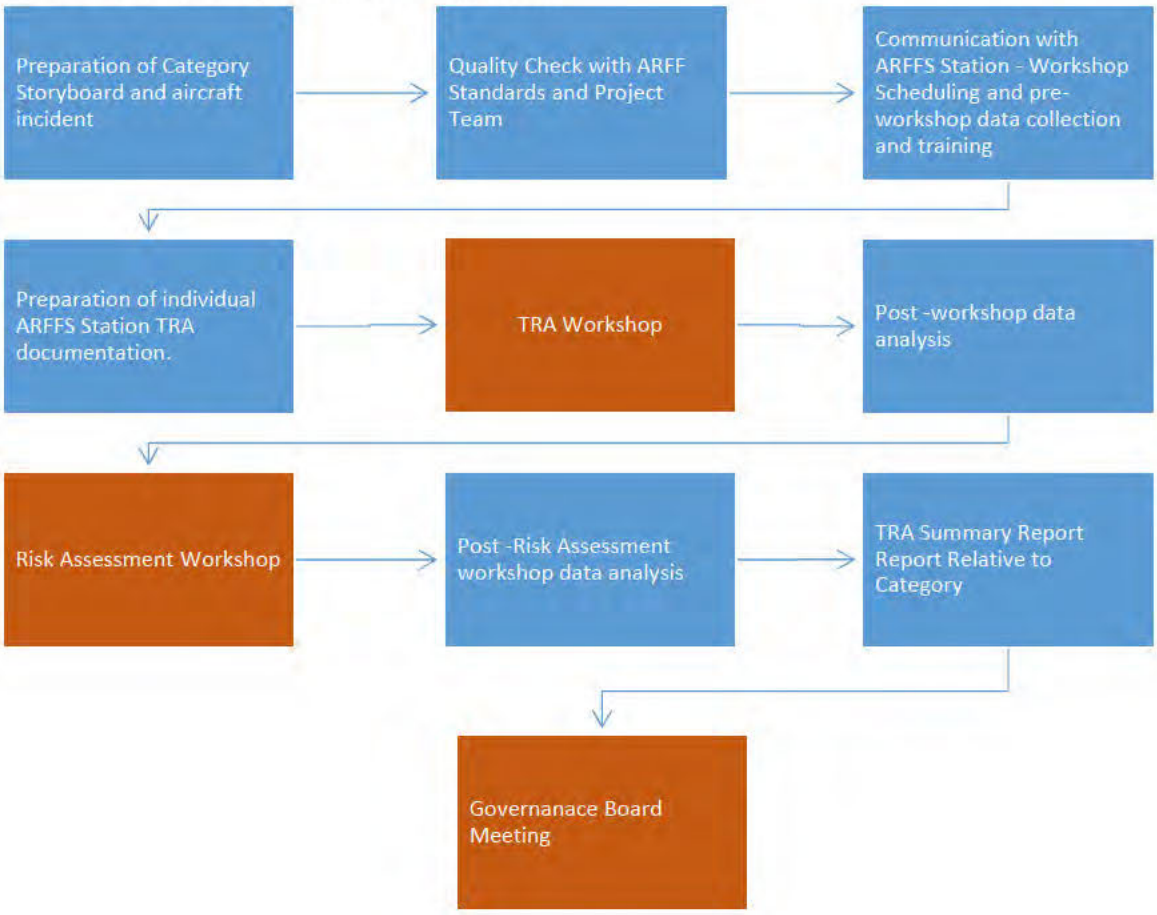
Follow-on Action	Accountability
Phase 2 (post workshop activities, prioritisation of TRA data)	
Communication to all staff on the completion of the TRA Project	ARFF Service Change
Exploration and prioritisation of all pinch point mitigations that were identified during the TRA workshop	ARFF Service Change
Phase 3 (Implementation of TRA outcomes)	
Project scope conducted to explore sustainable implementation of TRA within multiple operational areas of ARFFS (refer to Section 7 TRA Opportunities)	ARFF Service Change / Standards
Detailed scoping of individual priority projects as identified as part of phase 2.	ARFF Service Change
Publishing of each station's TRA in a suitable format	ARFF Standards
Post implementation review	ARFF Service Change

6 Project Approach, Analysis and Project Findings

6.1 TRA Approach – Overview

The delivery approach was to undertake TRA Workshops (inclusive of risk assessments) at each ARFFS location. The facilitation of workshops was via video conferencing, and each location was assessed at the highest category level they provide. Due to COVID-19 limitations and uncertainty surrounding domestic travel and state border lockdowns, all but one workshop was delivered via video conferencing. Despite this challenge, in a post TRA survey 83.3 per cent of participants stated that facilitation was above average or excellent (see appendix D). Data collection occurred at each workshop, with subsequent recommendations within category reports produced for a Governance Board. Figure 2 provides an overview of the project approach.

Figure 2: Overview of TRA Project Approach



6.2 Participants

TRA workshops utilised sufficiently qualified local staff to participate in the task analysis, pinch-point and mitigation strategy and risk assessment activities. As the TRA focused on large scale resource utilisation and decision making, as a minimum, the station Aerodrome ARFFS Line Leader (AALL) and a Fire Commander (FC) were required to participate. Staff that participated included:

- TRA Implementation Leads (Facilitators)
- AALL

- Appropriately qualified local ARFFS officer staff were required for participation due to the safety accountabilities associated with these roles.

Internal and external stakeholders were invited to observe the workshops; however, they were not essential to the TRA process. These stakeholders included:

- UFUA
- CASA
- Cert IV and other operational staff
- Other Airservices staff when available

See Appendix B for a list of each location's participants.

6.3 Data Collection

In accordance with the TRA methodology, data gathering activities were undertaken with suitably qualified local staff to ensure valid and robust outcomes.

1) Pre-implementation data was required prior to a TRA assessment being undertaken, this included:
    i) Local supporting services anticipated capability and response time/s
    ii) Specific location characteristics (aerodrome specific such as agent requirements/availability)
2) A standardised storyboard for each category was used to assess the baseline task analysis and allow for the identification of pinch-points associated with tasks and activities. Generic pinch points that affected all ARFFS locations remained in all storyboards.
3) Mitigation strategies/solutions were discussed to address each pinch-point identified in the storyboard. Agreed mitigations suitable for that location were documented.
4) Risk assessments of multiple staffing models were undertaken with participants who completed the workshop. The risk assessments continued until the risk was reduced to either medium or low.
5) The records of the assessment were reviewed and finalised.

6.4 Pre workshop Communication

Contact was initially made with AALL via either e-mail or phone, to identify a suitable date to undertake the workshop. The requirements of workshop (inclusive of participants and expectations) were also discussed. AALLs were provided the TRA Methodology to gain an understanding of the process. There was no requirement for the AALL to share this methodology document with other workshop participants. This was to reduce potential pre-planning prior to the workshop. The intent was for participants to complete the TRA in the mindset of an operational response.

6.5 Success Factors Training

An online TRA introductory presentation was developed and delivered through Success Factors prior to the TRA workshop. The presentation introduced participants to the TRA methodology and purpose. A small number of participants did not have

access to the presentation, as it was introduced after several TRA workshops had been completed. Refer to Section 9 Lessons Learned.

6.6 TRA Scenario

Participants were provided with a detailed operational narrative of a worst plausible credible accident scenario. This scenario was designed to align with a survivable accident. The scenario utilised the largest category aircraft in the relevant category band. Further information regarding the scenario can be found in the *Aviation Rescue Fire Fighting Service Task Resource Analysis Methodology*. In a post TRA survey, the majority of participants believed that the level of detail provided and their understanding of the scenario was above average or excellent (See appendix D for survey results).

6.7 TRA Storyboard

A detailed Excel Spreadsheet was used to convey a simulated operational aviation response. An example of the storyboard can be found in Appendix C. The TRA was conducted as per ICAO recommendations (see *Aviation Rescue Fire Fighting Service Task Resource Analysis Methodology*).

A standardised storyboard was created utilising resources applicable to the category being assessed. The storyboard provided an operational narrative, detailing practical activities undertaken on the fire-ground to complete identified tasks. These activities were critically analysed by workshop participants allowing for the identification of pinch-points which aligned with a task, and the possible inability to complete that task with the identified resources.

The storyboard continued until sufficient external resources arrived so that ARFFS was no longer reliant upon its own resources. Each station's storyboard completion time matched the expected times of external resources. These times are shown in Figure 3. Facilitation was complex, with participants regularly finding difficulty in following the story board. A post survey was conducted, which found that 35 per cent of participants had a poor to average ability to follow the storyboard. Refer to Sections 7 Challenges, Section 9 Lessons Learned and Appendix D for survey results.

The TRA storyboard revealed that ARFFS at all locations were able to meet their regulated functions, in relation to response times and agent delivery requirements, as per the *CASR Manual of Standards Part 139H*. ARFFS were able to successfully apply the amounts of Q1 and Q2 to create conditions for rescue by reducing the intensity of the external fire.

6.8 TRA Pinch Point and Mitigation Assessment

Information from the storyboard permitted the identification of pinch-points relating to tasks and activities undertaken. Pinch-points were associated with one of the following:

- Lack of ARFFS policy or procedure
- Clarification, breach, or misinterpretation of ARFFS policy or procedure
- Firefighter/fireground safety
- Limitation of available ARFFS resources (staff, agent, equipment)

A mitigation assessment was undertaken enabling a detailed examination of the pinch-points identified in the storyboard. This allowed participants to formulate agreed

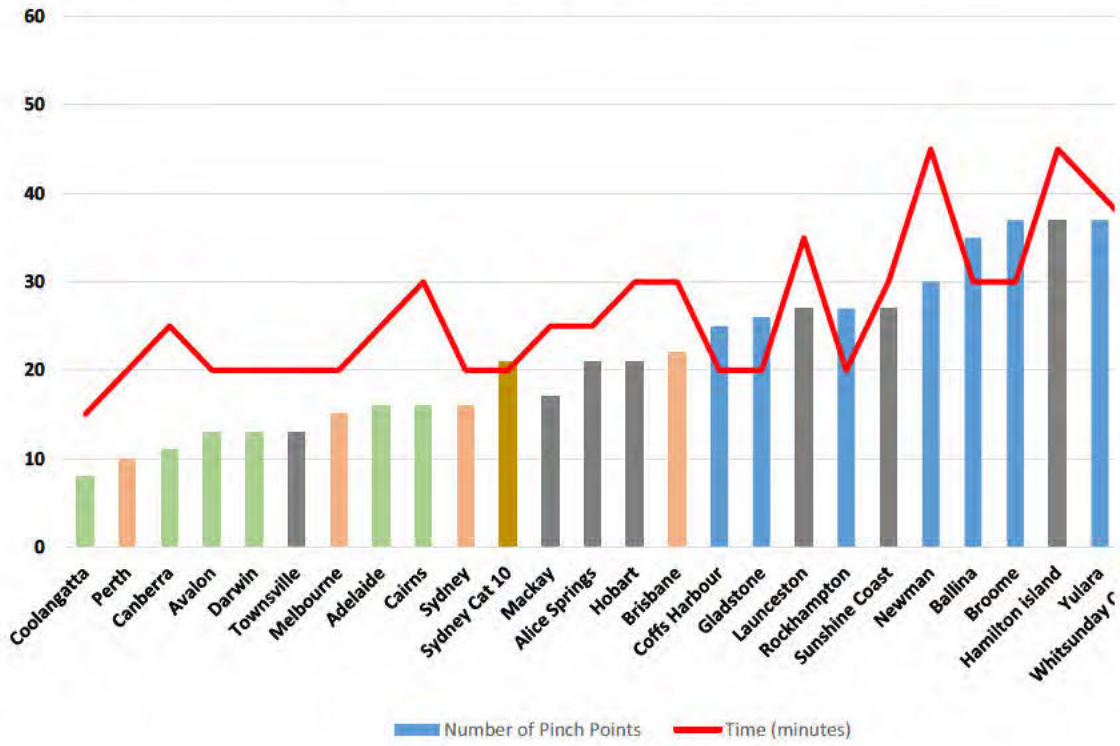
mitigation strategies. These strategies have been collated at Appendix A. Figure 3 presents all stations individual total pinch-points and TRA time frames.

The TRA storyboard related to a defined list of tasks as prescribed in the *ARFFS TRA Methodology*. These were:

1. Meet required response time
2. Control the external fire
3. Protect escape slides and exit routes
4. Assist in the self-evacuation of the aircraft
5. Create a survivable situation
6. Rescue trapped personnel
7. Maintain post fire security/control
8. Preserve evidence

Many of the pinch points identified related to those of task 5 and 6. ARFFS, as a primary responder, relies on external resources to successfully achieve the desired outcomes of an extended rescue scenario, as presented in the TRA. Therefor those activities relating to task 6 – rescue trapped personal presented many of the more difficult to mitigate pinch points. Due to the timeframes of the TRA storyboard and the relationship to arriving resources, no workshops explored tasks relating to 7 and 8 as defined above.

Figure 3 – TRA Pinch Point and Time Frames per ARFFS location



6.9 Risk Assessment

Risk assessments were undertaken to assess the multiple staffing levels identified in the workshops. The hazard assessed was ARFFS ability to meet its functional objectives functional objectives in accordance with the scenario defined in the TRA. Staffing models were assessed and adjustments in increments (+1) were made to determine risk levels. Assessment continued until the minimum staffing level was determined based upon the local acceptability of the determined level of operational risk. Each risk assessment utilised the Airservices risk management framework.

Risk assessments were initially conducted on the same day as the TRA workshop. They were undertaken once the storyboard and pinch-point mitigation strategies had been identified. Early in the category 6 workshop delivery program, a TRA Terms of Reference was established to support valid and reliable risk assessments across all locations. This was due to a situation where participants established either an incorrectly formed/supported opinion in relation to the risk assessment, or a pre-determined position which was unwilling to respond to the changes in resource allocation. Once established, TRA risk assessments were completed in a separate risk assessment workshop. Refer to Sections 7 Challenges, and Section 9 Lessons Learned.

6.10 Risk Assessment Participants

Each location's risk assessment was completed involving at minimum, an Airservices Safety Risk Specialist, TRA implementation Lead, the AALL, FC and any other available participants that completed the TRA workshop.

6.11 Risk Assessment Workshop Outcomes

The outcomes of each locations risk assessment are below. Further details on the outcomes of the risk assessments can be found in the individual category summary reports referenced in Section 10.

Table 8 – Category 5 Risk Assessments by Station

Location	Current state (1+2)	1+2+4	1+2+5
Adelaide	Extreme	Medium	Low
Brisbane	Extreme	Medium	Low
Port Headland	Extreme	Medium	Low
Maroochydore	Extreme	Medium	Low
Hamilton Is	Extreme	High	Low (1+2+6)
Cairns	Extreme	Low	Low
Hobart	Extreme	Low	Low
Karratha	Extreme	Medium	Low

Table 9 – Category 6 Risk Assessments by Station

Location	Current state (1+4)	1+2+4	1+2+5
Uluru/Ayers Rock	Extreme	Medium	Low
Ballina	Extreme	Medium	Low
Broome	High	Medium	Low
Coffs Harbour	High	Medium	Low
Gladstone	Extreme*	Extreme*	Extreme*
Gladstone (reviewed)	Extreme	Medium	Low
Karratha	High	Medium	Low
Newman	High	Medium	Low
Port Hedland	High	Medium	Low
Rockhampton	High	Medium	Low
Whitsunday Coast	High	Medium	Low

* Risk assessment reviewed as per Section 5.9

Table 10 – Category 7 Risk Assessments by Station

Location	Current state (2+4)	1+2+4	1+2+5
Alice Springs	Extreme/High	High	Low
Hamilton Is	Extreme	Extreme	Low (1+2+6)
Hobart	Extreme	High	Medium
Launceston	Extreme	High	Medium
Mackay	Extreme	Medium	Low
Sunshine Coast	Extreme	Medium	Low
Townsville	Extreme	Medium	Low

Table 11 – Category 8 Risk Assessments by Station

Location	Current state (2+6)	1+2+6	1+2+7	1+2+8
Adelaide	Extreme	Medium	Medium	Low
Avalon	Extreme	High	Medium	Low
Cairns	Extreme	High	Medium	Low
Canberra	High	Medium	Medium	Low
Coolangatta	High	Medium	Medium	Low
Darwin	Extreme	Medium	Medium	Low

Table 12 – Category 9 Risk Assessments by Station

Location	Current state (2+8)	1+2+8	1+2+9	1+2+10
Brisbane	Extreme	Medium	Medium	Low
Melbourne	Extreme	Medium	Medium	Low
Perth	Extreme	Medium	Medium	Medium
Sydney	High	Medium	Low	Low

Table 13 – Category 10 Risk Assessments by Station

Location	Current state (3+11)	1+3+12	1+3+13	1+3+14
Sydney	High	Medium	Low	Low

6.12 TRA Governance Board

The Governance Board was established to oversee the results and outcomes of the TRA and provide future direction of the TRA project.

6.13 Post TRA Participants Survey

A survey was undertaken with all participants after the completion of TRA workshops. The objective of the survey was to gain insight into the content and delivery of the workshops. This data will be beneficial for future delivery of TRA. Results from the survey can be found in Appendix D.

7 TRA Challenges

7.1 Workshop Delivery

The intent in the initial early planning of the TRA project, was for facilitation to occur in face-to-face workshops. Due to COVID-19, this method was altered so that workshops were facilitated via video conferencing. Due to this change in delivery method, challenges were identified in facilitating workshops. These challenges are as follows:

- Audio/visual at some locations was sub-optimal.
- Reduced ability to engage with participants.
- Difficulty in the presentation of a complex excel spread sheet via video conferencing.

7.2 Pre-Workshop Data

Location specific data relating to responding external resources were required prior to a locations workshop, for input into the TRA scenario. The AALL were asked to update a national TRA project document with revised response information for their location. This task was not completed and follow up was required to ascertain this information.

7.3 Storyboard

The delivery of TRA workshops included a standardised storyboard relevant to the category being assessed. The approach was applied to all locations with delivery via video conferencing. To avoid pre-planning, the storyboard was withheld from participants prior to the workshop. Several challenges have been noted facilitating the workshops in this manner.

- Some workshop participants had difficulty following the storyboard due to the complex nature and detailed account of tasking (See appendix D for participant survey results).
- The standardised approach, at times, created confusion, where sections of the storyboard did not relate to the location of the workshop (e.g., an aerodrome with a multiple station approach, inability to manoeuvre within the Runway End Safety Area (RESA)).
- While work was carried out prior to the TRA workshops to identify timings for practical tasks, such as hose deployment and CABA, there was debate surrounding times allocated to subjective tasks, such as FC directions, aircraft entry, and primary and secondary search.
- At some locations, debate surrounded the exact timings and resource allocation of responding external resource.
- As the storyboard was delivered using optimal conditions (timings, environmental conditions, and task allocation), participants regularly disputed these parameters.

7.4 Risk Assessment Workshop

The delivery of the risk assessments was initially undertaken within the workshops. However, during the Category 6 workshop phase, it was deemed necessary to separate risk assessments from the TRA workshops. Certain challenges have been noted.

- The detail of the TRA storyboard supported the identification of pinch points beyond those of staff. As such, several pinch-points were captured that related to lack of agent, additional vehicle, absence of fit-for-purpose equipment, lack of procedures or procedural clarification. These pinch points were mitigated in a future state resourcing level. There were at times an inability of participants to comprehend the future state when there were either, multiple mitigation solutions, or the implementation of the solution was not yet known. This is supported by 31 per cent of participants in the post TRA survey indicating that they had an average or below average understanding of the risk being assessed (see appendix D).
- At several locations there was a lack of understanding relating to the Airservices Safety Management System. In a post TRA survey, 35.6 per cent of participant self-reported an average or below average understanding of the risk assessment process (see appendix D). The lack of comprehension of consequence and likelihood descriptors may have resulted in inconsistent risk assessment outcomes with similar locations.
- Situations occurred, where participants established either an incorrectly formed/supported opinion in relation to the risk assessment, or a contrived or pre-determined position which they were unwilling to respond to the changes in resource allocation.
- Initially, TRA workshops were delivered over the course of a day. The risk assessments component was completed at the end of the TRA workshops. This resulted in a potential disengagement with the risk assessment process due to the length of the workshops.
- Due to the length of time between several TRA workshops and risk assessment workshops, some participants found it difficult to remember components of the TRA.

7.5 Staff engagement/understanding

It was noted that the understanding and application of procedures and how they are applied on the fire ground varied across stations. For example, there were varying levels of confidence on the ability of Leading Fire Fighters to fulfill roles of leadership on the fireground (Entry Control Officer (ECO) and Compressed Air Breathing Apparatus (CABA) Team leader). This caused inconsistency across stations in pinch point identification.

8 TRA Opportunities

8.1 TRA Storyboard

Microsoft Excel was utilised to develop and present to workshop participants. The development of the storyboard was a time-consuming task. Exploration into a more user-friendly program to speed up development of future storyboards and assist in the delivery of the workshop material would be beneficial.

8.2 Workshop Visuals

To assist with the facilitation of TRA workshops and provide participants with a visual understanding of the scenario, utilising a program such as XVR or similar may be beneficial.

8.3 Risk Assessment

TRA identified pinch points and associated mitigation strategies beyond additional staff. There is an opportunity to risk assess, non-staff related mitigation strategies only (such as new technology), to measure the effect on ARFFS capability prior to adding any additional staffing resources.

8.4 TRA Review

There may be a requirement to periodically review a stations TRA (similar to a stations Operational Risk Assessment). Development of a training package to guide the review process is necessary. This task may require support from a dedicated national or station portfolio holder.

8.5 Operational Pre-plan

The TRA storyboard may benefit ARFFS operations by enabling stations to undertake pre-plan type activities for incidents including developing local strategy and tactics for:

- aviation incidents (crash on water, difficult terrain operations).
- non-aviation incidents (building fire, HAZMAT incident)
- degraded conditions, such as loss of vehicle, staff.
- communication planning.

8.6 Training

The TRA tool has the potential to assist with training of staff at multiple levels. In a post TRA survey, most participants found the TRA, as a process, extremely valuable for understanding the complexities and challenges of an aviation incident (see appendix D). The TRA can provide Certificate IV, and Diploma students the ability to gain experience making critical decisions in a safe and controlled environment. The TRA tool may also be utilised to support staff endorsements on station such as, Managing Incidents and Pre-Incident planning.

The TRA identified a varying understanding and application of some policies and procedures. There is an opportunity to ensure ARFFS operations are consistent across the business unit. Areas of discrepancy included:

- ARFFS role in rescue
- CABA SSW
- Command and control
- Strategies and tactics

8.7 Change management

The TRA can assess and support operational related changes. The introduction of procedural change, new equipment and changes to aerodrome infrastructure are examples where the TRA may be applied to determine the impact on staffing.

8.8 Future development

The TRA may have commercial potential for Airservices to market as a system to identify resourcing deficiencies and guide towards capability. This may have applications for other emergency services or as an industrial crisis management tool.

8.9 ARFFS Innovation Strategy

Due to the level of detail provided in the TRA, there are numerous pinch point mitigation strategies that do not require additional staff. These strategies are new and innovative ways to mitigate the operational limitations and may require further investigation to assess their applicability. A detailed list of these is attached in Appendix C.

8.10 External Communication

The TRA project may provide learnings for other organisations. This information could be disseminated to industry via events such as AFAC or ICAO conferences or through appropriate journals.

9 Lessons Learned Summary

The following table summarises the lessons learned regarding both project management and project approach.

Table 13 – Lessons Learned Summary

Lesson	Rationale/source	Target audience
No change log established	There were multiple changes regarding the delivery of the project. A change log that captured each of these alterations, along with supporting evidence for the change is important for project management governance. For details on changes that occurred refer to Section 4.5.	Project Team
No project risk management plan established	Identifying potential risks prior to the commencement of the TRA Project may have allowed for contingencies or mitigation actions when risks were realised. Refer to Section 4.6.	Project Team
Stakeholder Communication	Communications occurred in an ad hoc nature, and from multiple sources. The complexities of the TRA, in terms of methodology, delivery and interpretation was difficult to communicate to staff. A clearly defined communication plan through a single point of reference may have been beneficial. Refer to Section 4.8.	Project Team
Online Delivery	Online workshop delivery did have some technical challenges that can be easily overcome with planning and improved competence of workshop participants. Balancing these challenges with benefits of cost savings and shorter timeframes showed that delivery method was in general efficient and effective.	Project Team
Success Factors Training	Survey results suggest that participants understanding of TRA was greater after completing the training. However, participants recommend that more detail may be required in the presentation. Using success factors, as a tool to educate and inform, is an important consideration as part of early project planning.	Project Team / Organisational Development
Pre workshop data collation methodology	Due to the importance of timeframes and capability of arriving external resources, as an input to the TRA, a standardised approach to sourcing, collating, and presenting pre-workshop information is an area to be reviewed to ensure the validity of the data.	Project Team / ARFF Standards

Lesson	Rationale/source	Target audience
Risk Assessment Workshop	Risk Assessments frequently caused confusion regarding both the concept of likelihood and consequent and understanding the implications of future staffing models. The degree in which this effected the risk assessment component of the project was not understood prior to the project commencement. Pre workshop risk assessment training may assist to increase participants understanding of the above concepts.	Project Team / ARFF Standards
Storyboard	The delivery of the storyboard improved over time as the storyboard formatting adapted to consider participants understanding. The ability to adapt part way through a project to incorporate change was important.	Project Team
Early Implementation of TRA deliverables	There is an advantage to maintain a degree of flexibility regarding identifying, communicating, and implementing deliverables prior to the completion of the project. Early in the TRA project, it was identified that there was an opportunity to undertake a strategy and tactics review of ARFFS aviation response. Additionally reviewing ARFFS communication plans as well as CABA procedures have all been supported by TRA findings.	Project Team / ARFF Standards

10 References

Airservices Australia, Aviation Firefighting Manual – Category, AFFM-09, Version 4.

Airservices Australia, Task Resource Analysis (TRA) summary report relative to category 5, 2021

Airservices Australia, Task Resource Analysis (TRA) summary report relative to category 6, 2021

Airservices Australia, Task Resource Analysis (TRA) summary report relative to category 7, 2021

Airservices Australia, Task Resource Analysis (TRA) summary report relative to category 8, 2021

Airservices Australia, Task Resource Analysis (TRA) summary report relative to category 9, 2021

Aviation Rescue Fire Fighting Service Task Resource Analysis Methodology, Version 2.0, Effective 06 February 2020

Civil Aviation Safety Regulations, 1998, Section 139.710

ICAO's Airport Services Manual Part 1 2015, Section 10.5.1

Manual of Standards Part 139H — Standards Applicable to the Provision of Aerodrome Rescue and Fire Fighting Services

National Fire Protection Agency 403 – Standard for Aircraft Rescue & Firefighting Services at Airports

Service Delivery - ARFFS, Task Resource Analysis – Program Plan, Version: 2.1, Effective 08 December 2020

11 Definitions

All terms and abbreviations used in this document are defined in the below glossary. Each item is also defined in the body of the document where it is first used.

Table 14 – Definitions

Term	Definition
AALL	Aerodrome Aviation Line Leader
AEP	Aerodrome Emergency Plan
ALARP	As low as reasonably practicable
ARFFS	Aviation Rescue Firefighting Service
CABA	Compressed Air Breathing Apparatus
CASA	Civil Aviation Safety Authority
CoC	Call out Contingency
ECO	Entry Control Officer
FC	Fire Commander
FCC	Fire Control Centre
HOTS	Hot, Oxygen Deficient, Toxic, Smoke
HRET	High Reach Extendable Turret
ICAO	International Civil Aviation Organization
MCI	Mass Casualty Incident
OIC	Operational Incident Commander
PPE	Personal Protective Equipment
RESA	Runway End Safety Area
RIT	Rapid Intervention Team
SSW	Safe Systems of Work
TRA	Task Resource Analysis
UFUA	United Firefighters Union Aviation Branch

Appendix A All Categorised Workshop Pinch Points and Mitigation Strategies

Table 1A – Categorised Workshop Pinch Points and Mitigation Strategies

Category	Pinch-point Description	Mitigators
Aerodrome	Inability to reposition on nose of aircraft due to terrain.	1. Review and employ alternate strategy and tactics (as per operational risk assessment). 2. Training regarding alternate tactics.
	Lack of Airport resources to assist with escorting external responding agencies to the incident site.	1. A review of response times for the AALL/Call out Contingency (CoC). 2. A review of communications with airport safety officers with a potential for dedicated communications. 3. A review of current ARFFS radios. 4. A review of communications with state agencies (inter-operability). 5. Develop closer relationships with airport operators regarding emergency management process and roles within the AEP.
	Inability to traverse RESA 01L (direction per Brisbane Airport Corp).	1. Confirm with aerodrome operator RESA capability/AEP. 2. Alternative routes to incident (pre-plan). 3. Vehicle capability.
Agent	Inability to monitor agent level and pump operation when CABA team are internal.	1. A review of procedures regarding oversight of vehicle pump operations. 2. A review of sufficient quantities of agent for fire ground (how much agent is required to backup internal operations/). 3. Additional firefighter.
	Inability to replenish agent due to lack of staff.	1. Additional vehicle. 2. Additional staff. 3. Water Tanker.

Category	Pinch-point Description	Mitigators
Agent	Insufficient agent affecting the ability to maintain the backup line, foam blanket (FB10x) and continued fireground/internal operations.	Vehicles; 1. Additional vehicles. 2. Vehicles with more capacity. 3. Water tankers. 4. Hose laying vehicles (replenish from remote hydrants). 5. Vehicle with more capability (HRET/Snozzle/Compressed Air Foam System/System/Dual agent delivery). Agent: 1. A review of sufficient quantities of agent for fire ground (how much agent is required to backup internal operations). Until the safety margin is defined, the third vehicle is used to address such deficiency. 2. C Class foam. 3. Review secondary agent- halotron/ Compressed Air Foam System. 4. Strategy and Tactics- efficiency of agent use. 5. Review of Dry Chemical Powder DCP and its use on the fire ground. Training has decreased. 6. Larger drop tanks to increase speed of replenishment. Staff: 1. Additional firefighters to replenish vehicle. 2. A review of CoC to include level of incident/Emergency Vehicle Tech/arriving staff.
	Single vehicle supply of agent to operation resulting in nil back-up agent or contingency in the event of failure. (Category 5 TRA)	1. Make available secondary primary attack vehicle.
	Depleted vehicle (T3) unattended on fire ground.	1. Additional Firefighter. 2. Review strategy and tactics.

Category	Pinch-point Description	Mitigators
Agent	Driver returning to replenish vehicle alone - potential safety of driver (heightened stress of driver)	1. Review of AFFM-Driving vehicles.
	Unable to meet continuous agent requirements	1. Additional Vehicle (Brisbane).
	Inability to replenish vehicle within the TRA timeframe. Implications to agent requirement on fireground.	1. Review the ability to replenish vehicle on airports and its effect on TRA.
CABA	Avalon ARFFS currently employ 300 Bar cylinders reduced to 207 Bar due to lack of 300Bar compressor.	1. 300 bar compressor. 2. Memorandum of Understanding with local Fire Rescue Victoria (mobile refilling station, cleaning face pieces etc). 3. Additional CABA team (with equipment).
	Lack of Rapid Intervention Team (RIT) (minimum of 2 CABA fire fighters). Not following CABA Safe Systems of Work (SSW) procedure. (Cat5/6)	1. Additional two fire fighters. 2. Additional CABA set/s.
	Lack of dedicated ECO (Cat5/6) as the FC is performing role of OIC and ECO.	1. Additional supervisory officer/ fire fighter. 2. Additional CABA set. 3. A review of the training/ability to complete ECO.
	RIT team members undertaking fireground tasks prior to and whilst being designated as a RIT member	1. A review of CABA SSW to clarify the tasks a RIT team member can complete on the fire ground. 2. Additional firefighter.

Category	Pinch-point Description	Mitigators
CABA	Due to the complexity of incident, there are concerns surrounding the Leading Firefighter undertaking the role/function of ECO/RIT Team leader.	1. Review of the roles and responsibilities within the CABA SSW. 2. Review of procedure regarding the minimum training and qualifications levels of ECO and RIT Team Leader Roles. 3. Upskilling staff. 4. CABA ECO role included in ongoing endorsement training.
	RIT leader not positioned near the ECO position on fireground	1. One additional fire fighter with supporting equipment (CABA). 2. A review of CABA SSW to clarify workload/tasking/location of RIT Team leader.
	Fire fighter potentially in HOTS environment.	1. One additional fire fighter with supporting equipment (CABA). 2. Utilisation of respirators.

Category	Pinch-point Description	Mitigators
	Potential p/point re the requirement for donning CABA.	1. Ongoing risk assessment by the Fire Commander to ensure CABA donning occurs at a suitable time. 2. Training around safe systems of work / CABA. 3. Research & development around determination of HOTS (aircraft incident - composite fibres). 5. Aligning aviation procedures (short term) around our hazmat procedures. 6. Review of Personal Protective Equipment (PPE) to align with recommendation of Heat Stress procedures. 7. Confirm the availability of, and/or establish procedure and/or training to guide / support the notion of 'when CABA should be donned and started-up'. 8. Additional firefighter/s and additional vehicle to ensure a dedicated BA team. 9. Additional Firefighters - Dedicated external fire ground attack team (not to be utilised as CABA team/ RIT/ECO). 10. Aide Memoire to assist in defining HOTS. 11. Review of fireground operations to support firefighters remaining in vehicle (when applicable) to reduce exposure to heat stress/ HOTS environment12. Formalised "hot zones" identified (standardised PPE requirements for aircraft incidents) in support of situation size up. 13. Investigate various levels of PPE (Respirators through to CABA).

Category	Pinch-point Description	Mitigators
Casualty Management	Lack of casualty management procedure to perform first aid (HOTS environment) and its relationship with other firefighting activities (i.e. overhaul is being undertaken whilst casualties require rescue)	1. Review and develop improved procedures / guidance on casualty management and assessment / triage of casualties. 2. Clarification of procedure - 'do we manage the fire first, or rescue first'? Order of priority for aircraft incidents. 3. Training to support the effective application of improved procedures and casualty assessment / triage. 4. Additional Firefighter/CABA teams/team structure - to support casualty management 5. Develop better ventilation strategies (Positive Pressure Ventilation post fire). 6. Learning from other agencies / international ARFFS / Military and other international standards (National Fire Protection Agency). 7. Strategy and tactics for internal firefighting/rescue (e.g. CABA team A1 fire attack, CABA A2 team rescue).
	Lack of effective method for casualty removal / extraction (rescue).	1. Complete analysis on the nature and definition of rescue and confirm how this can be achieved and applied by ARFFS relative to the TRA scenario. Implement the outcomes of this analysis. Including the following: a) A review into the potential to utilise onsite aircraft access equipment. b) A review of resources/equipment to make entry and to extricate casualties (ARFFS air stairs / extendable platform/heights, aircraft types, soft ground etc). c) Review of obligations of aerodrome operator regarding equipment (e.g. Crash rescue kits).

Category	Pinch-point Description	Mitigators
Casualty Management	1. Insufficient resources to manage / relocate casualties inside aircraft (physical effort to move casualties)	1. Additional staff - availability of an additional CABA team member to supporting existing team, creating a team of 3. 2. Establish separate CABA teams / fire attack and rescue with defined separate functions. 3. Procedural development for the management of casualties. 4. MCI reverse triage tags and associated training. 5. Further training / understanding (aircraft familiarisation) on the ability to re-adjust seating to improve access to casualties or improve advancement of CABA Team 6. Additional equipment and techniques (research from other agencies) and associated procedures. 7. Standardisation for staffing numbers for internal CABA team. 8. Investigate effects of compounding workload on CABA team.
	Unable to complete MCI triage	1. Inclusion of MCI training as part of annual first aid training 2. Suitable equipment for ARFFS to undertake triage relating to MCI (appropriate to ARFFS role). 3. Additional Firefighter. 4. Dedicate Fire Control Centre (FCC) operator to relay casualty numbers, status etc.

Category	Pinch-point Description	Mitigators
Communications	Total review of communications on the fire ground inclusive of the following areas. 1. Communication between Forward Command Post and fireground (ECO, VHF 131 / tower, UHF, response mobile) - loss of situational awareness 2. Communication of CABA on separate UHF frequency 3. Inability of OIC to communicate with staff/recall 4. Lack inability of communication with Airport safety. 5. Multiple communication streams OIC has reduced ability to monitor all devices. 6. No ability to communicate and coordinate with arriving agencies	1. Additional staff/officer within EM role. 2. Revise 90min response time for AALL/CoC. 3. Permanent FCC with enhanced emergency management. 4. Remote FCC/Centralised FCC. 5. Designated rescue frequency/ECO to CABA teams. 6. Digital radio. 7. Dedicated comms with safety officer. 8. Review communications with responding resources (interoperability) to include direct comms with responding agencies (radios, blue card system as per ACT/NSW). 9. Radio positioned in Airport ICS Van (Melbourne).
	Inability to communicate with FC due to single phone.	1. Review of local procedures. 2. Equipment/phone.
	Inability to communicate with disembarked flight crew to inform size-up.	1. Additional staff.
Decontamination/ Heat Stress	Firefighter donning CABA from vehicle after being in contaminated area/fire ground.	1. Review of decontamination procedures. 2. Additional CABA available from external of vehicle (additional up to 2 sets) (location of sets extra sets).

Category	Pinch-point Description	Mitigators
Decontamination/ Heat Stress	Potential lack of sufficient resources to establish and assist with decontamination/heat stress prior to CABA team exit from aircraft.	1. Fireground equipment ready to be deployed via trailer/ (General Use Vehicle) (existing/modified). 2 Additional firefighters to obtain and set up equipment. 3. Review vehicle stowage for decon. 4. Review decontamination procedures. 5. Review external resources capability. 6. Review what external resources will be used for on fireground.
	Inability to utilise station-based equipment required for fireground (CABA board easel, hazardous material equipment, Decontamination equipment, heat stress equipment).	1. Advice on continuing and improving heat stress management procedure (inclusive of review of equipment, active cooling on the fireground). 2. Review PPE with intent to improve PPE to consider heat stress considerations. 3 Review capability to enhance vehicles to ensure cool environment prior to PPE/CABA activities. 4. Review of fireground operations to support firefighters remaining in vehicle (when applicable) to reduce exposure to heat stress/ HOTS environment. 5. Additional staff to assist in reducing workload and potential subsequent heat stress. 6. Ability to utilise heat stress equip. 7. Fireground equipment ready to be deployed via trailer/ General Use Vehicle (existing/modified). 8. HRET Nozzle. 9. Formalise staff recall requirements - ability to utilise recalled staff. Dedicated on call staff - Staff CoC. 10. Technology to monitor temp/heat stress of firefighters. 11. CoC arriving staff to assume the role of establishing heat management of staff. 12. Additional fire fighter - delayed FCC response in separate vehicle - allowing time for quick establishment of heat stress equipment (Broome as example).
External Agencies	Limited external med resources to assist (ARFFS CABA team on exit)	1. Additional firefighters.

Category	Pinch-point Description	Mitigators
External Agencies	There is a question mark over the suitability and number of the arriving resources and their ability to aid ARFFS within a suitable timeframe inclusive of initial and subsequent arrivals.	1. pre-determined rapid deployment team/s for remote locations such as Hamilton Island/Port Hedland. 2. Additional firefighters/vehicle. 3. Investigate the ability of staff on recall to effectively reach the station during a major incident (roadblock) - may require ARFF identification. 3 Review of capability of technology for recall (potential text message). 4. Undertake analysis relating to supporting services, to identify expectations of real ability to respond. 5. Guarantee availability of spare vehicle. 6. Clarification on ARFFS requirements to achieve tasks and objectives beyond arriving external resources. 7. Review of ARFFS call back procedures Strengthening recall procedures inclusive of ability to recall Hamilton Island and Mackay staff. 8. Review Interoperability of ARFFS and other services (procedures, equipment, and communication).
Fireground	Uncertainty regarding ARFFS role in directing evacuating passengers	1. Additional firefighter/officer. 2. Review of ARFFS role regarding directing evacuating passengers.
	FB10X deployed on fireground when vehicle available resulting in heavy workload for firefighter.	1. Remain in vehicle and utilise monitor/bumper monitor. 2. HRET. 3. 50% reduction in bumper monitor output to conserve agent.
	FB10X not deployed on starboard of aircraft prior to work carried out.	1. Review of strategies and tactics. 2. Additional supervisory officer on the starboard side.
	FC is maintaining fire ground protection resulting in the inability to engage with safety officer / emergency management and maintain fire ground safety	1. Provision of a second / additional supervisory Officer. 2. Additional staff member (fire fighter) to make available Supervisory Officer.

Category	Pinch-point Description	Mitigators
Fireground	FC/firefighter operating in a HOTS environment without CABA.	1. Additional firefighters. 2. Equipment to improve entry/egress into aircraft to alleviate staff from working into HOTS environment. 3. Formalised "hot zones" identified (standardised PPE requirements for aircraft incidents) to support size up. 4. Investigate various levels of PPE (Respirators through to CABA) (air stairs).
	Inability to effectively maintain foam blanket from a static position	1. Additional firefighters/s. 2. HRET vehicle. 3. Vehicle with larger capacity to stay mobile longer. 4. Additional vehicle.
	Initial attack and back up line (2 lengths) insufficient to complete tasking.	1. Review strategy and tactics. 2. Additional firefighter.
	Insufficient resources to commence an attack on internal fire from external of aircraft.	1. Additional firefighter.
	Insufficient staff to maintain fire ground protection whilst entry and exit is underway	1. Provision of a second / additional supervisory Officer. 2. Additional staff member (firefighter) to make available Supervisory Officer.
	Insufficient staff to sustain operations until responding resources arrive	1. Additional firefighter.
	Lack of resources to support the provision of ancillary equipment into hot zone (Category 5/6)	1. Additional firefighter.

Category	Pinch-point Description	Mitigators
Fireground	Reduced ability to manage port and starboard sides of aircraft.	1. Provide additional Officer/firefighter resource (potential dedicated fireground safety officer). 2. Provide additional training to other staff to perform size-up activities. 3. Additional firefighter with advanced team leader training (Sub-Station Officer) to (become CABA team leader) (allowing Station Officer to remain external as starboard sector).
	Limitation of staffing to support preparation of future objectives (preparing for next stages of operation)	1. An additional staff member (fire fighter).
	FC has a loss of situational awareness and fire ground safety.	1. Additional supervisory officer / fire fighter. 2. Application of procedure - dedicated of Fire Ground Safety officer. 3. Additional fire fighter with appropriate qualification for level 2 incident. 4. Review of training and assessment standards at ARFFS training (need for officer internal of aircraft).
	Nil backup line / insufficient staff to deploy back-up line. (Category 5)	1. Additional primary attack vehicle. 2. Additional staff member.
	Nil fire protection on s/board side.	1. Additional fire fighter staff. 2. Additional equipment to support additional fire fighter (FB10X, CABA, hose etc). 3. Additional primary attack vehicle. 4. Exploration of potential to utilise HRET on future acquisition.
	Reduced ability to observe s/board side of aircraft - reduced ability to undertake complete size-up due to single officer / single vehicle. (Category 5)	1. Additional supervisory Officer. 2. Additional primary attack vehicle. 3. Additional responding General Use Vehicle supporting the Officer.
	Reduced ability to undertake fireground safety whilst tasked with don PPE CABA.	1. Additional firefighter. 2. Review of strategy and tactics.

Category	Pinch-point Description	Mitigators
Fireground	FF8 shuts down defensive attack - potential for conditions to escalate prior to CABA team making entry.	1. Additional Firefighter. 2. Additional equipment for (CABA etc). 3. Additional attack line.
	Reduced ability to undertake full size up of incident	1. Provide additional Officer/firefighter resource. 2. Provide additional training to other staff to perform size-up activities. 3. FCV. 1. FC not positioned in attack vehicle. 2. FC positioned on a command vehicle.
	White out T1 - down wind application of agent	1 Review of strategy and tactics to negate white out. 2. OIC decision making.
	Charging of attack line before or after entry.	1. Additional training / clarification regarding making entry into aircraft with a charged/uncharged line (standardised approach). 2. Additional Firefighter (charge line).
Internal Operations	The ability to safely access / egress the aircraft via ladder.	1. A review of access/egress of aircraft. 2. A review potential to utilise onsite aircraft access equipment. 3. Review to include training.
	Delay to deploy ancillary equipment into the aircraft.	1. Review procedure/process used to enable equipment to be taken aloft inclusive of ladder procedures. 2. Review of current equipment used for overhaul/internal operations- is it fit for purpose.
	Delay in controlling internal conditions.	1. Additional firefighters/s. 2. HRET/snozzle. 3. Rapid Attack Team.

Category	Pinch-point Description	Mitigators
Internal Operations	Lack of multiple CABA team for multi aisle aircraft	1. Additional firefighters. 2. Additional equipment for CABA Team (Thermal Imaging Camera /CABA). 3. HRET/Snozzle to create internal conditions that support CABA team prior to entry.
	Firefighter fatigue from fireground workload prior to internal operations	1. Designated/clarification of roles for external and internal operations. 2. Additional fire fighter.
	Inability to manoeuvre hose / advance hose and utilise ancillary (Thermal Imaging Camera) whilst progressing down fuselage.	1. Additional staff - availability of an additional CABA team member to supporting existing team, creating a team of 3. 2. Introduction of 38mm hose. 3. Review of equipment required for CABA use.
	Lack of officer oversight / management for internal environment	1. Additional staff member (fire fighter) to make available Supervisory Officer. 2. Provision of a second / additional supervisory Officer. 3. Enhancement to training so that fire fighter staff can better perform relevant roles inside the aircraft absent of Officer oversight.
	Nil persons available to continue casualty management / first aid inside aircraft.	Provide two additional firefighting staff.
	1. Suitability of the Gas Alert Micro (GAM) (inability to bump test) to sense internal HOTS environment.	1. Acquire a more fit for purpose / user friendly sensing device suitable for the interior of aircraft. 2. Review of procedural use of the GAM and when to use in firefighting procedures. 3. Better training and understanding of when and what we are assessing.
Response	Inability to achieve 3-minute response time to all thresholds with one vehicle (Category 5 Brisbane) resulting in delay to achieve Q1.	1. Secondary vehicle with officer (one at each station).

Category	Pinch-point Description	Mitigators
Response	Inability to achieve initial (vacating station) response preparedness time due to the delay in departure associated with the FCC operator (Category 5 Brisbane)	1. Establish FCC operator independent of category.
	Response procedures relating to first and second response to aviation incident. FC in first or second vehicle (sunshine coast)	1. Review of policy and procedure regarding first arriving officer. (Certificate IV). 2. Review local instructions regarding the above.
	Sydney operates 2 stations with FCC operating from Station 2.	1. Staff dispositions for CATEGORY 9 documented in Local Instructions. 2. Permanent FCC operator.
	Delay in arrival due to distance of travel required to New Parallel Runway Brisbane	1. Additional vehicle.
	Inability to traverse RESA 01L (direction per Brisbane Airport Corp). (Brisbane)	1. Confirm with aerodrome operator RESA capability/AEP. 2. Alternative routes to incident (pre-plan). 3. Vehicle capability.

Category	Pinch-point Description	Mitigators
Staff	Lack of timely response by supporting emergency management resources. (AALL/ CoC)	1. Revise the '90-minute response time' - more suitable / shorter timeframe aligned with TRA timeframes (15-20min mark) inclusive of CoC review. 2. If effective 15m response times cannot be achieved - on-shift Emergency Manager exclusive of superintendent's role as part of broader AIMS structure. 3. Permanent FCC operator with enhanced Emergency Management / control / communication elements 4. Undertake review of emergency management function and resource analysis to determine staffing requirements. 5. Enhance technology to support emergency management (FC access to iPad / laptop etc.). 6. Review of staff recall (technology to improve and enhance timeframe). 7. Use of the ARFFS National Resource Centre (Ops- 143). 8. Rostered CoC emergency management function. 9. Utilise aerodrome staff until communications with Line Leader can be established and/or staff recall in place. Associated agreement/training for aerodrome staff to fill this initial role.
Staff	Inexperience of staff at stations with a high number of recruits (e.g. Whitsunday coast)	1. Additional supervisory officer. 2. Utilising the rank of Sub-Station Officer as a requirement for crewing. 3. Consideration of rank/service time when recruiting multiple positions (workforce deployment).
Staff	The ability of CoC with Yulara being 430km and lack of qualified staff to take on CoC role.	1. Increased levels of qualifications at both locations (to ensure single aerodrome/model for incident management. 2. Review of local arrangement (both aerodromes).
Staff	Unclear roles of ARFFS recall staff	1. Formalise recall of ARFFS staff and roles they will be required to complete. 2. Review of the structure of roles and responsibilities of arriving off duty staff.

Appendix B Workshop Locations, Participants and Observers

Table 1B - TRA participants – Adelaide Category 5 (7 APR 2021)**

Name	Position
[redacted]	Operational Risk and Safety Specialist
	TRA Facilitator
	TRA Facilitator
	ARFFS Standards Lead
	Local Operations Manager / Line Leader
	Fire Commander
	Fire Commander
	Station Officer
	Sub Station Officer
	UFUA

Table 2B - TRA participants – Adelaide Category 8 (3 SEP 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	Sub Station Officer
	Operational Risk and Safety Specialist
	UFUA
	UFUA
	UFUA

Table 3 B - TRA participants – Alice Springs Category 7 (6 JUL 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	Service Change
	Operational Risk and Safety Specialist
	Operational Standards
	UFUA
	UFUA

Table 4B - TRA participants – Avalon Category 8 (16 AUG 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	Sub Station Officer
	Sub Station Officer
	Service Change
	Operational Risk and Safety Specialist
	Deputy Chief
	UFUA
	UFUA
	UFUA

Table 5B - TRA participants – Ballina Category 6 (17 JUN 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	Sub Station Officer
	Operational Risk and Safety Specialist
	UFUA
	UFUA

Table 6B - TRA participants – Brisbane Category 5 (31 MAR 2021)**

Name	Position
[redacted]	Operational Risk and Safety Specialist
	TRA Facilitator
	TRA Facilitator
	ARFFS Standards Lead
	Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	UFUA

Table 7B - TRA participants – Brisbane Category 9 (12 OCT 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	Sub Station Officer
	Sub Station Officer
	Sub Station Officer
	Operational Risk and Safety Specialist
	UFUA
	UFUA
	CASA

Table 8B - TRA participants – Broome Category 6 (22 JUN 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Sub Station Officer
	Leading Firefighter
	Leading Firefighter
	Service Change
	Operational Risk and Safety Specialist
	Deputy Chief
	Operational Standards
	UFUA

Table 9B - TRA participants – Cairns Category 5 (6-7 OCT 2020)**

Name	Position
[redacted]	Operational Risk and Safety Specialist
	ARFFS Standards Lead
	Local Operations Manager
	Fire Commander
	Fire Commander

Table 10B - TRA participants – Cairns Category 8 (19 AUG 2020)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Fire Commander
	Fire Commander
	A/Fire Commander
	Fire Commander
	Station Officer
	A/ Station Officer
	Station Officer
	Sub Station Officer
	Service Change
	Operational Risk and Safety Specialist
	UFUA
	UFUA

Table 11B - TRA participants – Canberra Category 8 (19 AUG 2020)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Sub Station Officer
	Service Change
	Operational Risk and Safety Specialist
	Deputy Chief
	UFUA
	UFUA
	UFUA

Table 12B - TRA participants – Coffs Harbour Category 6 (14 JUN 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Sub Station Officer
	Service Change
	Deputy Chief
	Operational Standards
	Operational Risk and Safety Specialist
	UFUA
	UFUA

Table 13B - TRA participants – Coolangatta Category 8 (14 SEP 2021)

Name	Position
[redacted]	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	Station Officer
	Sub Station Officer
	Operational Risk and Safety Specialist
	Service Change
	UFUA
	CASA

Table 14B - TRA participants – Darwin Category 8 (01 SEP 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager
	A/Fire Commander
	A/Station Officer
	Service Change
	Operational Risk and Safety Specialist
	UFUA
	UFUA

Table 15B - TRA participants – Gladstone Category 6 (3 JUN 2021)**

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Fire Commander
	Service Change
	Deputy Chief
	Operational Standards
	UFUA
	UFUA

Table 16B - TRA participants – Hamilton Island Category 5 (22 APR 2021)**

Name	Position
[redacted]	Operational Risk and Safety Specialist
	TRA Facilitator
	TRA Facilitator
	ARFFS Standards Lead
	Local Operations Manager / Line Leader
	Fire Commander
	Sub Station Officer

Table 17B - TRA participants – Hamilton Island Category 7 (05 AUG 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	UFUA
	Operational Risk and Safety Specialist
	UFUA

Table 18B- TRA participants – Hobart Category 5 (14-15 OCT 2020)**

Name	Position
[redacted]	Operational Risk and Safety Specialist
	Operational Standards Specialist
	ARFFS Standards Lead
	Local Operations Manager
	Fire Commander
	Sub Station Officer
	Sub Station Officer

Table 19B - TRA participants – Hobart Category 7 (03 AUG 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager
	Fire Commander
	Station Officer
	Sub Station Officer
	Service Change
	Operational Risk and Safety Specialist
	UFUA
	UFUA
	UFUA

Table 20B - TRA participants – Karratha Category 5 (4 MAY 2021)**

Name	Position
[redacted]	Operational Risk and Safety Specialist
	TRA Facilitator
	TRA Facilitator
	ARFFS Standards Lead
	Local Operations Manager / Line Leader
	Fire Commander
	Leading Fire Fighter
	UFUA

Table 21B - TRA participants – Karratha Category 6 (29 JUN 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Leading Fire Fighter
	UFUA

Table 22B - TRA participants – Launceston Category 7 (14 JUL 2020)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager
	A/Fire Commander
	A/Station Officer
	Sub Station Officer
	Service Change
	Operational Risk and Safety Specialist
	UFUA

Table 23B - TRA participants – Mackay Category 7 (26 JUL 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager
	Fire Commander
	Station Officer
	Service Change
	Operational Risk and Safety Specialist
	Deputy Chief
	UFUA

Table 24B - TRA participants – Melbourne Category 9 (14 OCT 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	Station Officer
	Chief Fire Officer
	Operational Risk and Safety Specialist
	UFUA
	UFUA
	CASA

Table 25B - TRA participants – Newman Category 6 (1 JUN 2021)**

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Service Change
	Deputy Chief
	Operational Standards
	UFUA

Table 26B - TRA participants – Perth Category 9 (30 SEPT 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	A/Fire Commander
	Fire Commander
	Station Officer
	Operational Risk and Safety Specialist
	Service Change
	Deputy Chief
	UFUA
	UFUA
	CASA
	CASA

Table 27B - TRA participants – Port Hedland Category 5 (10 MAY 2021)**

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	UFUA
	UFUA

Table 28B - TRA participants – Port Hedland Category 6 (02 AUG 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Sub Station Officer
	Leading Fire Fighter
	Service Change
	Operational Risk and Safety Specialist
	Deputy Chief

Table 29B - TRA participants – Rockhampton Category 6 (15 JUN 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	Service Change
	Operational Risk and Safety Specialist
	Deputy Chief
	Operational Standards

Table 30B - TRA participants – Sunshine Coast Category 5 (15 APR 2021)**

Name	Position
[redacted]	Operational Risk and Safety Specialist
	TRA Facilitator
	TRA Facilitator
	ARFFS Standards Lead
	Local Operations Manager / Line Leader
	Acting Local Operations Manager / Line Leader
	Fire Commander
	Sub Station Officer

Table 31B - TRA participants – Sunshine Coast Category 7 (08 JUL 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Acting Local Operations Manager / Line Leader
	Fire Commander
	Sub Station Officer
	Operational Risk and Safety Specialist

Table 32B - TRA participants – Sydney Category 9 (08 OCT 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	A/Station Officer
	Station Officer
	Station Officer
	Operational Risk and Safety Specialist
	UFUA
	UFUA
	UFUA
	CASA

Table 33B - TRA participants – Townsville Category 7 (28 JUL 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	A/Local Operations Manager / Line Leader
	Fire Commander
	Station Officer
	Sub Station Officer
	Service Change
	Deputy Chief
	Operational Risk and Safety Specialist
	UFUA
	UFUA

Table 34B - TRA participants – Whitsunday Coast Category 6 (24 JUN 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Acting Local Operations Manager / Line Leader
	Fire Commander
	Sub Station Officer
	Service Change
	Deputy Chief
	Operational Risk and Safety Specialist
	Operational Standards
	UFUA

Table 35B - TRA participants – Yulara Category 6 (05 JUL 2021)

Name	Position
[redacted]	TRA Facilitator
	TRA Facilitator
	Acting Local Operations Manager / Line Leader
	Fire Commander
	Operational Risk and Safety Specialist

Table 32B - TRA participants – Sydney Category 10 (16 Aug 2022)

Name	Position
[redacted]	TRA Facilitator
	Local Operations Manager / Line Leader
	Fire Commander
	A/Station Officer
	Operational Standards
	Operational Standards
	Operational Risk and Safety Specialist
	UFUA
	UFUA
	CASA

* Participants involved in the Risk Assessment Workshop.

** All workshop participants were involved in Risk Assessments. These assessments were completed within the TRA workshop.

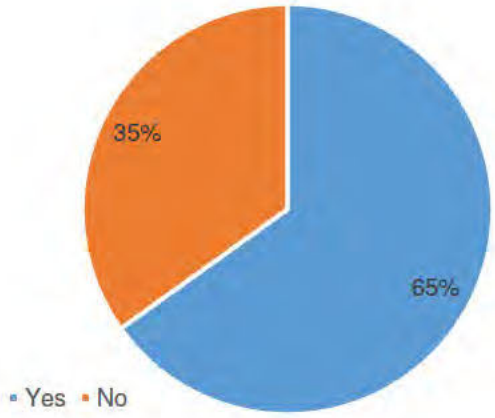
*** Participants involved in risk assessment workshops only.

Appendix C TRA Storyboard Example

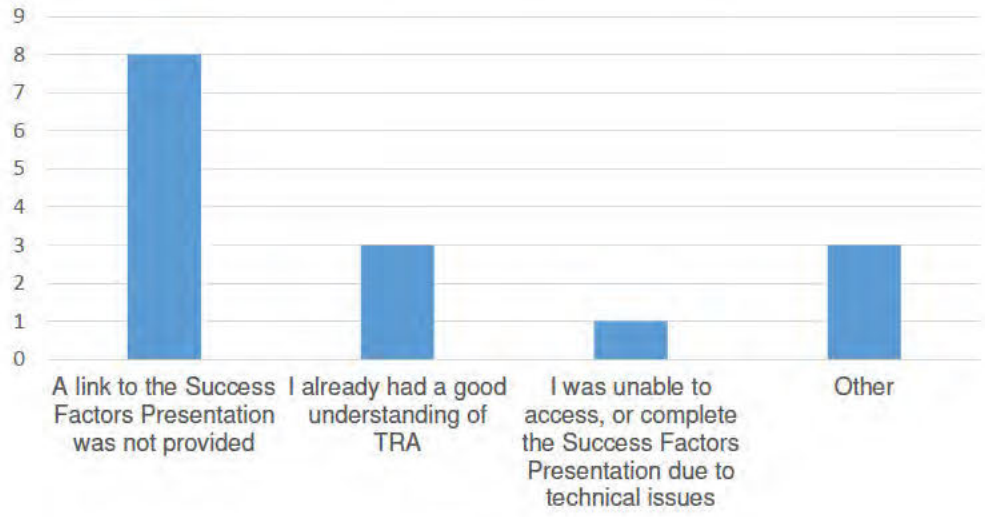
Task /	Time	Activity	Activity Duration	Activity Completion time	Task Status	CABA Tracker	PP Marker	Staff and Vehicle Deployment													
								Response Vehicle (T1)					Response Vehicle (T2)					Response Vehicle (T3)			
								M	Avl	PC	FF1	FF2	M	Avl	SO	FF3	FF4	M	Avl	FF5	FF6
1. Meet required response time	0:00:00	**Call information received - crash alarm operated**		0:00:00																	
	0:00:00	**Evacuation of ACFT commences**	90	0:01:30						x	x	x			x	x	x			x	x
	0:00:00	Crew respond to and mount vehicle	45	0:00:45						x	x	x			x	x	x			x	x
	0:00:45	T1 - Vehicle departs station	135	0:03:00						x					x	x	x			x	x
	0:00:45	FC commences incident SIZEUP - confirms AEP initiated	20	0:01:05						x	x	x			x	x	x			x	x
	0:00:45	T2 - Vehicle departs station	140	0:03:05						x	x	x			x	x	x			x	x
	0:01:05	FC attempts to contact aircraft. Nil response	45	0:01:50						x					x	x	x			x	x
	0:01:10	T3 - Vehicle departs station	135	0:03:25						x	x	x			x	x	x			x	x
	0:01:30	**Evacuation complete (relative to those that can evacuate)**								x	x	x			x	x	x			x	x
	0:01:50	FC continues incident SIZEUP and formulation of initial action plan. FC communicates with fire fighters in vehicle.	70	0:03:00						x					x	x	x			x	x
	0:02:40	**T1 Crew observe a group of people moving away from the ACFT starboard side. Large fire port-side - impinging fuselage.**								x	x	x			x	x	x			x	x
	0:02:40	FC directs T1 on arrival pump and roll - p/side rear of aircraft transitioning to mobile operations along p/side utilising dispersed pattern	15	0:02:55						x	x	x			x	x	x			x	x
	0:02:55	FC communicates with T2 via UHF tasking them on arrival to position p/side rear at 45 degrees and commence monitor operations	15	0:03:10						x					x	x	x			x	x
	0:03:00	**T1 arrives on scene**								x	x	x			x	x	x			x	x
2. Control the external fire	0:03:00	T1 pump and roll - p/side rear of aircraft transitioning to mobile operations along p/side utilising dispersed pattern (20 seconds @ 100% discharge - 6% foam)	20							x	x	x			x	x	x			x	x
	0:03:05	**T2 arrives on scene**								x	x	x			x	x	x			x	x
	0:03:05	T2 pump roll monitor operations commence (35 seconds @ 100% discharge - 6% foam)	35	0:03:40						x	x	x			x	x	x			x	x
	0:03:10	FC communictes with T3 via UHF tasking them on arrival to position front of aircraft portside at a 45 degree angle and commence monitor operation.	15	0:03:25						x	x	x			x	x	x			x	x
	0:03:20	T1 ceases mobile application and repositions p/s nose of aircraft - FC and crew reassessing operations	15	0:03:35				1,600	2,400	x	x	x			x	x	x			x	x
	0:03:25	**T3 arrives on scene**								x	x	x			x	x	x			x	x
	0:03:25	T3 commences monitor operations for 30 seconds @ 100% discharge - 6% foam on the p/side.	30	0:03:55						x	x	x			x	x	x			x	x
	0:03:30	**Fire not yet under control.**								x	x	x			x	x	x			x	x
	0:03:35	FC directs T1 - continue monitor operations (15 seconds @ 100% dichgarge- 6%)	15	0:03:50						x	x	x			x	x	x			x	x
	0:03:40	**T2 ceases application**								x	x	x	2,800	4,200	x	x	x			x	x
	0:03:50	**T1 ceases application**						1,200	6,000	x	x	x								x	x
	0:03:55	**T3 ceases application**								x	x	x						2,400	6,000	x	x
	0:04:00	**FC observes fire ground - 90% knockdown achieved (Q1). (Fire Controled utilising 8,000 litres agent - Q1 requirement is 7767 L) - Crew observe slow fuel leak - port mainplane**								x	x	x									
3. Protect escape slides and exit routes	0:04:10	FC directs T2 to reposition on the nose of the aircraft - s/s and protect escape routes and slides. FC designates SO s/s sector to control and provide sit-rep	15	0:04:25						x					x	x	x				
	0:04:25	T2 manoeuvres to reposition on S/side	30	0:04:55						x					x	x	x				
	0:04:25	FC directs T3 to remain mobile and apply foam to any pockets of fire on the p/s	15	0:04:40						x					x	x	x			x	x
	0:04:40	T3 undertakes mobile operations applying foam and extinguishing pockets of remaining fire p/s aircraft (utilising combinations of roof monitor and bumper monitor)	130	0:06:50						x					x	x	x			x	x
	0:04:40	FC directs FF1 - remain in vehicle and don PPE.	10	0:04:50						x					x	x	x			x	x
	0:04:50	FF1 commences donning of PPE.	80	0:06:10						x	x				x	x	x			x	x
	0:04:50	FC direct FF2 to don PPE- deploy 1 line, 2 lengths, FB10X from T1 to nose of aircraft. Charge the line	15	0:05:05						x	x	x			x	x	x			x	x
	0:04:55	**T2 positioned on S/side protecting escape routes and slides**		0:04:55						x	x	x			x	x	x			x	x
4. Assist in the self-evacuation of the aircraft										x											
5. Create a survivable situation	0:04:55	SO directs FF3 to remain in vehicle don PPE and maintain fire ground protection, and directs FF4 to don PPE and CABA	15	0:05:10						x											
	0:05:05	FC and FF2 alights vehicle - dons PPE.	80	0:06:25						x	x	x					x			x	x
	0:05:10	FF4 commences donning PPE and CABA	170	0:08:00			PPE			x	x	x					x			x	x
	0:05:10	FF3 remains in T2 and commences donning PPE	80	0:06:30																	
	0:05:10	SO provides brief sit rep to FC via UHF - Nil fire on starboard side, nil passengers evacuating from aircraft. All slides deployed.	20	0:05:30						x											

Appendix D Post TRA Participant Survey Results

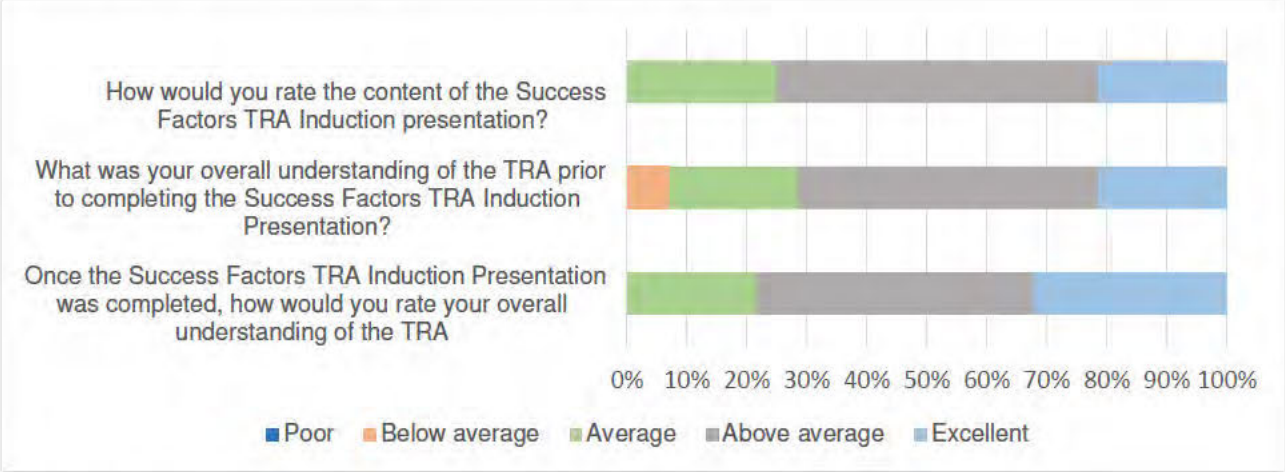
Question 1. Did you complete the Success Factors TRA Induction Presentation prior to the TRA workshop?



Question 2. If you answered No in Question 1, please advise a reason, and proceed to Question 4.



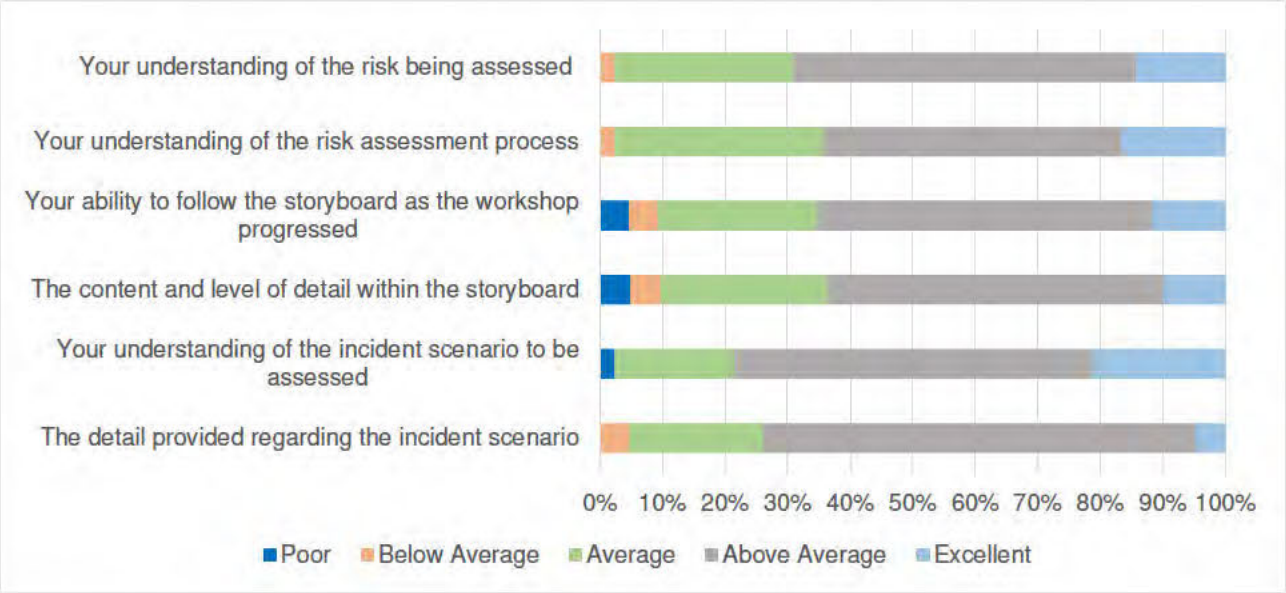
Question 3. If you answered Yes in Question 1, please rate the following?



Question 4. If you answered yes in Question 1, how could the online presentation be improved?

- Is there a need with all the stations having exposure to the TRA now?
- Little bit more detail on the actual process.
- Too long ago to remember exactly.
- More information around the reason for doing the TRA.
- Explain risk assessment in a little more detail especially around future deliverables.
- Current process (from what I remember) was already ok.
- This is a new way of thinking for ARFFS and just a matter of educating all staff on what TRA is and how it may affect us either positively or negatively. I think certain staff already have a preconceived idea of what we should have rather than going in with an open mind.
- An online Teams meeting before the TRA with Q and A and explanations
- Further background information and suggested links for less experienced staff/ officers to gather details prior to TRA.
- Further detail and understanding of the TRA exercise and why the exercise went through without any potential setbacks or issues from ARFFS performance.

Question 5. Please rate the following regarding the various sections of your station's TRA workshop



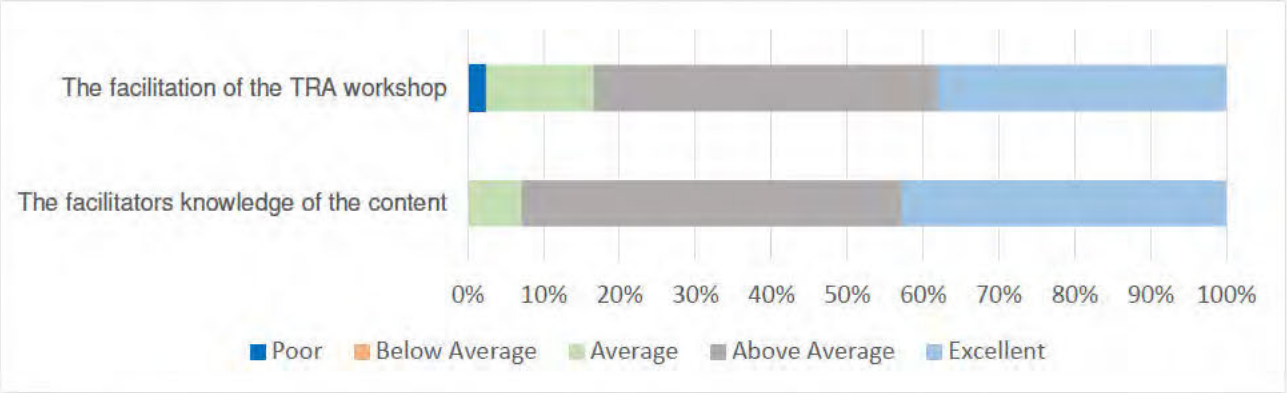
Question 6. How could any of the above sections of the TRA Workshop be improved?

- There was no visual advancement on the storyboard. There is an area for massive improvement utilizing minimal technology, (some we have at hand).
- What happens after supporting resources arrive.
- TRA is a snapshot in best conditions - it only gets worse from there. Not sure if that goes back to the powers that be.
- I feel the risk assessment should cover things such as the extra staff needed for a RIT, it obviously has a set parameter where it ends but I don't feel this encapsulates all the staffing risks that would be presented.
- Too long ago.
- Location specific.
- "More believable scenario. These are the sections of the scenario that were a bit iffy.
- The speed at which the aircraft was evacuated.
- The effectiveness of removing people off the plane with exit slides that were at an almost horizontal state (plane landed belly up).
- The unrealistic speed to which the aircraft was rendered SAFE to allow external agencies into the HOT ZONE (this factors in extra ARFFS staff needed to realistically render the area SAFE).
- Running staff through how a risk assessment is completed as per Airservices policies. Some staff were not aware on how to complete a risk assessment generally.
- I believe staff were in general agreement; to understand that the scenario is to proceed regardless of identified operational shortcomings. The process may be improved by further educating participants to let the process continue, regardless if actions can be carried out or not. It was once we reached the end

of the process, we understood why this format is to be followed through to the end.

- If TRA is location specific the story board may need more flexibility
- I believe that the people who conduct the TRA should also be involved in the Risk Assessment.
- "A printed story board provided to participants to follow along as opposed to the facilitator scrolling on the only copy.
- The story is known by the facilitator, yet the participants are seeing it for the first time. Many requirements from SOPs were missed in the story board and where not allowed to be added."
- I have no suggested improvements.
- Scenario sent out to participants prior to TRA so that they can understand the intricacies involved, and by that, I mean develop a full understanding of the role the various FF are undertaking throughout the process, as the context can be easily lost when these meetings reconducted via teams, skype, WebEx and the like.
- The person doing the TRA for the station should be the same person to do the risk assessment.
- Due to the workshop being done via teams online there was a lag with documents being presented which made it hard to follow at times when scrolling back and forth between the timelines. Having a copy of our own to follow would have made it a bit easier.
- Visual aids and placement of resources. Risk assessments to include loss of control hazards.
- Be nice to potentially have the incident scenario and storyboard available in real time on station. Understand issues with COVID and the TRA taking place online. Would have been advantageous to have a hard copy of everything as we went through the TRA process to continually refer to.
- More online information sessions.
- Pre discussion to assist a greater understanding of what the objectives and potential outcome would be.
- "The generic nature of the storyboard was not appropriate. It would be a preference to have the individual sites operating model and actual timings inputted into the scenario presented. not the one size fits all.
- The end time of TRA should be reviewed for accuracy as remote locations that have few resources should not be reviewed as adequate to achieve the (sufficient to ensure the ARFFS is no longer reliant upon its own resources).
- Storyboard lacked detail of staff/resource requirements once inside an aircraft for search and rescue. Lack of testing and data was used as the excuse.
- There were too Many "Just assume it’s all ok" moments for it to be a realistic storyboard.

Question 7. How would you rate the following in regard to the facilitation of the TRA workshop?

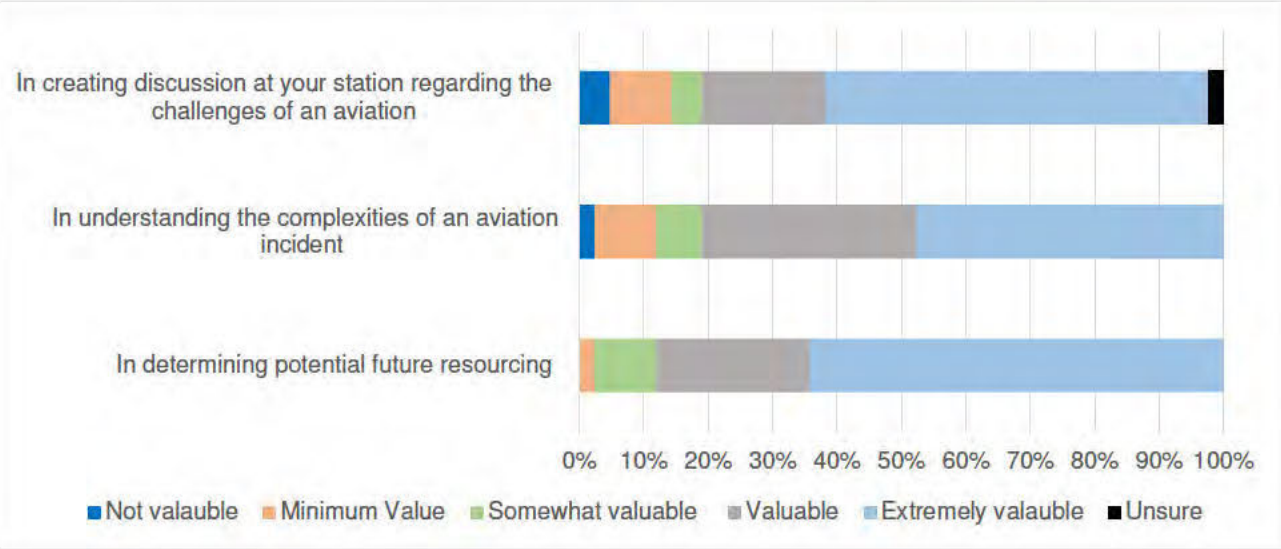


Question 8. How could the facilitation of the TRA be improved?

- The instructors were good with extensive knowledge in this area, there is definitely a realisation that we are understaffed during these exercises, however, there has been no impact to operations.
- Facilitators were good - process perhaps could have been sped up at times but overall allowed for good impute from staff.
- I feel an in-person workshop would be better, remote still works fine but that would be an improvement I would make.
- Too long ago.
- Face to Face.
- Overall great knowledge of the facilitation team however as stated earlier, if the scenario was more realistic, it would inevitably be more believable.
- Outside of COVID I believe an in-person desk top interactive would be beneficial.
- Pinch points where delayed to later in the story board. While this did not seem to affect the TRA at the time on completion of the story board Facilitators where proud that pinch point where later in the time line and that the early stages showed little issues that was in fact not true and was to the facilitator delaying the entry to a later time.
- I have no suggested improvements.
- More time for understanding and discussion. The whole process seemed rushed, which can create doubts about the authenticity of the whole process.
- The TRA could be improved by using simplified descriptions of the TRA process during the introduction specifically around how the data collection was to occur, as well as a more detailed explanation of how the data collected from the TRA will be used in the future during the presentation's conclusion.
- Presenters delivered well.
- COVID issues forced facilitation to be online. Face to face could be better. Hard copies of the storyboard and incident. Having time away to research what we may need from a local point of view so as not to miss anything.
- Great team with a good understanding of subject.

- Process was run very well. Having experienced participants and the Union involved as well enabled a well-rounded group.
- Can't improve on [redacted]
- More sophisticated tools to present the dynamic nature of the process, live modelling.
- Listen to feedback on pinch points rather than argue their validity. i.e. Provision of additional resources to assist in the control of an incident but not the staff numbers to staff those resources.
- Focus on the local issues of the station/site that are raised. Don't just say for the sake of the storyboard we have to assume something. If a station has to operate a specific way, then that is how the story board so run.

Question 9. Do you believe the TRA was a valuable process?



Question 10. Did your station's TRA highlight any aspects of operations you would like ARFF Standards to review? If so, please provide details.

- Lack of resources, both at Category 6 and limited arriving resources.
- "Yes, Regional locations have limited resources and limited response from external agencies.
- The AALL being up to 90 minutes away is unhelpful to FC on shift in a major incident, it places so much, more pressure on them. As a minimum an extra staff member for FCC and communications to ensure all notifications and recall happen would be a forward step"
- Staffing levels for Cat 6 aren't enough.
- Too long ago.
- Staffing.
- The dire need for more staff members at an incident particularly more officers to help the FC. Still don't understand why the TRA covers the AALL at the station at all times? In the real world, we know that this position is tied up with meetings away from the station from time to time and emergencies are unpredictable, so I

find it very interesting how you are going to make the AALL here at the station from start to finish. You would be much better off with an extra officer DIPLOMA rated as a minimum in the event the AALL is called away making sure that if the AALL has to be called away, you have someone to take that role.

- Hamilton Island agent capacity.
- Reference ARFFS Launceston's findings.
- The use of TRA to assess staffing when implementing new procedures i.e. Heat stress, CABA SSW.
- The need for ARFF to provide guidelines around Q3 for internal FF including quantity, critical flow rates. management of agent and reserves for withdrawal of crew.
- The current recall of off duty staff is unquantifiable in both number of staff and timeframes, look at utilising on duty staff at other units where geographically possible and back fill"
- Longer term response requirements. Heat related conditions, longer term crew/recall required, decontamination, prolonged CABA, Internal casualty rescue.
- Especially transport of equipment from the station and who can facilitate this in a realistic timeframe."
- rescue equipment improvements
- Yes, as noted in the TRA applicable to our station, our ARFF Standards team need to develop strategies and tactics for egressing / relocating mass casualties and/ or injured casualties from a crashed aircraft, and also develop realistic instructions and procedures around triaging mass casualty events. Further, we need to develop better access to crashed aircraft than ladders.
- More on BA safe systems of work, and people roles, including decontamination
- remission factor
- It's all well and good to have findings but unless those findings/outcomes are followed through on it will just be words on a paper.
- Staffing levels and how this will be addressed through ARFFs Standards.
- Knowledge of all staff in respect to a major incident. Many staff members have very little insight as to what to expect when responding to a major incident.
- Yes, application of procedures/multiple procedures. Struggle to create safe working environments in low resourced stations.
- Heat stress capability and staffing requirements
- Staff numbers, heat stress, equipment
- AALL response time. FCC staffed during an incident.
- The TRA conducted identified the RESA area at both ends of the runway are DTO ops. ARFFS cannot successfully meet the regulated response time during the winter months if an incident played out as was provided.
- All staff at all levels would benefit from undertaking and participating in a TRA
- Staffing levels for the level of service provided and staffing the required vehicles in addition to managing arriving agencies.
- Nil

- The operating Model in Brisbane has multiple high risks involved with the minor continuous agent overlap reduced immediate availability of the required number of vehicles to achieve an appropriate coverage of a 3D incident site when applied to either CAT 8 with Cat 8 resources and CAT 9 operations. The success is only possible if there was no delay in the crossing of the non-emergency, active runway (highly unlikely).
- "Internal aviation incident staffing requirements
- Additional resource staffing requirements"
- Yes, Plenty, Modern Vehicles, Modern Technology, Effective training and upskilling, Crewing numbers.
- Severely under resourced for a major aviation incident.

Question 11. Are there any further comments or suggestions you would like to make regarding any aspect of the TRA workshop?

- Great piece of work and full credit to ASA for taking it on, it would be great to see this transpire into a workable staffing model at stations. i.e. who sets up the heat stress station, how is the de-con equipment transported to site
- TRA was very interesting, keep them coming for all operational areas.
- I am not convinced ASA will act on the findings from the TRA. clearly there are shortfalls e nice to know the full process and intent rather than cat 6 will be completed in 12 months - and?
- More access for people to get involved.
- This survey to be completed soon after the process was completed
- Local resources
- As a bare minimum for the smallest station, it should be CAT 8 staffing (I'll be generous, you can include the AALL in that staffing), that way there are acceptable and safe numbers of staff available should an emergency arise, which will allow us to perform our roles effectively until such times as the external resources begin to arrive.
- Nil, great process. Good work to the team.
- This is the start and will only improve from here
- Great work by the TRA members very well facilitated
- Allowing changes to the story board to reflect what SOP's require staff to perform. continue to the completion of the incident for ARFF. decon, heat stress, off duty response transport of equipment stored at station.
- This was/is a valuable tool, as it was clearly able to identify where our equipment and procedures future should be focused, ASAP. Well done to the team of presenters too.
- I felt that we arrived at a position that was predetermined. I feel I could not argue any point during the risk assessment phase.
- Felt as though Sam Woodman was steering staff towards his conclusion in the RA component of the TRA.
- Clarity and comprehension is required from the facilitator to differentiate between the TRA scenario and a real incident. Too many discussions revolved

around what would actually occur at the particular airport rather than how the TRA process is trying to capture data through a theoretical scenario.

- the TRA is flawed when the person who does the TRA does not get to the risk assessment. how does someone justify pinch points when they were not involved in the TRA.
- Ensuring ARFFS review current strategy and tactics against lessons learnt and international service providers in the entirety of service to ensure service excellence.
- "Enjoyed the process highlighted other areas like equipment and vehicle capability that would impact the scenarios provided. Also opens up that more research and information required re agent capability FFF and the requirement for more review re alternative agents ""fire retardant foam, water / DCP branch and HRET capability FLIR and thermal imaging technology to support firefighting actions on scene this includes water supply and mobile emergency management trailers fitted out with medical and heat stress capability for on scene support.
- It was well done
- Knowledgeable facilitators.
- I have been involved from the start of the TRA process, so I think I had a good understanding of subject
- Rather than stopping the TRA process with the arrival of supporting agencies, there are still further tasks required such as having sufficient staffing available to facilitate the decontamination of our teams and the management of heat stress issues/ staff welfare. This was not addressed in the process and would require resources to set up in addition to those at the incident site.
- Great process.
- Felt like a predicted outcome
- "What level of risk is Airservices prepared to accept now that the data has been collated for all testing sites?
- Particularly important considering our current staffing levels are in the extreme risk range at most, if not all, categories."
- I did not like the risk analysis section where you have to give a risk rating, based on all the pinch points being resolved. But we are not told how they are resolved. Makes it hard to risk assess just saying the problem has gone away. Need to know more on what sort of fix has been applied.
- Use real world examples of aviation incidents to suggest appropriate agent, staffing and equipment levels.

Project Report

Task Resources Analysis – Phase 2

Version 1.0

Effective 30 October 2022

End of Project Report Approval

	Name & Title	Signature	Date
Prepared by:	TRA Implementation Lead – [redacted]		
Endorsed: Program Manager	[redacted] – ARFF Service Change		
Approved: Project Sponsor	[redacted] – Service Improvement		

Document pending: signatures to be completed at 'End of Project'

Change summary

Version	Date	Change description
0.1	31 May 2022	Initial Draft
0.2	04 October 2022	Program Review [redacted] Feedback changes incorporated
1.0	30 October 2022	Final

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1 Executive Summary

At the beginning of 2019, Airservices embarked on a task resource analysis of Aviation Rescue Firefighting Service (ARFFS) resources. This was in response to the 2015 Aviation Safety Regulation Review. It was recommended that ARFFS providers use the Task Resource Analysis (TRA) methodology, as prescribed by the International Civil Aviation Organization (ICAO), to determine suitable staffing levels.

Airservices developed a TRA methodology to identify the minimum number of staff required to meet ARFFS functional requirements as per Civil Aviation Safety Regulations (CASR) 139.710. Location specific and operational data was used to create a desk top scenario consisting of a credible worst-case incident within a probable location on the aerodrome. The methodology sought input from local operational staff at all ARFFS locations, to define the limitations (pinch-points) and mitigation strategies for tasks relating to fire ground operations. With an understanding of these pinch points and mitigation strategies, risk assessments were undertaken to evaluate current and alternate staffing models.

This first phase of TRA generated staff and non-staff related mitigations to operational pinch points, in addition to levels of risk associated with alternate staffing models based on the TRA scenario. Phase 2 of the TRA reviewed the data and outputs from the TRA workshops. Phase 3 will prioritise and scope projects for implementation based on the endorsed program of work identified in Phase 2.

A Mitigation Strategies Working Group (MSWG) was formed to complete a review of mitigation strategies identified in Phase 1. Phase 2B, the systematic review, analysis and prioritisation of 185 non-staff related pinch points and mitigation strategies resulted in the following outcome:

- 62 Supported strategies
- 57 Supported strategies currently under review or in a project
- 66 unsupported strategies

Of the supported strategies, 33 were deemed to be of high benefit with a low complexity of implementation, 12 had a low benefit and low complexity rating and 17 were a high benefit but with a high complexity of implementation into service.

Following the review of all mitigation strategies, the supported strategies were then assessed against the pinch-points in a Category 6 TRA. If the strategy was deemed to mitigate the pinch-point, that pinch point was removed from the storyboard's process. Any pinch-point that were not mitigated were deemed to be residual risks.

The outcome of this process saw a reduction in pinch points of 71%-76% across all categories. Category 6 had a decrease from 37 pinch points down to a residual pinch point count of 11. A reduction of a further 4 pinch points is possible at Category 6 when one officer is added to the staffing levels. Category 6 was the only level of service that showed the addition of staff reduced the residual pinch point to any extent. All other category levels showed the addition of staffing had no effect on the residual risk once all mitigations were included.

At the completion of this phase, there are no new or uncontrolled risks.

2 Purpose

2.1 Project Management

This document seeks to capture the performance of the delivered TRA Phase 2 project in comparison to the original plans and intentions. This includes:

- comparing actual outcomes to the original objectives.
- reviewing delivered scope against the original scope statement.
- assessing the effectiveness of the project approach.
- assessing the project management approaches and outcomes.
- providing a summary of the project variations that occurred through the life of the project.

2.2 Project Approach, Outcomes and Future Opportunities

In addition to the project management aspect of TRA as outlined in the above section 2.1, this report will also capture the TRA:

- Project approach
- Outcomes
- Challenges
- Opportunities

3 Background

At the beginning of 2019, Airservices embarked on a task resource analysis of ARFFS resources. This was in response to the 2015 Aviation Safety Regulation Review which raised concerns regarding insufficient staff levels. Following is the Senate committee's recommendation:

> *Recommendation Four - 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.*

Airservices developed an initial TRA methodology in consultation with internal and external stakeholders. The methodology provided a framework to support the determination of the minimum number of staff necessary for the ARFFS to achieve its operational objectives based on a probable scenario. The methodology was tested at selected locations to evaluate its application.

To determine the minimum staffing requirements for each category based on the agreed methodology, TRA workshops were undertaken at each of the 27 ARFFS locations around Australia. This implementation, or data gathering phase of TRA, commenced in March 2021, and concluded in November 2021.

The TRA provides a framework to identify recommendations for minimum levels of staffing required to achieve Aviation Rescue Fire Fighting Services (ARFFS) functional requirements. The output of the Phase 1 of the TRA project was a data set that identified pinch points and associated mitigation strategies which went beyond simply the provision of additional staff.

The output of Phase 1 of the TRA project produced two sets of data:

1. Various levels of risk associated with the current and alternate staffing models by category.
2. Strategies (not relating to additional staff) to mitigate operational limitations identified within the TRA.

To maximise the value of the data gathered in Phase 1 a detailed critical analysis, investigation and prioritisation of the data (not relating to staff) was required. 185 strategies were assessed by the MSWG to assess the validity of each strategy.

4 Scope

The scope of Phase 2 was to formally review and prioritise each of the mitigation strategies identified and captured in Phase 1 of the TRA project. These mitigation strategies resulted from pinch points associated with one of the following themes.

- Lack of ARFFS policy or procedure
- Clarification or breach of ARFFS policy or procedure
- Firefighter/fireground safety
- Limitation of available ARFFS resources (staff, agent, equipment)

Mitigation strategies that were associated with additional staff were excluded from the scope of this project.

5 TRA Project Management

5.1 Project Objective/s

Table 1 details the objectives stated in the original TRA Phase 2 Project Plan.

Table 1: Project Objective Achievements

Objective/s	Achieved/Not Achieved/Partially Achieved & Comments
To systematically review each mitigation strategy and make determinations on the feasibility of the appropriate identified solution.	Achieved- Each mitigation strategy assessed by MSWG, and outcomes captured: See Annex C
Prioritisation of mitigation strategies	Achieved- MS were placed in one of three categories: Low benefit, low complexity High benefit, Low complexity High benefit, high complexity Note: There were no MS deemed to be low value, high complexity. See Annex B
Undertake TRA to assess the effect of mitigation strategies on staffing levels.	Achieved- a TRA was conducted utilising results from the MSWG. Pinch points were actioned depending on total mitigation or partial mitigation.
Defined set or projects to increase ARFFS capability	To be completed in Phase 3

6 Project Scope

Table 2 details the agreed scope items stated in the original project management plan, and the delivered scope.

Table 2: Project Scope Achievements

Scope Item	Delivered/Not Delivered/Partially Delivered & Comments
Review mitigation strategies identified in the 2021 TRA workshops	Delivered – All mitigation strategies captured from TRA workshops (2021) were reviewed.
Prioritise supported mitigation strategies.	Delivered – All supported mitigation strategies (not currently in review or project) were prioritised.

6.1 Project Performance

The project management plan forecast a completion date of May 2022. Table 3 below summarises achievement of major milestones throughout the project compared to the original project management plan:

Table 3: Project Performance

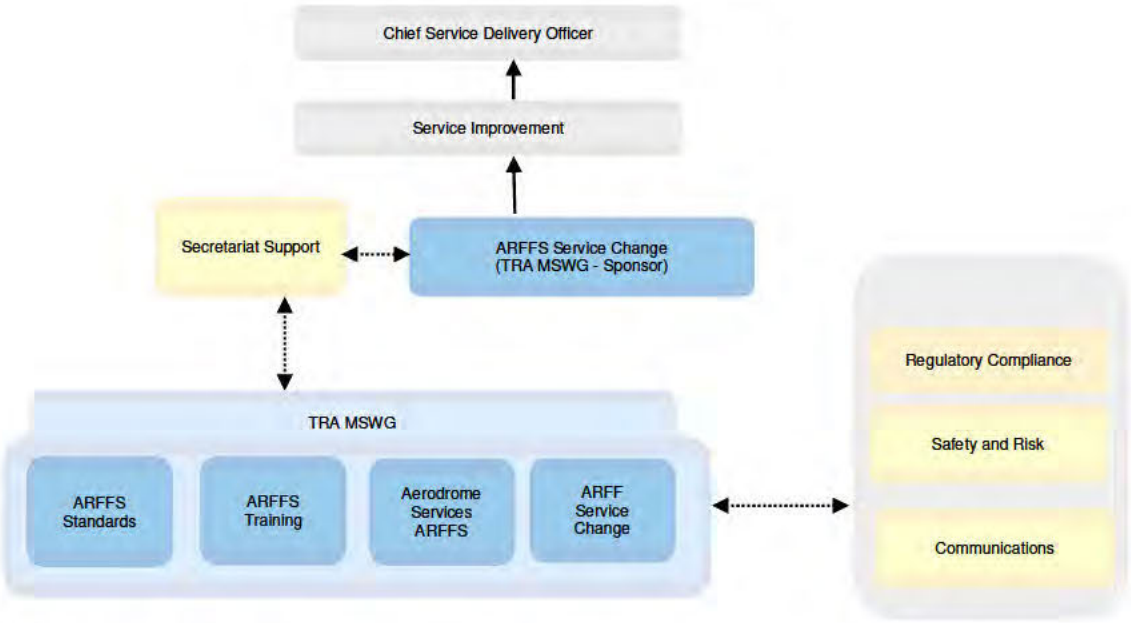
Milestone	Baseline Date	Actual Date	Comments
Phase 2A	Jan 2022	Jan 2022	Terms of reference accepted by MSWG
Phase 2B	Feb 2022	May 2022	MSWG members held positions that enable them to make decisions on behalf of their respective business units
Phase 2C	Jun 2022	Aug 2022	Mitigation strategies prioritised and TRA undertaken at each category.

7 Governance

7.1 Project Management Structure

The structure was effective in providing direction and reporting at key stages during the project. Support and input from all levels was sufficient and consistent across the life of the project. (Refer to Figure 1).

Figure 1: Project Management Structure



7.2 Change Control

Change control was managed informally and as required. There was nil change required during Phase 2.

7.3 Risk Management

Due to the small scale, risks were not identified as part of the initial TRA Phase 2 Project Plan. There was one risk that presented during the project:

- MSWG group members not able to attend meetings.

7.4 Quality Management

Quality management was undertaken for various components of the TRA Project. Table 4 details those areas.

Table 4: Quality Management Components

Quality Management	Details	Effectiveness
TRA MSWG Terms of Reference	Reviewed by TRA project team and Training Design and Development Specialist. Detailed document outlining the TOR for the MSWG.	Effective
MSWG mitigation strategies template	MSWG template created to capture data from mitigation strategies analysis.	Effective
MS data formatted for analysis	Mitigation strategies formatted to allow for effective analysis by MSWG	Effective
RAPID decision-making tool	Utilisation of a system to assist the MSWG in following a consistent decision-making process regarding mitigation strategies.	Effective

7.5 Communications Management

As per the TRA Project Plan Phase 2, the project communications plan mapped out a strategy to inform stakeholders of the MSWG progress. MSWG Chair reported to the ARFFS Service Change manager in relation to the MSWG meetings. Meetings were conducted to report on the progress of the meeting outcomes, and to seek direction as issues evolved.

Staff communication in relation to TRA was undertaken through the Weekly Enterprise Objective and Initiatives Team Meetings. Progress reports were delivered to station managers approximately every 6 weeks.

7.6 Stakeholder Engagement

A stakeholder engagement plan was created to ensure all relevant stakeholders were briefed of the progress of Phase 2. While a stakeholder plan was in place, the frequency of stakeholder communications was one area that required more attention.

7.7 Resource Management

The MSWG TOR detailed resourcing required to complete Phase 2 of the project. The MSWG agreed to meet weekly for 2 hours until all mitigation strategies had been reviewed. Meetings were held via video conferencing resulting in a low cost to deliver this project. Financial resourcing was sufficient.

7.8 Hand-over Issues

Nil items relating to the delivery of the project.

7.9 Follow-on Actions

The following actions need to be completed in the future to ensure benefits of the project are maximised. Table 5 details the follow-on actions.

Table 5: Follow on Actions

Follow-on Action	Accountability
Phase 3 (Implementation of TRA outcomes)	
Project scope conducted to explore sustainable implementation of TRA within multiple operational areas of ARFFS.	ARFF Service Change / Standards
Detailed scoping of individual priority projects as identified as part of Phase 2.	ARFF Service Change
Publishing of each station's TRA in a suitable format	ARFF Standards
Post implementation review	ARFF Safety and Risk

8 Project Approach, Analysis and Project Findings

8.1 TRA Phase 2 Approach – Overview

The approach taken for Phase 2 of the TRA process was to divide the process into 3 Phases. Phase 2A was creating the project plan and associated documents. Phase 2B established the MSWG methodology and undertook the review of mitigation strategies. Phase 2C prioritised the supported mitigation strategies, developed work packages for business units and completed a TRA at each category to assess the benefits of the mitigation strategies that were supported on staffing levels.

8.2 Phase 2 A

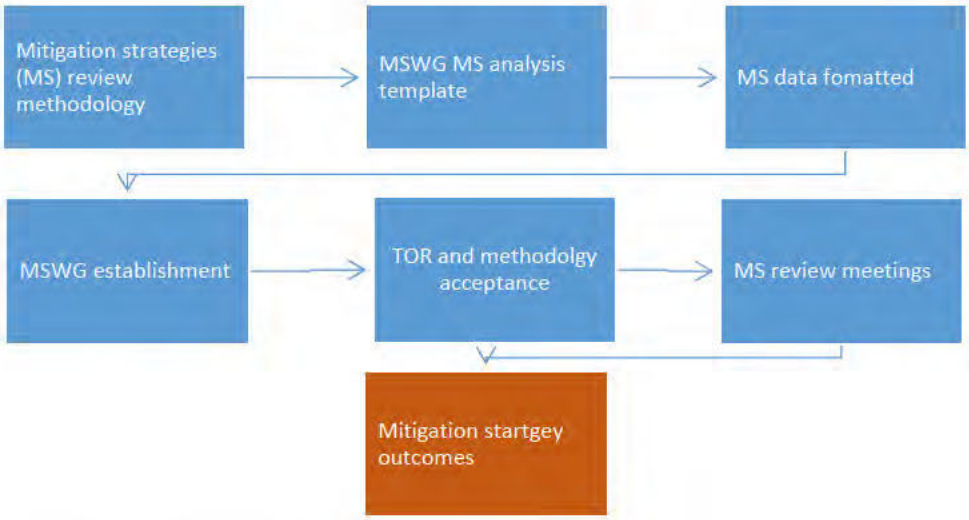
Documentation preparation was undertaken in Phase 2 A. Plan was produced outlining Phase 2 activities and deliverables. Develop a Terms of Reference to define the framework for the mitigation strategy review. Preparation of the mitigation strategies data into a format for review. Commence an interdependent review of the TRA scenario to validate the concept that was implemented.

8.3 Phase 2 B

The MSWG was formed, and the facilitation of meetings was conducted via video conferencing. Data collection occurred at each meeting, with subsequent recommendations captured within MSWG mitigation strategies template. Results can be seen in Appendix C.

Figure 2 provides an overview of the project approach.

Figure 2: Overview of TRA Phase 2B Project Approach



8.4 Phase 2 B Participants

The TRA MSWG comprised representatives from various Airservices Business groups. Members held positions that enabled them to make decisions on behalf of their

respective business units. The roles of TRA MSWG members are summarised below in Table 6

Table 6: TRA MSWG Roles

Role	Business Unit / Position	Decision Making Authority	Role Contribution (Summary)
Manager ARFFS Service Change	Service Improvement	Accountable and Informed	TRA MSWG Sponsor Provide direction, leadership and decision-making regarding the establishment and defined deliverables of the MSWG. Set clear objectives regarding reporting timeframes and the prioritisation of the mitigation strategies.
Service Improvement Change Specialist	Service Improvement	Responsible Consulted	TRA MSWG Chair Provide Subject Matter Expert (SME) advice regarding the feasibility and priority of TRA mitigation strategies for all pinch points identified from 2021 TRA workshops.
TRA Implementation Lead	Service Improvement	Responsible Consulted	TRA MSWG Secretariat Provide support to the TRA MSWG regarding scheduling, background briefings, reporting, and documenting outcomes.
Aerodrome ARFFS Line Leader	ARFFS Training / Aerodrome Services ARFF	Responsible Consulted	TRA MSWG Member Provide SME advice regarding the feasibility and priority of TRA mitigation strategies for all pinch points identified from 2021 TRA workshops.
Sub-Station Officer	Aerodrome Services ARFF	Responsible Consulted	
Senior Operational Standards Officer	ARFFS Standards	Responsible Consulted	
Station Officer	ARFFS Training / Aerodrome Services ARFF	Responsible Consulted	
Fire Commander	Aerodrome Services ARFF	Responsible Consulted	
As required	Safety and Risk Communications Regulatory Compliance	Consulted	TRA MSWG Support Provide ad hoc support and advice as required and when request by the TRA MSWG

8.5 Frequency

The MSWG agreed to meet for 2 hours weekly for the duration of the mitigation strategies review. In total, the MSWG attended 14 meetings.

8.6 Meeting outcomes

The MSWG minutes were the primary mechanism for recording and communicating regular meeting outcomes which included action items.

Any attendee who was responsible for an action item reported on progress against the item at each meeting until that item was closed. Closure was documented through the subsequent meeting's minutes which were distributed to (or made available to) members and meeting attendees after each meeting.

The mitigation strategy outcomes are recorded and can be seen in Annex B.

8.7 Phase 2 C

Recommended mitigation strategies were reviewed and prioritised utilising a benefit/complexity matrix. Work packages were created for individual business units. A TRA review of each category was undertaken by the MSWG to assess the effects of supported mitigation strategies.

Note: It should be noted that the assessment is subjective and was based on the value to ARFFS capability versus the complexity of the implementation of the assesses strategy. This is not to say, that once individual business units conduct the implementation of mitigation strategies that priorities maty change.

8.8 Participants

Service Improvement and ARFFS Standards provided representatives to review and prioritise supported mitigation strategies in addition to ARFFS SMEs and a UFUA representative [redacted] on the MSWG. The participants utilised a benefit/complexity matrix to determine the priority of 62 strategies.

A scale of 1-5 was used with 1 indicating low benefit/complexity and 5 indicating high benefit complexity. The following definitions benefit/complexity and low high were used when prioritising strategies.

- Benefit- What is the overall benefit to ARFFS capabilities if this mitigation strategy is implemented? E.g. HRET potentially adds enormous benefits to ARFFS capability in the way of firefighter safety, possible passenger safety etc.
- Complexity- How complex will it be to implement this mitigation strategy. Complexity includes, cost, implementation strategy, and timelines. E.g. HRET vehicle will have a high level of complexity, implementation strategy and a long timeframe.

9 Mitigation Strategies Analysis Criteria

9.1 Criteria

To detail the criteria to be implemented when analysing the mitigation strategies identified from the Task Resource Analyses (TRA). When implemented, the documented outcome of the criteria was sufficient to produce a supported and robust list of prioritised mitigation strategies. In complying with the criteria, the documented outcomes acted to inform and support the progression of recommended mitigation strategies. The following criteria provided guidance to systematically review each mitigation strategy.

- Location specific or whole of service limitation
- TRA storyboard issue
- Current or completed projects
- Policies and procedures
- Regulatory constraints
- Organisational and ARFFS strategic direction
- Enhancing ARFFS capability (safety/ efficiency/ efficacy)

Annex A details a flow chart to assist in reviewing individual strategies.

9.2 Mitigation Strategy Categories

The mitigation strategies collated from Phase 1 were placed into 11 categories to assist the MSWG in the analysis Phase. The categorisation of the mitigation strategies grouped strategies that had a similar theme. A pinch-point may have multiple strategies that may provide a mitigating solution. These were separated so that all mitigation strategies were analysed individually. The following is a list of the categories that MS were grouped in.

- Aerodrome
- Agent
- CABA
- Casualty Management
- Communications
- Decontamination/Heat stress
- External Agencies
- Fireground
- Internal Operations
- Staff

9.3 Decision making

The MSWG was primarily a decision-making group. Where practical, a consensus of all members was required for decisions to be passed. To assist the MSWG, the RAPID decision- making model was utilised. A criterion was implemented that provided guidance to systematically review each mitigation strategy. (Section 8 Mitigation Strategies Analysis Criteria). During the review, all mitigation strategy outcomes were unanimously supported or unsupported with reasoning attributed to each decision. The mitigation strategy outcomes are recorded in Annex B.

9.4 The RAPID decision-making model

The key roles of people involved in decision making utilising the RAPID system are:

1. **Recommend**: create the initial proposals and recommendations
2. **Agree**: Must agree with the proposals from the recommend group
3. **Perform**: Execute the work following the decision
4. **Input**: Provides information and facts to the recommend group
5. **Decide**: The person who has the authority to make the decision

The model's central position is the Decide role. All other roles support this function.

Note: these roles are normally performed in the following order:

1. Recommend with input
2. Agree
3. Decide
4. Perform

9.5 Outcome

The MSWG made decisions to support or not support each individual mitigation strategy. Where possible, reference material was provided to the MSWG, to assist with these decisions and a reason was provided for all decisions made for supported or unsupported mitigation strategies. These have been collated and can be viewed in Annex B.

Each strategy that was assessed finished with one of the following outcomes:

- Supported- the mitigation strategy was viewed to be credible and potentially enhance ARFFS capability.
- Supported (current project)- the mitigation strategy was viewed to be credible, potentially enhance ARFFS capability and is already within a current review or project.
- Unsupported- the mitigation strategy was viewed as having no impact on ARFFS capability.

10 Results

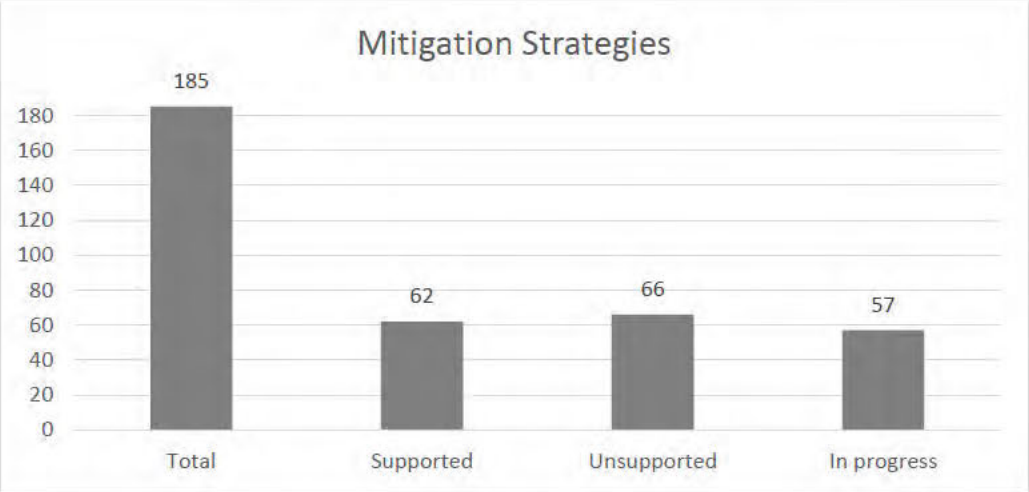
10.1 Phase 2 B Results

The MSWG reviewed 185 mitigation strategies over the course of the Phase 2B project. Systematically working through each category, the group either supported or provided an unsupported verdict on each individual strategy. There were strategies identified that are presently being examined or developed within current projects. These strategies were supported by the MSWG.

Figure 3 represents the results of mitigation strategy decisions.

Once all strategies had been analysed, the supported mitigation strategies (that were not presently within a current project) are to be prioritised to assist ARFFS Service Change in defining a set of priority projects.

Figure 3: Mitigation Strategy Results



10.2 Phase 2C Results

9.2.1 Prioritisation of Mitigation Strategies

Phase 2C was the review and prioritisation of supported mitigation strategies outcomes form Phase 2B. The following are results from the prioritisation process:

- 12- Low benefit with low complexity
- 33- High benefit with low complexity
- 17- High benefit with high complexity

9.2.2 Effects of Supported Mitigating Strategies

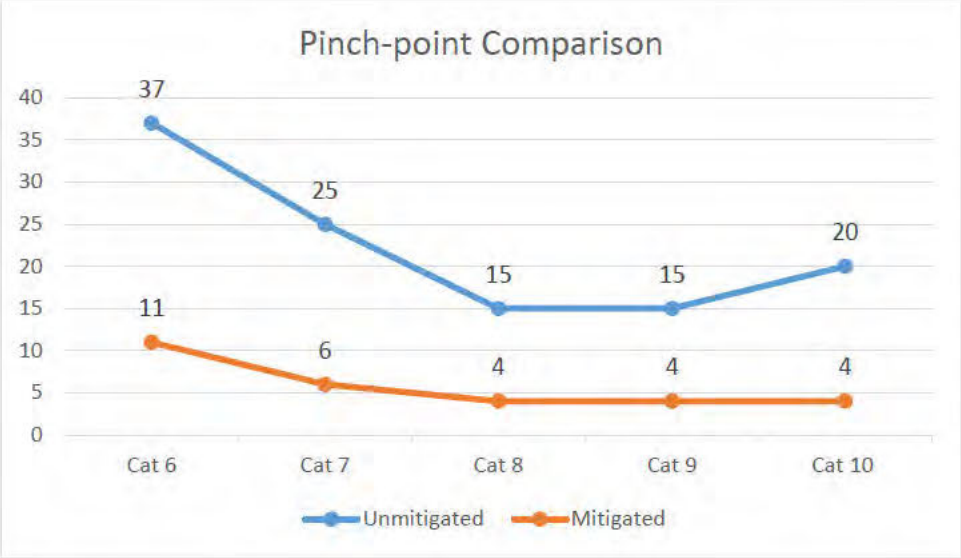
The MSWG then assess the effect of the supported strategies on pinch points identified in TRA Phase 1. The group assessed Category 6 for this exercise and were taken through the storyboard utilised during Phase 1. The group was tasked with determining if the supported strategies were implemented, would that mitigator eliminate the corresponding pinch point.

The group then assessed the 26 Category 6 pinch points using the standard storyboard and assessed if a Pinch Point was mitigated or not. When a pinch point was mitigated at Category 6, that pinch point was also deemed to be mitigated at Category 7, 8, 9 and 10.

The following are results from the implementation of supported mitigation strategies and show the effect the removal of pinch points had on the TRA storyboards.

Figure 4 represents the effect of implementing supported mitigation strategies on pinch points within each category level of service.

Figure 4: Implementation of Supported Mitigation Strategy Effect



11 TRA Phase 2 Opportunities

11.1 Staff understanding

The MSWG found that there is varied understanding of ARFFS policies and procedures across the service and how they are applied on the fire ground. For example, there were varying levels of confidence in the ability of Leading Fire Fighters to fulfill roles of leadership on the fireground (Entry Control Officer (ECO) and Compressed Air Breathing Apparatus (CABA) Team leader). This presents an opportunity to improve and ensure ARFFS operations are consistent across the business unit. Significant areas of misunderstanding included:

- ARFFS role in rescue
- CABA SSW
- Command and control
- Strategies and tactics

12 Lessons Learned Summary

The following table summarises the lessons learned regarding both project management and project approach.

Table 7: Lessons Learned Summary

Lesson	Rationale/source	Target audience
Stakeholder Communication	A clearly defined communication plan was developed, however did not fully meet the projects stated purpose. An improvement in communications would assist in stakeholder engagement.	Project Team

13 References

Aviation Rescue Fire Fighting Service Task Resource Analysis Methodology, Version 2.0, Effective 06 February 2020

Manual of Standards Part 139H — Standards Applicable to the Provision of Aerodrome Rescue and Fire Fighting Services

Service Delivery - ARFFS, Task Resource Analysis – Program Plan, Version: 2.1, Effective 08 December 2020

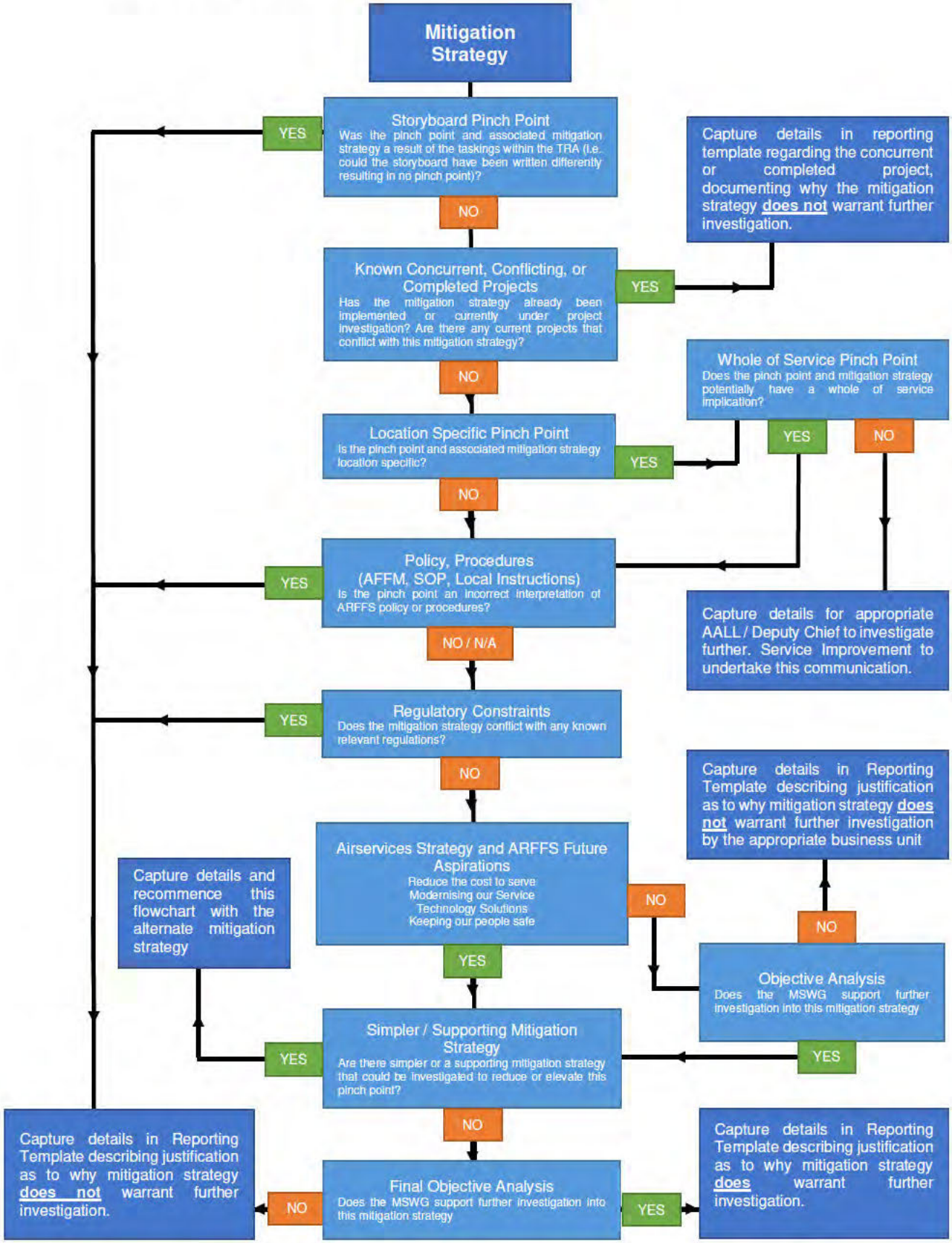
Task Resource Analysis- Mitigation Strategies Working Group- Terms of Reference. Version: 1.0, Effective 19 January 2022

14 Definitions

All terms and abbreviations used in this document are defined in the below glossary. Each it: Definitions

Term	Definition
CASA	Civil Aviation Safety Authority
CFA	Country Fire Authority
MOS	Manual of Standards
MoU	Memorandum of Understanding
MS	Mitigation Strategies
MSWG	Mitigation Strategies Working Group
TOR	Terms of Reference

Annex 1: Mitigation Strategy Decision Tree



Annex 2: Supported Mitigation Strategies - Aerodrome

Pinch-point Lack of Airport resources to assist with escorting external responding agencies to the incident site.	
Mitigation Strategy PPMS093 - Develop closer relationships with airport operators (esp. in regard to AEP) regarding EM process and roles.	
Supported - Ongoing relations with aerodromes maintained. Deputies to discuss this aspect (limitation) identified in TRA with stations to ensure ongoing understanding of roles.	
Date reviewed	25/02/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS097 - Review of response times for the LL/CoC (Revise the '90-minute response time - more suitable / shorter timeframe)	
Supported - Group support the review of the 90 minutes response times (Ops-111) to a more suitable timeframe that align with the operational requirements of the LL/CoC.	
Date reviewed	25/02/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	OPS-111 Incident / Emergency Support Procedures Operational Procedure
Related Mitigation Strategy	PPMS012 PPMS115 PPMS133

Annex 3: Unsupported Mitigation Strategies - Aerodrome

Pinch-point Lack of Airport resources to assist with escorting external responding agencies to the incident site.	
Mitigation Strategy PPMS094 - Review of communications with airport safety officers with a potential for dedicated communications.	
Unsupported - Communications are available between safety officer and OIC. This can be established through various options (phone/radio). Location specific communications issue scan be dealt as part of AEP and potential expenditure on equipment (additional radio).	
Date reviewed	25/02/22
Further actions	Nil
References	Nil
Related Mitigation Strategy	PPMS129
Mitigation Strategy PPMS095 - Review of communications with state agencies (interoperability)	
Unsupported - Review has already been completed as part of the radio replacement program, and Strategy and Tactics Working Group development into an ARFFS communications plan.	
Date reviewed	25/02/22
Further actions	Nil
References	Nil
Related Mitigation Strategy	PPMS147
Mitigation Strategy PPMS096 - Review of current ARFFS radios	
Unsupported - Review has already been completed as part of the radio replacement program.	
Date reviewed	25/02/22
Further actions	Nil
References	Nil
Related Mitigation Strategy	PPMS130

Annex 4: Supported Mitigation Strategies - Agent

Pinch-point Inability to monitor agent level and pump operation when BA team are internal.	
Mitigation Strategy PPMS057 - Review of procedures regarding oversight of vehicle pump operations	
Supported- Unsupported- A project is underway to record resource levels on vehicles including but not limited to agent.	
Date reviewed	23/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	AFFM-07
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS058 - Review of sufficient quantities of agent for fire ground (how much agent is required to backup internal operations/safety margin)	
Supported- A better understanding of amount of agent required for internal firefighting and required as a reserve amount of agent is supported.	
Date reviewed	23/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	PPMS082

Pinch-point Inability to replenish agent due to lack of staff.	
Mitigation Strategy PPMS059 - Additional vehicle	
Supported- Current project is currently being undertaken.	
Date reviewed	23/03/22
Further actions	Nil
Responsible Unit	Service Change
References	Nil
Related Mitigation Strategy	PPMS014, PPMS052, PPMS075, PPMS122, PPMS123, PPMS148, PPMS157, PPMS166, PPMS176
Mitigation Strategy PPMS060 - Water Tanker	
Unsupported- A project is underway to record resource levels on vehicles including but not limited to agent.	
Date reviewed	23/03/22
Further actions	Nil
Responsible Unit	Service Change
References	MOS 139H
Related Mitigation Strategy	Nil

Pinch-point Inability to replenish vehicle within the TRA timeframe. Implications to agent requirement on fireground.	
Mitigation Strategy PPMS061 – Decrease in filling times for replenishment - drop tanks/ water and foam	
Supported- AALL consultation with aerodrome operators to investigate options. (hydrants)	
Date reviewed	23/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	MOS 139H
Related Mitigation Strategy	PPMS079
Mitigation Strategy PPMS62- Review the ability to replenish vehicle on airports and its effect on TRA.	
Supported- AALL consultation with aerodrome operators to investigate options. (hydrants)	
Date reviewed	23/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil

Pinch-point Insufficient agent affecting the ability to maintain the backup line, foam blanket (FB10x) and continued fireground/internal operations.	
Mitigation Strategy PPMS075 - Additional vehicle	
Supported- Current project is currently being undertaken.	
Date reviewed	23/03/22
Further actions	Nil
Responsible Unit	Service Change
References	Nil
Related Mitigation Strategy	PPMS014, PPMS052, PPMS059, PPMS122, PPMS123, PPMS148, PPMS157, PPMS166, PPMS176
Mitigation Strategy PPMS076 – C Class Foam	
Supported- Current project is currently being undertaken.	
Date reviewed	23/03/22
Further actions	Nil
Responsible Unit	Service Change
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS077 – Dual agent monitor	
Supported- Current project is currently being undertaken.	
Date reviewed	23/03/22
Further actions	Nil

Responsible Unit	Service Change
References	Chemcore nozzle
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS079 – Decrease in filling times for replenishment - drop tanks/ water and foam	
Supported- AALL consultation with aerodrome operators to investigate options. (hydrants)	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	MOS139H
Related Mitigation Strategy	PPMS079
Mitigation Strategy PPMS080- Review of CoC to include level of incident/EVTs/arriving staff	
Supported- review of utilising spare vehicles and having instructions for its use in an incident with outcomes potentially placed in Local Instructions.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Ops-111
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS081- Review of DCP and its use on the fire ground. Training has decreased.	
Supported- a review of theory and practical training regarding DCP is supported. An increase in agent capabilities has been deemed as an action.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	AFFM-07
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS082- Review of sufficient quantities of agent for fire ground (how much agent is required to backup internal operations/safety margin)	
Supported- A better understanding of amount of agent required for internal firefighting and required as a reserve amount is supported.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	PPMS058
Mitigation Strategy PPMS083- Review secondary agent- Halotron/CAFS	
Supported- secondary agent to be reviewed to assess the benefit for ARFFS along with C Class foam.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	ICAO-ASM Sect 8.2
Related Mitigation Strategy	Nil

Pinch-point Insufficient agent affecting the ability to maintain the backup line, foam blanket (FB10x) and continued fireground/internal operations.	
Mitigation Strategy PPMS084 – Review strategy and tactics - efficacy of agent use	
Supported- Current project is currently being undertaken.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS085 – Vehicle capability	
Supported- Current project is currently being undertaken.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	Service Change
References	Nil
Related Mitigation Strategy	PPMS054, PPMS066
Mitigation Strategy PPMS086 - Water Tanker	
Supported- Current project is currently being undertaken.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	Service Change
References	Nil
Related Mitigation Strategy	Nil

Annex 5: Unsupported Mitigation Strategies - Agent

Pinch-point Depleted vehicle (T3) unattended on fire ground.	
Mitigation Strategy PPMS018 - Review strategy and tactics	
Unsupported- this is dependent on situational awareness on the fire ground. The vehicle is available for use.	
Date reviewed	23/03/22
Further actions	Nil
References	Nil
Related Mitigation Strategy	PPMS026, PPMS027, PPMS150, PPMS180

Pinch-point Driver returning to replenish vehicle alone - potential safety of driver (heightened stress of driver)	
Mitigation Strategy PPMS019 - Review of AFFM-Driving vehicles	
Unsupported- Procedures allow for a vehicle to be driven by a single operator at an incident airside.	
Date reviewed	23/03/22
Further actions	Nil
References	AFFM-03

Pinch-point Insufficient agent affecting the ability to maintain the backup line, foam blanket (FB10x) and continued fireground/internal operations.	
Mitigation Strategy PPMS078 - Hose laying vehicles (replenish from remote hydrants)	
Unsupported- Hose laying vehicle would be unsuitable as it is an ineffective way for replenishment for ARFFS	
Date reviewed	30/03/22
Further actions	Nil
References	Nil

Pinch-point Single vehicle supply of agent to operation resulting in nil back-up agent or contingency in the event of failure. (Cat 5 TRA)	
Mitigation Strategy PPMS157 – Additional vehicle	
Unsupported- Have sufficient resourcing to cater for Cat 5.	
Date reviewed	30/03/22
Further actions	Nil
References	Nil

Pinch-point Unable to meet continuous agent requirements	
Mitigation Strategy PPMS176 – Additional vehicle	
Unsupported - This pinch point is related to Brisbane only. Additional vehicle online in Brisbane. Pinch point mitigated	
Date reviewed	30/03/22
Further actions	Nil
References	Nil

Annex 6: Supported Mitigation Strategies - CABA

Pinch-point Due to the complexity of incident, there are concerns surrounding the LFF undertaking the role/function of ECO/RIT Team leader	
Mitigation Strategy PPMS020 - CABA ECO role included in ongoing endorsement training (TRAX).	
Supported - MSWG supports the mitigation strategy being investigated further to include the ECO role in a performance standard. Results from the PIR undertaken as part of the implementation of the BASSW support further training regarding the ECO role. The enhancement of training to firefighter tasking as an ECO supports safety and Airservices values of Safe Always.	
Date reviewed	16/02/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	ARFF-GUIDE-CA - Compressed Air Breathing Apparatus Performance Standards
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS023 - Upskilling staff.	
Supported - Upskilling of staff is required in regard to the ECO role. This upskilling can be linked to the requirement identified in the ECO performance standard.	
Date reviewed	16/02/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	ARFF-GUIDE-CA - Compressed Air Breathing Apparatus Performance Standards
Related Mitigation Strategy	Nil

Pinch-point Lack of dedicated ECO (Cat5/6) as the FC is performing role of OIC and ECO.	
Mitigation Strategy PPMS104 - Review of the training/ability to complete ECO role.	
Supported - This strategy to improve the understanding of the implementation of the BA SSW through further training of the officer group (ability to undertake dual roles of ECO and OIC as per AFFM) group. The enhancement of officer training increases safety and relates to Airservices values of Safe Always.	
Date reviewed	16/02/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	AFFM-BA - Compressed Air Breathing Apparatus
Related Mitigation Strategy	Nil

Pinch-point Potential pinch-point regarding the requirement for donning CABA
Mitigation Strategy PPMS144 - Review of fireground operations to support firefighters remaining in vehicle (when applicable) to reduce exposure to heat stress/ HOTS environment.

Supported – Strategy &Tactics Working Group and standards to review AFFM/SOP to ensure that the current practices taught in the Gen 2 Workshops are incorporated into documentation.	
Date reviewed	25/02/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	PPMS045
Mitigation Strategy PPMS145 - Review PPE with intent to improve PPE to consider Heat stress considerations.	
Supported – Review to be referred to ARFFS Standards. Ongoing consideration to the implications of heat stress with current PPE should be periodically reviewed.	
Date reviewed	25/02/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Aust Std AS4967
Related Mitigation Strategy	PPMS046
Mitigation Strategy PPMS140 - Investigate various levels of PPE (Respirators through to CABA).	
Supported – The Group supports the investigation into the introduction of respirators as part of PPE options. However a concurrent project by the MSA implementation team, along with ARFFS standards, are currently investigating the introduction of respirators utilised with the MSA CABA	
Date reviewed	25/02/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	AFFM BA
Related Mitigation Strategy	PPMS033
Mitigation Strategy PPMS139 - Formalised "hot zones" identified (standardised PPE requirements for aircraft incidents) in support of situation size up.	
Supported - Supported- Clarification regarding hot zones/hazardous zones is supported including the use of BA. Documentation and training to be reviewed. Standardising or nominating hot zones for aviation incidents reduces the ability of the OIC to undertake a dynamic risk assessment on the fire ground. Each incident will have unique hazards that should be managed as part of the OIC IAP.	
Date reviewed	25/02/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	AFFM-HZ – HazMat
Related Mitigation Strategy	PPMS032

Pinch-point RIT leader not positioned near the ECO position on fireground
Mitigation Strategy PPMS155 - Review of BASSW to clarify workload/tasking/location of RIT Team leader

Supported - As part of the BASSW PIR, clarity regarding the tasking and positioning of the RIT team leader is currently being reviewed.	
Date reviewed	25/02/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	AFFM-BA
Related Mitigation Strategy	PPMS125 PPMS156

Pinch-point RIT team members undertaking fireground tasks prior to and whilst being designated as a RIT member
Mitigation Strategy PPMS156 - Review of BASSW to clarify workload/tasking/location of RIT Team leader
Supported - As part of the BASSW PIR, clarity regarding the tasking and positioning of the RIT team leader is currently being reviewed.

Date reviewed	25/02/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	AFFM-BA
Related Mitigation Strategy	PPMS125 PPMS155

Annex 7: Unsupported Mitigation Strategies – CABA

Pinch-point Avalon ARFFS currently employ 300-bar cylinders reduced to 207-bar due to lack of 300-bar compressor.
Mitigation Strategy PPMS007 - A 300-bar compressor
Unsupported - AALL Hendy has confirmed that Avalon now have a 300-bar compressor on site and operational.

Date reviewed	16/02/22
Further actions	Nil
References	Nil

Mitigation Strategy PPMS008 - MoU with local Fire Rescue Victoria (to provide mobile refilling station, cleaning face pieces etc)
Unsupported - Avalon have a 300Bar compressor on site. A MoU already in place for Avalon ARFFS with Victoria CFA. The Agencies agree, subject to capacity, to provide support to each other at incidents. This may include the provision of equipment, personnel, and incident management support or specialist advice.

Date reviewed	16/02/22
Further actions	Nil
References	MoU CFA - MoU with Country Fire Authority, Victoria - AV, ML

Pinch-point Due to the complexity of incident there are concerns surrounding the LFF undertaking the role/function of ECO/RIT Team leader.
Mitigation Strategy PPMS021 - Review of procedure regarding the minimum training and qualifications levels of ECO and RIT Team Leader Roles
Unsupported - A process is already in place regarding the minimum training required for the roles of ECO/RIT team leader (delivered from recruit level). Any training improvements have been identified and are being actioned through BA PIR.

Date reviewed	16/02/22
Further actions	Nil
References	AFFM-BA - Compressed Air Breathing Apparatus

Mitigation Strategy PPMS022 - Review of the roles and responsibilities within the BA SSW.
Unsupported - The roles and responsibilities are stated in AFFM-BA. Any improvements understanding these roles and responsibilities have been identified and are being actioned through BA PIR.

Date reviewed	16/02/22
Further actions	Nil
References	AFFM-BA - Compressed Air Breathing Apparatus

Pinch-point Potential pinch-point regarding the requirement for donning CABA
Mitigation Strategy PPMS137 - Aide Memoire to assist in defining HOTS

Unsupported - The OIC has the ability to undertake dynamic risk assessments on the fire ground. It was deemed unnecessary to support this mitigation strategy as it potentially restricts the flexibility of the OIC.	
Date reviewed	16/02/22
Further actions	Nil
References	Nil
Mitigation Strategy PPMS138 - Aligning aviation procedures (short term) around our hazmat procedures	
Unsupported - Officers set the boundaries and the limitations of the incident based on knowledge and the size up process. Limiting the OIC with a set procedure reduces the ability to dynamically risk assess the incident and develop an appropriate incident action plan.	
Date reviewed	25/02/22
Further actions	Nil
References	AFFM-RI - Responding to Incidents AFFM-HZ - HazMat
Mitigation Strategy PPMS141 - Ongoing risk assessment by the Fire Commander to ensure CABA donning occurs at a suitable time	
Unsupported - ARFF documentation provides guidance regarding Dynamic Risk Assessments. Undertaking risk assessments is documented at all levels within SMS-201 Safety Accountabilities	
Date reviewed	25/02/22
Further actions	Upskilling of staff regarding their own WHS accountability as per PPMS143
References	AFFM-05 Incident Management
Mitigation Strategy PPMS142 - Research & development around determination of HOTS (aircraft incident - composite fibres)	
Unsupported - ARFFS Standards undertake industry engagement domestically and internationally to monitor developments relating to aviation standards and techniques. Composite Fibres is included in this engagement when periodically reviewing AFFM documentation.	
Date reviewed	25/02/22
Further actions	Nil
References	AFFM-HZ
Mitigation Strategy PPMS143 - Review and confirm the availability of, and/or establish procedure and/or training to guide/support the notion of 'when CABA should be donned and started-up'.	
Unsupported - Policies procedures and training are currently documented regarding when CABA requires to be donned and started up.	
Date reviewed	25/02/22
Further actions	Upskilling of staff regarding their own WHS accountability as per PPMS141
References	AFFM-BA

Annex 8: Supported Mitigation Strategies – Casualty Management

Pinch-point A lack of effective method for casualty removal / extraction (rescue).	
Mitigation Strategy PPMS001 - Clarification of procedure - 'do we manage the fire first, or rescue first'? Order of priority for aircraft incidents.	
Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.	
Date reviewed	02/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Airport Services Manual Sect 12.3.1 and 12.3.2
Related Mitigation Strategy	PPMS098 PPMS181
Mitigation Strategy PPMS002 - Complete analysis on the nature and definition of rescue and confirm how this can be achieved and applied by ARFFS relative to the TRA scenario. Implement the outcomes of this analysis.	
Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.	
Date reviewed	02/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Airport Services Manual Sect 12.3.1 and 12.3.2
Related Mitigation Strategy	PPMS099 PPMS121
Mitigation Strategy PPMS003 - Review and develop improved procedures / guidance / training on casualty management and assessment / triage of casualties. Potential learnings from other agencies and/or international standards	
Supported- triage is a part of a review and ongoing facilitation work being undertaken by Ambulance Victoria and ARFFS.	
Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	
Related Mitigation Strategy	PPMS102,183
Mitigation Strategy PPMS004 - Review into the potential to utilise onsite aircraft access equipment. (MOU)	
Supported- It was identified that aerodrome stakeholders have equipment that may be beneficial to ARFFS in an emergency incident situation. This is an action for regional and local managers to investigate what equipment is available and to discuss its use by ARFFS if needed.	
Date reviewed	02/03/22
Further actions	Nil

Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil

Mitigation Strategy PPMS006 - Review of resources/equipment to make entry and to extricate casualties (ARFFS air stairs / extendable platform/heights, aircraft types, soft ground etc)

Supported- It was identified that aerodrome stakeholders have equipment that may be beneficial to ARFFS in an emergency incident situation. This is an action for regional and local managers to investigate what equipment is available and to discuss its use by ARFFS if needed.

Date reviewed	02/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil

Pinch-point
Lack of casualty management procedure to perform first aid (HOTS environment) and its relationship with other firefighting activities (i.e. overhaul is being undertaken whilst casualties require rescue)

Mitigation Strategy PPMS098 - Clarification of procedure - 'do we manage the fire first, or rescue first'? Order of priority for aircraft incidents.

Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.

Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Airport Services Manual Sect 12.3.1 and 12.3.2
Related Mitigation Strategy	PPMS001 PPMS181

Mitigation Strategy PPMS102 - Review and develop improved procedures / guidance / training on casualty management and assessment / triage of casualties. Potential learnings from other agencies and/or international standards

Supported - triage is a part of a review and ongoing facilitation work being undertaken by Ambulance Victoria and ARFFS.

Date reviewed	09/03/22
Further actions	Nil
References	Nil
Related Mitigation Strategy	PPMS003 PPMS183

Mitigation Strategy PPMS103 - Review strategy and tactics for internal firefighting/rescue

Supported - Strategy and tactics group to consider internal firefighting/rescue as a topic as part of the working group's scope.

Date reviewed	09/03/22
Further actions	Nil

Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	PPMS184

Mitigation Strategy PPMS099 - Complete analysis on the nature and definition of rescue and confirm how this can be achieved and applied by ARFFS relative to the TRA scenario. Implement the outcomes of this analysis.

Supported - Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.

Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Airport Services Manual Sect 12.3.1 and 12.3.2
Related Mitigation Strategy	PPMS002 PPMS121

Mitigation Strategy PPMS100 - Develop better ventilation strategies (PPV post fire)

Supported - Understanding of ventilation strategies may be lacking in ARFFS. Additional development inclusive of training is required.

Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil

Mitigation Strategy PPMS101 - Further training CFBT creating improved internal conditions (remove hazard).

Supported - Further/continued training in CFBT required. Development/upskilling of SME as CFBT instructors. Expansion of requirement for staff to undertake practical/theoretical training.

Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	Nil
Related Mitigation Strategy	Nil

Pinch-point
Insufficient resources to manage / relocate casualties inside aircraft (physical effort to move casualties)

Mitigation Strategy PPMS090 - Investigate effects of compounding workload on BA team

Supported - Increase the understanding/knowledge of staff regarding monitoring of workloads and the effects of heat stress on firefighters.

Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards

References	
Related Mitigation Strategy	PPMS182
Mitigation Strategy PPMS089 - Inclusion of MCI training as part of annual first aid training inclusive of associated equipment.	
Unsupported- triage/MCI is a part of a review and ongoing facilitation work being undertaken by Ambulance Victoria and ARFFS. Linkage to PPMS005 regarding additional action - triage equipment per AEP.	
Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	Nil
Mitigation Strategy PPMS091 - Procedural development for the management of casualties.	
Unsupported- triage is a part of a review and ongoing facilitation work being undertaken by Ambulance Victoria and ARFFS.	
Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	Nil

Pinch-point Unable to complete MCI triage	
Mitigation Strategy PPMS174 - Inclusion of MCI training as part of annual first aid training inclusive of associated equipment.	
Unsupported - triage/MCI is a part of a review and ongoing facilitation work being undertaken by Ambulance Victoria and ARFFS. Linkage to PPMS005 regarding additional action - triage equipment per AEP.	
Date reviewed	09/03/22
Further actions	Discussion with AV regarding what their expectations are of ARFFS knowledge regarding MCI.
Responsible Unit	ARFFS Training
References	Nil
Mitigation Strategy PPMS175 - Suitable equipment for ARFFS to undertake triage relating to MCI (appropriate to ARFFS role).	
Unsupported - triage/MCI is a part of a review and ongoing facilitation work being undertaken by Ambulance Victoria and ARFFS. Linkage to PPMS005 regarding additional action - triage equipment per AEP.	
Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	Nil

Annex 9 Unsupported Mitigation Strategies - Casualty Management

Pinch-point A lack of effective method for casualty removal / extraction (rescue).	
Mitigation Strategy PPMS005 - Review of obligations of aerodrome operator regarding equipment (e.g. Crash rescue kits)	
Unsupported- This is not the responsibility of ARFFS rather the aerodrome operator.	
Date reviewed	02/03/22
Further actions	AALLs to review AEPs and if required to follow up with AEC to assess crash kit contents and availability.
References	Nil

Pinch-point Insufficient resources to manage / relocate casualties inside aircraft (physical effort to move casualties)	
Mitigation Strategy PPMS087 - Additional equipment and techniques (research from other agencies) and associated procedures.	
Unsupported- sufficient casualty management techniques are documented in AFFM-07	
Date reviewed	02/03/22
Further actions	Nil
References	AFFM-07
Mitigation Strategy PPMS088 - Further training / understanding (aircraft familiarisation) on the ability to re-adjust seating to improve access to casualties or improve advancement of BA Team	
Unsupported- Aircraft familiarisation is carried out on a regular basis. The endorsement covers aircraft hazards that have direct effect on ARFFS operation and objectives. Any further training is to be conducted at local levels.	
Date reviewed	02/03/22
Further actions	Nil
References	Nil
Mitigation Strategy PPMS092 - Standardisation for staffing numbers for internal BA team.	
Unsupported - The BA SSW defines minimum number of staff for internal operations. Additional staff above the minimum is decided by the OIC pending available resources and a risk assessment of the incident.	
Date reviewed	09/03/22
Further actions	Nil
References	AFFM-BA
Related Mitigation Strategy	PPMS185

Annex 10: Supported Mitigation Strategies - Communications

Pinch-point Communication between FCP and fireground (ECO, VHF 131 / tower, UHF, response mobile) - loss of situational awareness	
Mitigation Strategy PPMS010 - Designated rescue frequency/ECO to BA teams	
Supported- radio replacement project and a comms plan are currently underway.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS011 – Digital radios	
Unsupported- radio replacement project and a comms plan are currently underway	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS012 - Review of response times for the LL/CoC (Revise the '90-minute response time - more suitable / shorter timeframe)	
Supported- a review of the 90-minute time frame for response of LL/CoC is required. (ops111). The time frame for response was viewed as being too long.	
Date reviewed	30/03/22
Further actions	Comms plan from OIC on the fireground to LL/CoC in the aviation environs.
Responsible Unit	ARFFS Standards
References	Ops-111, 4.3
Related Mitigation Strategy	PPMS097, PPMS115, PPMS133

Pinch-point Communication of BA on UHF frequency	
Mitigation Strategy PPMS013 – Designated rescue frequency/ECO to BA teams	
Supported- radio replacement project and a communications plan are currently underway.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil

Pinch-point Nil or delayed communication with safety officer

Mitigation Strategy PPMS126 – Clarity / understanding of AEP commitments re ARFFS resources involvement.	
Supported - relationship further developed between Aerodrome operator and ARFFS in relation to the roles of ARFF. Action at the local level (AEC)	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	AEP
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS127- Enhance technology to support EM (FC access to iPad / laptop etc.).	
Supported - as per current projects in relation to MSA telemetry project and FCC MS Project.	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	FCCMS
Related Mitigation Strategy	PPMS110
Mitigation Strategy PPMS0128 – Radio positioned in Airport ICS caravan. (Melbourne)	
Supported - explored at the local level for those stations in which communications with aerodrome safety officer is limited. (Relates to PP above)	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS129- Review of communications with airport safety officers with a potential for dedicated communications (equipment/phone)	
Supported - explored at the local level for those stations in which communications with aerodrome safety officer is limited. (Relates to PP above)	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	PPMS094
Mitigation Strategy PPMS131- Review of EM function and resource analysis to determine staffing requirements.	
Supported - explored at the local level for those stations in which communications with aerodrome safety officer is limited. Clarity of understanding between aerodrome and ARFFS regarding roles when communication is poor.	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	PPMS114
Mitigation Strategy PPMS132- Review of local procedures	

Supported - explored at the local level for those stations in which communications with aerodrome safety officer is limited. Clarity of understanding between aerodrome and ARFFS regarding roles when communication is poor.	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS133- Review of response times for the LL/CoC (Revise the '90-minute response time - more suitable / shorter timeframe)	
Supported- a review of the 90-minute time frame for response of LL/CoC is required. (ops111). The time frame for response was viewed as being too long.	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Ops-111, 4.3
Related Mitigation Strategy	PPMS012, PPMS097, PPMS115

Pinch-point Reduced ability for communication between OIC and external resources/staff recall.	
Mitigation Strategy PPMS146 - Remote FCC/Centralised FCC	
Unsupported - Currently being explored via FCC MS project and radio replacement project.	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	FCCMS
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS147 – Review of communications with state agencies (inter-operability)	
Unsupported - Currently being explored via radio replacement project.	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	PPMS095

Annex 11: Unsupported Mitigation Strategies - Communications

Pinch-point Inability to communicate with FC due to single phone. (Sunshine Coast)	
Mitigation Strategy PPMS050 - Equipment/phone	
Unsupported - Sunshine Coast have addressed with an additional phone.	
Date reviewed	08/04/22
Further actions	Nil
References	Nil
Mitigation Strategy PPMS051 – Review of local procedures	
Unsupported - Sunshine Coast have addressed with an additional phone.	
Date reviewed	08/04/22
Further actions	Nil
References	Nil

Pinch-point Nil or delayed communication with safety officer	
Mitigation Strategy PPMS130 – Review of current ARFFS radios	
Unsupported - Ability of safety officer to have comms via radio replacements and ARFFS Communication may result in complications (Dedicated comms with arriving resources and fireground priority)	
Date reviewed	08/04/22
Further actions	Nil
References	Nil

Annex 12: Supported Mitigation Strategies – Heat Stress

Pinch-point Heat stress / crew welfare	
Mitigation Strategy PPMS039 - Ability to quickly adjust crash notification to ensure max recall numbers	
Supported- FCCMS project currently reviewing this option for faster recall via SMS	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	FCCMS
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS042 - HRET	
Supported- An analysis on the capabilities and benefits of HRET to assist and improve ARFFS operations at an incident is supported.	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	Service Change
References	Nil
Related Mitigation Strategy	PPMS015, PPMS024, PPMS053, PPMS107, PPMS124
Mitigation Strategy PPMS043 - Improved training/guidance in the implementation of heat stress protocols	
Supported - refresher package on heat stress management (in relation to training). Practical aspects/points rather than technical physiological information. Potential to develop similar package with focus on operational response.	
Date reviewed	08/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS046 - Review PPE with intent to improve PPE to consider Heat stress considerations.	
Supported - Review to be referred to ARFFS Standards. Ongoing consideration to the implications of heat stress with current PPE should be periodically reviewed.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	PPMS145
Mitigation Strategy PPMS047 – Review vehicle stowage to ensure all essential equipment on vehicle	
Supported- Current task request has been asked of SC to review national locker stowage solution.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards

References	Nil
Related Mitigation Strategy	Nil

Pinch-point Inability to utilise station-based equipment required for fireground (BA Board easel, Hazmat equipment, Decontamination equipment, heat stress equipment).	
Mitigation Strategy PPMS067 - Additional BA board (smaller in size) or other technology suitable for initial stages of BA operations	
Supported- ARFFS operations are conducting testing with new CABA sets and CABA boards with new MSA CABA sets.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS068 - Fireground equipment ready to be deployed via trailer/GUV (existing/modified)	
Supported- Current task request has been asked of SC to review national locker stowage solution.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS069 - Formalise recall of ARFFS staff, and roles and responsibilities of arriving off duty staff (potential on call staff - CoC). e.g. establishing heat stress equipment etc)	
Supported- Locally staff should have an awareness of the structure required when arriving on station. Having a formal list of considerations is deemed to be an appropriate approach for staff recall.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	PPMS178
Mitigation Strategy PPMS070 - Review vehicle stowage to ensure all essential equipment on vehicle	
Supported- Current task request has been asked of SC to review national locker stowage solution.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS071 - Technology to monitor temp/heat stress of FFs	
Supported - ARFF specialist (Brenden P) currently undertaking work regarding heat stress. Part of that position is to continually review and explore improvements	
Date reviewed	13/04/22

Further actions	To include instruction in SOP/AFFM to have state ambulance service onsite ASAP for ARFFS staff
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil

Pinch-point Potential lack of sufficient resources to establish and assist with decontamination/heat stress prior to BA team exit from aircraft.	
Mitigation Strategy PPMS134 - Fireground equipment ready to be deployed via trailer/GUV (existing/modified)	
Supported- Current task request has been asked of SC to review national locker stowage solution.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS0136 - Review vehicle stowage to ensure all essential equipment on vehicle	
Supported- Current task request has been asked of SC to review national locker stowage solution.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil

Annex 13: Unsupported Mitigation Strategies – Heat Stress

Pinch-point FF donning CABA from vehicle after being in contaminated area/fire ground.	
Mitigation Strategy PPMS035 - Additional CABA available from external of vehicle (additional up to 2 sets) (location of sets rather extra sets).	
Unsupported - Decontamination of the vehicle will need to complete regardless at a large-scale incident. AFFM-HZ defines decontamination of vehicles.	
Date reviewed	08/04/22
Further actions	Nil
References	AFFM-HZ
Mitigation Strategy PPMS036 – Review of decontamination procedures	
Unsupported - Decontamination procedures in place for personnel and vehicles (inclusive of specialist external agencies)	
Date reviewed	08/04/22
Further actions	Nil
References	SOP-053, AFFM-HZ

Pinch-point Heat stress / crew welfare	
Mitigation Strategy PPMS040 – Advice on continuing and improving heat stress management procedure (inclusive of review of equipment, active cooling on the fireground).	
Unsupported - ARFF specialist [redacted] currently undertaking work regarding heat stress. Part of that position is to continually review and explore improvements.	
Date reviewed	08/04/22
Further actions	Nil
References	AFFM-01
Mitigation Strategy PPMS041 – Fireground equipment ready to be deployed via trailer/GUV (existing/modified)	
Unsupported - potentially unpractical to deploy at an incident site (baths, ice, clean water). Returning to station was deemed as an appropriate solution, however, can be determined locally.	
Date reviewed	08/04/22
Further actions	Nil
References	Nil
Mitigation Strategy PPMS044 - Review capability to enhance vehicles to ensure cool environment prior to PPE/CABA activities.	
Unsupported- no evidence to suggest that air conditioning will have an effect on cooling core temperatures.	
Date reviewed	13/04/22
Further actions	Nil
References	Nil

Mitigation Strategy PPMS045 – Review of fireground operations to support firefighters remaining in vehicle (when applicable) to reduce exposure to heat stress/ HOTS environment.	
Unsupported- There is no reason for staff to alight the vehicle if not required. These teachings have been consistent at ARRFS training over the last few years. AFFM-06	
Date reviewed	13/04/22
Further actions	Nil
References	AFFM-01

Pinch-point Inability to utilise station-based equipment required for fireground (BA Board easel, Hazmat equipment, Decontamination equipment, heat stress equipment).	
Mitigation Strategy PPMS135 - Review of decontamination procedures	
Unsupported - Decontamination procedures in place for personnel and vehicles (inclusive of specialist external agencies)	
Date reviewed	13/04/22
Further actions	Nil
References	Nil

Annex 14: Supported Mitigation Strategies – External Agencies

Pinch-point There is a question mark over the suitability and number of the arriving resources and their ability to provide assistance to ARFFS within a suitable timeframe inclusive of initial and subsequent arrivals.	
Mitigation Strategy PPMS166 - Additional vehicle	
Supported- current project reviewing vehicles.	
Date reviewed	4/05/22
Further actions	Nil
Responsible Unit	Service Change
References	AFFM-M8
Related Mitigation Strategy	PPMS014, PPMS052, PPMS059, PPMS122, PPMS123, PPMS148, PPMS157, PPMS176
Mitigation Strategy PPMS167 - Clarification on ARFFS requirements to achieve tasks and objectives beyond arriving external resources	
Supported- The requirements of ARFFS does not change but the role will change depending on situation presented to the OIC including the availability of local resources.	
Date reviewed	04/05/22
Further actions	Pre plan to be reviewed to potentially include meetings with external services on regular basis to increase knowledge and capability at different stages of an incident.
Responsible Unit	ARFFS Standards
References	ICAO ASM, SOP-004
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS170 - Review Interoperability of ARFFS and other services (procedures, equipment, communication).	
Supported- Link to PPMS173 for procedural and equipment interoperability. Current radio replacement project and communications plan cover communications.	
Date reviewed	04/05/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS171 - Review of ARFFS call back procedures strengthening recall procedures inclusive of ability to recall staff from nearby locations (Port Hedland, Karratha, HI, Yulara, Newman).	
Supported- review is supported to investigate call back procedures at remote locations	
Date reviewed	04/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	AFFM-08
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS172 - Review of capability of technology for recall (potential text message) to improve and enhance recall timeframe.	
Supported- FFCMS project currently undertaking review of enhanced recall as part of system	

Date reviewed	04/05/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	PPMS112
Mitigation Strategy PPMS173 - Undertake analysis relating to supporting services, to identify expectations of real ability to respond	
Supported- an analysis into supporting services, resources and capabilities is required and what is expected of these resources. Local inter-agency development is suggested.	
Date reviewed	04/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil

Annex 15: Unsupported Mitigation Strategies – External Agencies

Pinch-point There is a question mark over the suitability and number of the arriving resources and their ability to provide assistance to ARFFS within a suitable timeframe inclusive of initial and subsequent arrivals	
Mitigation Strategy PPMS168 - Guarantee availability of spare vehicle.	
Unsupported- there is no regulation that requires a spare vehicle to be available for category. The guarantee of a spare vehicle is not possible at a majority of aerodromes.	
Date reviewed	05/04/22
Further actions	Nil
References	Nil
Mitigation Strategy PPMS169 - Investigate the ability of staff on recall to effectively reach the station during a major incident (roadblock) - may require ARFF ID (ASIC).	
Unsupported- a major incident will cause access issues that will be needed to be managed on the day on a local basis. Stations may review local instructions to pre-plan the options available to staff.	
Date reviewed	05/04/22
Further actions	Nil
References	AAA-Airport Emergency planning in Australia

Annex 16: Supported Mitigation Strategies - Fireground

Pinch-point Charging of attack line before or after entry.	
Mitigation Strategy PPMS009 - Additional training / clarification regarding making entry into aircraft with a charged/uncharged line (standardised approach).	
Supported- Task request in place to assess the access to an aircraft with hose lines via ladder.	
Date reviewed	4/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	AFFM-07
Related Mitigation Strategy	Nil

Pinch-point FB10X deployed on fireground when vehicle available resulting in heavy workload for FF	
Mitigation Strategy PPMS024 - HRET	
Supported- An analysis on the capabilities and benefits of HRET to assist and improve ARFFS operations at an incident is supported.	
Date reviewed	4/05/22
Further actions	Nil
Responsible Unit	Service Change
References	DOT/FAA/AR-05/53
Related Mitigation Strategy	PPMS015, PPMS042, PPMS053, PPMS107, PPMS124

Pinch-point FC has a loss of situational awareness and fire ground safety.	
Mitigation Strategy PPMS028 - Enhancement to training so that fire fighter staff can better perform relevant roles inside the aircraft absent of Officer oversight.	
Supported- This mitigator is supported however further understanding of what is actually needed to be upskilled is required	
Date reviewed	18/05/22
Further actions	Questionnaire required for better understanding of skills required to be improved.
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	PPMS108, PPMS120
Mitigation Strategy PPMS029 - FC positioned on a Forward Command Vehicle.	
Supported- A trial has been carried out in Melbourne however the group supports a further review into the benefits of this mitigation strategy.	
Date reviewed	04/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil

Mitigation Strategy PPMS032 - Formalised "hot zones" identified (standardised PPE requirements for aircraft incidents) in support of situation size up.	
Supported - Supported- Clarification regarding hot zones/hazardous zones is supported including the use of BA. Documentation and training to be reviewed. Standardising or nominating hot zones for aviation incidents reduces the ability of the OIC to undertake a dynamic risk assessment on the fire ground. Each incident will have unique hazards that should be managed as part of the OIC IAP.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	AFFM-HZ – HazMat
Related Mitigation Strategy	PPMS139

Pinch-point FC/FF operating in a HOTS environment without CABA.	
Mitigation Strategy PPMS031 - Equipment to improve entry/egress into aircraft to alleviate staff from working in HOTS environment.	
Supported- This strategy is being looked at within the CABA PIR.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS033 - Investigate various levels of PPE (Respirators through to CABA)	
Supported - The Group supports the investigation into the introduction of respirators as part of PPE options. However a concurrent project by the MSA implementation team, along with ARFFS standards, are currently investigating the introduction of respirators utilised with the MSA CABA sets.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	PMS140
Mitigation Strategy PPMS034 - Utilisation of respirators	
Supported - The Group supports the investigation into the introduction of respirators as part of PPE options. However a concurrent project by the MSA implementation team, along with ARFFS standards, are currently investigating the introduction of respirators utilised with the MSA CABA sets.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil

Pinch-point FF8 shuts down defensive attack - potential for conditions to escalate prior to BA team making entry.	
Mitigation Strategy PPMS037 - Additional attack line	
Supported- An additional attack line may be required and would be a decision of the OIC dependant on resourcing available.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	AFFM-HZ
Related Mitigation Strategy	Nil

Pinch-point Inability to effectively maintain foam blanket from a static position	
Mitigation Strategy PPMS053 - HRET	
Supported- An analysis on the capabilities and benefits of HRET to assist and improve ARFFS operations at an incident is supported.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	Service Change
References	Nil
Related Mitigation Strategy	PPMS015, PPMS024, PPMS042, PPMS107, PPMS124
Mitigation Strategy PPMS054 - Vehicle capability	
Supported- An analysis on the capabilities and benefits of HRET to assist and improve ARFFS operations at an incident is supported.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	Service Change
References	Nil
Related Mitigation Strategy	PPMS066, PPMS085

Pinch-point Nil fire protection on s/board side.	
Mitigation Strategy PPMS124 - HRET	
Supported- An analysis on the capabilities and benefits of HRET to assist and improve ARFFS operations at an incident is supported.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	Service Change
References	Nil
Related Mitigation Strategy	PPMS015, PPMS024, PPMS042, PPMS053, PPMS107

Mitigation Strategy PPMS125 - Review of BASSW to clarify workload/tasking/location of RIT Team leader	
Supported- As part of the BASSW PIR, clarity regarding the tasking and positioning of the RIT team leader is currently being reviewed.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	PPMS155, PPMS155

Pinch-point Reduced ability to observe s/board side of aircraft - reduced ability to undertake complete size-up due to single officer / single vehicle. (Cat 5)	
Mitigation Strategy PPMS149 - FC positioned on a Forward Command Vehicle	
Supported- A trial has been carried out in Melbourne however the group supports a further review into the benefits of this mitigation strategy.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil

Pinch-point Reduced ability to undertake full size up of incident	
Mitigation Strategy PPMS151 - FC positioned on a Forward Command Vehicle	
Supported- A trial has been carried out in Melbourne however the group supports a further review into the benefits of this mitigation strategy.	
Date reviewed	18/05/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	Nil

Annex 17: Unsupported Mitigation Strategies - Fireground

Pinch-point FB10X deployed on fireground when vehicle available resulting in heavy workload for FF
Mitigation Strategy PPMS025 - Remain in vehicle and utilise monitor/bumper monitor
Unsupported- The use of bumper monitor/ monitor is already available to ARFFS OIC. Gen 2 workshops delivered training relating to utilising the MK8 to its full capacity.

Date reviewed	18/04/22
Further actions	Nil
References	Nil

Mitigation Strategy PPMS026 - Review strategy and tactics
Unsupported- the ability for the OIC to make decisions from their dynamic risk assessment to utilise the FB10X in fireground operations is already in service.

Date reviewed	18/04/22
Further actions	Nil
References	Nil

Pinch-point FB10X not deployed on s/s of aircraft prior to work carried out.
Mitigation Strategy PPMS027 - Review strategy and tactics
Unsupported- the ability for the OIC to make decisions from their dynamic risk assessment to utilise the FB10X in fireground operations is already in service.

Date reviewed	18/04/22
Further actions	Nil
References	Nil

Pinch-point FC has a loss of situational awareness and fire ground safety.
Mitigation Strategy PPMS030 - Provide additional training to other staff to perform size-up activities
Unsupported- Information regarding size up activities is already delivered through training. Any gap in knowledge needs to be actioned at a local level.

Date reviewed	18/05/22
Further actions	Nil
References	Nil

Pinch-point Inability to effectively maintain foam blanket from a static position
Mitigation Strategy PPMS052 - Additional vehicle
Unsupported- ARFFS have more than one option to maintain the foam blanket on the fireground. The OIC needs the flexibility to make risk assessments to enact the IAP.

Date reviewed	25/05/22
Further actions	Nil

References	Nil

Pinch-point Initial attack and back up line (2 lengths) insufficient to complete tasking.	
Mitigation Strategy PPMS074 - 38 mm hose to reduce workload	
Unsupported- 38mm hose has been introduced to service	
Date reviewed	18/05/22
Further actions	Nil
References	Nil

Pinch-point Nil backup line / insufficient staff to deploy back-up line. (Cat 5)	
Mitigation Strategy PPMS122 - Additional vehicle	
Unsupported- understanding Cat 5 resourcing the OIC is required to use their assessment of the risk and deploy resourcing appropriate for the risk identified.	
Date reviewed	18/05/22
Further actions	Nil
References	Nil

Pinch-point Nil fire protection on s/board side.	
Mitigation Strategy PPMS123 - Additional vehicle	
Unsupported- ARFFS have options to provide fire protection on the starboard side by deploying a FB10X	
Date reviewed	18/05/22
Further actions	Nil
References	Nil

Pinch-point Reduced ability to observe s/board side of aircraft - reduced ability to undertake complete size-up due to single officer / single vehicle. (Cat 5	
Mitigation Strategy PPMS148 - Additional vehicle	
Unsupported- understanding Cat 5 resourcing the OIC is required to use their assessment of the risk and deploy resourcing appropriate for the risk.	
Date reviewed	18/05/22
Further actions	Nil
References	Nil

Pinch-point Reduced ability to undertake fireground safety whilst tasked with don PPE CABA.	
Mitigation Strategy PPMS150 - Review strategy and tactics	
Unsupported- staff have the ability to continue to monitor the fire ground while completing other tasks.] including donning PPE.	
Date reviewed	18/05/22
Further actions	Nil
References	Nil

Pinch-point Reduced ability to undertake full size up of incident	
Mitigation Strategy PPMS152 - Provide additional training to other staff to perform size-up activities	
Unsupported- Information regarding size up activities is already delivered through training. Any gap in knowledge needs to be actioned at a local level.	
Date reviewed	18/05/22
Further actions	Nil
References	Nil

Pinch-point Uncertainty regarding ARFFS role in directing evacuating passengers	
Mitigation Strategy PPMS177 - Review of ARFFS role regarding directing evacuating passengers	
Unsupported- This is referenced in documentation. Assistance can be provided to passengers if required to meet the IAP.	
Date reviewed	18/05/22
Further actions	Nil
References	Nil

Pinch-point White out T1 - down wind application of agent	
Mitigation Strategy PPMS179 - OIC decision making	
Unsupported- The OIC requires flexibility to make decisions to enact the IAP. If required, the ability to operate downwind sits with the OIC and what they are attempting to achieve.	
Date reviewed	18/04/22
Further actions	Nil
References	Nil
Mitigation Strategy PPMS180 - Review strategy and tactics	
Unsupported- The OIC requires flexibility to make decisions to enact the IAP. If required, the ability to operate downwind sits with the OIC and what they are attempting to achieve.	
Date reviewed	18/04/22

Further actions	Nil
References	Nil

Annex 18: Supported Mitigation Strategies – Internal Operations

Pinch-point Delay in controlling internal conditions.	
Mitigation Strategy PPMS015 - HRET	
Supported - An analysis on the capabilities and benefits of HRET to assist and improve ARFFS operations at an incident is supported.	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	Operational Standards
References	
Related Mitigation Strategy	PPMS024, PPMS042, PPMS053, PPMS107, PPMS124

Pinch-point Delay to deploy ancillary equipment into the aircraft.	
Mitigation Strategy PPMS016 – Review of current equipment used for overhaul/internal operations- is it fit for purpose.	
Supported - A review of current equipment has already been initiated; however it has not been prioritised as yet.	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	Operational Standards
References	
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS017- Review procedure/process used to enable equipment to be taken aloft inclusive of ladder procedures.	
A review of procedure/process to take equipment aloft is supported. Equipment is available to improve this mitigator. (Work has already been completed)	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	Operational Standards
References	
Related Mitigation Strategy	Nil

Pinch-point High risk activities internal of aircraft
Mitigation Strategy PPMS048- Upskilling of firefighters to undertake high risk decision making.
Supported -This mitigator is supported however further understanding of what is actually needed to be upskilled is required.

Date reviewed	18/03/22
Further actions	Survey staff to assess what high-risk decision-making needs further training.
Responsible Unit	ARFFS Training
References	
Related Mitigation Strategy	

Pinch-point Lack of multiple BA team for multi aisle aircraft	
Mitigation Strategy PPMS107 – HRET	
Supported- An analysis on the capabilities and benefits of HRET to assist and improve ARFFS operations at an incident is supported.	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	
Related Mitigation Strategy	PPMS015, PPMS024, PPMS042, PPMS053, PPMS124

Pinch-point Lack of officer oversight / management for internal environment	
Mitigation Strategy PPMS108 - Enhancement to training so that fire fighter staff can better perform relevant roles inside the aircraft absent of Officer oversight.	
Supported - This mitigator is supported however further understanding of what is actually needed to be upskilled is required	
Date reviewed	18/03/22
Further actions	Survey staff to assess what high-risk decision-making needs further training.
Responsible Unit	ARFFS Operations
References	
Related Mitigation Strategy	PPMS028 PPMS120

Pinch-point Lack of training and procedure for rescuing persons from an aircraft incident without officer oversight.	
Mitigation Strategy PPMS120 - Enhancement to training so that fire fighter staff can better perform relevant roles inside the aircraft absent of Officer oversight.	
Supported - This mitigator is supported however further understanding of what is actually needed to be upskilled is required	
Date reviewed	18/03/22
Further actions	Survey staff to assess what high-risk decision-making needs further training.
Responsible Unit	ARFFS Operations
References	
Related Mitigation Strategy	PPMS028 PPMS108

Pinch-point Suitability of the GAM (inability to bump test) to sense internal HOTS environment.	
Mitigation Strategy PPMS159 – Better training and understanding of when and what we are assessing.	
Supported - A review of the training is supported to improve ARFFS knowledge of what is being assessed.	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS160- A review of the training is supported to improve ARFFS knowledge of when to use a gas detector.	
Supported - A review of procedure/process to take equipment aloft is supported. Equipment is available to improve this mitigator. (Work has already been completed)	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	ARFFS Training
References	
Related Mitigation Strategy	Nil

Pinch-point The ability to safely access / egress the aircraft via ladder.	
Mitigation Strategy PPMS165- Review potential to utilise onsite aircraft access equipment.	
Supported- It was identified that aerodrome stakeholders have equipment that may be beneficial to ARFFS in an emergency incident situation. This is an action for regional and local managers to investigate what equipment is available and to discuss its use by ARFFS if needed.	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil

Pinch-point Workload of BA team (increased fatigue)	
Mitigation Strategy PPMS181 – Clarification of procedure - 'do we manage the fire first, or rescue first'? Order of priority for aircraft incidents.	

Supported - Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Airport Services Manual Sect 12.3.1 and 12.3.2
Related Mitigation Strategy	PPMS001 PPMS098
Mitigation Strategy PPMS182- Investigate effects of compounding workload on BA team	
Supported - Increase the understanding/knowledge of staff regarding monitoring of workloads and the effects of heat stress on firefighters.	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	
Related Mitigation Strategy	PPMS090
Mitigation Strategy PPMS183 – Review and develop improved procedures / guidance / training on casualty management and assessment / triage of casualties. Potential learnings from other agencies and/or international standards	
Supported- triage is a part of a review and ongoing facilitation work being undertaken by Ambulance Victoria and ARFFS.	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	ARFFS Training
Related Mitigation Strategy	PPMS003 PPMS102
Mitigation Strategy PPMS184- Review strategy and tactics for internal firefighting/rescue (e.g. BA team A1 fire attack, BA A2 team rescue)	
Supported - Strategy and tactics group to consider internal firefighting/rescue as a topic to as part of the working groups scope.	
Date reviewed	18/03/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	
Related Mitigation Strategy	PPMS103

Annex 19: Unsupported Mitigation Strategies – Internal Operations

Pinch-point Firefighter fatigue from fireground workload prior to internal operations	
Mitigation Strategy PPMS038 - Designated/clarification of roles for external and internal operations	
Unsupported- Situational awareness is vital for an OIC to deploy resources as needed. By designating roles on the fireground that ability is reduced.	
Date reviewed	18/03/22
Further actions	Nil
References	Nil

Pinch-point Inability to manoeuvre hose / advance hose and utilise ancillary (TIC) whilst progressing down fuselage.	
Mitigation Strategy PPMS055 - 38 mm hose to reduce workload	
Unsupported- 38mm hose has been introduced to service	
Date reviewed	18/03/22
Further actions	Nil
References	AFFM-EQ
Related Mitigation Strategy	PPMS074
Mitigation Strategy PPMS056 - Review of equipment required for BA use.	
Unsupported- G Force Branches and 38mm hoses have been introduced into service.	
Date reviewed	18/03/22
Further actions	Nil
References	AFFM-EQ

Pinch-point Lack of GAM (Broome &Whitsunday Coast)	
Mitigation Strategy PPMS105 - Acquire GAM	
Unsupported - Broome and Whitsunday Coast have now received a MultiRAE Lite Gas detector.	
Date reviewed	18/03/22
Further actions	Nil
References	Nil

Pinch-point Lack of multiple BA team for multi aisle aircraft	
Mitigation Strategy PPMS106 - Equipment that supports CFBT (efficiency regarding agent use)	
Unsupported - G Force Branches and 38mm hoses have been introduced into service.	
Date reviewed	18/03/22
Further actions	Nil
References	AFFM-EQ

Pinch-point Suitability of the GAM (inability to bump test) to sense internal HOTS environment.	
Mitigation Strategy PPMS158 - Acquire a more fit for purpose / user friendly sensing device suitable for the interior of aircraft.	
Unsupported A new and improved gas detector has been introduced into service. The MultiRAE lite gas detector is now available.	
Date reviewed	18/03/22
Further actions	Nil
References	AFFM-EQ

Pinch-point The ability to safely access / egress the aircraft via ladder.	
Mitigation Strategy PPMS164 - Review of access/egress of aircraft inclusive of training	
Unsupported - The process to access and egress an aircraft via ladder has been deemed sufficient at this time.	
Date reviewed	18/03/22
Further actions	Nil
References	AFFM-EQ

Pinch-point Workload of BA team (increased fatigue)	
Mitigation Strategy PPMS185- Standardisation for staffing numbers for internal BA team	
Unsupported - BA SSW defines minimum number of staff for internal operations. Additional staff above the minimum is decided to be the OIC pending available resources and risk assessment of the incident.	
Date reviewed	18/03/22
Further actions	Nil
References	Nil
Related Mitigation Strategy	PPMS092

Annex 20: Supported Mitigation Strategies – Response

Pinch-point Inability to reposition on nose of aircraft due to terrain.	
Mitigation Strategy PPMS063 - Review, train and employ alternate strategy and tactics (as per ORA).	
Supported- further investigations required - AALLS discussions with aerodrome operators regarding ability to manoeuvre on the RESA and requirements of 139. Additional strategies and tactics considered at individual locations. Consideration if applicable inclusion in ORA.	
Date reviewed	09/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	CASR139 – 6.26
Related Mitigation Strategy	Nil

Pinch-point Inability to traverse RESA 01L (direction per BAC?).	
Mitigation Strategy PPMS064 - Alternative routes to incident (pre-plan)	
Supported- further investigations required - AALLS discussions with aerodrome operators regarding ability to manoeuvre on the RESA and requirements of 139. Additional strategies and tactics considered at individual locations. Consideration if applicable inclusion in ORA.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS065 - Confirm with aerodrome operator RESA capability/AEP	
Supported- further investigations required - AALLS discussions with aerodrome operators regarding ability to manoeuvre on the RESA and requirements of 139. Additional strategies and tactics considered at individual locations. Consideration if applicable inclusion in ORA.	
Date reviewed	30/03/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	CASR139 - 6.26
Related Mitigation Strategy	Nil

Annex 21: Unsupported Mitigation Strategies – Response

Pinch-point Delay in arrival due to distance of travel required to New Parallel Runway Brisbane	
Mitigation Strategy PPMS014 – Additional vehicle	
Unsupported - Additional vehicle online. Pinch-point mitigated	
Date reviewed	09/03/22
Further actions	Nil
References	Nil

Pinch-point Inability to achieve 3-minute response time to all thresholds with one vehicle (Cat 5 Brisbane) resulting in delay to achieve Q1.	
Mitigation Strategy PPMS049 – Secondary vehicle with officer (one at each station)	
Unsupported - Additional vehicle/staff online when Cat 5. Pinch-point mitigated	
Date reviewed	09/03/22
Further actions	Nil
References	Nil

Pinch-point Inability to traverse RESA 01L (direction per BAC?).	
Mitigation Strategy PPMS066 - Vehicle capability	
Unsupported- All-wheel drive, differential locks and inter-differential locks assists vehicle movement in difficult terrain.	
Date reviewed	30/03/22
Further actions	Nil
References	AFFM-03, AFFM-M8

Pinch-point Response procedures relating to first and second response to aviation incident. FC in first or second vehicle (Sunshine Coast)	
Mitigation Strategy PPMS153 - Review local instructions regarding the above (SO on first response)	
Unsupported- Local instructions determine response procedures.	
Date reviewed	30/03/22
Further actions	Nil
References	Nil
Mitigation Strategy PPMS154 - Review of policy and procedure regarding first arriving officer. (Cert 4)	

Unsupported- Cert 4 are rated to respond to incidents.	
Date reviewed	30/03/22
Further actions	Nil
References	Nil

Pinch-point Sydney operates 2 stations with FCC operating from Station 2.	
Mitigation Strategy PPMS161 - Staff dispositions for CAT 9 documented in LI (Syd)	
Unsupported-Sydney dispositions for Cat 9 have already been documented in SYD Local Instructions identifying the two-station model.	
Date reviewed	30/03/22
Further actions	Nil
References	Nil

Annex 22: Supported Mitigation Strategies – Staff

Pinch-point Lack of timely response by supporting emergency management resources. (Line leader/ CoC)	
Mitigation Strategy PPMS109 - Dedicated command channel	
Supported- Radio replacement project is currently being undertaken with a comms plan being designed including a command channel.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS110 - Enhance technology to support EM (FC access to iPad / laptop etc.).	
Supported - as per current projects in relation to MSA telemetry project and FCC MS Project.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	PPMS127
Mitigation Strategy PPMS111 - Incident support- better support equipment such as EM grab bags, including tabards, electronics, charging brick etc.	
Supported- Review contents of ICS kits for possible national implementation.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Melbourne ARFFS
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS112 - Review of capability of technology for recall (potential text message) to improve and enhance recall timeframe.	
Supported- FFCMS project currently undertaking review of enhanced recall as part of system.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	PPMS172
Mitigation Strategy PPMS113 - Review of EM comms plan to improve capability	
Supported- Radio replacement project is currently being undertaken with a comms plan being designed including a command channel.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil

Mitigation Strategy PPMS114 - Review of EM function and resource analysis to determine staffing requirements.	
Supported - explore at the local level for those stations in which communications with aerodrome safety officer is limited. Clarity of understanding between aerodrome and ARFFS regarding roles when communication is poor.	
Date reviewed	13/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	AFFM-05, SOP-04
Related Mitigation Strategy	PPMS131
Mitigation Strategy PPMS115 - Review of response times for the LL/CoC (Revise the '90-minute response time - more suitable / shorter timeframe)	
Supported - Group support the review of the 90 minutes response times (ops-111) to a more suitable timeframe.	
Date reviewed	13/04/22
Further actions	Comms plan from OIC on the fireground to LL/CoC in the aviation environs.
Responsible Unit	ARFFS Standards
References	Ops-111
Related Mitigation Strategy	PPMS012, PPMS097, PPMS133
Mitigation Strategy PPMS117 - The ability for remote management of comms from other ARFFS stations	
Supported- an investigation into remote communications from other stations or NCC is supported and links in with the FCCMS project.	
Date reviewed	27/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil
Mitigation Strategy PPMS119 - Utilise aerodrome staff until communications with Line Leader can be established and/or staff recall in place. Associated agreement/training for aerodrome staff to fill this initial role.	
Supported- a review into utilising aerodrome staff at incidents on aerodrome and how that resource can be utilised to assist ARFFS is supported.	
Date reviewed	27/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Airport Emergency Planning (AAA), MOS139
Related Mitigation Strategy	Nil

Pinch-point Nil additional fire fighters available to provide replacement CABA team.
Mitigation Strategy PPMS121 - Complete analysis on the nature and definition of rescue and confirm how this can be achieved and applied by ARFFS relative to the TRA scenario. Implement the outcomes of this analysis.

Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.	
Date reviewed	27/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Nil
Related Mitigation Strategy	PPMS099, PPMS121

Pinch-point The ability of CoC with Yulara being 430km and lack of qualified staff to take on CoC role.	
Mitigation Strategy PPMS163 - Review of local arrangement (both aerodromes)	
Supported- a review locally of CoC arrangements and options available to local staff.	
Date reviewed	27/04/22
Further actions	Nil
Responsible Unit	ARFFS Operations
References	Nil
Related Mitigation Strategy	Nil

Pinch-point Unclear roles of ARFFS recall staff	
Mitigation Strategy PPMS178 - Formalise recall of ARFFS staff, and roles and responsibilities of arriving off duty staff (potential on call staff - CoC). e.g. establishing heat stress equipment etc)	
Supported- Locally staff should have an awareness of the structure required when arriving on station. Having a formal list of considerations is deemed to be an appropriate approach for staff recall.	
Date reviewed	27/04/22
Further actions	Nil
Responsible Unit	ARFFS Standards
References	Ops-111
Related Mitigation Strategy	PPMS069

Annex 23: Unsupported Mitigation Strategies – Staff

Pinch-point Inexperience of staff at stations with a high number of recruits (e.g. Whitsunday coast)	
Mitigation Strategy PPMS072 - Consideration of rank/service time when recruiting multiple positions (workforce deployment)	
Unsupported- staff having been rated are deemed competent to fulfil their accountabilities.	
Date reviewed	13/04/22
Further actions	Nil
References	Nil
Mitigation Strategy PPMS073 - Utilising the rank of SSO as a requirement for crewing	
Unsupported- the use of SSO is already available to stations with staff with that qual. The ability to staff units with all ranks is desirable but should not be mandated and is potentially a local opportunity for staff to upskill.	
Date reviewed	13/04/22
Further actions	Nil
References	Nil

Pinch-point Lack of timely response by supporting emergency management resources. (Line leader/ CoC)	
Mitigation Strategy PPMS116 - Rostered CoC EM function	
Unsupported- The ability to roster staff for CoC is already available to stations.	
Date reviewed	27/04/22
Further actions	Nil
References	Nil
Mitigation Strategy PPMS118 - Use of the ARFFS National Resource Centre (Ops- 143)	
Unsupported- Ops-143 is designed for national incidents where ARFFS have been requested via mutual aid.	
Date reviewed	27/04/22
Further actions	Nil
References	Nil

Pinch-point The ability of CoC with Yulara being 430km and lack of qualified staff to take on CoC role.	
Mitigation Strategy PPMS162 - Increased levels of qualifications at both locations (to ensure single aerodrome/model for incident management	
Unsupported- Increase in qualifications does not have a bearing on the lack of responding resources at a remote locality.	
Date reviewed	27/04/22
Further actions	Nil
References	Nil

TRA Phase 3
Implementation Phase

OFFICIAL: Sensitive
1. Airservices takes its security responsibilities seriously with all Airservices employees undertaking to protect and preserve official information as a requirement of their employment.
2. To protect the confidentiality and sensitivity of the data contained in the TRA, Airservices has limited access to the Phase 1 and 2 TRA workshops to specified personnel.
Attendees have not been permitted to take any hard or soft copy information away from the workshops.
3. The TRA information has been stored in an appropriate and secure drive by Airservices and has not been shared external to Airservices due to its national security and commercial sensitivities.

	Name and Title	Signature	Date
Prepared by: Project Manager	[redacted] ARFFS- Service Improvement Specialist	[redacted]	DD/MM/YYYY
Approved: Program Manager /Approving Authority	[redacted] Manager ARFF Service Change	[redacted]	DD/MM/YYYY

Document – Version Control

Version No.	Date	Changed by	Nature of amendment
0.1		[redacted]	Initial draft for approval

Document pending: signatures to be completed at 'End of Project'

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1. Introduction

This project plan is a statement of how the Task Resource Analysis (TRA) Phase 3 objectives are to be implemented and achieved. It plans the project scope, schedule, governance arrangements and related management activities necessary to support successful project delivery.

2. Basis for Planning

2.1 Background

The TRA provides a framework to identify recommendations for minimum levels of staffing and resourcing required to achieve Aviation Rescue Fire Fighting Services (ARFFS) functional requirements. The output of the Phase 1 of the TRA project was a data set that identified pinch points and associated mitigation strategies which went beyond simply the provision of additional staff. To maximise the value of the data gathered in phase 1 a detailed critical analysis, investigation and prioritisation of the data set was completed relating to all pinch-point not related to additional staff. The outcomes of phase 2 resulted in sixty-six supported, fifty-seven supported strategies that are already covered by an existing project. Phase 3 will provide a detailed, feasible and executable improvement program of work.

2.2 Objectives

The key objective of this project is to provide the appropriate business units with a set of defined and prioritised mitigation strategies identified as part of TRA phase 2. Business units will then scope, plan, and implement the priority strategies that have been assigned to each unit. The implementation of the prioritised mitigation strategies will provide an increase in ARFFS capabilities.

2.3 Strategic Priorities

Priority	How does the change help deliver the target and vision?
Airservices Australia Strategy	
Reduce cost to serve – Responding to the environment through lowering our transaction costs	The TRA project seeks to explore diverse options to improve service delivery. An input into this improvement is to reduce ARFFS cost to serve by exploring assorted opportunities for change (technology and the way we serve).
Facilitate our licence to grow – Modernising to meet community expectations	To ensure ARFFS continues to meet the community expectations of a capable and modern aerodrome emergency service, the exploration into service improvements is essential.
Foster culture and High performance – Create a workplace of highly engaged people living our values.	This project seeks input from various units within ARFFS service delivery – creating the opportunity for individuals to collaborate and engage in line with our strategic priorities.
ARFFS Future aspirations	
Valued first responders at Australian aerodromes.	The project will evaluate and prioritise the improvements to service delivery (captured from TRA workshops).
Augmented Surveillance for increased situational awareness	There are improvements that were identified within the TRA workshops relating to technology solutions that increase the situational awareness of our staff.
Keep our people safe from harm and protect the environment through remotely controlled and conditionally automated technologies	The majority of the service improvements that will be explored as part of this project have an element of reducing potential harm to our staff.

2.4 Scope

In scope:

- Only mitigation strategies identified in the 2021 TRA workshops that were supported by the Mitigation Strategies Working Group (MSWG).
- Only mitigation strategies identified in the 2021 TRA workshops that were supported by the Mitigation Strategies Working Group (MSWG) and that are currently within a project.

Out of scope:

- Mitigation strategies relevant to additional staff
- Mitigation strategies that were unsupported by the MSWG.
- Limitations to operations not identified in TRA workshops

2.5 Assumptions

The following assumptions are made:

- The implementation plan is accepted.
- That the implementation mitigation strategies are able to be undertaken.
- Business units can complete the implementation of strategies assigned to that unit.

2.6 Interdependencies

The following table identifies interdependent activities and outlines impacts to this project.

Table 1 - Interdependencies

Interdependent Activity	Possible Impact
Service Improvement Projects	Duplication of effort between working groups
Strategy and Tactics review	As above
Communications Workshop	As above
ARFFS Operations Initiative Steering Committee	As above

3. Project Approach and Timings

3.1 Overview of planned project activities

1) Collate the mitigation strategies into a format appropriate for review and scoping by individual business units.
2) Define the framework for the implementation of phase 3. This will be inclusive of defining the scope, plan and expected deliverables.
3) Deliver MS work packages to individual business units.
4) Maintain oversight of implementation strategies and timeframes through tracking tool.

5) Review of the TRA phase 3 implementation strategy, time frames and deliverables.

3.2 Project Stages/Deliverables

The following table outlines key deliverables and planned project milestones.

Table 2 – Project Stages

Project Stages	Planned start	Planned Finish
Stage 3- TRA Implementation		
Recommended mitigation strategies from MSWG reviewed and managed by ARFFS Service Change.	Jun 2022	Dec 2023
TRA undertaking to assess the effect of prioritised MS on staffing levels.	Jul 2022	Jul 2022
Deliverable- a defined set of priority projects packages for individual business units.	Oct 2022	Oct 2022
Mitigation strategies implemented by business units.	Oct 2022	Dec 2023
Review of implementation phase.	Dec 2023	Jan 2023

4. Implementation Stage

Service Improvement (SI) will oversee implementation of supported mitigation strategies and those strategies that are already within a current project. MS will be designated to business unit's dependant on that business unit's responsibility. The recognised business units are as follows.

- ARFFS Operations
- ARFFS Standards
- ARFFS Training
- Service Improvement

The supported MS have been placed into three categories. These are:

1. High value/low complexity
2. Low value/low complexity
3. High value/high complexity

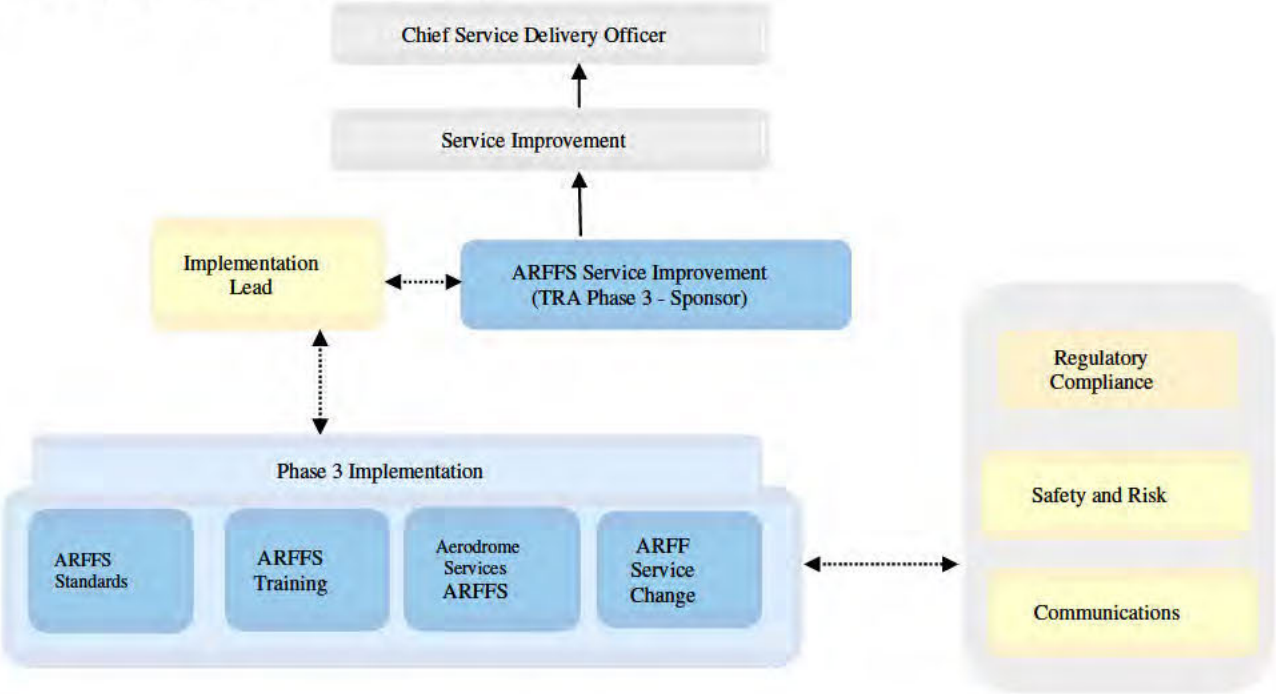
These determinations providing a methodical progression for implementation based on value to service and ease of introduction. Tracking of the MS implementation will be done with a project tracking tool to ensure accountability and measurability. It allows SI to track and assist where needed to ensure timely implementation of supported strategies.

5. Governance

5.1 Project Management Structure

The below figure details the project management structure, with the Chief Service Delivery Officer (CSDO) and nominated delegates making up the governance board. The role of the board is to ensure the implementation of mitigation strategies meets regulatory compliance and organisational strategic objectives. Figure 1 represents the governance board structure for this phase of the TRA.

Figure 1 – Project Management Structure



6. Change Control

6.1 Change requests

The project manager will be responsible for approving any changes to the project and changes will be documented in a change log.

7. Stakeholder management

Project stakeholder engagement can be found within the stakeholder plan. Project communications can be found within the comms plan

8. Risk management

Risk will only be recognised if a mitigation strategy is unable to be implemented by a business unit. If this were to occur the pinch point that the strategy was mitigating would be reinstated and may have an effect on the TRA outcomes.

9. Terms and Acronyms

Term / Acronym	Definition
ARFFS	Aviation Rescue Fire Fighting Service
CSDO	Chief Service Delivery Officer
MS	Mitigation strategy
SI	Service Improvement
SME	Subject Matter Expert
TOR	Terms of Reference
TRA	Task Resource Analysis

10. Annex A

10.1 High value/low complexity

Number	Mitigation Strategy	Details
PPMS001	Clarification of procedure - 'do we manage the fire first, or rescue first'? Order of priority for aircraft incidents.	Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.
PPMS002	Complete analysis on the nature and definition of rescue and confirm how this can be achieved and applied by ARFFS relative to the TRA scenario. Implement the outcomes of this analysis.	Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.
PPMS017	Review procedure/process used to enable equipment to be taken aloft inclusive of ladder procedures.	Supported- A review of procedure/process to take equipment aloft is supported. Equipment is available to improve this mitigator. (Work has already been completed)
PPMS029	FC positioned on a Forward Command Vehicle	Supported- A trial has been carried out in Melbourne however the group supports a further review into the benefits of this mitigation strategy.
PPMS032	Formalised "hot zones" identified (standardised PPE requirements for aircraft incidents) in support of situation size up.	Supported- Clarification regarding hot zones/hazardous zones is supported including the use of BA. Documentation and training to be reviewed. By standardising or nominating hot zones for aviation incidents reduces the ability of the OIC to undertake a dynamic risk assessment on the fire ground. Each incident will have unique hazards that should be managed as part of the OIC IAP.
PPMS043	Improved training/guidance in the implementation of heat stress protocols	Supported - refresher package on heat stress management (in relation to training). Practical aspects/points rather than technical physiological information. Potential to develop similar package with focus on operational response.
PPMS069	Formalise recall of ARFFS staff, and roles and responsibilities of arriving off duty staff (potential on call staff - CoC). e.g. establishing heat stress equipment etc)	Supported- Locally staff should have an awareness of the structure required when arriving on station. Having a formal list of considerations is deemed to be an appropriate approach for staff recall.
PPMS079	Decrease in filling times for replenishment - drop tanks/ water and foam	Supported- AALL consultation with aerodrome operators to investigate options. (hydrants)

Number	Mitigation Strategy	Details
PPMS080	Review of CoC to include level of incident/EVTs/arriving staff	Supported- review of utilising spare vehicles and having instructions for its use in an incident with outcomes potentially placed in Local Instructions.
PPMS081	Review of DCP and its use on the fire ground. Training has decreased.	Supported- a review of theory and practical training regarding DCP is supported. An increase in agent capabilities has been deemed as an action.
PPMS082	Review of sufficient quantities of agent for fire ground (how much agent is required to backup internal operations/safety margin)	Supported- A better understanding of amount of agent required for internal firefighting and required as a reserve amount is supported.
PPMS083	Review secondary agent- halotron/CAFS	Supported- secondary agent to be reviewed to assess the benefit for ARFFS along with C Class foam.
PPMS097	Review of response times for the LL/CoC (Revise the '90-minute response time - more suitable / shorter timeframe)	Supported- Group support the review of the 90 minutes response times (Ops-111) to a more suitable timeframe that align with the operational requirements of the LL/CoC.
PPMS098	Clarification of procedure - 'do we manage the fire first, or rescue first'? Order of priority for aircraft incidents.	Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.
PPMS099	Complete analysis on the nature and definition of rescue and confirm how this can be achieved and applied by ARFFS relative to the TRA scenario. Implement the outcomes of this analysis.	Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.
PPMS101	Further training CFBT creating improved internal conditions (remove hazard).	Supported - Further/continued training in CFBT required. Development/upskilling of SME as CFBT instructors. Expansion of requirement for staff to undertake practical/theoretical training. (Inclusion of case studies)

Number	Mitigation Strategy	Details
PPMS103	Review strategy and tactics for internal firefighting/rescue	Supported- Strategy and tactics group to consider internal firefighting/rescue as a topic as part of the working group's scope.
PPMS111	Incident support- better support equipment such as EM grab bags, including tabards, electronics, charging brick etc.	Supported- Review contents of ICS kits for possible national implementation.
PPMS119	Utilise aerodrome staff until communications with Line Leader can be established and/or staff recall in place. Associated agreement/training for aerodrome staff to fill this initial role.	Supported- a review into utilising aerodrome staff at incidents on aerodrome and how that resource can be utilised to assist ARFFS is supported.
PPMS121	Complete analysis on the nature and definition of rescue and confirm how this can be achieved and applied by ARFFS relative to the TRA scenario. Implement the outcomes of this analysis.	Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.
PPMS126	Clarity / understanding of AEP commitments re ARFFS resources involvement.	Supported - relationship further developed between Aerodrome operator and ARFFS in relation to the roles of ARFF. Action at the local level (AEC)
PPMS132	Review of local procedures	Supported - explored at the local level for those stations in which communications with aerodrome safety officer is limited. Clarity of understanding between aerodrome and ARFFS regarding roles when communication is poor.
PPMS149	FC positioned on a Forward Command Vehicle	Supported- A trial has been carried out in Melbourne however the group supports a further review into the benefits of this mitigation strategy.
PPMS151	FC positioned on a Forward Command Vehicle	Supported- A trial has been carried out in Melbourne however the group supports a further review into the benefits of this mitigation strategy.
PPMS159	Better training and understanding of when and what we are assessing.	Supported- A review of the training is supported to improve ARFFS knowledge of what is being assessed.

Number	Mitigation Strategy	Details
PPMS160	Review of procedural use of the GAM and when to use in firefighting procedures.	Supported- A review of the training is supported to improve ARFFS knowledge of when to use a gas detector.
PPMS165	Review potential to utilise onsite aircraft access equipment.	Supported- It was identified that aerodrome stakeholders have equipment that may be beneficial to ARFFS in an emergency incident situation. This is an action for regional and local managers to investigate what equipment is available and to discuss its use by ARFFS if needed.
PPMS171	Review of ARFFS call back procedures strengthening recall procedures inclusive of ability to recall staff from nearby locations (Port Hedland, Karratha, HI, Yulara, Newman).	Supported- review is supported to investigate call back procedures at remote locations
PPMS178	Formalise recall of ARFFS staff, and roles and responsibilities of arriving off duty staff (potential on call staff - CoC). e.g. establishing heat stress equipment etc)	Supported- Locally staff should have an awareness of the structure required when arriving on station. Having a formal list of considerations is deemed to be an appropriate approach for staff recall.
PPMS181	Clarification of procedure - 'do we manage the fire first, or rescue first'? Order of priority for aircraft incidents.	Supported- Information contained in the Airport Services Manual (12.3.1- 12.3.2) to be inserted into ARFFS documentation. Follow up training package to be developed to increase knowledge regarding roles of ARFFS delivered by SMEs.
PPMS184	Review strategy and tactics for internal firefighting/rescue (e.g. BA team A1 fire attack, BA A2 team rescue)	Supported - Strategy and tactics group to consider internal firefighting/rescue as a topic to as part of the working groups scope.

10.2 Low value/low complexity

Number	Mitigation Strategy	Details
PPMS004	Review into the potential to utilise onsite aircraft access equipment. (MOU)	Supported- It was identified that aerodrome stakeholders have equipment that may be beneficial to ARFFS in an emergency incident situation. This is an action for regional and local managers to investigate what equipment is available and to discuss its use by ARFFS if needed
PPMS037	Additional attack line	Supported- An additional attack line may be required and would be a decision of the OIC dependant on resourcing available.
PPMS063	Review, train and employ alternate strategy and tactics (as per ORA).	Supported - further investigations required - AALLS discussions with aerodrome operators regarding ability to manoeuvre on the RESA and requirements of 139. Additional strategies and tactics considered at individual locations. Consideration if applicable inclusion in ORA.
PPMS064	Alternative routes to incident (pre-plan)	Supported - further investigations required - AALLS discussions with aerodrome operators regarding ability to manoeuvre on the RESA and requirements of 139. Additional strategies and tactics considered at individual locations. Consideration if applicable inclusion in ORA.
PPMS065	Confirm with aerodrome operator RESA capability/AEP	Supported - further investigations required - AALLS discussions with aerodrome operators regarding ability to manoeuvre on the RESA and requirements of 139. Additional strategies and tactics considered at individual locations. Consideration if applicable inclusion in ORA.
PPMS128	Radio positioned in Airport ICS caravan. (Melbourne)	Supported - explored at the local level for those stations in which communications with aerodrome safety officer is limited. (Relates to PP above)
PPMS129	Review of communications with airport safety officers with a potential for dedicated communications (equipment/phone)	Supported - explored at the local level for those stations in which communications with aerodrome safety officer is limited. (Relates to PP above)
PPMS139	Formalised "hot zones" identified (standardised PPE requirements for aircraft incidents) in support of situation size up.	Supported- Clarification regarding hot zones/hazardous zones is supported including the use of BA. Documentation and training to be reviewed. Standardising or nominating hot zones for aviation incidents reduces the ability of the OIC to undertake a dynamic risk assessment on the fire ground. Each incident will have unique hazards that should be managed as part of the OIC IAP.
PPMS144	Review of fireground operations to support firefighters remaining in vehicle (when applicable) to reduce exposure to heat stress/ HOTS environment	Supported- Strategy &Tactics Working Group and standards to review AFFM/SOP to ensure that the current practices taught in the Gen 2 Workshops are incorporated into documentation.

PPMS145	Review PPE with intent to improve PPE to consider Heat stress considerations	Supported- Review to be referred to ARFFS Standards. Ongoing consideration to the implications of heat stress with current PPE should be periodically reviewed
PPMS167	Clarification on ARFFS requirements to achieve tasks and objectives beyond arriving external resources	Supported- The requirements of ARFFS does not change but the role will change depending on situation presented to the OIC including the availability of local resources.
PPMS173	Undertake analysis relating to supporting services, to identify expectations of real ability to respond.	Supported- an analysis into supporting services, resources and capabilities is required and what is expected of these resources. Local inter-agency development is suggested.

10.3 High value/high complexity

Number	Mitigation Strategy	Details
PPMS006	Review of resources/equipment to make entry and to extricate casualties (ARFFS air stairs / extendable platform/heights, aircraft types, soft ground etc)	Supported- It was identified that aerodrome stakeholders have equipment that may be beneficial to ARFFS in an emergency incident situation. This is an action for regional and local managers to investigate what equipment is available and to discuss its use by ARFFS if needed
PPMS028	Enhancement to training so that fire fighter staff can better perform relevant roles inside the aircraft absent of Officer oversight.	Supported- This mitigator is supported however further understanding of what is actually needed to be upskilled is required
PPMS031	Equipment to improve entry/egress into aircraft to alleviate staff from working in HOTS environment	Supported- It was identified that aerodrome stakeholders have equipment that may be beneficial to ARFFS in an emergency incident situation. This is an action for regional and local managers to investigate what equipment is available and to discuss its use by ARFFS if needed.
PPMS046	Review PPE with intent to improve PPE to consider Heat stress considerations.	Supported - Review to be referred to ARFFS Standards. Ongoing consideration to the implications of heat stress with current PPE should be periodically reviewed.
PPMS048	Upskilling of firefighters to undertake high risk decision making.	Supported- This mitigator is supported however further understanding of what is actually needed to be upskilled is required

Number	Mitigation Strategy	Details
PPMS058	Review of sufficient quantities of agent for fire ground (how much agent is required to backup internal operations/safety margin)	Supported- A better understanding of amount of agent required for internal firefighting and required as a **reserve amount i**s supported.
PPMS061	Decrease in filling times for replenishment - drop tanks/ water and foam	Supported- AALL Consultation with aerodrome operators to investigate options.
PPMS062	Review the ability to replenish vehicle on airports and its effect on TRA.	Supported- AALL Consultation with aerodrome operators to investigate options.
PPMS071	Technology to monitor temp/heat stress of FFs	Supported - ARFF specialist ([redacted] currently undertaking work regarding heat stress. Part of that position is to continually review and explore improvements.
PPMS090	Investigate effects of compounding workload on BA team	Supported - Increase the understanding/knowledge of staff regarding monitoring of workloads and the effects of heat stress on firefighters.
PPMS093	Develop closer relationships with airport operators (esp. in regard to AEP) regarding EM process and roles	Supported- Ongoing relations with aerodromes maintained. Deputies to discuss this aspect (limitation) identified in TRA with stations to ensure ongoing understanding of roles.
PPMS100	Develop better ventilation strategies (PPV post fire)	Supported- Understanding of ventilation strategies may be lacking in ARFFS. Additional development inclusive of training is required.
PPMS108	Enhancement to training so that fire fighter staff can better perform relevant roles inside the aircraft absent of Officer oversight.	Supported- This mitigator is supported however further understanding of what is actually needed to be upskilled is required
PPMS114	Review of EM function and resource analysis to determine staffing requirements.	Supported - explored at the local level for those stations in which communications with aerodrome safety officer is limited. Clarity of understanding between aerodrome and ARFFS regarding roles when communication is poor.

Number	Mitigation Strategy	Details
PPMS115	Review of response times for the LL/CoC (Revise the '90-minute response time - more suitable / shorter timeframe)	Supported - Group support the review of the 90 minutes response times (ops-111) to a more suitable timeframe.
PPMS120	Enhancement to training so that fire fighter staff can better perform relevant roles inside the aircraft absent of Officer oversight.	Supported- This mitigator is supported however further understanding of what is actually needed to be upskilled is required
PPMS131	Review of EM function and resource analysis to determine staffing requirements.	Supported - explored at the local level for those stations in which communications with aerodrome safety officer is limited. Clarity of understanding between aerodrome and ARFFS regarding roles when communication is poor.
PPMS163	Review of local arrangement (both aerodromes)	Supported- a review locally of CoC arrangements and options available to local staff.
PPMS182	Investigate effects of compounding workload on BA team	Supported- Increase the understanding/knowledge of staff regarding monitoring of workloads and the effects of heat stress on firefighters.

Task Resource Analysis (TRA) summary report relative to category 5

Operational Risk Assessment

Version 1.2

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

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Change summary

Version	Date	Change description
0.1	12 MAY 2021	Initial draft development by [redacted]
1.0	21 MAY 2021	Updated by [redacted].
1.0	26 MAY 2021	Editorial update [redacted].
1.1	27 JUL 2021	Updated by [redacted] to include delimitations section, clarifying risk data relationship to the current risk baselines (ORAs).
1.2	27 AUG 2023	Editorial update to add watermark and ensure consistency of delimitation information and other editorial aspects across all summary reports. Identified errors have also been corrected. Note – such changes have not adjusted risk classifications or control measures as informed by the TRA data.

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OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS 004

Disclaimer

This paper represents a theoretical operational risk assessment of a future operational environment informed by Task Resource Analysis data. This future operational environment will be realised when the Civil Aviation Safety Authority (CASA) incorporates the requirement for a Task Resource Analysis (TRA) into the regulations governing the conduct of Aviation Rescue and Fire Fighting Services (ARFFS) and Airservices Australia amends its operations manual to comply with these new requirements.

Until Airservices is required to implement TRA requirements, the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS 004

1 Executive summary

This report provides a forecast of operational risk associated with implementation of Task Resource Analysis (TRA) into the Australian requirements for the provision of Aviation Rescue Fire Fighting Services ARFFS) in Australia. Refer to section 1.1 (delimitations) regarding the relationship between forecast TRA risk data and the current state operational risk baseline.

Category 5 is the lowest level of service Airservices ARFFS is approved to provide. Whilst the current operation specification for CAT 5 meets certain requirements it has been identified that should we move to a new regulatory environment (future state) and current operational specification for category 5 were retained, certain deficiencies and limitations will exist (as identified via Task Resource Analysis), resulting in a (forecast) unacceptable 'extreme' level of risk. This future state assessment is based upon:

1. The existing category 5 specification is retained in its current format, without change, and
2. TRA has been introduced into the Australian requirements for the provision of ARFFS and the requirements of this process accurately match the obligations set out in the TRA methodology document.
3. Airservices amending its ARFFS operations manual to apply TRA.

As a result of the TRA process and in order to reduce the level of risk in the future state (to remove or reduce to as low as reasonably practicable (ALARP)), two options have been determined to achieve this outcome:

1. Eliminate the operational risk by removing category 5 from the ARFFS operations manual.
    a. In the limited situations where category 5 may be mandatory, replace category 5 with a higher (acceptable) level of category in the Airservices ARFFS operations manual.
2. Reduction of the level of risk to (either) medium or low via enhancement to the operational specification of category 5 so that it remains functionally capable to achieve all ARFFS objectives.
    a. Should this option be selected, additional analysis to validate locations that are classified as remote or unsupported will need to be completed to confirm insufficient arriving resources within the 45-minute analysis period.

This report presents supporting information relevant to these options, sufficient to ensure Airservices manages the potential operational risk associated with the implementation of TRA.

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS 004

1.1 Delimitations

This report has been designed to provide an accurate reflection of the operational risk that may be experienced upon TRA being introduced to the Australian requirements for the provision of ARFFS and subsequent inclusion in the Airservices ARFFS operations manual.

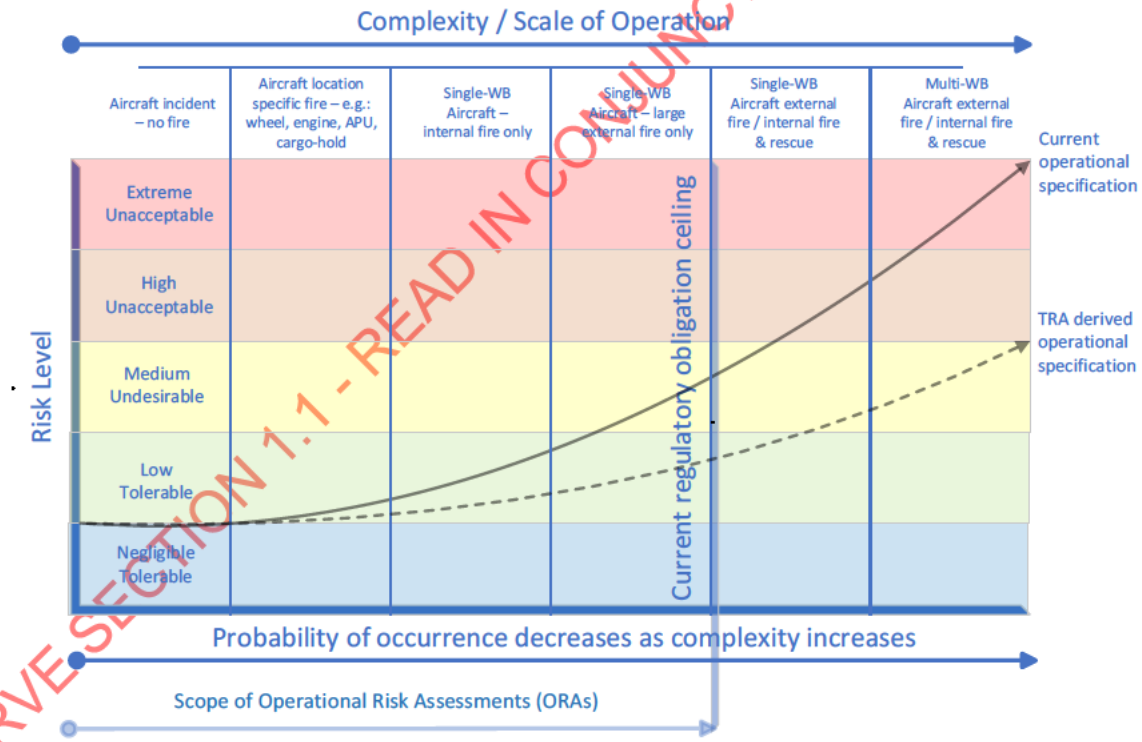
TRA fundamentally adjusts the method in which the functional specification of ARFFS is determined, requiring operational capability to be determined relevant to the worst

plausible and credible aircraft scenario, introducing differences to that of the existing regulated requirements.

Risk data presented in this report has been developed to assist with preparation for the regulatory introduction of TRA by informing Airservices as to the level of risk which may be experienced were the current level of operational capability provided relevant to a future state as defined by the TRA assessment.

As such, information within this report is not relevant to the current state but provides valuable forecast and planning data that will assist in the readiness of operations to achieve the ARFFS objectives. The change to the future state will occur upon the Civil Aviation Safety Authority (CASA) formally requiring TRA and the Airservices ARFFS operations manual (rule-set) being subsequently amended to implement these requirements.

Until Airservices is required to transition to the future state the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).



OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

2 Purpose

This document provides collective (summary) operational risk assessment relative to the category 5 band as assessed via the TRA methodology.

Information within this document provides a national representation of the future state operational risk associated with category 5 service provision, and the required actions (immediate and ongoing) which are necessary to achieve and maintain a level of risk that is acceptable and is as low as reasonably practicable.

3 Scope

Relative to the hazard identified, the scope of this risk assessment is inclusive of the following consequence descriptor groupings – being:

- Operational risk (ARFFS margin of safety)

Analysis within this document is applicable to all ARFFS locations that may be required to provide category 5 service.

The locations that have been selected for the completion of category 5 TRA provide a representative baseline from which broader application across all ARFFS locations can be effectively achieved (refer to section 5.0 for additional information).

4 Background

Airservices is implementing the TRA methodology to determine the minimum number of operational staff (inclusive of all operational resources) in the future state necessary to effectively manage a probable and credible worst-case aviation incident up and until sufficient supporting resources arrive (so that ARFFS is no longer reliant upon its own, initial responding resources).

For further information on the design of the TRA methodology, inclusive of the probable and credible worst-case scenario descriptor, refer to the supporting TRA methodology document.

TRA is fundamentally a data gathering activity that provides quantitative and qualitative outputs that can be utilised to inform resourcing decisions. The TRA also provides a framework to permit a detailed understanding of the complexities associated with an ARFFS operation and, as a product of the process; it produces a range of proposed measures (controls) that actively seek to improve core service delivery and fire fighter safety.

Central to the TRA concept is the utilisation of qualitative risk assessment. It is acknowledged within the TRA methodology that more than one staffing/resource level will exist relative to any one scenario. This is a reflection of the non-binary or spectrum approach to staffing levels which reflect a shifting scale of capability relative to ARFFS operations. Whilst there is a point at which ARFFS is unable to achieve any operational objectives relative to the staffing/resourcing provided (for example, 1 fire fighter is unable to mount any form of response), as resourcing increases, so does the capability of ARFFS to achieve objectives.

Operational risk assessment has been employed by the TRA methodology to assist in accurately determining the minimum number of staff (and resourcing) required to achieve all ARFFS operational objectives aligned with the TRA scenario (up and until the arrival of sufficient supporting resources). Through application of the Airservices Safety Management System (SMS), risk assessment has been utilised to inform the level of risk associated with different levels of staffing (and supporting resources) as determined via the TRA process. This approach provides an organisationally aligned and accepted method for analysing, treating and ultimately accepting the level of risk which is managed to a level that is as low as reasonably practicable.

For further information on the risk assessment process utilised, please refer to AA-PROC-SAF-0105.

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

This document draws upon the data obtained from relevant and representative TRAs (within a particular category band), collating the data into a single document and articulating the associated operational risk.

Note: coding relative to staffing resources within this document is displayed as: Senior Officer + Officer + Fire Fighter.

5 Commonality of risk data

The TRA methodology requires analysis to be performed relevant to each location ARFFS is provided. In implementing this approach, situations may arise whereby the level of variability between locations is insufficient to require change to the resource specifications. Such circumstances reflect broadly comparable operating environments, or an environment that may represent an improvement to that previously assessed (for example, an improvement to the availability time of local supporting resources).

This notion implies that broadly comparable locations are likely to present commonality in risk data, and, at a certain stage in the process, the value derived from such TRAs diminishes due to repeat outcomes being delivered. In order to recognise commonality in the risk data, the locations assessed must be reflective of the genuine operational differences expected between locations (for example, capital city supported aerodromes compared to remote / isolated aerodromes). This approach ensures representative data which, when subjected to repeat risk assessment, may generate consistent risk outputs. At such a stage, data saturation may be achieved and, if sufficient data is available, valid applied outcomes can be extended to aerodromes with common attributes.

Such an approach has been applied to category 5, with the 8 locations assessed providing sufficient data from which valid outcomes can be determined for the remaining locations.

OBSERVE SECTION 1 - READ IN CONJUNCTION WITH SMS 004

6 Risk Assessment

6.1 Process

The risk management process applied within this assessment is in accordance with AA-PROC-SAF-0105.

Key steps within this process are detailed within this report.

A risk assessment review panel was assembled in relation to each risk assessment completed. The participants included:

Table 1 - TRA participants – Adelaide Category 5 (7 APR 2021)

Name	Position
[redacted]	Operational Risk and Safety Specialist
[redacted]	TRA Facilitator
[redacted]	TRA Facilitator
[redacted]	ARFFS Standards Lead

Name	Position
[redacted]	Local Operations Manager / Line Leader
[redacted]	Fire Commander
[redacted]	Fire Commander
[redacted]	Station Officer
[redacted]	Sub Station Officer
[redacted]	UFU representative

Table 2 - TRA participants – Brisbane Category 5 (31 MAR 2021)

Name	Position
[redacted]	Operational Risk and Safety Specialist
[redacted]	TRA Facilitator
[redacted]	TRA Facilitator
[redacted]	ARFFS Standards Lead
[redacted]	Local Operations Manager / Line Leader - Adelaide
[redacted]	Fire Commander
[redacted]	Station Officer
[redacted]	UFU Representative

Table 3 - TRA participants – Cairns (6-7 OCT 2020)

Name	Position
[redacted]	Operational Risk and Safety Specialist
[redacted]	ARFFS Standards Lead
[redacted]	Local Operations Manager
[redacted]	Fire Commander
[redacted]	Fire Commander

Table 4 - TRA participants – Hamilton Island (22 APR 2021)

Name	Position
[redacted]	Operational Risk and Safety Specialist
[redacted]	TRA Facilitator
[redacted]	TRA Facilitator
[redacted]	ARFFS Standards Lead
[redacted]	Local Operations Manager / Line Leader
[redacted]	Fire Commander
[redacted]	Sub Station Officer

Table 5 - TRA participants – Hobart (14-15 OCT 2020)

Name	Position
[redacted]	Operational Risk and Safety Specialist
[redacted]	Operational Standards Specialist
[redacted]	ARFFS Standards Lead
[redacted]	Local Operations Manager
[redacted]	Fire Commander

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Name	Position
[redacted]	Sub Station Officer
[redacted]	Sub Station Officer

Table 6 - TRA participants – Karratha (4 MAY 2021)

Name	Position
[redacted]	Operational Risk and Safety Specialist
[redacted]	TRA Facilitator
[redacted]	TRA Facilitator
[redacted]	ARFFS Standards Lead
[redacted]	Local Operations Manager / Line Leader
[redacted]	Fire Commander
[redacted]	Leading Fire Fighter
[redacted]	UFU Representatives

Table 7 - TRA participants – Port Hedland (10 MAY 2021)

Name	Position
[redacted]	TRA Facilitator
[redacted]	TRA Facilitator
[redacted]	Local Operations Manager / Line Leader
[redacted]	Fire Commander
[redacted]	UFU Representatives

Table 8 - TRA participants – Sunshine Coast (15 APR 2021)

Name	Position
[redacted]	Operational Risk and Safety Specialist
[redacted]	TRA Facilitator
[redacted]	TRA Facilitator
[redacted]	ARFFS Standards Lead
[redacted]	Local Operations Manager / Line Leader
[redacted]	Acting Local Operations Manager / Line Leader
[redacted]	Fire Commander
[redacted]	Sub Station Officer

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6.2 Step 1 – Consult and communicate

Communication and consultation relevant to this assessment has been undertaken within the assessment panels.

Additional communication and consultation with the United Firefighters Union (Aviation Branch) and the Civil Aviation Safety Authority (CASA) has been undertaken at the concept/design and implementation phase, with ongoing invitation for both parties to attend and observe TRA workshops.

Please refer to the TRA methodology document for further information relating to consultation and communication relevant to TRA process.

6.3 Step 2 – Define the scope, context and criteria

The scope of this risk assessment is in accordance with that previously defined in this document (section 3).

The locations that have completed a category 5 TRA include:

- Adelaide
- Brisbane
- Cairns
- Hamilton Island (remote / isolated location)
- Hobart
- Karratha (remote / isolated location)
- Port Hedland (remote / isolated location)
- Sunshine Coast/Maroochydore

For the purpose of this assessment, the context is established in relation to the ability for ARFFS to achieve all operational objectives associated with the execution of ARFFS functions[1] at a probable and credible worst-case aircraft incident[2].

The risk assessment criteria to be utilised is in accordance with AA-PROC-SAF-0105 (refer to appendix A for details).

All operational objectives relevant to the period until the TRA ends (that is, when sufficient supporting resources arrive on-scene, so that the ARFFS is no longer reliant upon its own, initially responding resources) are within the scope of this risk assessment.

6.4 Step 3 – Risk identification

Acknowledging the established context and background information, the assessment panel has identified the following hazards relevant to the service design.

Further details in relation to the hazards can be found in appendix B.

HAZARD TITLE
Operational safety (ARFFS margins of safety)

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[1] Refer to the Civil Aviation Safety Regulation 1998 section 139.710
[2] Refer to section 7.2.2.5 of the TRA methodology V2.0 for details.

HAZARD TITLE
Hazard 1 - Reduced ability (margins of safety) for the ARFFS to achieve operational objectives. This hazard relates to the ability for ARFFS to execute its statutory functions (achieved via operational objectives as outlined within the TRA) relative to the resourcing (staffing, vehicles, equipment, agent, other optional consumables) and the anticipated on-scene arrival time of supporting emergency resources.

6.5 Step 4 – Analyse risk

In consultation with the individuals listed in table 1-8 (risk assessment panel/s), the hazard defined in section 5.4 has been subjected to risk analysis in accordance with AA-PROC-SAF-0105 and the criteria defined in appendix A.

Consistent with the TRA methodology requirements, the forecast TRA informed operational risk associated with the existing minimum staffing/resource specification (relative to category 5) has been assessed.

Table 9 provides an overview of the risk classifications:

Refer to appendix B for details of the risk analysis relevant to each location.

Table 9 - The risk classification relative to the existing specification / minimum for category 5 when assessed against future TRA requirements.

Location	Existing spec (1+2)
Brisbane	Extreme
Adelaide	Extreme
Port Headland	Extreme
Maroochydore / Sunshine Coast	Extreme
Hamilton Island	Extreme
Cairns	Extreme
Hobart	Extreme
Karratha	Extreme

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6.6 Step 5 – Evaluate risk

In accordance with the Airservices SMS (in particular AA-PROC-SAF-0105), an extreme level of risk is unacceptable and must be afforded immediate risk treatment to reduce the level of risk to as low as reasonably practicable (ALARP), or, cease the activity.

Relative to category 5 service provision, there is only 1 ARFFS location (Adelaide) that is recorded to provide category 5 as a 'normal' level of service.

It should be noted that that whilst Airservices provides a CAT 5 service in Adelaide during the curfew, were it confirmed that there is no Air Transport Operation (ATO) movements during this period, an argument could be considered to modify hours of

service at this time. Such an approach would require separate safety analysis, however, previous examinations of this matter have raised legitimate question over the definition of ATO. With the exception of Adelaide, category 5 for all other locations represents a temporary degraded state of capability from that which is normally provided at that location (as per the number associated with the ARFFS approval certificate).

Whilst category 5 is a recognised (and lowest approved) level of category which Airservices ARFFS can provide, doing so in accordance with the minimum specification outlined in the ARFFS operations manual (relative to the worst plausible and credible aircraft scenario) presents an extreme and unacceptable level of risk.

This level of risk is primarily associated with the inability to achieve certain ARFFS operational objectives. Whilst initial external operations may achieve objectives, internal firefighting operations (inclusive of rescue as informed by advice from the Civil Aviation Safety Authority) is where the most significant operational limitations and inabilities exist. The resources aligned with the current-state category 5 specification are (generally) able to achieve initial external objectives (specifically Q1 and Q2 ground fire control and/or extinguishment), however, its ability to support rescue operations establishes the basis for the extreme risk due to an inability for this function to be performed correctly and effectively.

Utilising the process outlined in the TRA methodology, analysis of the deficiencies and limitations associated with the minimum staffing specification of 1+2 (referred to by TRA process as pinch-points) has been completed. This analysis informs the nature (description and causation) relative to each pinch-point, supporting the identification of mitigation measures sufficient to address each pinch-point in context of the assessment scenario.

Generally, the following pinch-points/limitations were identified as key contributors to the initial risk classification. Please refer to the relevant TRA baseline data for a more detailed exploration of the pinch-points as required.

1. Insufficient fire-fighting staff to support correct application of all procedures (specifically internal operations / compressed air breathing apparatus use).
2. Insufficient agent (primarily associated with internal operations when combined with significant external operations requiring Q1 and Q2 agent usage).
3. Limitations associated with a single vehicle response, inability to afford vehicle/monitor protection to one side of the aircraft.
4. Insufficient officer staffing, impacting the achievement of functions associated with fire-ground decision making and supervision.
5. Insufficient procedural clarity as to the role and function of rescue (inclusive of casualty management).

The outcomes of this analysis has informed the design of two new specifications relative to category 5, with this information forming the basis of the proposed risk treatment activities defined in section 5.7.

Due to the category determination criteria and the method in which temporary changes to category are executed, should Airservices elect to no longer provide category 5 by

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replacing this level of service with a higher level of service, the risk associated with providing category 5 would be eliminated.

Such an approach would eliminate the associated operational risk with category 6 becoming the lowest level of recognised service provided by Airservices ARFFS.

6.7 Step 6 - Treat risk

This step seeks to include identified control measures which are required to manage the resulting risk ALARP.

The risk treatment hierarchy of controls (AA-PROC-SAF-0105) has been considered by the assessment panel in the determination of treatment measures.

The TRA methodology has been utilised to inform the controls (or treatment measures) necessary to address identified 'pinch-points' within the respective TRA baseline and inform a new staffing/resource specification.

The primary purpose of TRA is to determine the minimum number of staffing/resourcing required for service provision relative to the assessment scenario.

As such, more than one level of proposed specification has been established to inform a comparison between proposed-states. Such an approach permits the determination of the minimum specification that is still capable of managing the associated operational risk to a level that is as low as reasonably practicable.

Table 10 provides an overview of the residual level/s relative to the risk treatments applied in appendix B (with an expended explanation of the proposed states included later in this section).

Refer to section 5.9 for details of residual risk acceptance.

Table 10 - Forecast risk classifications relative to proposed-state/s minimum category 5 specification

Location	Existing spec (1+2)	Proposed-state 1 1+2+4	Proposed-state 2 1+2+5*
Adelaide	Extreme	Medium	Low
Brisbane	Extreme	Medium	Low
Port Headland	Extreme	Medium	Low
Sunshine Coast/ Maroochydore	Extreme	Medium	Low
Hamilton Island	Extreme	High	Low*
Cairns	Extreme	Low	Low
Hobart	Extreme	Low	Low
Karratha	Extreme	Medium	Low

*Note proposed-state 2 may require additional fire fighter resources relative to certain remote locations due to limited local supporting resources. Refer to section 5.7.3 for further details.

6.7.1 Eliminate the risk

Airservices can elect the categories of ARFFS it provides, so long as the levels of service provided meet or exceed the requirement of the aircraft in question (unless remission is being observed).

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Currently, Airservices is approved to provide category 5 to 10, however, category 1 to 4 cannot be provided as they are not within the design or scope of our operations manual. Therefore, in the event of a category 1-4 aircraft requiring service, Airservices would need to provide category 5 (or higher) as a minimum.

Due to the level of risk forecast in the existing category 5 specification, risk elimination could be achieved by treating category 5 the same as category 1 to 4. By removing category 5 from the ARFFS operations manual, the risk associated with its service delivery is eliminated. In the very limited situations where category 5 may be mandatory (for example, the Adelaide curfew period) a higher level of service can be provided in place (category 6 or 7). Doing so eliminates the risk of category 5 service provision by no longer making this specification of ARFFS resources available, yet, retains the necessary service delivery for our customers through the utilisation of an acceptably safe operational specification (that being category 6 or 7).

It should be noted that such elimination would remove the ability for category 5 to be used as a degraded state. Whilst historically employed to provide a remaining level of capability in the event that unforeseen circumstances or a concurrent operational response, removal of such a service option will ensure the elimination of the associated risk. In such circumstances, instead of degrading to category 5, locations would inform industry of category 0.

6.7.2 Category 5 proposed future state 1 (all locations) – 1+2+4

Proposed-state 1 retains category 5 as a service level and comprises a range of treatments/controls which significantly increases the capability of ARFFS relative to the assessment scenario.

For locations that are not remote/isolated (with significant restriction or limitation on the availability of local supporting services), propose-state specification 1 reduces the level of risk to that aligned with undesirable (medium) or tolerable (low). This is reflective of a specification that, when analysed by the TRA baseline, is able to generally perform objectives consistent with requirements.

Some limitations and/or restrictions remain, predominantly relating to the efficacy of internal operations and the performance of rescue.

For complete detail on the required improvement measures for proposed-state 1 (relative to a particular location), please refer to the parent TRA data. The following list provides a generalised capture of the enhancement/improvements associated with category 5 proposed state 1:

- An increase to staff, providing an additional supervisory officer and two additional fire fighters.
- An improvement to the timeframe for senior Officer accessibility (deployment to the fire-ground).
- An additional (fully equipped and resourced) primary attack vehicle.
- Enhanced clarity as to the role/function of rescue.
- Enhanced casualty management procedures (specific to aircraft), inclusive of rapid triage / casualty assessment method (inclusive of casualty extraction from aircraft).

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- Enhanced method of sensing/monitoring internal atmosphere/s and determining the acceptability of the internal environment to support acceptably safe access by supporting resources.
- Increased agent, sufficient to support all operations.

6.7.3 Category 5 proposed future state 2 at supported locations – 1+2+5

Proposed-state 2 retains category 5 as a service level and provides further enhancement to that of proposed-state 1. This is achieved by the availability of an additional fire-fighter. This resource was identified during a number of TRA workshops with its applied utility being:

- Provision of an additional firefighter to support the operation of a three-person CABA team inside the aircraft.

Whilst operations can be performed without a third firefighter supporting internal operations, relative to a number of pinch-points, such a resource may assist in certain stages of the operation.

All other specifications in proposed-state 2 remaining consistent with that of proposed-state 1.

6.7.4 Category 5 proposed future state 2 at remote locations – 1+2+5*

The TRA baseline assessment provides for analysis up to 45 minutes from the commencement of an operation. For the majority of locations, sufficient local supporting resources arrive on-scene within this time – at which point TRA ceases.

Locations that do not receive support within this time are reflective of highly isolated or remote localities which may require additional control measures (treatments) to that of supported locations.

Such a determination applied to Hamilton Island, whereby, special additional control measures have been determined as necessary to support effective operations at category 5. These control measures include:

1. An additional two firefighters to that of the minimum specification in proposed-state 1 (resulting in 1+2+6).
2. The staging of the senior officer on Hamilton Island to permit an effective response time (20-45mins).
3. The establishment of an emergency staff deployment capability from Whitsunday Coast and/or Mackay ARFFS to permit operational crews to be deployed, via helicopter, onto Hamilton Island to support ARFFS operations in the event of a major aircraft incident.

Such specific control measures may be required at other remote locations where the ability to receive sufficient support is unavailable. Validation will be required to determine the nature (extent and capability) of the supporting resources to confirm (or otherwise) if sufficient resources arrive in a 45 minute period. If sufficient resources take longer than 45 minutes, then treatment as an ‘unsupported or remote’ locality is required to achieve ALARP (if category 5 is to be provided).

Refer to appendix B and the TRA parent data for further information.

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6.7.5 Multiple station locations

Where a location provides ARFFS services to an aerodrome via multiple stations (that is, a multi-station solution as opposed to repeat, independent service delivery) special consideration must be given to the achievement of response times.

Such considerations where identified during the Brisbane TRA workshop, whereby, due to the very tight margins for response time achievement, if a single vehicle response is initiated from each respective station, the delay associated with FCC vacating must be considered relevant to response time. Such consideration already exists within the existing response time test procedures.

Based upon situational analysis, if response times cannot be achieved (given the available margin and the time taken for the FCC to be vacated), then either of the following control measures will be required:

1. FCC is staffed independent of category (eliminates any delay associated with FCC vacating when undertaking a single vehicle response).
2. Operate more than one vehicle from the station providing FCC functions.

Refer to appendix B for additional information on the applied outcomes of this analysis.

6.8 Step 7 - Monitor and review

There is no specific monitoring and/or review requirements relative to the forecast assessments made within this document.

6.9 Acceptance and sign-off

Due to the design and nature of this report, (providing a forecast of future operational risk associated with TRA implementation) there is no requirement (at this stage) for formal risk acceptance or sign-off.

Data presented within this report will assist and inform capability planning sufficient to ensure that operational risk associated with the eventual implementation of TRA is managed to ALARP.

Upon CASA implementing TRA requirements and the Airservices ARFFS operational manual being updated accordingly, operational risk associated with TRA will be transferred to the approved operational risk baseline. This risk data will be informed by information within this report, the locations parent TRA documentation and the level of capability relative to the improvements required (as outlined herein).

Formal risk acceptance and sign-off will be undertaken at this time, relative to the respective operational risk baseline and the broader safety management system requirements.

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Appendix A Risk assessment criteria

Table 1 – Risk Classification Matrix

		CONSEQUENCE				
		Insignificant	Minor	Moderate	Major	Catastrophic
LIKELIHOOD	Expected	Medium	Medium	High	Extreme	Extreme
	Likely	Low	Medium	Medium	High	Extreme
	Possible	Low	Low	Medium	Medium	High
	Unlikely	Negligible	Low	Low	Medium	Medium / High*
	Rare	Negligible	Negligible	Negligible	Low	Medium / High*

*Note: *Where primary consequence type is determined to be Safety, Work Health & Safety or Environment, apply the 'high' risk rating under catastrophic.*

Table 2 – Likelihood Criteria

Likelihood Criteria for Non-ATM Safety Consequences

Likelihood	Qualitative Descriptor	Quantitative Guidance	
		Timeframes	Probability *(within a year)*
Expected	The risk event is **expected** to occur or has occurred within the past year	Daily – Yearly	Greater than 95%
Likely	The risk event is more **likely** to occur than not	Yearly – 3 Yearly	33% to 95%
Possible	The risk event is **possible** but infrequent	3 Yearly – 10 Yearly	10% to 33%
Unlikely	The risk event is **unlikely** to occur	10 Yearly – 20 Yearly	5% to 10%
Rare	The risk event is only **remotely** probable	Greater than 20 years	Less than 5%

		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Generic Consequence Descriptions		Some loss that can be managed via existing management procedures having a negligible impact on achievement of business objectives.	Event with consequences that can be readily absorbed but requires management effort to minimise the impact on achievement of business objectives.	Significant event or circumstance that requires management to institute enhanced monitoring of controls to assure continued delivery of business objectives.	Critical event or circumstance that can be endured with proper management, however achievement of business objectives are impaired.	Event or circumstance with potentially disastrous impact leading to an inability to achieve business objectives.
Safety (Margins of Safety)	**ATM**	An operational condition with the potential to reduce the margins of safety (undesired state).	An operational condition in which the margins of safety have been compromised (unrecovered state).	An operational condition in which the margins of safety have been significantly eroded.	Low capacity/General Aviation aircraft accident.	Medium to high capacity aircraft accident.
	ARFFS	Minimal impact to ARFFS operational objectives.	Some impact to ARFFS operational objectives.	Significant impact to ARFFS operational objectives.	An inability to achieve ARFFS operational objectives.	A sustained and complete inability to achieve ARFFS operational objectives.
Work Health & Safety		Exposure to circumstances where injury may occur.	Injuries requiring medical treatment or first aid.	Serious injuries or illness requiring immediate medical treatment/hospital admission.	Injury or illness resulting in permanent impairment.	Fatality/fatalities.
Environment		Negligible effect or implication on the physical environment. Insignificant noise and emissions impacts.	Minor effect or implication on the physical environment. Minor noise and emissions impacts.	Moderate, medium term effect or implication on the physical environment. Moderate noise and emissions impacts.	Long term effect or implication on the physical environment. Major noise and emissions impacts.	Irreversible and extensive effect on the physical environment which has national or global implications.
Service Delivery (Impact on Customers)		Negligible efficiency impact on delivery of ATM/ARFF services.	Delivery of ATM/ARFF services are impaired, resulting in minor inefficiencies for our customers.	Inability to deliver some ATM/ARFF services, resulting in moderate efficiency impacts.	Inability to deliver majority of ATM/ARFF services, causing significant efficiency impacts and reducing the value delivered to our customers.	Sustained inability to deliver any ATM/ARFF services, which severely impacts the efficiency of our customers' operations.
Organisational Capability (Internal Impacts)		A noticeable degradation in organisational capability that does not reduce the effectiveness of the function.	A significant degradation in organisational capability to an extent and duration that, while Airservices can perform its primary functions, the effectiveness of the functions is noticeably reduced.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its primary functions.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its functions for an extended time.	Total loss of organisational capability to an extent and duration that Airservices cannot perform any of its functions.
Reputation		Internal impact only with no adverse customer or ministerial involvement. Ability to be managed by staff internally.	Some adverse publicity resulting in internal reviews of existing policies and practices.	Substantial adverse publicity or loss of some stakeholder confidence. Scrutiny/criticism by the Minister, Parliamentary Committees and key customers, requiring Ministerial and/or Customer response.	Adverse national media reports on failings, inefficiency or inadequacies resulting in serious loss of confidence by customers and the Minister. Serious embarrassment to Minister and Government. Parliamentary enquiry may be instigated.	Complete loss of stakeholder confidence resulting in Board/CEO resignation. Royal commission may be instigated.
Financial Sustainability*		A financial impact up to $500,000.	A financial impact between $500,000 and $5m.	A financial impact between $5m and $50m.	A financial impact greater than $50m.	Airservices is no longer able to operate as a going concern.

**Note:* *A financial impact constitutes both potential and actual impacts on Airservices profit and loss statement (i.e. revenue and expenditure). Potential impacts include: expenditure avoidance and opportunity costs. Financial figures presented are in the context of the organisation.*

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Table 4 – Risk Acceptance, Mitigation Strategies and Review Timeframes

	Risk acceptance – minimum authority	Risk mitigation strategy – safety & environment risks	Risk mitigation strategy – business risks	Minimum review timeframes
Extreme (E)	Must be referred to the CEO for attention and action	**Unacceptable** Immediate risk treatment required to reduce the level of risk to as low as reasonably practicable (ALARP) or cease the activity.	**Unacceptable** Immediate risk treatment required to reduce the level of risk to align with the organisational risk appetite or cease the activity.	Weekly (continuous risk treatment)
High (H)	Responsible Executive General Manager (EGM)	**Unacceptable** Immediate risk treatment required to reduce the level of risk to ALARP or cease the activity.	**Undesirable** Risk must be reduced to align with the organisational risk appetite.	Monthly
Medium (M)	Responsible Direct Report to Executive (DRE)	**Undesirable** Risk treatment required to reduce the level of risk to ALARP, unless the cost of reducing the risk is grossly disproportionate to the expected risk reduction benefit.	**Tolerable** Risk should be reduced to align with the organisational risk appetite, unless the cost exceeds the benefits achieved.	Quarterly
Low (L)	Responsible Other Leadership Role (OLR)	**Tolerable** Risk is broadly acceptable, however risk treatment should be applied to reduce the level of risk to ALARP, unless the cost of reducing the risk is disproportionate to the expected risk reduction benefit.	**Acceptable** Risk is broadly acceptable. Maintain current systems, monitor and review. Further reduction only if costs are insignificant.	Biannually
Negligible (N)	Responsible Team Leader and above	**Tolerable** Risk is acceptable, however the risk must be monitored to assure that it remains within risk tolerance/appetite. ALARP evidence is current.	**Acceptable** Risk is acceptable. No further reduction is necessary.	Annually

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Appendix B Hazard and Risk Assessment Record

The following risk data has been extracted from the parent TRA assessment. Please refer to the relevant TRA spreedsheet document for additional information and/or justification relevant to risk classification/s and/or control meaures.

Adelaide risk classifications – Existing minimum / proposed-state specification 1 / proposed-state specification 2

	Existing minimum specification (1+2)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	**1.** Existing category 5 minimum resource specifications: a. 1x Officer b. 2x Fire Fighter c. 1x Senior Officer (90min) d. 1x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Catastrophic **Consequence**: Expected **Classification**: Extreme	**1.** Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. **2.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Medium	**1.** Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 5x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. **2.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Rare **Consequence**: Minor **Classification**: Low

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Brisbane risk classifications – Existing minimum / proposed-state specification 1 / proposed-state specification 2

	Existing minimum specification (1+2)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 5 minimum resource specifications: a. 1x Officer b. 2x Fire Fighter c. 1x Senior Officer (90min) d. 1x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Catastrophic **Consequence**: Expected **Classification**: Extreme	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. g. Independent FCC operation when only a single vehicle is being provided from station East (category 5 being provided). 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Possible **Consequence**: Major **Classification**: Medium	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 5x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. g. Independent FCC operation when only a single vehicle is eing provided from station East (category 5 being provided). 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Unlikely **Consequence**: Minor **Classification**: Low

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Cairns risk classifications – Existing minimum / proposed-state specification 1 / proposed-state specification 2

	Existing minimum specification (1+2)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Initial Control Measures**	**Initial Risk Classification**	**Proposed Control Measures**	**Residual Risk Classification**	**Proposed Control Measures**	**Residual Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 5 minimum resource specifications: a. 1x Officer b. 2x Fire Fighter c. 1x Senior Officer (90min) d. 1x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Expected **Consequence**: Major **Classification**: Extreme	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Unlikely **Consequence**: Minor **Classification**: Medium	Proposed-state 2 not assessed	

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Hamilton Island risk classifications – Existing minimum / proposed-state specification 1 / proposed-state specification 2

	Existing minimum specification (1+2)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+6)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Residual Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existingc ategory 5 minimum resource specifications: a. 1x Officer b. 2x Fire Fighter c. 1x Senior Officer (90min) d. 1x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Expected **Consequence**: Major **Classification**: Extreme	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Likely **Consequence**: Major **Classification**: High	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 6x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

OBSERVE SECTION 1.1 - READ IN CONJUNC -004

Hobart risk classifications – Existing minimum / proposed-state specification 1 / proposed-state specification 2

	Existing minimum specification (1+2)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 5 minimum resource specifications: a. 1x Officer b. 2x Fire Fighter c. 1x Senior Officer (90min) d. 1x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Expected **Consequence**: Major **Classification**: Extreme	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low	Proposed-state 2 not assessed	

OBSERVE SECTION 1.1 - READ IN CONJUNC

Karratha risk classifications – Existing minimum / proposed-state specification 1 / proposed-state specification 2

	Existing minimum specification (1+2)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 5 minimum resource specifications: a. 1x Officer b. 2x Fire Fighter c. 1x Senior Officer (90min) d. 1x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Major **Consequence**: Expected **Classification**: Extreme	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Possible **Consequence**: Moderate **Classification**: Medium	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 5x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

OBSERVE SECTION 1.1 - READ IN CONJUNC

Port Hedland risk classifications – Existing minimum / proposed-state specification 1 / proposed-state specification 2

	Existing minimum specification (1+2)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 5 minimum resource specifications: a. 1x Officer b. 2x Fire Fighter c. 1x Senior Officer (90min) d. 1x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Major **Consequence**: Expected **Classification**: Extreme	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Likely **Consequence**: Minor **Classification**: Medium	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 5x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

OBSERVE SECTION - PENDING CHANGE MS-004

Sunshine Coast risk classifications – Existing minimum / proposed-state specification 1 / proposed-state specification 2

	Existing minimum specification (1+2)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 5 minimum resource specifications: a. 1x Officer b. 2x Fire Fighter c. 1x Senior Officer (90min) d. 1x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Major **Consequence**: Expected **Classification**: Extreme	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Possible **Consequence**: Moderate **Classification**: Medium	1. Immediate modification to Category 5 minimum resource specification: a. 2x Officer b. 5x Fire Fighter c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 5 with additional ancillary equipment associated with second primary attack vehicle, inclusive of additional CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

OBSERVE SECTION - REQUIRED TO COMPLY WITH SMS-004

Task Resource Analysis (TRA) summary report relative to category 6

Operational Risk Assessment

Version 1.1

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

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Change summary

Version	Date	Change description
0.1	14 AUG 2021	Initial draft development
1.0	19 AUG 2021	Updated post review feedback from [redacted]
1.1	27 AUG 2023	Editorial update to add watermark and ensure consistency of delimitation information and other editorial aspects across all summary reports. Identified errors have also been corrected. Note – such changes have not adjusted risk classifications or control measures as informed by the TRA data.

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OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

Disclaimer

This paper represents a theoretical operational risk assessment of a future operational environment informed by Task Resource Analysis data. This future operational environment will be realised when the Civil Aviation Safety Authority (CASA) incorporates the requirement for a Task Resource Analysis (TRA) into the regulations governing the conduct of Aviation Rescue and Fire Fighting Services (ARFFS) and Airservices Australia amends its operations manual to comply with these new requirements.

Until Airservices is required to implement TRA requirements, the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

1 Executive summary

This report provides a forecast of operational risk associated with implementation of Task Resource Analysis (TRA) into the Australian requirements for the provision of Aviation Rescue Fire Fighting Services ARFFS) in Australia. Refer to section 1.1 (delimitations) regarding the relationship between forecast TRA risk data and the current state operational risk baseline.

Category 6 is a commonplace level of service provided by Airservices ARFFS, and is the approved level of category for ten aerodromes listed on the ARFFS provider certificate (139H.0007). Whilst the current operational specification for CAT 6 meets certain requirements it has been identified that should we move to a new regulatory environment (future state) and current operational specification for category 6 were retained, certain deficiencies and limitations will exist (as identified via Task Resource Analysis), resulting in a (forecast) unacceptable 'high' level of risk. This future state assessment is based upon:

1. The existing category 6 specification is retained in its current format, without change, and
2. TRA has been introduced into the Australian requirements for the provision of ARFFS and the requirements of this process accurately match the obligations set out in the TRA methodology document.
3. Airservices amending its ARFFS operations manual to apply TRA.

As a result of the TRA process and in order to reduce the level of risk in the future state (to remove or reduce to as low as reasonably practicable (ALARP), two options have been determined to achieve this outcome:

1. Reduction of the level of risk to medium via enhancement to the operational specification of category 6 so that it remains functionally capable to achieve all ARFFS objectives.
    a. Should this option be selected, additional analysis to validate locations that are classified as remote or unsupported will need to be completed to confirm insufficient arriving resources within the 45-minute analysis period.
2. Reduction of the level of risk to (either) low via enhancement to the operational specification of category 6 so that it remains functionally capable to achieve all ARFFS objectives.
    a. Should this option be selected, additional analysis to validate locations that are classified as remote or unsupported will need to be completed to confirm insufficient arriving resources within the 45-minute analysis period.

This report presents supporting information relevant to these options, sufficient to ensure Airservices manages the potential operational risk associated with the implementation of TRA.

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS 0004

1.1 Delimitations

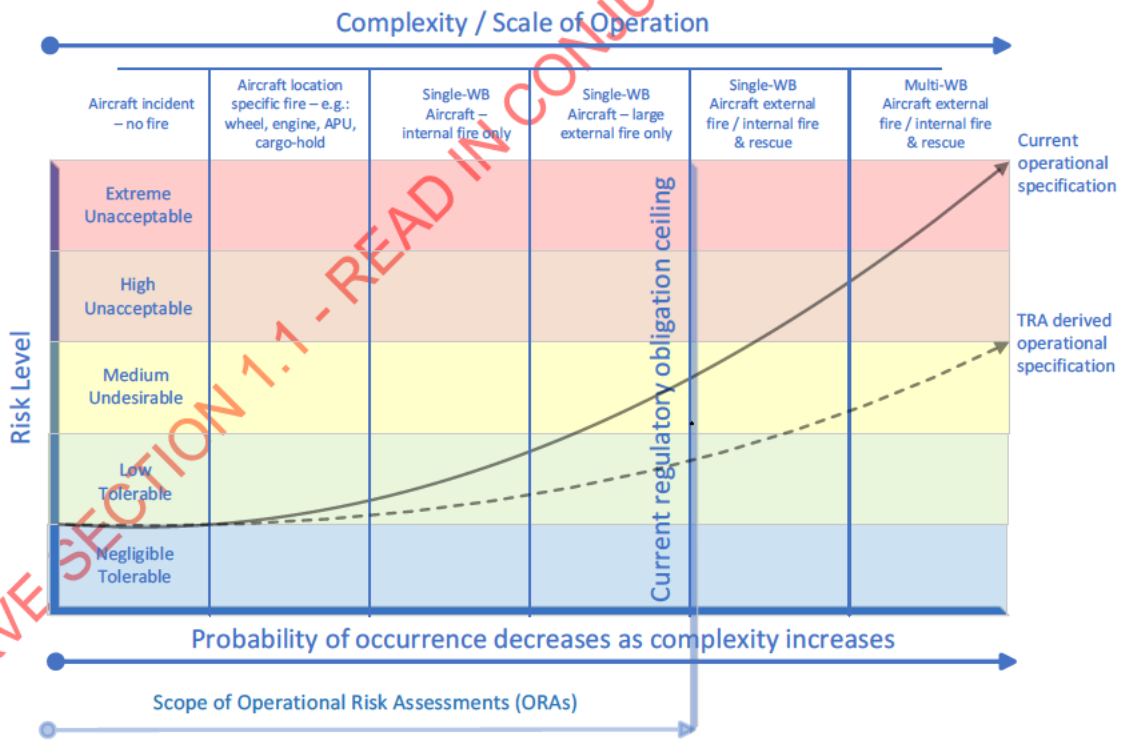
This report has been designed to provide an accurate reflection of the operational risk that may be experienced upon TRA being introduced to the Australian requirements for the provision of ARFFS and subsequent inclusion in the Airservices ARFFS operations manual.

TRA fundamentally adjusts the method in which the functional specification of ARFFS is determined, requiring operational capability to be determined relevant to the worst plausible and credible aircraft scenario, introducing differences to that of the existing regulated requirements.

Risk data presented in this report has been developed to assist with preparation for the regulatory introduction of TRA by informing Airservices as to the level of risk which may be experienced were the current level of operational capability provided relevant to a future state as defined by the TRA assessment.

As such, information within this report is not relevant to the current state but provides valuable forecast and planning data that will assist in the readiness of operations to achieve the ARFFS objectives. The change to the future state will occur upon the Civil Aviation Safety Authority (CASA) formally requiring TRA and the Airservices ARFFS operations manual (rule-set) being subsequently amended to implement these requirements.

Until Airservices is required to transition to the future state the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).



OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

2 Purpose

This document provides collective (summary) operational risk assessment relative to the category 6 band as assessed via the TRA methodology.

Information within this document provides a national representation of the future state operational risk associated with category 6 service provision, and the required actions

(immediate and ongoing) which are necessary to achieve and maintain a level of risk that is acceptable and is as low as reasonably practicable.

3 Scope

Relative to the hazard identified, the scope of this risk assessment is inclusive of the following consequence descriptor groupings – being:

- Operational risk (ARFFS margin of safety)

Analysis within this document is applicable to all ARFFS locations that may be required to provide category 6 service.

The locations that have been selected for the completion of category 6 TRA provide a representative baseline from which broader application across all ARFFS locations can be effectively achieved (refer to section 5.0 for additional information).

4 Background

Airservices is implementing the TRA methodology to determine the minimum number of operational staff (inclusive of all operational resources) in the future state necessary to effectively manage a probable and credible worst-case aviation incident up and until sufficient supporting resources arrive (so that ARFFS is no longer reliant upon its own, initial responding resources).

For further information on the design of the TRA methodology, inclusive of the probable and credible worst-case scenario descriptor, refer to the supporting TRA methodology document.

TRA is fundamentally a data gathering activity that provides quantitative and qualitative outputs that can be utilised to inform resourcing decisions. The TRA also provides a framework to permit a detailed understanding of the complexities associated with an ARFFS operation and, as a product of the process; it produces a range of proposed measures (controls) that actively seek to improve core service delivery and fire fighter safety.

Central to the TRA concept is the utilisation of qualitative risk assessment. It is acknowledged within the TRA methodology that more than one staffing/resource level will exist relative to any one scenario. This is a reflection of the non-binary or spectrum approach to staffing levels which reflect a shifting scale of capability relative to ARFFS operations. Whilst there is a point at which ARFFS is unable to achieve any operational objectives relative to the staffing/resourcing provided (for example, 1 fire fighter is unable to mount any form of response), as resourcing increases, so does the capability of ARFFS to achieve objectives.

Operational risk assessment has been employed by the TRA methodology to assist in accurately determining the minimum number of staff (and resourcing) required to achieve all ARFFS operational objectives aligned with the TRA scenario (up and until the arrival of sufficient supporting resources). Through application of the Airservices Safety Management System (SMS), risk assessment has been utilised to inform the level of risk associated with different levels of staffing (and supporting resources) as determined via the TRA process. This approach provides an organisationally aligned and accepted method for analysing, treating and ultimately accepting the level of risk which is managed to a level that is as low as reasonably practicable.

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

For further information on the risk assessment process utilised, please refer to AA-PROC-SAF-0105.

This document draws upon the data obtained from relevant and representative TRAs (within a particular category band), collating the data into a single document and articulating the associated operational risk.

Note: coding relative to staffing resources within this document is displayed as: Senior Officer + Officer + Fire Fighter.

5 Commonality of risk data

The TRA methodology requires analysis to be performed relevant to each location ARFFS is provided. In implementing this approach, situations may arise whereby the level of variability between locations is insufficient to require change to the resource specifications. Such circumstances reflect broadly comparable operating environments, or an environment that may represent an improvement to that previously assessed (for example, an improvement to the availability time of local supporting resources).

This notion implies that broadly comparable locations are likely to present commonality in risk data, and, at a certain stage in the process, the value derived from such TRAs diminishes due to repeat outcomes being delivered. In order to recognise commonality in the risk data, the locations assessed must be reflective of the genuine operational differences expected between locations (for example, capital city supported aerodromes compared to remote / isolated aerodromes). This approach ensures representative data which, when subjected to repeat risk assessment, may generate consistent risk outputs. At such a stage, data saturation may be achieved and, if sufficient data is available, valid applied outcomes can be extended to aerodromes with common attributes.

Such an approach has been applied to category 6, with the 10 locations assessed providing sufficient data from which valid outcomes can be determined for the remaining locations.

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

6 Risk Assessment

6.1 Process

The risk management process applied within this assessment is in accordance with AA-PROC-SAF-0105.

Key steps within this process are detailed within this report.

A risk assessment review panel was assembled in relation to each risk assessment completed. The participants included:

Table 1 - TRA participants – Port Hedland (02 AUG 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Sub Station Officer

Name	Position
[redacted]	Leading Fire Fighter
	TRA Implementation Lead
	TRA Implementation Lead

Table 2 - TRA participants – Ayers Rock (Yulara) (5 JUL 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	TRA Implementation Lead
	TRA Implementation Lead

Table 3 - TRA participants – Ballina (17 JUN 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	Fire Commander
	TRA Implementation Lead
	TRA Implementation Lead
	Sub Station Officer

Table 4 - TRA participants – Broome (22 JUN 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	TRA Implementation Lead
	TRA Implementation Lead

Table 5 - TRA participants – Coffs Harbour (14 JUN 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	Sub Station Officer
	TRA Implementation Lead
	TRA Implementation Lead

Table 6 - TRA participants - Gladstone (3 JUN 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	Fire Commander
	TRA Implementation Lead
	TRA Implementation Lead

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Table 7 - TRA participants - Karratha (29 JUN 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Leading Fire Fighter
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

Table 8 - TRA participants - Newman (1 JUN 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

Table 9 - TRA participants - Rockhampton (15 JUN 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

Table 10 - TRA participants – Whitsunday Coast (24 JUN 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Fire Commander
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

OBSERVE SECTION 1.1 - RE[illegible]N CONJUNC[illegible]ON WITH SM[illegible]004

6.2 Step 1 – Consult and communicate

Communication and consultation relevant to this assessment has been undertaken within the assessment panels.

Additional communication and consultation with the United Firefighters Union (Aviation Branch) and the Civil Aviation Safety Authority (CASA) has been undertaken at the concept/design and implementation phase, with ongoing invitation for both parties to attend and observe TRA workshops.

Please refer to the TRA methodology document for further information relating to consultation and communication relevant to TRA process.

6.3 Step 2 – Define the scope, context and criteria

The scope of this risk assessment is in accordance with that previously defined in this document (section 3).

The locations that have completed a category 6 TRA include:

- Ayers Rock (Yulara)
- Ballina
- Broome
- Coffs Harbour
- Gladstone
- Karratha
- Newman
- Port Hedland
- Rockhampton
- Whitsunday Coast

For the purpose of this assessment, the context is established in relation to the ability for ARFFS to achieve all operational objectives associated with the execution of ARFFS functions[1] at a probable and credible worst-case aircraft incident[2].

The risk assessment criteria to be utilised is in accordance with AA-PROC-SAF-0105 (refer to appendix A for details).

All operational objectives relevant to the period until the TRA ends (that is, when sufficient supporting resources arrive on-scene, so that the ARFFS is no longer reliant upon its own, initially responding resources) are within the scope of this risk assessment.

6.4 Step 3 – Risk identification

Acknowledging the established context and background information, the assessment panel has identified the following hazards relevant to the service design.

Further details in relation to the hazards can be found in appendix B.

HAZARD TITLE
Operational safety (ARFFS margins of safety)

OBSERVE SECTION 1 - READ IN CONJUNCTION WITH SMS-004

[1] Refer to the Civil Aviation Safety Regulation 1998 section 139.710
[2] Refer to section 7.2.2.5 of the TRA methodology V2.0 for details.

HAZARD TITLE
Hazard 1 - Reduced ability (margins of safety) for the ARFFS to achieve operational objectives. This hazard relates to the ability for ARFFS to execute its statutory functions (achieved via operational objectives as outlined within the TRA) relative to the resourcing (staffing, vehicles, equipment, agent, other operational consumables) and the anticipated on-scene arrival time of supporting emergency resources.

6.5 Step 4 – Analyse risk

In consultation with the individuals listed in table 1-10 (risk assessment panel/s), the hazard defined in section 6.4 has been subjected to risk analysis in accordance with AA-PROC-SAF-0105 and the criteria defined in appendix A.

Consistent with the TRA methodology requirements, the forecast TRA informed operational risk associated with the existing minimum staffing/resource specification (relative to category 6) has been assessed.

Table 11 provides an overview of the risk classifications:

Refer to appendix B for details of the risk analysis relevant to each location.

OBSERVE SE READ IN CONJUNCTION WITH SMS-004

Table 11 - Theoretical risk classification relative to the existing specification / minimum staffing for category 6 when assessed against future TRA requirements.

Location	Existing spec (1+4)
Ayers Rock	Extreme
Ballina	Extreme
Broome	High
Coffs Harbour	High
Gladstone	Extreme
Karratha	High
Newman	High
Port Hedland	High
Rockhampton	High
Whitsunday Coast	HIgh

Whilst the majority of locations indicated an existing specification risk classification of ***high*** (as a result of determining a moderate consequence classification), three locations maintained a position of ***extreme*** (as a result of determining a major consequence).

A specification of 1+4 was not previously assessed in category 5 TRA risk assessments.

Participants were prompted frequently to explain and justify why a consequence of *major* applied (that is, an inability to achieve an operational objective). The consistent explanation was that 1+4 remains unable to effectively perform internal and external

operations consistent with procedural requirements (in their opinion) and that the classification should remain *extreme*. Whilst inconsistent with seven other category 6 assessments, risk assessment review and clarification in accordance with the assessment 'TRA SME risk assessment panel terms of reference' was not required due to the applied outcome (when assessed against the Airservices risk acceptance criteria) remaining *unacceptable* irrespective of high or extreme.

6.6 Step 5 – Evaluate risk

In accordance with the Airservices SMS (in particular AA-PROC-SAF-0105), an *extreme* or *high* level of risk is *unacceptable* and must be afforded immediate risk treatment to reduce the level of risk to as low as reasonably practicable (ALARP), or, cease the activity.

This level of risk is primarily associated with the inability or significantly impacted ability to achieve certain ARFFS operational objectives. Whilst initial external operations can achieve objectives, internal firefighting operations (inclusive of rescue as informed by advice from the Civil Aviation Safety Authority) is where the most significant operational limitations and (relative to three locations assessed) inabilities exist.

The resources aligned with the current-state category 6 specification are able to achieve initial external objectives (specifically Q1 and Q2 ground fire control and/or extinguishment), however, its ability to support internal rescue operations establishes the basis for the *unacceptable* level of risk due to an inability for this function to be performed correctly and effectively.

Utilising the process outlined in the TRA methodology, analysis of the deficiencies and limitations associated with the minimum staffing specification of 1+4 (referred to by TRA process as pinch-points) has been completed. This analysis informs the nature (description and causation) relative to each pinch-point, supporting the identification of mitigation measures sufficient to address each pinch-point in context of the assessment scenario.

Generally, the following pinch-points/limitations were identified as key contributors to the initial risk classification. Please refer to the relevant TRA baseline data for a more detailed exploration of the pinch-points as required.

1. Limited fire-fighting staff to support correct or full application of all procedures (specifically internal operations / compressed air breathing apparatus use).
2. Insufficient officer staffing, impacting the achievement of functions associated with fire-ground decision making and supervision.
3. Insufficient procedural clarity as to the role and function of rescue (inclusive of casualty management).

The outcomes of this analysis has informed the design of two new specifications relative to category 6, with this information forming the basis of the proposed risk treatment activities defined in section 6.7.

OBSERVE SECTION 11 - READ IN CONJUNCTION WITH SMS-004

6.7 Step 6 - Treat risk

This step seeks to include identified control measures which are required to manage the resulting risk ALARP.

The risk treatment hierarchy of controls (AA-PROC-SAF-0105) has been considered by the assessment panel in the determination of treatment measures.

The TRA methodology has been utilised to inform the controls (or treatment measures) necessary to address identified 'pinch-points' within the respective TRA baseline and inform a new staffing/resource specification.

The primary purpose of TRA is to determine the minimum number of staffing/resourcing required for service provision relative to the assessment scenario.

As such, more than one level of proposed specification has been established to inform a comparison between proposed-states. Such an approach permits the determination of the minimum specification that is still capable of managing the associated operational risk to a level that is as low as reasonably practicable.

Table 12 provides an overview of the residual level/s relative to the risk treatments applied in appendix B (with an expanded explanation of the proposed states included later in this section).

Refer to section 6.9 for details of residual risk acceptance.

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Table 12 – Theoretical risk classifications relative to proposed-state/s minimum category 6 specification

Location	Existing spec (1+4)	Proposed-state 1 1+2+4	Proposed-state 2 1+2+5
Ayers Rock	Extreme	Medium	Low
Ballina	Extreme	Medium	Low
Broome	High	Medium	Low
Coffs Harbour	High	Medium	Low
Gladstone (reviewed)	Extreme*	Extreme*	Extreme*
	Extreme	Medium	Low
Karratha	High	Medium	Low
Newman	High	Medium	Low
Port Hedland	High	Medium	Low
Rockhampton	High	Medium	Low
Whitsunday Coast	High	Medium	Low

*See section 6.7.1 for explanation of the enduring *extreme* classification at Gladstone.

6.7.1 Gladstone enduring *extreme* classification

In table 12, Gladstone indicates an enduring *extreme* classification, irrespective of the resources allocated. This classification is (both) inconsistent with all other locations assessments of proposed state one and two, and indicates no variation to either consequence or likelihood relative to hazard realisation, even though the assessed improved states contain a significant increase in operational resources. When

promoted for justification for these levels of classification (during the workshop), no procedurally supported explanation could be provided.

The outcome of this assessment highlighted a situation whereby, in the event that local TRA participants establish (either) an incorrectly formed/supported opinion in relation to the risk assessment, or a contrived or pre-determined position which is unwilling to respond to the changes in context, then an avenue for review and reassessment must exist to correct and amend erroneous data.

In relation to the applicability of the *extreme* classification for proposed-state 1 and proposed-state 2, it is determined that consistent with the extensive comparable data available and no identifiable specific factors that have resulted in such a high level of sustained operational risk, such a classification is not accurate or reflective of the genuine operational risk relative to the context. Due to the characteristics of Gladstone aerodrome (confined to the requirements of the TRA methodology) and the particulars outlined in section 5 of this report, the *extreme* risk has been documented for record-keeping purposes, however, a review of this data has subsequently corrected Gladstone to that of proposed-state 1 and 2 relative to the other 9 assessment locations.

6.7.2 Category 6 proposed future state 1 (all locations) – 1+2+4

Proposed-state 1 retains category 6 as a service level and comprises a range of treatments/controls which increases the capability of ARFFS relative to the assessment scenario.

For locations that are not remote/isolated (with significant restriction or limitation on the availability of local supporting services), propose-state specification 1 reduces the level of risk to that aligned with undesirable (*medium*). This is reflective of a specification that, when analysed by the TRA baseline, is able to generally perform objectives consistent with requirements, however, there are acknowledged significant impacts with the achievement of operational objectives at some stages of the operation.

The significant limitations and/or restrictions (that remain), predominantly relate to the efficacy of internal operations and the performance of rescue.

For complete detail on the required improvement measures for proposed-state 1 (relative to a particular location), please refer to the parent TRA data. The following list provides a generalised capture of the enhancement/improvements associated with category 6 proposed state 1:

- An improvement to the timeframe for senior Officer accessibility (deployment to the fire-ground).
- An increase to staff, providing an additional supervisory officer.
- Enhanced clarity as to the role/function of rescue.
- Enhanced casualty management procedures (specific to aircraft), inclusive of rapid triage / casualty assessment method (inclusive of casualty extraction from aircraft).
- Enhanced method of sensing/monitoring internal atmosphere/s and determining the acceptability of the internal environment to support acceptably safe access by supporting resources.

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH GMS-0004

6.7.3 Category 6 proposed future state 2 at supported locations – 1+2+5

Proposed-state 2 retains category 6 as a service level and provides further enhancement to that of proposed-state 1. This is achieved by the availability of an additional fire-fighter. This resource was identified during a number of TRA workshops with its applied utility being:

- Provision of an additional firefighter to support fire-ground operations whilst internal operations are undertaken (in accordance with) existing CABA procedural requirements.

Whilst operations can be performed without a third firefighter supporting fire-ground operations, relative to a number of pinch-points, such a resource may assist in certain stages of the operation and relieve the *significant impacts* referred to in section 6.7.2.

All other specifications in proposed-state 2 remaining consistent with that of proposed-state 1.

6.7.4 Category 6 proposed future state 2 at remote locations – accepted outcome for CAT6+[2]*

The TRA baseline assessment provides for analysis up to 45 minutes from the commencement of an operation. For the majority of locations, sufficient local supporting resources arrive on-scene within this time – at which point TRA ceases.

Locations that do not receive support within this time are reflective of highly isolated or remote localities which may require additional control measures (treatments) to that of supported locations.

Such a determination requires additional control measures to support effective operations at category 6. These control measures include:

1. An additional two firefighters to that of the minimum specification in proposed-state 1. Note, the additional two fire fighters are not immediately required, but must be capable of being available on the fire-ground and ready for operational use in a time no greater than 45 minutes from incident commencement. Such an increase results in an unsupported category 6 specification reflecting – accepted outcome for CAT6+[2]).

Whilst the TRA has determined the requirement for resources at locations which are both classified as *supported* (sufficient local resources within 45 minutes) and *unsupported* (insufficient local resources within 45 minutes), the assessment and confirmation of a location being '*unsupported*' remains outstanding and separate to the TRA process. Such confirmation will require direct engagement with senior representative/s of state/territory fire services (and other agencies as applicable) to advise and inform as to the genuine expected level of support relative to a particular location (preferably in writing). Only after such analysis and confirmation can a location be accurately classified as *unsupported* and receive the additional control treatment outlined in this section.

6.8 Step 7 - Monitor and review

There is no monitoring and/or review requirements for the theoretical assessments made within this document.

OBSERVE SECTION 1.1 READ IN CONJUNCTION WITH SAS-004

6.9 Acceptance and sign-off

As this is a theoretical risk assessment of an assumed future state there is no requirement for formal risk acceptance or sign-off.

Data presented within this report will assist and inform capability planning sufficient to ensure that operational risk associated with any future implementation of TRA is managed to ALARP.

Upon CASA implementing TRA requirements and the Airservices ARFFS operational manual being updated, operational risk associated with TRA will be transferred to the approved operational risk baseline. This risk data will be informed by information within this report, the locations parent TRA documentation and the level of capability relative to the improvements required (as outlined herein).

Formal risk acceptance and sign-off will be undertaken at this time, relative to the respective operational risk baseline and the broader safety management system requirements.

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS 004

Appendix A Risk assessment criteria

Table 1 – Risk Classification Matrix

LIKELIHOOD	CONSEQUENCE					
		Insignificant	Minor	Moderate	Major	Catastrophic
	Expected	Medium	Medium	High	Extreme	Extreme
	Likely	Low	Medium	Medium	High	Extreme
	Possible	Low	Low	Medium	Medium	High
	Unlikely	Negligible	Low	Low	Medium	Medium / High*
	Rare	Negligible	Negligible	Negligible	Low	Medium / High*

*__Note:__ *Where primary consequence type is determined to be Safety, Work Health & Safety or Environment, apply the 'high' risk rating under catastrophic.*

Table 2 – Likelihood Criteria

Likelihood Criteria for Non-ATM Safety Consequences

Likelihood	Qualitative Descriptor	Quantitative Guidance	
		Timeframes	Probability *(within a year)*
Expected	The risk event is **expected** to occur or has occurred within the past year	Daily – Yearly	Greater than 95%
Likely	The risk event is more **likely** to occur than not	Yearly – 3 Yearly	33% to 95%
Possible	The risk event is **possible** but infrequent	3 Yearly – 10 Yearly	10% to 33%
Unlikely	The risk event is **unlikely** to occur	10 Yearly – 20 Yearly	5% to 10%
Rare	The risk event is only **remotely** probable	Greater than 20 years	Less than 5%

		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Generic Consequence Descriptions		Some loss that can be managed via existing management procedures having a negligible impact on achievement of business objectives.	Event with consequences that can be readily absorbed but requires management effort to minimise the impact on achievement of business objectives.	Significant event or circumstance that requires management to institute enhanced monitoring of controls to assure continued delivery of business objectives.	Critical event or circumstance that can be endured with proper management, however achievement of business objectives are impaired.	Event or circumstance with potentially disastrous impact leading to an inability to achieve business objectives.
Safety (Margins of Safety)	**ATM**	An operational condition with the potential to reduce the margins of safety (undesired state).	An operational condition in which the margins of safety have been compromised (unrecovered state).	An operational condition in which the margins of safety have been significantly eroded.	Low capacity/General Aviation aircraft accident.	Medium to high capacity aircraft accident.
	ARFFS	Minimal impact to ARFFS operational objectives.	Some impact to ARFFS operational objectives.	Significant impact to ARFFS operational objectives.	An inability to achieve ARFFS operational objectives.	A sustained and complete inability to achieve ARFFS operational objectives.
Work Health & Safety		Exposure to circumstances where injury may occur.	Injuries requiring medical treatment or first aid.	Serious injuries or illness requiring immediate medical treatment/hospital admission.	Injury or illness resulting in permanent impairment.	Fatality/fatalities.
Environment		Negligible effect or implication on the physical environment. Insignificant noise and emissions impacts.	Minor effect or implication on the physical environment. Minor noise and emissions impacts.	Moderate, medium term effect or implication on the physical environment. Moderate noise and emissions impacts.	Long term effect or implication on the physical environment. Major noise and emissions impacts.	Irreversible and extensive effect on the physical environment which has national or global implications.
Service Delivery (Impact on Customers)		Negligible efficiency impact on delivery of ATM/ARFF services.	Delivery of ATM/ARFF services are impaired, resulting in minor inefficiencies for our customers.	Inability to deliver some ATM/ARFF services, resulting in moderate efficiency impacts.	Inability to deliver majority of ATM/ARFF services, causing significant efficiency impacts and reducing the value delivered to our customers.	Sustained inability to deliver any ATM/ARFF services, which severely impacts the efficiency of our customers' operations.
Organisational Capability (Internal Impacts)		A noticeable degradation in organisational capability that does not reduce the effectiveness of the function.	A significant degradation in organisational capability to an extent and duration that, while Airservices can perform its primary functions, the effectiveness of the functions is noticeably reduced.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its primary functions.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its functions for an extended time.	Total loss of organisational capability to an extent and duration that Airservices cannot perform any of its functions.
Reputation		Internal impact only with no adverse customer or ministerial involvement. Ability to be managed by staff internally.	Some adverse publicity resulting in internal reviews of existing policies and practices.	Substantial adverse publicity or loss of some stakeholder confidence. Scrutiny/criticism by the Minister, Parliamentary Committees and key customers, requiring Ministerial and/or Customer response.	Adverse national media reports on failings, inefficiency or inadequacies resulting in serious loss of confidence by customers and the Minister. Serious embarrassment to Minister and Government. Parliamentary enquiry may be instigated.	Complete loss of stakeholder confidence resulting in Board/CEO resignation. Royal commission may be instigated.
Financial Sustainability*		A financial impact up to $500,000.	A financial impact between $500,000 and $5m.	A financial impact between $5m and $50m.	A financial impact greater than $50m.	Airservices is no longer able to operate as a going concern.

**Note:* *A financial impact constitutes both potential and actual impacts on Airservices profit and loss statement (i.e. revenue and expenditure). Potential impacts include: expenditure avoidance and opportunity costs. Financial figures presented are in the context of the organisation.*

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Table 4 – Risk Acceptance, Mitigation Strategies and Review Timeframes

	Risk acceptance – minimum authority	Risk mitigation strategy – safety & environment risks	Risk mitigation strategy – business risks	Minimum review timeframes
Extreme (E)	Must be referred to the CEO for attention and action	**Unacceptable** Immediate risk treatment required to reduce the level of risk to as low as reasonably practicable (ALARP) or cease the activity.	**Unacceptable** Immediate risk treatment required to reduce the level of risk to align with the organisational risk appetite or cease the activity.	Weekly (continuous risk treatment)
High (H)	Responsible Executive General Manager (EGM)	**Unacceptable** Immediate risk treatment required to reduce the level of risk to ALARP or cease the activity.	**Undesirable** Risk must be reduced to align with the organisational risk appetite.	Monthly
Medium (M)	Responsible Direct Report to Executive (DRE)	**Undesirable** Risk treatment required to reduce the level of risk to ALARP, unless the cost of reducing the risk is grossly disproportionate to the expected risk reduction benefit.	**Tolerable** Risk should be reduced to align with the organisational risk appetite, unless the cost exceeds the benefits achieved.	Quarterly
Low (L)	Responsible Other Leadership Role (OLR)	**Tolerable** Risk is broadly acceptable, however risk treatment should be applied to reduce the level of risk to ALARP, unless the cost of reducing the risk is disproportionate to the expected risk reduction benefit.	**Acceptable** Risk is broadly acceptable. Maintain current systems, monitor and review. Further reduction only if costs are insignificant.	Biannually
Negligible (N)	Responsible Team Leader and above	**Tolerable** Risk is acceptable, however the risk must be monitored to assure that it remains within risk tolerance/appetite. ALARP evidence is current.	**Acceptable** Risk is acceptable. No further reduction is necessary.	Annually

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Appendix B Hazard and Risk Assessment Record

The following risk data has been extracted from the parent TRA assessment. Please refer to the relevant TRA spreedsheet document for additional information and/or justification relevant to risk classification/s and/or control meaures.

Ayers Rock (Yulara) and Ballina – Existing minimum / proposed-state spec 1 / proposed-state spec 2

	Existing minimum specification (1+4)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 2 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	**1.** Existing category 6 minimum resource specifications: a. 1x Officer b. 4x Fire Fighter c. 1x Senior Officer (90min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 6 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Major **Consequence**: Expected **Classification**: Extreme	**1.** Immediate modification to Category 6 minimum resource specification: **a. 2x Officer** b. 4x Fire Fighter **c. 1x Senior Officer (20-45min)** d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 6 with additional ancillary equipment associated with additional officer inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. **2.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. **3. For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Moderate **Classification**: Medium	**1.** Immediate modification to Category 6 minimum resource specification: a. 2x Officer **b. 5x Fire Fighter** c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 6 with additional ancillary equipment associated with additional officer and fire fighter, inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. **2.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. **3. For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Poss ble **Consequence**: Minor **Classification**: Low

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Broome, Coffs Harbour, Karratha, Newman, Port Hedland, Rockhampton and Whitsunday Coast risk classifications – Existing minimum / proposed-state spec 1 / proposed-state spec 2 (note – refer to section 6.7.1 for information realting to Gladstone)

	Existing minimum specification (1+4)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 2 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 6 minimum resource specifications: a. 1x Officer b. 4x Fire Fighter c. 1x Senior Officer (90min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 6 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Moderate **Consequence**: Expected **Classification**: High	1. Immediate modification to Category 6 minimum resource specification: **g. 2x Officer** h. 4x Fire Fighter **i. 1x Senior Officer (20-45min)** j. 2x primary attack vehicle k. Equipment as per AFFM-09 CAT 6 with additional ancillary equipment associated with additional officer inclusive of CABA. l. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Moderate **Classification**: Medium	1. Immediate modification to Category 6 minimum resource specification: g. 2x Officer **h. 5x Fire Fighter** i. 1x Senior Officer (20-45min) j. 2x primary attack vehicle k. Equipment as per AFFM-09 CAT 6 with additional ancillary equipment associated with additional officer and fire fighter, inclusive of CABA. l. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

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Task Resource Analysis (TRA) summary report relative to category 7

Operational Risk Assessment

Version 1.1

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Change summary

Version	Date	Change description
0.1	20 NOV 2021	Initial draft development
1.0	1 DEC 2021	Update to version 1.0
1.1	27 AUG 2023	Editorial update to add watermark and ensure consistency of delimitation information and other editorial aspects across all summary reports. Identified errors have also been corrected. Note – such changes have not adjusted risk classifications or control measures as informed by the TRA data.

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Disclaimer

This paper represents a theoretical operational risk assessment of a future operational environment informed by Task Resource Analysis data. This future operational environment will be realised when the Civil Aviation Safety Authority (CASA) incorporates the requirement for a Task Resource Analysis (TRA) into the regulations governing the conduct of Aviation Rescue and Fire Fighting Services (ARFFS) and Airservices Australia amends its operations manual to comply with these new requirements.

Until Airservices is required to implement TRA requirements, the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).

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1 Executive summary

This report provides a forecast of operational risk associated with implementation of Task Resource Analysis (TRA) into the Australian requirements for the provision of Aviation Rescue Fire Fighting Services ARFFS) in Australia. Refer to section 1.1 (delimitations) regarding the relationship between forecast TRA risk data and the current state operational risk baseline.

Category 7 is a commonplace level of service provided by Airservices ARFFS, and is the approved level of category for seven aerodromes listed on the ARFFS provider certificate (139H.0007). Whilst the current operational specification for CAT 7 meets certain requirements it has been identified that should we move to a new regulatory environment (future state) and current operational specification for category 7 were retained, certain deficiencies and limitations will exist (as identified via Task Resource Analysis), resulting in a (forecast) unacceptable 'high' level of risk. This future state assessment is based upon:

1. The existing category 7 specification is retained in its current format, without change, and
2. TRA has been introduced into the Australian requirements for the provision of ARFFS and the requirements of this process accurately match the obligations set out in the TRA methodology document.
3. Airservices amending its ARFFS operations manual to apply TRA.

As a result of the TRA process and in order to reduce the level of risk in the future state (to remove or reduce to as low as reasonably practicable (ALARP), two options have been determined to achieve this outcome:

1. Reduction of the level of risk to **medium** via enhancement to the operational specification of category 7 so that it remains functionally capable to achieve all ARFFS objectives.
    a. Should this option be selected, additional analysis to validate locations that are classified as remote or unsupported will need to be completed to confirm insufficient arriving resources within the 45-minute analysis period.
2. Reduction of the level of risk to **low** via enhancement to the operational specification of category 7 so that it remains functionally capable to achieve all ARFFS objectives.
    a. Should this option be selected, additional analysis to validate locations that are classified as remote or unsupported will need to be completed to confirm insufficient arriving resources within the 45-minute analysis period.

This report presents supporting information relevant to these options, sufficient to ensure Airservices manages the potential operational risk associated with the implementation of TRA.

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS 0094

1.1 Delimitations

This report has been designed to provide an accurate reflection of the operational risk that may be experienced upon TRA being introduced to the Australian requirements for the provision of ARFFS and subsequent inclusion in the Airservices ARFFS operations manual.

TRA fundamentally adjusts the method in which the functional specification of ARFFS is determined, requiring operational capability to be determined relevant to the worst plausible and credible aircraft scenario, introducing differences to that of the existing regulated requirements.

Risk data presented in this report has been developed to assist with preparation for the regulatory introduction of TRA by informing Airservices as to the level of risk which may be experienced were the current level of operational capability provided relevant to a future state as defined by the TRA assessment.

As such, information within this report is not relevant to the current state but provides valuable forecast and planning data that will assist in the readiness of operations to achieve the ARFFS objectives. The change to the future state will occur upon the Civil Aviation Safety Authority (CASA) formally requiring TRA and the Airservices ARFFS operations manual (rule-set) being subsequently amended to implement these requirements.

Until Airservices is required to transition to the future state the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).

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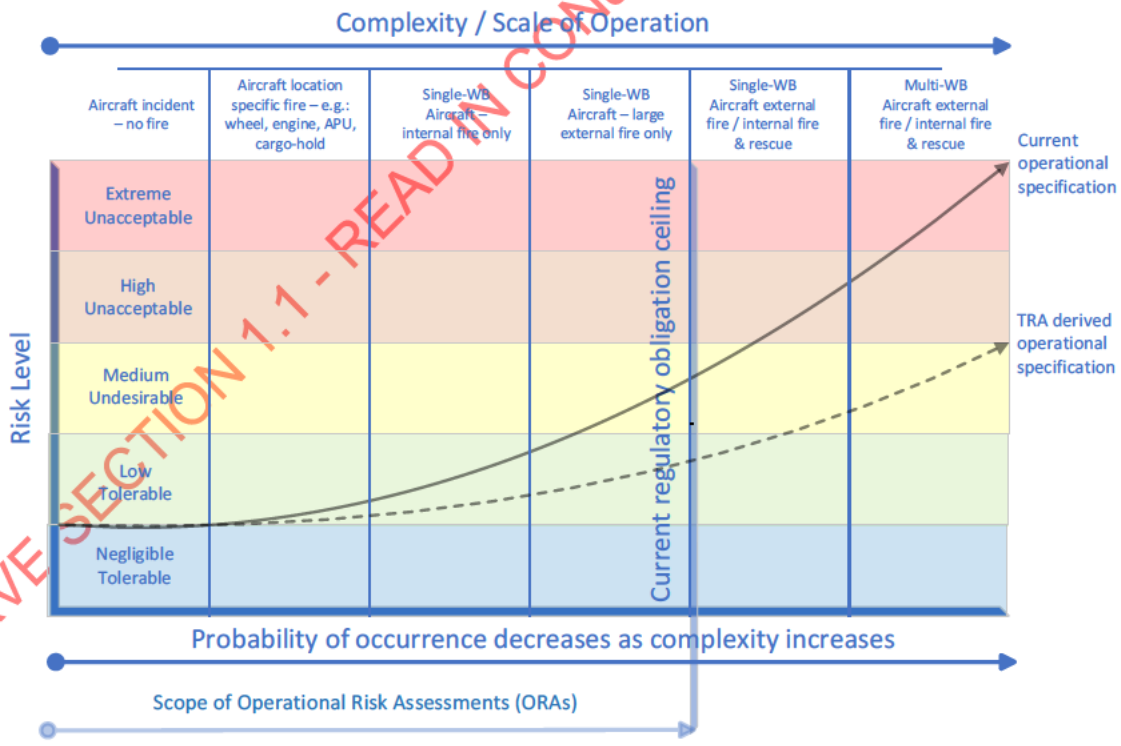

2 Purpose

This document provides collective (summary) operational risk assessment relative to the category 7 band as assessed via the TRA methodology.

Information within this document provides a national representation of the future state operational risk associated with category 7 service provision, and the required actions (immediate and ongoing) which are necessary to achieve and maintain a level of risk that is acceptable and is as low as reasonably practicable.

3 Scope

Relative to the hazard identified, the scope of this risk assessment is inclusive of the following consequence descriptor groupings – being:

- Operational risk (ARFFS margin of safety)

Analysis within this document is applicable to all ARFFS locations that may be required to provide category 7 service.

The locations that have been selected for the completion of category 7 TRA provide a representative baseline from which broader application across all ARFFS locations can be effectively achieved (refer to section 5.0 for additional information).

4 Background

Airservices is implementing the TRA methodology to determine the minimum number of operational staff (inclusive of all operational resources) in the future state necessary to effectively manage a probable and credible worst-case aviation incident up and until sufficient supporting resources arrive (so that ARFFS is no longer reliant upon its own, initial responding resources).

For further information on the design of the TRA methodology, inclusive of the probable and credible worst-case scenario descriptor, refer to the supporting TRA methodology document.

TRA is fundamentally a data gathering activity that provides quantitative and qualitative outputs that can be utilised to inform resourcing decisions. The TRA also provides a framework to permit a detailed understanding of the complexities associated with an ARFFS operation and, as a product of the process; it produces a range of proposed measures (controls) that actively seek to improve core service delivery and fire fighter safety.

Central to the TRA concept is the utilisation of qualitative risk assessment. It is acknowledged within the TRA methodology that more than one staffing/resource level will exist relative to any one scenario. This is a reflection of the non-binary or spectrum approach to staffing levels which reflect a shifting scale of capability relative to ARFFS operations. Whilst there is a point at which ARFFS is unable to achieve any operational objectives relative to the staffing/resourcing provided (for example, 1 fire fighter is unable to mount any form of response), as resourcing increases, so does the capability of ARFFS to achieve objectives.

OBSERVE SECTION 1.1 READ IN CONJUNCTION WITH SMS-004

Operational risk assessment has been employed by the TRA methodology to assist in accurately determining the minimum number of staff (and resourcing) required to achieve all ARFFS operational objectives aligned with the TRA scenario (up and until the arrival of sufficient supporting resources). Through application of the Airservices Safety Management System (SMS), risk assessment has been utilised to inform the level of risk associated with different levels of staffing (and supporting resources) as determined via the TRA process. This approach provides an organisationally aligned and accepted method for analysing, treating and ultimately accepting the level of risk which is managed to a level that is as low as reasonably practicable.

For further information on the risk assessment process utilised, please refer to AA-PROC-SAF-0105.

This document draws upon the data obtained from relevant and representative TRAs (within a particular category band), collating the data into a single document and articulating the associated operational risk.

Note: coding relative to staffing resources within this document is displayed as: Senior Officer + Officer + Fire Fighter.

OBSERVE SECTION 1.1. READ IN CONJUNCTION WITH SMS-004

5 Commonality of risk data

The TRA methodology requires analysis to be performed relevant to each location ARFFS is provided. In implementing this approach, situations may arise whereby the level of variability between locations is insufficient to require change to the resource specifications. Such circumstances reflect broadly comparable operating environments, or an environment that may represent an improvement to that previously assessed (for example, an improvement to the availability time of local supporting resources).

This notion implies that broadly comparable locations are likely to present commonality in risk data, and, at a certain stage in the process, the value derived from such TRAs diminishes due to repeat outcomes being delivered. In order to recognise commonality in the risk data, the locations assessed must be reflective of the genuine operational differences expected between locations (for example, capital city supported aerodromes compared to remote / isolated aerodromes). This approach ensures representative data which, when subjected to repeat risk assessment, may generate consistent risk outputs. At such a stage, data saturation may be achieved and, if sufficient data is available, valid applied outcomes can be extended to aerodromes with common attributes.

Such an approach has been applied to category 6, with the 10 locations assessed providing sufficient data from which valid outcomes can be determined for the remaining locations.

6 Risk Assessment

6.1 Process

The risk management process applied within this assessment is in accordance with AA-PROC-SAF-0105.

Key steps within this process are detailed within this report.

A risk assessment review panel was assembled in relation to each risk assessment completed. The participants included:

Table 1 - TRA participants – Hamilton Island (05 AUG 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	Station Officer
	TRA Implementation Lead
	TRA Implementation Lead

Table 2 - TRA participants – Alice Springs (5 JUL 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	TRA Implementation Lead
	TRA Implementation Lead

Table 3 - TRA participants – Hobart (17 JUN 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	Fire Commander
	TRA Implementation Lead
	TRA Implementation Lead
	Sub Station Officer

Table 4 - TRA participants – Launceston (22 JUN 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	TRA Implementation Lead
	TRA Implementation Lead

Table 5 - TRA participants – Mackay (14 JUN 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	Sub Station Officer
	TRA Implementation Lead
	TRA Implementation Lead

OBSERVE 1.1 - READ IN CONJUNCTION WITH SMS-004

Table 6 - TRA participants – Sunshine Coast (3 JUN 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Fire Commander
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

Table 7 - TRA participants - Townsville (29 JUN 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Leading Fire Fighter
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

6.2 Step 1 – Consult and communicate

Communication and consultation relevant to this assessment has been undertaken within the assessment panels.

Additional communication and consultation with the United Firefighters Union (Aviation Branch) and the Civil Aviation Safety Authority (CASA) has been undertaken at the concept/design and implementation phase, with ongoing invitation for both parties to attend and observe TRA workshops.

Please refer to the TRA methodology document for further information relating to consultation and communication relevant to TRA process.

6.3 Step 2 – Define the scope, context and criteria

The scope of this risk assessment is in accordance with that previously defined in this document (section 3).

The locations that have completed a category 7 TRA include:

- Hamilton Island
- Alice Springs
- Hobart
- Launceston
- Mackay
- Sunshine Coast
- Townsville

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS 004

For the purpose of this assessment, the context is established in relation to the ability for ARFFS to achieve all operational objectives associated with the execution of ARFFS functions[1] at a probable and credible worst-case aircraft incident[2].

The risk assessment criteria to be utilised is in accordance with AA-PROC-SAF-0105 (refer to appendix A for details).

All operational objectives relevant to the period until the TRA ends (that is, when sufficient supporting resources arrive on-scene, so that the ARFFS is no longer reliant upon its own, initially responding resources) are within the scope of this risk assessment.

6.4 Step 3 – Risk identification

Acknowledging the established context and background information, the assessment panel has identified the following hazards relevant to the service design.

Further details in relation to the hazards can be found in appendix B.

HAZARD TITLE
Operational safety (ARFFS margins of safety)
Hazard 1 - Reduced ability (margins of safety) for the ARFFS to achieve operational objectives. This hazard relates to the ability for ARFFS to execute its statutory functions (achieved via operational objectives as outlined within the TRA) relative to the resourcing (staffing, vehicles, equipment, agent, other operational consumables) and the anticipated on-scene arrival time of supporting emergency resources.

OBSERVE SECTION 1.1 - READ IN CONJUNCTION WITH SMS-004

6.5 Step 4 – Analyse risk

In consultation with the individuals listed in table 1-10 (risk assessment panel/s), the hazard defined in section 6.4 has been subjected to risk analysis in accordance with AA-PROC-SAF-0105 and the criteria defined in appendix A.

Consistent with the TRA methodology requirements, the forecast TRA informed operational risk associated with the existing minimum staffing/resource specification (relative to category 6) has been assessed.

Table 11 provides an overview of the risk classifications:

Refer to appendix B for details of the risk analysis relevant to each location.

[1] Refer to the Civil Aviation Safety Regulation 1998 section 139.710

[2] Refer to section 7.2.2.5 of the TRA methodology V2.0 for details.

Table 8 - Theoretical risk classification relative to the existing specification / minimum staffing for category 7 when assessed against future TRA requirements.

Location	Existing spec (2+4)
Hamilton Island	Extreme
Alice Springs	Extreme
Hobart	High
Launceston	High
Mackay	Extreme
Sunshine Coast	High
Townsville	High

Whilst the majority of locations indicated an existing specification risk classification of ***high*** (as a result of determining a moderate consequence classification), three locations maintained a position of ***extreme*** (as a result of determining a major consequence).

6.6 Step 5 – Evaluate risk

In accordance with the Airservices SMS (in particular AA-PROC-SAF-0105), an *extreme* or *high* level of risk is *unacceptable* and must be afforded immediate risk treatment to reduce the level of risk to as low as reasonably practicable (ALARP), or, cease the activity.

This level of risk is primarily associated with the inability or significantly impacted ability to achieve certain ARFFS operational objectives. Whilst initial external operations can achieve objectives, internal firefighting operations (inclusive of rescue as informed by advice from the Civil Aviation Safety Authority) is where the most significant operational limitations and (relative to three locations assessed) inabilities exist.

The resources aligned with the current-state category 7 specification are able to achieve initial external objectives (specifically Q1 and Q2 ground fire control and/or extinguishment), however, its ability to support internal rescue operations establishes the basis for the *unacceptable* level of risk due to an inability for this function to be performed correctly and effectively.

Utilising the process outlined in the TRA methodology, analysis of the deficiencies and limitations associated with the minimum staffing specification of 2+4 (referred to by TRA process as pinch-points) has been completed. This analysis informs the nature (description and causation) relative to each pinch-point, supporting the identification of mitigation measures sufficient to address each pinch-point in context of the assessment scenario.

Generally, the following pinch-points/limitations were identified as key contributors to the initial risk classification. Please refer to the relevant TRA baseline data for a more detailed exploration of the pinch-points as required.

1. Limited fire-fighting staff to support correct or full application of all procedures (specifically internal operations / compressed air breathing apparatus use).
2. Insufficient officer staffing, impacting the achievement of functions associated with fire-ground decision making and supervision.

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3. Insufficient procedural clarity as to the role and function of rescue (inclusive of casualty management).

The outcomes of this analysis has informed the design of two new specifications relative to category 7, with this information forming the basis of the proposed risk treatment activities defined in section 6.7.

6.7 Step 6 - Treat risk

This step seeks to include identified control measures which are required to manage the resulting risk ALARP.

The risk treatment hierarchy of controls (AA-PROC-SAF-0105) has been considered by the assessment panel in the determination of treatment measures.

The TRA methodology has been utilised to inform the controls (or treatment measures) necessary to address identified 'pinch-points' within the respective TRA baseline and inform a new staffing/resource specification.

The primary purpose of TRA is to determine the minimum number of staffing/resourcing required for service provision relative to the assessment scenario.

As such, more than one level of proposed specification has been established to inform a comparison between proposed-states. Such an approach permits the determination of the minimum specification that is still capable of managing the associated operational risk to a level that is as low as reasonably practicable.

Table 12 provides an overview of the residual level/s relative to the risk treatments applied in appendix B (with an expanded explanation of the proposed states included later in this section).

Refer to section 6.9 for details of residual risk acceptance.

Table 9 – Theoretical risk classifications relative to proposed-state/s minimum category 6 specification

Location	Existing spec (2+4)	Proposed-state 1 1+2+4	Proposed-state 2 1+2+5
Hamilton Island	Extreme	Extreme	Low @ 1+2+6
Alice Springs	Extreme	High	Low
Hobart	High	Medium	Low
Launceston	High	Medium	Low
Mackay	Extreme	Medium	Low
Sunshine Coast	High	Medium	Low
Townsville	High	Medium	Low

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6.7.1 Category 7 proposed future state 1 (all locations) – 1+2+4

Proposed-state 1 retains category 7 as a service level and comprises a range of treatments/controls which increases the capability of ARFFS relative to the assessment scenario.

For locations that are not remote/isolated (with significant restriction or limitation on the availability of local supporting services), propose-state specification 1 reduces the level of risk to that aligned with undesirable (*medium*). This is reflective of a specification that, when analysed by the TRA baseline, is able to generally perform objectives consistent with requirements, however, there are acknowledged significant impacts with the achievement of operational objectives at some stages of the operation.

The significant limitations and/or restrictions (that remain), predominantly relate to the efficacy of internal operations and the performance of rescue.

For complete detail on the required improvement measures for proposed-state 1 (relative to a particular location), please refer to the parent TRA data. The following list provides a generalised capture of the enhancement/improvements associated with category 7 proposed state 1:

- An improvement to the timeframe for senior Officer accessibility (deployment to the fire-ground).
- An increase to staff, providing an additional supervisory officer.
- Enhanced clarity as to the role/function of rescue.
- Enhanced casualty management procedures (specific to aircraft), inclusive of rapid triage / casualty assessment method (inclusive of casualty extraction from aircraft).
- Enhanced method of sensing/monitoring internal atmosphere/s and determining the acceptability of the internal environment to support acceptably safe access by supporting resources.

6.7.2 Category 7 proposed future state 2 at supported locations – 1+2+5

Proposed-state 2 retains category 7 as a service level and provides further enhancement to that of proposed-state 1. This is achieved by the availability of an additional fire-fighter. This resource was identified during a number of TRA workshops with its applied utility being:

- Provision of an additional firefighter to support fire-ground operations whilst internal operations are undertaken (in accordance with) existing CABA procedural requirements.

Whilst operations can be performed without a third firefighter supporting fire-ground operations, relative to a number of pinch-points, such a resource may assist in certain stages of the operation and relieve the *significant impacts* referred to in section 6.7.2.

All other specifications in proposed-state 2 remaining consistent with that of proposed-state 1.

6.7.3 Category 7 proposed future state 2 at remote locations – supported outcome for CAT7+[2]*

The TRA baseline assessment provides for analysis up to 45 minutes from the commencement of an operation. For the majority of locations, sufficient local supporting resources arrive on-scene within this time – at which point TRA ceases.

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Locations that do not receive support within this time are reflective of highly isolated or remote localities which may require additional control measures (treatments) to that of supported locations.

Such a determination requires additional control measures to support effective operations at category 7. These control measures include:

1. An additional two firefighters to that of the minimum specification in proposed-state 1. Note, the additional two fire fighters are not immediately required, but must be capable of being available on the fire-ground and ready for operational use in a time no greater than 45 minutes from incident commencement. Such an increase results in an unsupported category 7 specification reflecting – supported outcome for CAT7+[2]).

Whilst the TRA has determined the requirement for resources at locations which are both classified as *supported* (sufficient local resources within 45 minutes) and *unsupported* (insufficient local resources within 45 minutes), the assessment and confirmation of a location being '*unsupported*' remains outstanding and separate to the TRA process. Such confirmation will require direct engagement with senior representative/s of state/territory fire services (and other agencies as applicable) to advise and inform as to the genuine expected level of support relative to a particular location (preferably in writing). Only after such analysis and confirmation can a location be accurately classified as *unsupported* and receive the additional control treatment outlined in this section.

6.8 Step 7 - Monitor and review

There is no monitoring and/or review requirements for the theoretical assessments made within this document.

6.9 Acceptance and sign-off

As this is a theoretical risk assessment of an assumed future state there is no requirement for formal risk acceptance or sign-off.

Data presented within this report will assist and inform capability planning sufficient to ensure that operational risk associated with any future implementation of TRA is managed to ALARP.

Upon CASA implementing TRA requirements and the Airservices ARFFS operational manual being updated, operational risk associated with TRA will be transferred to the approved operational risk baseline. This risk data will be informed by information within this report, the locations parent TRA documentation and the level of capability relative to the improvements required (as outlined herein).

Formal risk acceptance and sign-off will be undertaken at this time, relative to the respective operational risk baseline and the broader safety management system requirements.

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Appendix A Risk assessment criteria

Table 1 – Risk Classification Matrix

		CONSEQUENCE				
		Insignificant	Minor	Moderate	Major	Catastrophic
LIKELIHOOD	Expected	Medium	Medium	High	Extreme	Extreme
	Likely	Low	Medium	Medium	High	Extreme
	Possible	Low	Low	Medium	Medium	High
	Unlikely	Negligible	Low	Low	Medium	Medium / High*
	Rare	Negligible	Negligible	Negligible	Low	Medium / High*

*__Note:__ *Where primary consequence type is determined to be Safety, Work Health & Safety or Environment, apply the 'high' risk rating under catastrophic.*

Table 2 – Likelihood Criteria

Likelihood Criteria for Non-ATM Safety Consequences

Likelihood	Qualitative Descriptor	Quantitative Guidance	
		Timeframes	Probability *(within a year)*
Expected	The risk event is **expected** to occur or has occurred within the past year	Daily – Yearly	Greater than 95%
Likely	The risk event is more **likely** to occur than not	Yearly – 3 Yearly	33% to 95%
Possible	The risk event is **possible** but infrequent	3 Yearly – 10 Yearly	10% to 33%
Unlikely	The risk event is **unlikely** to occur	10 Yearly – 20 Yearly	5% to 10%
Rare	The risk event is only **remotely** probable	Greater than 20 years	Less than 5%

		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Generic Consequence Descriptions		Some loss that can be managed via existing management procedures having a negligible impact on achievement of business objectives.	Event with consequences that can be readily absorbed but requires management effort to minimise the impact on achievement of business objectives.	Significant event or circumstance that requires management to institute enhanced monitoring of controls to assure continued delivery of business objectives.	Critical event or circumstance that can be endured with proper management, however achievement of business objectives are impaired.	Event or circumstance with potentially disastrous impact leading to an inability to achieve business objectives.
Safety (Margins of Safety)	**ATM**	An operational condition with the potential to reduce the margins of safety (undesired state).	An operational condition in which the margins of safety have been compromised (unrecovered state).	An operational condition in which the margins of safety have been significantly eroded.	Low capacity/General Aviation aircraft accident.	Medium to high capacity aircraft accident.
	ARFFS	Minimal impact to ARFFS operational objectives.	Some impact to ARFFS operational objectives.	Significant impact to ARFFS operational objectives.	An inability to achieve ARFFS operational objectives.	A sustained and complete inability to achieve ARFFS operational objectives.
Work Health & Safety		Exposure to circumstances where injury may occur.	Injuries requiring medical treatment or first aid.	Serious injuries or illness requiring immediate medical treatment/hospital admission.	Injury or illness resulting in permanent impairment.	Fatality/fatalities.
Environment		Negligible effect or implication on the physical environment. Insignificant noise and emissions impacts.	Minor effect or implication on the physical environment. Minor noise and emissions impacts.	Moderate, medium term effect or implication on the physical environment. Moderate noise and emissions impacts.	Long term effect or implication on the physical environment. Major noise and emissions impacts.	Irreversible and extensive effect on the physical environment which has national or global implications.
Service Delivery (Impact on Customers)		Negligible efficiency impact on delivery of ATM/ARFF services.	Delivery of ATM/ARFF services are impaired, resulting in minor inefficiencies for our customers.	Inability to deliver some ATM/ARFF services, resulting in moderate efficiency impacts.	Inability to deliver majority of ATM/ARFF services, causing significant efficiency impacts and reducing the value delivered to our customers.	Sustained inability to deliver any ATM/ARFF services, which severely impacts the efficiency of our customers' operations.
Organisational Capability (Internal Impacts)		A noticeable degradation in organisational capability that does not reduce the effectiveness of the function.	A significant degradation in organisational capability to an extent and duration that, while Airservices can perform its primary functions, the effectiveness of the functions is noticeably reduced.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its primary functions.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its functions for an extended time.	Total loss of organisational capability to an extent and duration that Airservices cannot perform any of its functions.
Reputation		Internal impact only with no adverse customer or ministerial involvement. Ability to be managed by staff internally.	Some adverse publicity resulting in internal reviews of existing policies and practices.	Substantial adverse publicity or loss of some stakeholder confidence. Scrutiny/criticism by the Minister, Parliamentary Committees and key customers, requiring Ministerial and/or Customer response.	Adverse national media reports on failings, inefficiency or inadequacies resulting in serious loss of confidence by customers and the Minister. Serious embarrassment to Minister and Government. Parliamentary enquiry may be instigated.	Complete loss of stakeholder confidence resulting in Board/CEO resignation. Royal commission may be instigated.
Financial Sustainability*		A financial impact up to $500,000.	A financial impact between $500,000 and $5m.	A financial impact between $5m and $50m.	A financial impact greater than $50m.	Airservices is no longer able to operate as a going concern.

**Note:* *A financial impact constitutes both potential and actual impacts on Airservices profit and loss statement (i.e. revenue and expenditure). Potential impacts include: expenditure avoidance and opportunity costs. Financial figures presented are in the context of the organisation.*

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Table 4 – Risk Acceptance, Mitigation Strategies and Review Timeframes

	Risk acceptance – minimum authority	Risk mitigation strategy – safety & environment risks	Risk mitigation strategy – business risks	Minimum review timeframes
Extreme (E)	Must be referred to the CEO for attention and action	**Unacceptable** Immediate risk treatment required to reduce the level of risk to as low as reasonably practicable (ALARP) or cease the activity.	**Unacceptable** Immediate risk treatment required to reduce the level of risk to align with the organisational risk appetite or cease the activity.	Weekly (continuous risk treatment)
High (H)	Responsible Executive General Manager (EGM)	**Unacceptable** Immediate risk treatment required to reduce the level of risk to ALARP or cease the activity.	**Undesirable** Risk must be reduced to align with the organisational risk appetite.	Monthly
Medium (M)	Responsible Direct Report to Executive (DRE)	**Undesirable** Risk treatment required to reduce the level of risk to ALARP, unless the cost of reducing the risk is grossly disproportionate to the expected risk reduction benefit.	**Tolerable** Risk should be reduced to align with the organisational risk appetite, unless the cost exceeds the benefits achieved.	Quarterly
Low (L)	Responsible Other Leadership Role (OLR)	**Tolerable** Risk is broadly acceptable, however risk treatment should be applied to reduce the level of risk to ALARP, unless the cost of reducing the risk is disproportionate to the expected risk reduction benefit.	**Acceptable** Risk is broadly acceptable. Maintain current systems, monitor and review. Further reduction only if costs are insignificant.	Biannually
Negligible (N)	Responsible Team Leader and above	**Tolerable** Risk is acceptable, however the risk must be monitored to assure that it remains within risk tolerance/appetite. ALARP evidence is current.	**Acceptable** Risk is acceptable. No further reduction is necessary.	Annually

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Appendix B Hazard and Risk Assessment Record

The following risk data has been extracted from the parent TRA assessment. Please refer to the relevant TRA spreedsheet document for additional information and/or justification relevant to risk classification/s and/or control meaures.

Ayers Rock (Yulara) and Ballina – Existing minimum / proposed-state spec 1 / proposed-state spec 2

	Existing minimum specification (2+4)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 2 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	**1.** Existing category 7 minimum resource specifications: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (90min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 7 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Major **Consequence**: Expected **Classification**: Extreme	**1.** Immediate modification to Category 7 minimum resource specification: **a. 2x Officer** b. 4x Fire Fighter **c. 1x Senior Officer (20-45min)** d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 7 with additional ancillary equipment associated with additional officer inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. **2.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. **3. For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Moderate **Classification**: Medium	**1.** Immediate modification to Category 7 minimum resource specification: a. 2x Officer **b. 5x Fire Fighter** c. 1x Senior Officer (20-45min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 7 with additional ancillary equipment associated with additional officer and fire fighter, inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. **2.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. **3. For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Poss ble **Consequence**: Minor **Classification**: Low

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Broome, Coffs Harbour, Karratha, Newman, Port Hedland, Rockhampton and Whitsunday Coast risk classifications – Existing minimum / proposed-state spec 1 / proposed-state spec 2 (note – refer to section 6.7.1 for information realting to Gladstone)

	Existing minimum specification (2+4)		Proposed-state specification 1 (1+2+4)		Proposed-state specification 2 (1+2+5)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 2 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 7 minimum resource specifications: a. 2x Officer b. 4x Fire Fighter c. 1x Senior Officer (90min) d. 2x primary attack vehicle e. Equipment as per AFFM-09 CAT 7 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Moderate **Consequence**: Expected **Classification**: High	1. Immediate modification to Category 7 minimum resource specification: **g. 2x Officer** h. 4x Fire Fighter **i. 1x Senior Officer (20-45min)** j. 2x primary attack vehicle k. Equipment as per AFFM-09 CAT 7 with additional ancillary equipment associated with additional officer inclusive of CABA. l. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Moderate **Classification**: Medium	1. Immediate modification to Category 7 minimum resource specification: g. 2x Officer **h. 5x Fire Fighter** i. 1x Senior Officer (20-45min) j. 2x primary attack vehicle k. Equipment as per AFFM-09 CAT 7 with additional ancillary equipment associated with additional officer and fire fighter, inclusive of CABA. l. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

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Task Resource Analysis (TRA) summary report relative to category 8

Operational Risk Assessment

Version 1.1

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Change summary

Version	Date	Change description
0.1	20 NOV 2021	Initial draft development
1.0	10 DEC 2021	Update to version 1.0
1.1	27 AUG 2023	Editorial update to add watermark and ensure consistency of delimitation information and other editorial aspects across all summary reports. Identified errors have also been corrected. Note – such changes have not adjusted risk classifications or control measures as informed by the TRA data.

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Disclaimer

This paper represents a theoretical operational risk assessment of a future operational environment informed by Task Resource Analysis data. This future operational environment will be realised when the Civil Aviation Safety Authority (CASA) incorporates the requirement for a Task Resource Analysis (TRA) into the regulations governing the conduct of Aviation Rescue and Fire Fighting Services (ARFFS) and Airservices Australia amends its operations manual to comply with these new requirements.

Until Airservices is required to implement TRA requirements, the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).

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1 Executive summary

This report provides a forecast of operational risk associated with implementation of Task Resource Analysis (TRA) into the Australian requirements for the provision of Aviation Rescue Fire Fighting Services ARFFS) in Australia. Refer to section 1.1 (delimitations) regarding the relationship between forecast TRA risk data and the current state operational risk baseline.

Category 8 is a commonplace level of service provided by Airservices ARFFS, and is the approved level of category for six aerodromes listed on the ARFFS provider certificate (139H.0007). Whilst the current operational specification for CAT 8 meets current regulatory requirements it has been identified that should we move to a new TRA informed regulatory environment (future state) and current operational specification for category 8 were retained, certain deficiencies and limitations will exist (as identified via Task Resource Analysis), resulting in a (forecast) unacceptable level of risk. This future state assessment is based upon:

1. The existing category 8 specification is retained in its current format, without change, and
2. TRA has been introduced into the Australian requirements for the provision of ARFFS and the requirements of this process accurately match the obligations set out in the TRA methodology document.
3. Airservices amending its ARFFS operations manual to apply TRA.

As a result of the TRA process and to reduce the level of risk in the future state (to remove or reduce to as low as reasonably practicable (ALARP), two options have been determined to achieve this outcome:

1. Reduction of the level of risk to **medium** via enhancement to the operational specification of category 8 so that it remains functionally capable to achieve all ARFFS objectives.
    a. Should this option be selected, additional analysis to validate locations that are classified as remote or unsupported will need to be completed to confirm insufficient arriving resources within the 45-minute analysis period.
2. Reduction of the level of risk to **low** via enhancement to the operational specification of category 8 so that it remains functionally capable to achieve all ARFFS objectives.
    a. Should this option be selected, additional analysis to validate locations that are classified as remote or unsupported will need to be completed to confirm insufficient arriving resources within the 45-minute analysis period.

This report presents supporting information relevant to these options, sufficient to ensure Airservices manages the potential operational risk associated with the implementation of TRA.

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1.1 Delimitations

This report has been designed to provide an accurate reflection of the operational risk that may be experienced upon TRA being introduced to the Australian requirements for the provision of ARFFS and subsequent inclusion in the Airservices ARFFS operations manual.

TRA fundamentally adjusts the method in which the functional specification of ARFFS is determined, requiring operational capability to be determined relevant to the worst plausible and credible aircraft scenario, introducing differences to that of the existing regulated requirements.

Risk data presented in this report has been developed to assist with preparation for the regulatory introduction of TRA by informing Airservices as to the level of risk which may be experienced were the current level of operational capability provided relevant to a future state as defined by the TRA assessment.

As such, information within this report is not relevant to the current state but provides valuable forecast and planning data that will assist in the readiness of operations to achieve the ARFFS objectives. The change to the future state will occur upon the Civil Aviation Safety Authority (CASA) formally requiring TRA and the Airservices ARFFS operations manual (rule-set) being subsequently amended to implement these requirements.

Until Airservices is required to transition to the future state the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).

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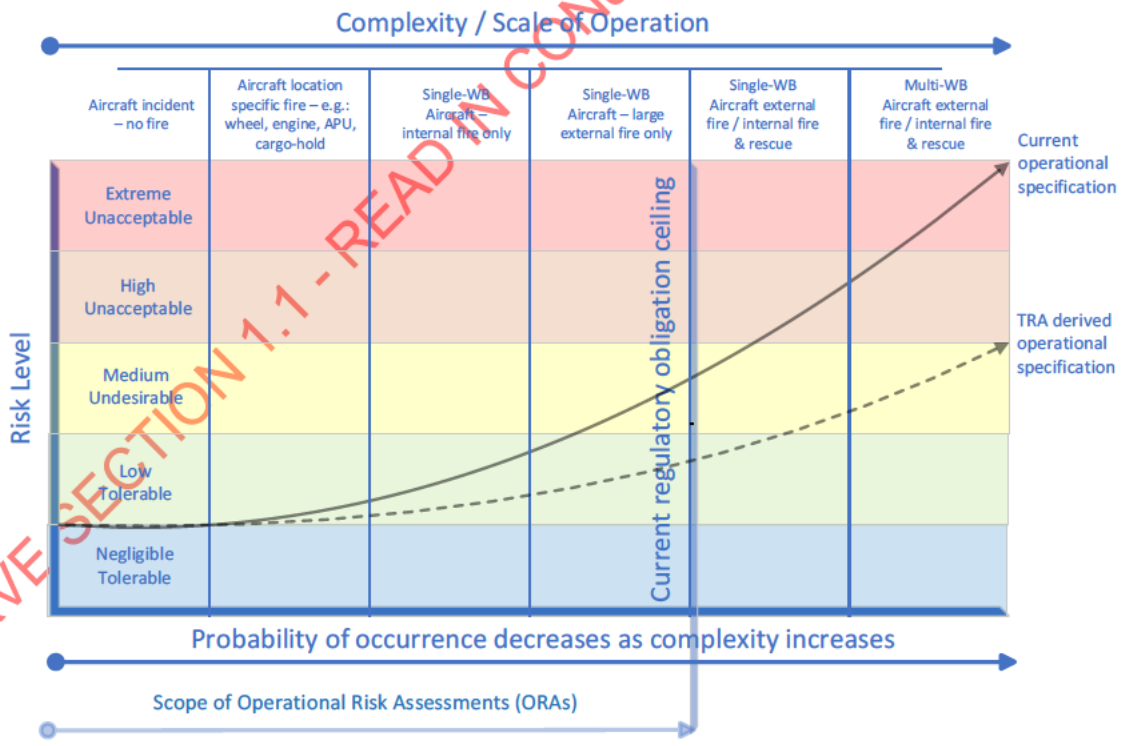

2 Purpose

This document provides collective (summary) operational risk assessment relative to the category 8 band as assessed via the TRA methodology.

Information within this document provides a national representation of the future state operational risk associated with category 8 service provision, and the required actions (immediate and ongoing) which are necessary to achieve and maintain a level of risk that is acceptable and is as low as reasonably practicable.

3 Scope

Relative to the hazard identified, the scope of this risk assessment is inclusive of the following consequence descriptor groupings – being:

- Operational risk (ARFFS margin of safety)

Analysis within this document is applicable to all ARFFS locations that may be required to provide category 8 service.

The locations that have been selected for the completion of category 8 TRA provide a representative baseline from which broader application across all ARFFS locations can be effectively achieved (refer to section 5.0 for additional information).

4 Background

Airservices is implementing the TRA methodology to determine the minimum number of operational staff (inclusive of all operational resources) in the future state necessary to effectively manage a probable and credible worst-case aviation incident up and until sufficient supporting resources arrive (so that ARFFS is no longer reliant upon its own, initial responding resources).

For further information on the design of the TRA methodology, inclusive of the probable and credible worst-case scenario descriptor, refer to the supporting TRA methodology document.

TRA is fundamentally a data gathering activity that provides quantitative and qualitative outputs that can be utilised to inform resourcing decisions. The TRA also provides a framework to permit a detailed understanding of the complexities associated with an ARFFS operation and, as a product of the process; it produces a range of proposed measures (controls) that actively seek to improve core service delivery and fire fighter safety.

Central to the TRA concept is the utilisation of qualitative risk assessment. It is acknowledged within the TRA methodology that more than one staffing/resource level will exist relative to any one scenario. This is a reflection of the non-binary or spectrum approach to staffing levels which reflect a shifting scale of capability relative to ARFFS operations. Whilst there is a point at which ARFFS is unable to achieve any operational objectives relative to the staffing/resourcing provided (for example, 1 fire fighter is unable to mount any form of response), as resourcing increases, so does the capability of ARFFS to achieve objectives.

Operational risk assessment has been employed by the TRA methodology to assist in accurately determining the minimum number of staff (and resourcing) required to achieve all ARFFS operational objectives aligned with the TRA scenario (up and until the arrival of sufficient supporting resources). Through application of the Airservices Safety Management System (SMS), risk assessment has been utilised to inform the level of risk associated with different levels of staffing (and supporting resources) as determined via the TRA process. This approach provides an organisationally aligned

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and accepted method for analysing, treating and ultimately accepting the level of risk which is managed to a level that is as low as reasonably practicable.

For further information on the risk assessment process utilised, please refer to AA-PROC-SAF-0105.

This document draws upon the data obtained from relevant and representative TRAs (within a particular category band), collating the data into a single document and articulating the associated operational risk.

Note: coding relative to staffing resources within this document is displayed as: Senior Officer + Officer + Fire Fighter.

5 Commonality of risk data

The TRA methodology requires analysis to be performed relevant to each location ARFFS is provided. In implementing this approach, situations may arise whereby the level of variability between locations is insufficient to require change to the resource specifications. Such circumstances reflect broadly comparable operating environments, or an environment that may represent an improvement to that previously assessed (for example, an improvement to the availability time of local supporting resources).

This notion implies that broadly comparable locations are likely to present commonality in risk data, and, at a certain stage in the process, the value derived from such TRAs diminishes due to repeat outcomes being delivered. In order to recognise commonality in the risk data, the locations assessed must be reflective of the genuine operational differences expected between locations (for example, capital city supported aerodromes compared to remote / isolated aerodromes). This approach ensures representative data which, when subjected to repeat risk assessment, may generate consistent risk outputs. At such a stage, data saturation may be achieved and, if sufficient data is available, valid applied outcomes can be extended to aerodromes with common attributes.

Such an approach has been applied to category 8, with the 6 locations assessed providing sufficient data from which valid outcomes can be determined for the remaining locations.

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6 Risk Assessment

6.1 Process

The risk management process applied within this assessment is in accordance with AA-PROC-SAF-0105.

Key steps within this process are detailed within this report.

A risk assessment review panel was assembled in relation to each risk assessment completed. The participants included:

Table 1 - TRA participants – Adelaide (03 SEP 2021)

Name	Position
[redacted]	Line Leader

Name	Position
[redacted]	Fire Commander
[redacted]	Station Officer
[redacted]	Sub Station officer
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

Table 2 - TRA participants – Avalon (16 AUG 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Station Officer
[redacted]	Sub Station Officer
[redacted]	Sub Station Officer
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

Table 3 - TRA participants – Cairns (19 AUG 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Station Officer
[redacted]	Station Officer
[redacted]	Fire Commander
[redacted]	Fire Commander
[redacted]	Fire Commander
[redacted]	Station Officer
[redacted]	Fire Commander
[redacted]	Sub Station officer
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

Table 4 - TRA participants – Canberra (26 AUG 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Station Officer
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

Table 5 - TRA participants – Coolangatta (14 SEP 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander

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Name	Position
[redacted]	Fire Commander
[redacted]	Station Officer
[redacted]	Sub Station Officer
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

Table 6 - TRA participants - Darwin (1 SEP 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Station Officer
[redacted]	TRA Implementation Lead
[redacted]	TRA Implementation Lead

6.2 Step 1 – Consult and communicate

Communication and consultation relevant to this assessment has been undertaken within the assessment panels.

Additional communication and consultation with the United Firefighters Union (Aviation Branch) and the Civil Aviation Safety Authority (CASA) has been undertaken at the concept/design and implementation phase, with ongoing invitation for both parties to attend and observe TRA workshops.

Please refer to the TRA methodology document for further information relating to consultation and communication relevant to TRA process.

6.3 Step 2 – Define the scope, context and criteria

The scope of this risk assessment is in accordance with that previously defined in this document (section 3).

The locations that have completed a category 8 TRA include:

- Adelaide
- Avalon
- Cairns
- Canberra
- Darwin
- Coolangatta

For the purpose of this assessment, the context is established in relation to the ability for ARFFS to achieve all operational objectives associated with the execution of ARFFS functions[1] at a probable and credible worst-case aircraft incident[2].

[1] Refer to the Civil Aviation Safety Regulation 1998 section 139.710

[2] Refer to section 7.2.2.5 of the TRA methodology V2.0 for details.

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As such, this risk assessment analyses an incident which exceeds current minimum regulatory requirements applicable to ARFFS.

The risk assessment criteria to be utilised is in accordance with AA-PROC-SAF-0105 (refer to appendix A for details).

All operational objectives relevant to the period until the TRA ends (that is, when sufficient supporting resources arrive on-scene, so that the ARFFS is no longer reliant upon its own, initially responding resources) are within the scope of this risk assessment.

6.4 Step 3 – Risk identification

Acknowledging the established context and background information, the assessment panel has identified the following hazards relevant to the service design.

Further details in relation to the hazards can be found in appendix B.

HAZARD TITLE
Operational safety (ARFFS margins of safety)
Hazard 1 - Reduced ability (margins of safety) for the ARFFS to achieve operational objectives. This hazard relates to the ability for ARFFS to execute its statutory functions (achieved via operational objectives as outlined within the TRA) relative to the resourcing (staffing, vehicles, equipment, agent, other operational consumables) and the anticipated on-scene arrival time of supporting emergency resources.

6.5 Step 4 – Analyse risk

In consultation with the individuals listed in table 1-7 (risk assessment panel/s), the hazard defined in section 6.4 has been subjected to risk analysis in accordance with AA-PROC-SAF-0105 and the criteria defined in appendix A.

Consistent with the TRA methodology requirements, the forecast TRA informed operational risk associated with the existing minimum staffing/resource specification (relative to category 8) has been assessed.

Table 8 provides an overview of the risk classifications:

Refer to appendix B for details of the risk analysis relevant to each location.

Table 7 - Risk classification relative to the existing specification / minimum staffing for category 8 when assessed against future TRA requirements.

Location	Existing spec (2+6)
Adelaide	Extreme
Avalon	Extreme
Cairns	Extreme
Canberra	High
Coolangatta	High
Darwin	Extreme

Four locations determined an ***extreme*** level of risk whilst two determined ***high*** associated with the TRA scenario when utilising existing category 8 resources.

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Participants were prompted frequently to explain and justify why a consequence of *major* applied (that is, an inability to achieve an operational objective). The consistent explanation was that 2+6 remains unable to effectively perform internal and external operations consistent with procedural requirements (in their opinion) and that the classification should remain *extreme*.

6.6 Step 5 – Evaluate risk

In accordance with the Airservices SMS (in particular AA-PROC-SAF-0105), an *extreme* or *high* level of risk is *unacceptable* and must be afforded immediate risk treatment to reduce the level of risk to as low as reasonably practicable (ALARP), or, cease the activity.

This level of risk is primarily associated with the inability or significantly impacted ability to achieve certain ARFFS operational objectives. Whilst initial external operations can achieve objectives, internal firefighting operations (inclusive of rescue as informed by advice from the Civil Aviation Safety Authority) is where the most significant operational limitations and (relative to three locations assessed) inabilities exist.

The resources aligned with the current-state category 8 specification are able to achieve initial external objectives (specifically Q1 and Q2 ground fire control and/or extinguishment), however, its ability to support internal rescue operations establishes the basis for the *unacceptable* level of risk due to an inability for this function to be performed correctly and effectively.

Utilising the process outlined in the TRA methodology, analysis of the deficiencies and limitations associated with the minimum staffing specification of 2+6 (referred to by TRA process as pinch-points) has been completed. This analysis informs the nature (description and causation) relative to each pinch-point, supporting the identification of mitigation measures sufficient to address each pinch-point in context of the assessment scenario.

Generally, the following pinch-points/limitations were identified as key contributors to the initial risk classification. Please refer to the relevant TRA baseline data for a more detailed exploration of the pinch-points as required.

1. Limited fire-fighting staff to support correct or full application of all procedures (specifically internal operations / compressed air breathing apparatus use) relative to a dual aisle aircraft (wide-body).
2. Insufficient officer staffing, impacting the achievement of functions associated with fire-ground decision making and supervision.
3. Insufficient procedural clarity as to the role and function of rescue (inclusive of casualty management).

The outcomes of this analysis has informed the design of two new specifications relative to category 8, with this information forming the basis of the proposed risk treatment activities defined in section 6.7.

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6.7 Step 6 - Treat risk

This step seeks to include identified control measures which are required to manage the resulting risk ALARP.

The risk treatment hierarchy of controls (AA-PROC-SAF-0105) has been considered by the assessment panel in the determination of treatment measures.

The TRA methodology has been utilised to inform the controls (or treatment measures) necessary to address identified 'pinch-points' within the respective TRA baseline and inform a new staffing/resource specification.

The primary purpose of TRA is to determine the minimum number of staffing/resourcing required for service provision relative to the assessment scenario.

As such, more than one level of proposed specification has been established to inform a comparison between proposed-states. Such an approach permits the determination of the minimum specification that is still capable of managing the associated operational risk to a level that is as low as reasonably practicable.

Table 9 provides an overview of the residual level/s relative to the risk treatments applied in appendix B (with an expanded explanation of the proposed states included later in this section).

Refer to section 6.9 for details of residual risk acceptance.

Table 8 – Risk classifications relative to proposed-state/s minimum category 8 specification. Note: Hamilton Island is treated as unsupported for this assessment.

Location	Existing spec (2+6)	Proposed-state 1 1+2+7	Proposed-state 2 1+2+8
Adelaide	Extreme	Medium	Low
Avalon	Extreme	Medium	Low
Cairns	Extreme	Medium	Low
Canberra	High	Medium	Low
Coolangatta	High	Medium	Low
Darwin	Extreme	Medium	Low

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6.7.1 Category 8 proposed future state 1 supported locations – 1+2+7

Proposed-state 1 retains category 8 as a service level and comprises a range of treatments/controls which increases the capability of ARFFS relative to the assessment scenario.

For locations that are not remote/isolated (with significant restriction or limitation on the availability of local supporting services), propose-state specification 1 reduces the level of risk to that aligned with undesirable (*medium*).

The limitations and/or restrictions (that remain), predominantly relate to the efficacy of internal operations and the performance of rescue.

For complete detail on the required improvement measures for proposed-state 1 (relative to a particular location), please refer to the parent TRA data. The following list provides a generalised capture of the enhancement/improvements associated with category 8 proposed state 1:

- An improvement to the timeframe for senior Officer accessibility (deployment to the fire-ground).
- An increase to staff, providing an additional supervisory officer.
- Enhanced clarity as to the role/function of rescue and how this will inform / guide the performance of internal operations during a very large incident (such as that defined by the TRA assessment scenario).
- Enhanced casualty management procedures (specific to aircraft), inclusive of rapid triage / casualty assessment method (inclusive of casualty extraction from aircraft).
- Enhanced method of sensing/monitoring internal atmosphere/s and determining the acceptability of the internal environment to support acceptably safe access by supporting resources.

6.7.2 Category 8 proposed future state 2 at supported locations – 1+2+8

Proposed-state 2 retains category 8 as a service level and provides further enhancement to that of proposed-state 1. This is achieved by the availability of an additional fire-fighter. This resource was identified during a number of TRA workshops with its applied utility being:

- Provision of an additional firefighter to support the ability to allocate separate CABA teams (one) to each aisle of the aircraft.

Whilst operations can be performed without an additional firefighter supporting fire-ground operations, relative to a number of pinch-points, such a resource may assist in certain stages of the operation and relieve the key limitations referred to in section 6.6.

All other specifications in proposed-state 2 remaining consistent with that of proposed-state 1.

6.7.3 Category 8 proposed future state 2 at remote locations – Supported outcome for CAT 8+[2]*

The TRA baseline assessment provides for analysis up to 45 minutes from the commencement of an operation. For the majority of locations, sufficient local supporting resources arrive on-scene within this time – at which point TRA ceases.

Locations that do not receive support within this time are reflective of highly isolated or remote localities which may require additional control measures (treatments) to that of supported locations.

Such a determination requires additional control measures to support effective operations at category 8. These control measures include:

1. An additional two firefighters to that of the minimum specification in proposed-state 1. Such an increase results in an unsupported category 8 specification reflecting – supported outcome for cat 8+[2]).

Whilst the TRA has determined the requirement for resources at locations which are both classified as *supported* (sufficient local resources within 45 minutes) and *unsupported* (insufficient local resources within 45 minutes), the assessment and confirmation of a location being '*unsupported*' remains outstanding and separate to the

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TRA process. Such confirmation will require direct engagement with senior representative/s of state/territory fire services (and other agencies as applicable) to advise and inform as to the genuine expected level of support relative to a particular location (preferably in writing). Only after such analysis and confirmation can a location be accurately classified as *unsupported* and receive the additional control treatment outlined in this section.

6.8 Step 7 - Monitor and review

There is no monitoring and/or review requirements for the theoretical assessments made within this document.

6.9 Acceptance and sign-off

As this is a theoretical risk assessment of an assumed future state there is no requirement for formal risk acceptance or sign-off.

Data presented within this report will assist and inform capability planning sufficient to ensure that operational risk associated with any future implementation of TRA is managed to ALARP.

Upon CASA implementing TRA requirements and the Airservices ARFFS operational manual being updated, operational risk associated with TRA will be transferred to the approved operational risk baseline. This risk data will be informed by information within this report, the locations parent TRA documentation and the level of capability relative to the improvements required (as outlined herein).

Formal risk acceptance and sign-off will be undertaken at this time, relative to the respective operational risk baseline and the broader safety management system requirements.

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Appendix A Risk assessment criteria

Table 1 – Risk Classification Matrix

		CONSEQUENCE				
		Insignificant	Minor	Moderate	Major	Catastrophic
LIKELIHOOD	Expected	Medium	Medium	High	Extreme	Extreme
	Likely	Low	Medium	Medium	High	Extreme
	Possible	Low	Low	Medium	Medium	High
	Unlikely	Negligible	Low	Low	Medium	Medium / High*
	Rare	Negligible	Negligible	Negligible	Low	Medium / High*

*__Note:__ *Where primary consequence type is determined to be Safety, Work Health & Safety or Environment, apply the 'high' risk rating under catastrophic.*

Table 2 – Likelihood Criteria

Likelihood Criteria for Non-ATM Safety Consequences

Likelihood	Qualitative Descriptor	Quantitative Guidance	
		Timeframes	Probability *(within a year)*
Expected	The risk event is **expected** to occur or has occurred within the past year	Daily – Yearly	Greater than 95%
Likely	The risk event is more **likely** to occur than not	Yearly – 3 Yearly	33% to 95%
Possible	The risk event is **possible** but infrequent	3 Yearly – 10 Yearly	10% to 33%
Unlikely	The risk event is **unlikely** to occur	10 Yearly – 20 Yearly	5% to 10%
Rare	The risk event is only **remotely** probable	Greater than 20 years	Less than 5%

		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Generic Consequence Descriptions		Some loss that can be managed via existing management procedures having a negligible impact on achievement of business objectives.	Event with consequences that can be readily absorbed but requires management effort to minimise the impact on achievement of business objectives.	Significant event or circumstance that requires management to institute enhanced monitoring of controls to assure continued delivery of business objectives.	Critical event or circumstance that can be endured with proper management, however achievement of business objectives are impaired.	Event or circumstance with potentially disastrous impact leading to an inability to achieve business objectives.
Safety (Margins of Safety)	**ATM**	An operational condition with the potential to reduce the margins of safety (undesired state).	An operational condition in which the margins of safety have been compromised (unrecovered state).	An operational condition in which the margins of safety have been significantly eroded.	Low capacity/General Aviation aircraft accident.	Medium to high capacity aircraft accident.
	ARFFS	Minimal impact to ARFFS operational objectives.	Some impact to ARFFS operational objectives.	Significant impact to ARFFS operational objectives.	An inability to achieve ARFFS operational objectives.	A sustained and complete inability to achieve ARFFS operational objectives.
Work Health & Safety		Exposure to circumstances where injury may occur.	Injuries requiring medical treatment or first aid.	Serious injuries or illness requiring immediate medical treatment/hospital admission.	Injury or illness resulting in permanent impairment.	Fatality/fatalities.
Environment		Negligible effect or implication on the physical environment. Insignificant noise and emissions impacts.	Minor effect or implication on the physical environment. Minor noise and emissions impacts.	Moderate, medium term effect or implication on the physical environment. Moderate noise and emissions impacts.	Long term effect or implication on the physical environment. Major noise and emissions impacts.	Irreversible and extensive effect on the physical environment which has national or global implications.
Service Delivery (Impact on Customers)		Negligible efficiency impact on delivery of ATM/ARFF services.	Delivery of ATM/ARFF services are impaired, resulting in minor inefficiencies for our customers.	Inability to deliver some ATM/ARFF services, resulting in moderate efficiency impacts.	Inability to deliver majority of ATM/ARFF services, causing significant efficiency impacts and reducing the value delivered to our customers.	Sustained inability to deliver any ATM/ARFF services, which severely impacts the efficiency of our customers' operations.
Organisational Capability (Internal Impacts)		A noticeable degradation in organisational capability that does not reduce the effectiveness of the function.	A significant degradation in organisational capability to an extent and duration that, while Airservices can perform its primary functions, the effectiveness of the functions is noticeably reduced.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its primary functions.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its functions for an extended time.	Total loss of organisational capability to an extent and duration that Airservices cannot perform any of its functions.
Reputation		Internal impact only with no adverse customer or ministerial involvement. Ability to be managed by staff internally.	Some adverse publicity resulting in internal reviews of existing policies and practices.	Substantial adverse publicity or loss of some stakeholder confidence. Scrutiny/criticism by the Minister, Parliamentary Committees and key customers, requiring Ministerial and/or Customer response.	Adverse national media reports on failings, inefficiency or inadequacies resulting in serious loss of confidence by customers and the Minister. Serious embarrassment to Minister and Government. Parliamentary enquiry may be instigated.	Complete loss of stakeholder confidence resulting in Board/CEO resignation. Royal commission may be instigated.
Financial Sustainability*		A financial impact up to $500,000.	A financial impact between $500,000 and $5m.	A financial impact between $5m and $50m.	A financial impact greater than $50m.	Airservices is no longer able to operate as a going concern.

****Note:** *A financial impact constitutes both potential and actual impacts on Airservices profit and loss statement (i.e. revenue and expenditure). Potential impacts include: expenditure avoidance and opportunity costs. Financial figures presented are in the context of the organisation.*

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Table 4 – Risk Acceptance, Mitigation Strategies and Review Timeframes

	Risk acceptance – minimum authority	Risk mitigation strategy – safety & environment risks	Risk mitigation strategy – business risks	Minimum review timeframes
Extreme (E)	Must be referred to the CEO for attention and action	**Unacceptable** Immediate risk treatment required to reduce the level of risk to as low as reasonably practicable (ALARP) or cease the activity.	**Unacceptable** Immediate risk treatment required to reduce the level of risk to align with the organisational risk appetite or cease the activity.	Weekly (continuous risk treatment)
High (H)	Responsible Executive General Manager (EGM)	**Unacceptable** Immediate risk treatment required to reduce the level of risk to ALARP or cease the activity.	**Undesirable** Risk must be reduced to align with the organisational risk appetite.	Monthly
Medium (M)	Responsible Direct Report to Executive (DRE)	**Undesirable** Risk treatment required to reduce the level of risk to ALARP, unless the cost of reducing the risk is grossly disproportionate to the expected risk reduction benefit.	**Tolerable** Risk should be reduced to align with the organisational risk appetite, unless the cost exceeds the benefits achieved.	Quarterly
Low (L)	Responsible Other Leadership Role (OLR)	**Tolerable** Risk is broadly acceptable, however risk treatment should be applied to reduce the level of risk to ALARP, unless the cost of reducing the risk is disproportionate to the expected risk reduction benefit.	**Acceptable** Risk is broadly acceptable. Maintain current systems, monitor and review. Further reduction only if costs are insignificant.	Biannually
Negligible (N)	Responsible Team Leader and above	**Tolerable** Risk is acceptable, however the risk must be monitored to assure that it remains within risk tolerance/appetite. ALARP evidence is current.	**Acceptable** Risk is acceptable. No further reduction is necessary.	Annually

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Appendix B Hazard and Risk Assessment Record

The following risk data has been extracted from the parent TRA assessment. Please refer to the relevant TRA spreedsheet document for additional information and/or justification relevant to risk classification/s and/or control meaures.

Adelaide, Avalon, Cairns and Darwin – Existing minimum / proposed-state spec 1 / proposed-state spec 2

	Existing minimum specification (2+6)		Proposed-state specification 1 (1+2+7)		Proposed-state specification 2 (1+2+8)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 8 minimum resource specifications: a. 2x Officer b. 6x Fire Fighter c. 1x Senior Officer (90min) d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 8 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Expected **Consequence**: Major **Classification**: Extreme	1. Immediate modification to Category 8 minimum resource specification: **a. 2x Officer** b. 7x Fire Fighter **c. 1x Senior Officer (20-45min)** d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 8 with additional ancillary equipment associated with additional officer inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Minor **Classification**: Medium	1. Immediate modification to Category 8 minimum resource specification: a. 2x Officer **b. 8x Fire Fighter** c. 1x Senior Officer (20-45min) d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 8 with additional ancillary equipment associated with additional officer and fire fighter, inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

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Canberra and Coolangatta – Existing minimum / proposed-state spec 1 / proposed-state spec 2

	Existing minimum specification (2+6)		Proposed-state specification 1 (1+2+7)		Proposed-state specification 2 (1+2+8)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 8 minimum resource specifications: a. 2x Officer b. 6x Fire Fighter c. 1x Senior Officer (90min) d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 8 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Expected **Consequence**: Moderate **Classification**: High	1. Immediate modification to Category 8 minimum resource specification: **a. 2x Officer** b. 7x Fire Fighter **c. 1x Senior Officer (20-45min)** d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 8 with additional ancillary equipment associated with additional officer inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Moderate **Classification**: Medium	1. Immediate modification to Category 8 minimum resource specification: a. 2x Officer **b. 8x Fire Fighter** c. 1x Senior Officer (20-45min) d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 8 with additional ancillary equipment associated with additional officer and fire fighter, inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

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Task Resource Analysis (TRA) summary report relative to category 9

Operational Risk Assessment

Version 1.0

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Change summary

Version	Date	Change description
0.1	20 NOV 2021	Initial draft development
1.0	10 DEC 2021	Update to version 1.0
1.1	27 AUG 2023	Editorial update to add watermark and ensure consistency of delimitation information and other editorial aspects across all summary reports. Identified errors have also been corrected. Note – such changes have not adjusted risk classifications or control measures as informed by the TRA data.

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Disclaimer

This paper represents a theoretical operational risk assessment of a future operational environment informed by Task Resource Analysis data. This future operational environment will be realised when the Civil Aviation Safety Authority (CASA) incorporates the requirement for a Task Resource Analysis (TRA) into the regulations governing the conduct of Aviation Rescue and Fire Fighting Services (ARFFS) and Airservices Australia amends its operations manual to comply with these new requirements.

Until Airservices is required to implement TRA requirements, the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).

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1 Executive summary

This report provides a forecast of operational risk associated with implementation of Task Resource Analysis (TRA) into the Australian requirements for the provision of Aviation Rescue Fire Fighting Services ARFFS) in Australia. Refer to section 1.1 (delimitations) regarding the relationship between forecast TRA risk data and the current state operational risk baseline.

Category 9 is a commonplace level of service provided by Airservices ARFFS, and is the approved level of category for four aerodromes listed on the ARFFS provider certificate (139H.0007). Whilst the current operational specification for CAT 9 meets current regulatory requirements it has been identified that should we move to a new TRA informed regulatory environment (future state) and current operational specification for category 9 were retained, certain deficiencies and limitations will exist (as identified via Task Resource Analysis), resulting in a (forecast) unacceptable level of risk. This future state assessment is based upon:

1. The existing category 9 specification is retained in its current format, without change, and
2. TRA has been introduced into the Australian requirements for the provision of ARFFS and the requirements of this process accurately match the obligations set out in the TRA methodology document.
3. Airservices amending its ARFFS operations manual to apply TRA.

As a result of the TRA process and to reduce the level of risk in the future state (to remove or reduce to as low as reasonably practicable (ALARP), two options have been determined to achieve this outcome:

1. Reduction of the level of risk to **medium** via enhancement to the operational specification of category 9 so that it remains functionally capable to achieve all ARFFS objectives.
    a. Should this option be selected, additional analysis to validate locations that are classified as remote or unsupported will need to be completed to confirm insufficient arriving resources within the 45-minute analysis period.
2. Reduction of the level of risk to **low** via enhancement to the operational specification of category 9 so that it remains functionally capable to achieve all ARFFS objectives.
    a. Should this option be selected, additional analysis to validate locations that are classified as remote or unsupported will need to be completed to confirm insufficient arriving resources within the 45-minute analysis period.

This report presents supporting information relevant to these options, sufficient to ensure Airservices manages the potential operational risk associated with the implementation of TRA.

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1.1 Delimitations

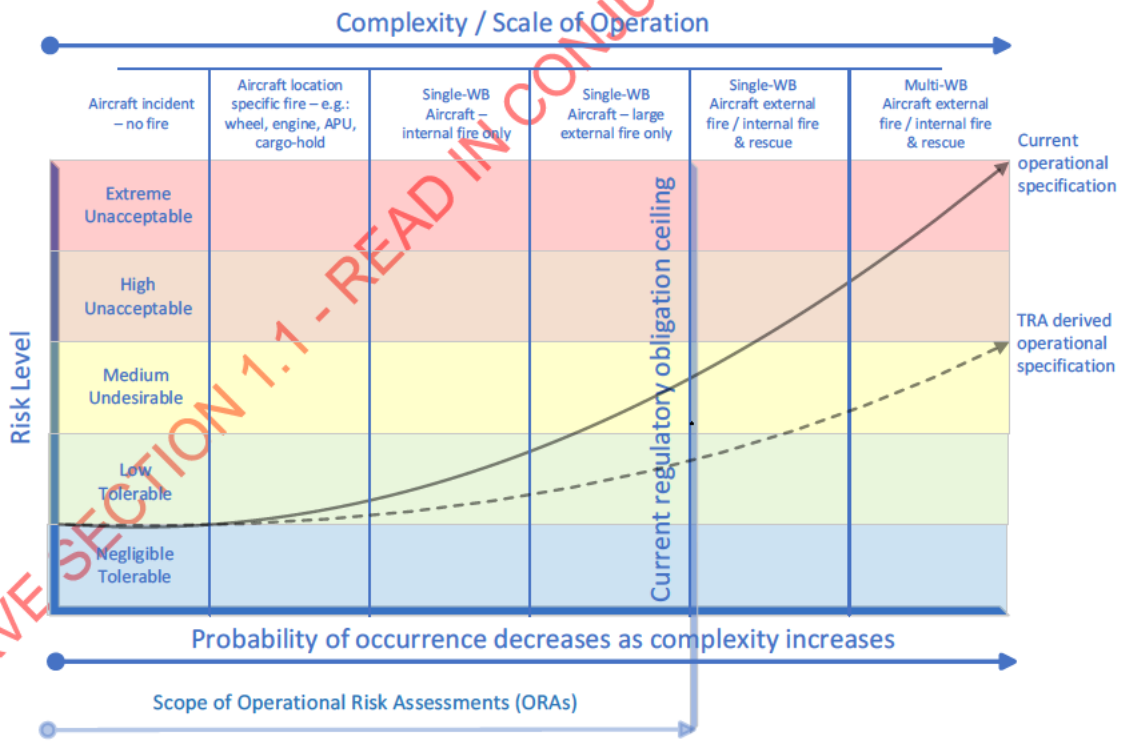
This report has been designed to provide an accurate reflection of the operational risk that may be experienced upon TRA being introduced to the Australian requirements for the provision of ARFFS and subsequent inclusion in the Airservices ARFFS operations manual.

TRA fundamentally adjusts the method in which the functional specification of ARFFS is determined, requiring operational capability to be determined relevant to the worst plausible and credible aircraft scenario, introducing differences to that of the existing regulated requirements.

Risk data presented in this report has been developed to assist with preparation for the regulatory introduction of TRA by informing Airservices as to the level of risk which may be experienced were the current level of operational capability provided relevant to a future state as defined by the TRA assessment.

As such, information within this report is not relevant to the current state but provides valuable forecast and planning data that will assist in the readiness of operations to achieve the ARFFS objectives. The change to the future state will occur upon the Civil Aviation Safety Authority (CASA) formally requiring TRA and the Airservices ARFFS operations manual (rule-set) being subsequently amended to implement these requirements.

Until Airservices is required to transition to the future state the existing ARFFS operational risk baseline (which is documented and approved consistent with SMS-004) continues to provide an accurate and current reflection of operational risk associated with the effective provision of ARFFS (relative to the current Australian standards and the operational obligations set out in the approved ARFFS operations manual).



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2 Purpose

This document provides collective (summary) operational risk assessment relative to the category 9 band as assessed via the TRA methodology.

Information within this document provides a national representation of the future state operational risk associated with category 9 service provision, and the required actions

(immediate and ongoing) which are necessary to achieve and maintain a level of risk that is acceptable and is as low as reasonably practicable.

3 Scope

Relative to the hazard identified, the scope of this risk assessment is inclusive of the following consequence descriptor groupings – being:

- Operational risk (ARFFS margin of safety)

Analysis within this document is applicable to all ARFFS locations that may be required to provide category 9 service.

The locations that have been selected for the completion of category 9 TRA provide a representative baseline from which broader application across all ARFFS locations can be effectively achieved (refer to section 5.0 for additional information).

4 Background

Airservices is implementing the TRA methodology to determine the minimum number of operational staff (inclusive of all operational resources) in the future state necessary to effectively manage a probable and credible worst-case aviation incident up and until sufficient supporting resources arrive (so that ARFFS is no longer reliant upon its own, initial responding resources).

For further information on the design of the TRA methodology, inclusive of the probable and credible worst-case scenario descriptor, refer to the supporting TRA methodology document.

TRA is fundamentally a data gathering activity that provides quantitative and qualitative outputs that can be utilised to inform resourcing decisions. The TRA also provides a framework to permit a detailed understanding of the complexities associated with an ARFFS operation and, as a product of the process; it produces a range of proposed measures (controls) that actively seek to improve core service delivery and fire fighter safety.

Central to the TRA concept is the utilisation of qualitative risk assessment. It is acknowledged within the TRA methodology that more than one staffing/resource level will exist relative to any one scenario. This is a reflection of the non-binary or spectrum approach to staffing levels which reflect a shifting scale of capability relative to ARFFS operations. Whilst there is a point at which ARFFS is unable to achieve any operational objectives relative to the staffing/resourcing provided (for example, 1 fire fighter is unable to mount any form of response), as resourcing increases, so does the capability of ARFFS to achieve objectives.

Operational risk assessment has been employed by the TRA methodology to assist in accurately determining the minimum number of staff (and resourcing) required to achieve all ARFFS operational objectives aligned with the TRA scenario (up and until the arrival of sufficient supporting resources). Through application of the Airservices Safety Management System (SMS), risk assessment has been utilised to inform the level of risk associated with different levels of staffing (and supporting resources) as determined via the TRA process. This approach provides an organisationally aligned and accepted method for analysing, treating and ultimately accepting the level of risk which is managed to a level that is as low as reasonably practicable.

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For further information on the risk assessment process utilised, please refer to AA-PROC-SAF-0105.

This document draws upon the data obtained from relevant and representative TRAs (within a particular category band), collating the data into a single document and articulating the associated operational risk.

Note: coding relative to staffing resources within this document is displayed as: Senior Officer + Officer + Fire Fighter.

5 Commonality of risk data

The TRA methodology requires analysis to be performed relevant to each location ARFFS is provided. In implementing this approach, situations may arise whereby the level of variability between locations is insufficient to require change to the resource specifications. Such circumstances reflect broadly comparable operating environments, or an environment that may represent an improvement to that previously assessed (for example, an improvement to the availability time of local supporting resources).

This notion implies that broadly comparable locations are likely to present commonality in risk data, and, at a certain stage in the process, the value derived from such TRAs diminishes due to repeat outcomes being delivered. In order to recognise commonality in the risk data, the locations assessed must be reflective of the genuine operational differences expected between locations (for example, capital city supported aerodromes compared to remote / isolated aerodromes). This approach ensures representative data which, when subjected to repeat risk assessment, may generate consistent risk outputs. At such a stage, data saturation may be achieved and, if sufficient data is available, valid applied outcomes can be extended to aerodromes with common attributes.

Such an approach has been applied to category 9, with the 4 locations assessed providing sufficient data from which valid outcomes can be determined for the remaining locations.

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6 Risk Assessment

6.1 Process

The risk management process applied within this assessment is in accordance with AA-PROC-SAF-0105.

Key steps within this process are detailed within this report.

A risk assessment review panel was assembled in relation to each risk assessment completed. The participants included:

Table 1 - TRA participants – Brisbane (12 OCT 2021)

Name	Position
[redacted]	Line Leader
[redacted]	Fire Commander
[redacted]	Station Officer

Name	Position
[redacted]	Sub Station Officer
	Sub Station Officer
	Sub Station Officer
	TRA Implementation Lead
	TRA Implementation Lead

Table 2 - TRA participants – Avalon (14 OCT 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	Station Officer
	Station Officer
	TRA Implementation Lead
	TRA Implementation Lead

Table 3 - TRA participants – Sydney (8 OCT 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	Station Officer
	Station Officer
	Station Officer
	TRA Implementation Lead
	TRA Implementation Lead

Table 4 - TRA participants – Perth (30 SEP 2021)

Name	Position
[redacted]	Line Leader
	Fire Commander
	Fire Commander
	TRA Implementation Lead
	TRA Implementation Lead

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6.2 Step 1 – Consult and communicate

Communication and consultation relevant to this assessment has been undertaken within the assessment panels.

Additional communication and consultation with the United Firefighters Union (Aviation Branch) and the Civil Aviation Safety Authority (CASA) has been undertaken at the concept/design and implementation phase, with ongoing invitation for both parties to attend and observe TRA workshops.

Please refer to the TRA methodology document for further information relating to consultation and communication relevant to TRA process.

6.3 Step 2 – Define the scope, context and criteria

The scope of this risk assessment is in accordance with that previously defined in this document (section 3).

The locations that have completed a category 9 TRA include:

- Brisbane
- Melbourne
- Sydney
- Perth

For the purpose of this assessment, the context is established in relation to the ability for ARFFS to achieve all operational objectives associated with the execution of ARFFS functions[1] at a probable and credible worst-case aircraft incident[2].

As such, this risk assessment analyses an incident which exceeds current minimum regulatory requirements applicable to ARFFS.

The risk assessment criteria to be utilised is in accordance with AA-PROC-SAF-0105 (refer to appendix A for details).

All operational objectives relevant to the period until the TRA ends (that is, when sufficient supporting resources arrive on-scene, so that the ARFFS is no longer reliant upon its own, initially responding resources) are within the scope of this risk assessment.

6.4 Step 3 – Risk identification

Acknowledging the established context and background information, the assessment panel has identified the following hazards relevant to the service design.

Further details in relation to the hazards can be found in appendix B.

HAZARD TITLE
Operational safety (ARFFS margins of safety)
Hazard 1 - Reduced ability (margins of safety) for the ARFFS to achieve operational objectives. This hazard relates to the ability for ARFFS to execute its statutory functions (achieved via operational objectives as outlined within the TRA) relative to the resourcing (staffing, vehicles, equipment, agent, other operational consumables) and the anticipated on-scene arrival time of supporting emergency resources.

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6.5 Step 4 – Analyse risk

In consultation with the individuals listed in table 1-4 (risk assessment panel/s), the hazard defined in section 6.4 has been subjected to risk analysis in accordance with AA-PROC-SAF-0105 and the criteria defined in appendix A.

[1] Refer to the Civil Aviation Safety Regulation 1998 section 139.710

[2] Refer to section 7.2.2.5 of the TRA methodology V2.0 for details.

Consistent with the TRA methodology requirements, the forecast TRA informed operational risk associated with the existing minimum staffing/resource specification (relative to category 9) has been assessed.

Table 5 provides an overview of the risk classifications:

Refer to appendix B for details of the risk analysis relevant to each location.

Table 5 - Risk classification relative to the existing specification / minimum staffing for category 9 when assessed against future TRA requirements.

Location	Existing spec (2+8)
Brisbane	Extreme
Melbourne	Extreme
Sydney	High
Perth	Extreme

Three locations determined an ***extreme*** level of risk whilst one determined ***high*** associated with the TRA scenario when utilising existing category 9 resources.

Participants were prompted frequently to explain and justify why a consequence of *major* applied (that is, an inability to achieve an operational objective). The consistent explanation was that 2+8 remains unable to effectively perform internal and external operations consistent with procedural requirements (in their opinion) and that the classification should remain *extreme*.

6.6 Step 5 – Evaluate risk

In accordance with the Airservices SMS (in particular AA-PROC-SAF-0105), an *extreme* or *high* level of risk is *unacceptable* and must be afforded immediate risk treatment to reduce the level of risk to as low as reasonably practicable (ALARP), or, cease the activity.

This level of risk is primarily associated with the inability or significantly impacted ability to achieve certain ARFFS operational objectives. Whilst initial external operations can achieve objectives, internal firefighting operations (inclusive of rescue as informed by advice from the Civil Aviation Safety Authority) is where the most significant operational limitations and (relative to three locations assessed) inabilities exist.

The resources aligned with the current-state category 9 specification are able to achieve initial external objectives (specifically Q1 and Q2 ground fire control and/or extinguishment), however, its ability to support internal rescue operations establishes the basis for the *unacceptable* level of risk due to an inability for this function to be performed correctly and effectively.

Utilising the process outlined in the TRA methodology, analysis of the deficiencies and limitations associated with the minimum staffing specification of 2+6 (referred to by TRA process as pinch-points) has been completed. This analysis informs the nature (description and causation) relative to each pinch-point, supporting the identification of mitigation measures sufficient to address each pinch-point in context of the assessment scenario.

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Generally, the following pinch-points/limitations were identified as key contributors to the initial risk classification. Please refer to the relevant TRA baseline data for a more detailed exploration of the pinch-points as required.

1. Limited fire-fighting staff to support correct or full application of all procedures (specifically internal operations / compressed air breathing apparatus use) relative to a dual aisle aircraft (wide-body).
2. Insufficient officer staffing, impacting the achievement of functions associated with fire-ground decision making and supervision.
3. Insufficient procedural clarity as to the role and function of rescue (inclusive of casualty management).

The outcomes of this analysis has informed the design of two new specifications relative to category 9, with this information forming the basis of the proposed risk treatment activities defined in section 6.7.

6.7 Step 6 - Treat risk

This step seeks to include identified control measures which are required to manage the resulting risk ALARP.

The risk treatment hierarchy of controls (AA-PROC-SAF-0105) has been considered by the assessment panel in the determination of treatment measures.

The TRA methodology has been utilised to inform the controls (or treatment measures) necessary to address identified 'pinch-points' within the respective TRA baseline and inform a new staffing/resource specification.

The primary purpose of TRA is to determine the minimum number of staffing/resourcing required for service provision relative to the assessment scenario.

As such, more than one level of proposed specification has been established to inform a comparison between proposed-states. Such an approach permits the determination of the minimum specification that is still capable of managing the associated operational risk to a level that is as low as reasonably practicable.

Table 9 provides an overview of the residual level/s relative to the risk treatments applied in appendix B (with an expanded explanation of the proposed states included later in this section).

Refer to section 6.9 for details of residual risk acceptance.

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Table 6 – Risk classifications relative to proposed-state/s minimum category 9 specification. Note: Hamilton Island is treated as unsupported for this assessment.

Location	Existing spec (2+8)	Proposed-state 1 1+2+8	Proposed-state 2 1+2+10
Brisbane	Extreme	Medium	Low
Melbourne	Extreme	Medium	Low
Sydney	High	Medium	Low
Perth	Extreme	Medium	Medium

6.7.1 Category 9 proposed future state 1 supported locations – 1+2+8

Proposed-state 1 retains category 9 as a service level and comprises a range of treatments/controls which increases the capability of ARFFS relative to the assessment scenario.

For locations that are not remote/isolated (with significant restriction or limitation on the availability of local supporting services), propose-state specification 1 reduces the level of risk to that aligned with undesirable (*medium*).

The limitations and/or restrictions (that remain), predominantly relate to the efficacy of internal operations and the performance of rescue.

For complete detail on the required improvement measures for proposed-state 1 (relative to a particular location), please refer to the parent TRA data. The following list provides a generalised capture of the enhancement/improvements associated with category 9 proposed state 1:

- An improvement to the timeframe for senior Officer accessibility (deployment to the fire-ground).
- An increase to staff, providing an additional supervisory officer.
- Enhanced clarity as to the role/function of rescue and how this will inform / guide the performance of internal operations during a very large incident (such as that defined by the TRA assessment scenario).
- Enhanced casualty management procedures (specific to aircraft), inclusive of rapid triage / casualty assessment method (inclusive of casualty extraction from aircraft).
- Enhanced method of sensing/monitoring internal atmosphere/s and determining the acceptability of the internal environment to support acceptably safe access by supporting resources.

6.7.2 Category 9 proposed future state 2 at supported locations – 1+2+10

Proposed-state 2 retains category 9 as a service level and provides further enhancement to that of proposed-state 1. This is achieved by the availability of an additional fire-fighter. This resource was identified during a number of TRA workshops with its applied utility being:

- Provision of two additional firefighters to support the ability to allocate separate CABA teams (one) to each aisle of the aircraft.

Whilst operations can be performed without an additional firefighter supporting fire-ground operations, relative to a number of pinch-points, such a resource may assist in certain stages of the operation and relieve the key limitations referred to in section 6.6.

All other specifications in proposed-state 2 remaining consistent with that of proposed-state 1.

Note: Perth TRA risk analysis identified an enduring medium classification, even with the additional two fire fighters. In the opinion of the operational staff informing the

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assessment, there was ability for additional staff to reduce the consequence below moderate (significant impact to achieving operational objectives).

6.7.3 Category 9 proposed future state 2 at remote locations – Supported outcome for CAT9+[2]*

The TRA baseline assessment provides for analysis up to 45 minutes from the commencement of an operation. For the majority of locations, sufficient local supporting resources arrive on-scene within this time – at which point TRA ceases.

Locations that do not receive support within this time are reflective of highly isolated or remote localities which may require additional control measures (treatments) to that of supported locations.

Such a determination requires additional control measures to support effective operations at category 9. These control measures include:

1. An additional two firefighters to that of the minimum specification in proposed-state 1. Such an increase results in an unsupported category 9 specification reflecting – supported outcome for CAT9+[2]).

Whilst the TRA has determined the requirement for resources at locations which are both classified as *supported* (sufficient local resources within 45 minutes) and *unsupported* (insufficient local resources within 45 minutes), the assessment and confirmation of a location being '*unsupported*' remains outstanding and separate to the TRA process. Such confirmation will require direct engagement with senior representative/s of state/territory fire services (and other agencies as applicable) to advise and inform as to the genuine expected level of support relative to a particular location (preferably in writing). Only after such analysis and confirmation can a location be accurately classified as *unsupported* and receive the additional control treatment outlined in this section.

6.8 Step 7 - Monitor and review

There is no monitoring and/or review requirements for the theoretical assessments made within this document.

6.9 Acceptance and sign-off

As this is a theoretical risk assessment of an assumed future state there is no requirement for formal risk acceptance or sign-off.

Data presented within this report will assist and inform capability planning sufficient to ensure that operational risk associated with any future implementation of TRA is managed to ALARP.

Upon CASA implementing TRA requirements and the Airservices ARFFS operational manual being updated, operational risk associated with TRA will be transferred to the approved operational risk baseline. This risk data will be informed by information within this report, the locations parent TRA documentation and the level of capability relative to the improvements required (as outlined herein).

Formal risk acceptance and sign-off will be undertaken at this time, relative to the respective operational risk baseline and the broader safety management system requirements.

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Appendix A Risk assessment criteria

Table 1 – Risk Classification Matrix

		CONSEQUENCE				
		Insignificant	Minor	Moderate	Major	Catastrophic
LIKELIHOOD	Expected	Medium	Medium	High	Extreme	Extreme
	Likely	Low	Medium	Medium	High	Extreme
	Possible	Low	Low	Medium	Medium	High
	Unlikely	Negligible	Low	Low	Medium	Medium / High*
	Rare	Negligible	Negligible	Negligible	Low	Medium / High*

*Note: *Where primary consequence type is determined to be Safety, Work Health & Safety or Environment, apply the 'high' risk rating under catastrophic.*

Table 2 – Likelihood Criteria

Likelihood Criteria for Non-ATM Safety Consequences

Likelihood	Qualitative Descriptor	Quantitative Guidance	
		Timeframes	Probability *(within a year)*
Expected	The risk event is **expected** to occur or has occurred within the past year	Daily – Yearly	Greater than 95%
Likely	The risk event is more **likely** to occur than not	Yearly – 3 Yearly	33% to 95%
Possible	The risk event is **possible** but infrequent	3 Yearly – 10 Yearly	10% to 33%
Unlikely	The risk event is **unlikely** to occur	10 Yearly – 20 Yearly	5% to 10%
Rare	The risk event is only **remotely** probable	Greater than 20 years	Less than 5%

		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Generic Consequence Descriptions		Some loss that can be managed via existing management procedures having a negligible impact on achievement of business objectives.	Event with consequences that can be readily absorbed but requires management effort to minimise the impact on achievement of business objectives.	Significant event or circumstance that requires management to institute enhanced monitoring of controls to assure continued delivery of business objectives.	Critical event or circumstance that can be endured with proper management, however achievement of business objectives are impaired.	Event or circumstance with potentially disastrous impact leading to an inability to achieve business objectives.
Safety (Margins of Safety)	**ATM**	An operational condition with the potential to reduce the margins of safety (undesired state).	An operational condition in which the margins of safety have been compromised (unrecovered state).	An operational condition in which the margins of safety have been significantly eroded.	Low capacity/General Aviation aircraft accident.	Medium to high capacity aircraft accident.
	ARFFS	Minimal impact to ARFFS operational objectives.	Some impact to ARFFS operational objectives.	Significant impact to ARFFS operational objectives.	An inability to achieve ARFFS operational objectives.	A sustained and complete inability to achieve ARFFS operational objectives.
Work Health & Safety		Exposure to circumstances where injury may occur.	Injuries requiring medical treatment or first aid.	Serious injuries or illness requiring immediate medical treatment/hospital admission.	Injury or illness resulting in permanent impairment.	Fatality/fatalities.
Environment		Negligible effect or implication on the physical environment. Insignificant noise and emissions impacts.	Minor effect or implication on the physical environment. Minor noise and emissions impacts.	Moderate, medium term effect or implication on the physical environment. Moderate noise and emissions impacts.	Long term effect or implication on the physical environment. Major noise and emissions impacts.	Irreversible and extensive effect on the physical environment which has national or global implications.
Service Delivery (Impact on Customers)		Negligible efficiency impact on delivery of ATM/ARFF services.	Delivery of ATM/ARFF services are impaired, resulting in minor inefficiencies for our customers.	Inability to deliver some ATM/ARFF services, resulting in moderate efficiency impacts.	Inability to deliver majority of ATM/ARFF services, causing significant efficiency impacts and reducing the value delivered to our customers.	Sustained inability to deliver any ATM/ARFF services, which severely impacts the efficiency of our customers' operations.
Organisational Capability (Internal Impacts)		A noticeable degradation in organisational capability that does not reduce the effectiveness of the function.	A significant degradation in organisational capability to an extent and duration that, while Airservices can perform its primary functions, the effectiveness of the functions is noticeably reduced.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its primary functions.	A severe degradation in, or loss of, organisational capability to an extent and duration that Airservices cannot perform one or more of its functions for an extended time.	Total loss of organisational capability to an extent and duration that Airservices cannot perform any of its functions.
Reputation		Internal impact only with no adverse customer or ministerial involvement. Ability to be managed by staff internally.	Some adverse publicity resulting in internal reviews of existing policies and practices.	Substantial adverse publicity or loss of some stakeholder confidence. Scrutiny/criticism by the Minister, Parliamentary Committees and key customers, requiring Ministerial and/or Customer response.	Adverse national media reports on failings, inefficiency or inadequacies resulting in serious loss of confidence by customers and the Minister. Serious embarrassment to Minister and Government. Parliamentary enquiry may be instigated.	Complete loss of stakeholder confidence resulting in Board/CEO resignation. Royal commission may be instigated.
Financial Sustainability*		A financial impact up to $500,000.	A financial impact between $500,000 and $5m.	A financial impact between $5m and $50m.	A financial impact greater than $50m.	Airservices is no longer able to operate as a going concern.

**Note:* *A financial impact constitutes both potential and actual impacts on Airservices profit and loss statement (i.e. revenue and expenditure). Potential impacts include: expenditure avoidance and opportunity costs. Financial figures presented are in the context of the organisation.*

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Table 4 – Risk Acceptance, Mitigation Strategies and Review Timeframes

	Risk acceptance – minimum authority	Risk mitigation strategy – safety & environment risks	Risk mitigation strategy – business risks	Minimum review timeframes
Extreme (E)	Must be referred to the CEO for attention and action	**Unacceptable** Immediate risk treatment required to reduce the level of risk to as low as reasonably practicable (ALARP) or cease the activity.	**Unacceptable** Immediate risk treatment required to reduce the level of risk to align with the organisational risk appetite or cease the activity.	Weekly (continuous risk treatment)
High (H)	Responsible Executive General Manager (EGM)	**Unacceptable** Immediate risk treatment required to reduce the level of risk to ALARP or cease the activity.	**Undesirable** Risk must be reduced to align with the organisational risk appetite.	Monthly
Medium (M)	Responsible Direct Report to Executive (DRE)	**Undesirable** Risk treatment required to reduce the level of risk to ALARP, unless the cost of reducing the risk is grossly disproportionate to the expected risk reduction benefit.	**Tolerable** Risk should be reduced to align with the organisational risk appetite, unless the cost exceeds the benefits achieved.	Quarterly
Low (L)	Responsible Other Leadership Role (OLR)	**Tolerable** Risk is broadly acceptable, however risk treatment should be applied to reduce the level of risk to ALARP, unless the cost of reducing the risk is disproportionate to the expected risk reduction benefit.	**Acceptable** Risk is broadly acceptable. Maintain current systems, monitor and review. Further reduction only if costs are insignificant.	Biannually
Negligible (N)	Responsible Team Leader and above	**Tolerable** Risk is acceptable, however the risk must be monitored to assure that it remains within risk tolerance/appetite. ALARP evidence is current.	**Acceptable** Risk is acceptable. No further reduction is necessary.	Annually

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Appendix B Hazard and Risk Assessment Record

The following risk data has been extracted from the parent TRA assessment. Please refer to the relevant TRA spreedsheet document for additional information and/or justification relevant to risk classification/s and/or control meaures.

Sydney – Existing minimum / proposed-state spec 1 / proposed-state spec 2

	Existing minimum specification (2+8)		Proposed-state specification 1 (1+2+8)		Proposed-state specification 2 (1+2+10)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 9 minimum resource specifications: a. 2x Officer b. 8x Fire Fighter c. 1x Senior Officer (90min) d. 3x primary attack vehicle (4th due to running 2 stations) e. Equipment as per AFFM-09 CAT 9 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Expected **Consequence**: Moderate **Classification**: High	1. Immediate modification to Category 9 minimum resource specification: **a. 2x Officer** b. 8x Fire Fighter **c. 1x Senior Officer (20-45min)** d. 3x primary attack vehicle (4th due to running two stations) e. Equipment as per AFFM-09 CAT 9 with additional ancillary equipment associated with additional officer inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Minor **Classification**: Medium	1. Immediate modification to Category 9 minimum resource specification: a. 2x Officer **b. 10x Fire Fighter** c. 1x Senior Officer (20-45min) d. 3x primary attack vehicle (4th due to unning two stations) e. Equipment as per AFFM-09 CAT 9 with additional ancillary equipment associated with additional officer and fire fighters, inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

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Perth – Existing minimum / proposed-state spec 1 / proposed-state spec 2

	Existing minimum specification (2+8)		Proposed-state specification 1 (1+2+8)		Proposed-state specification 2 (1+2+10)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	1. Existing category 9 minimum resource specifications: a. 2x Officer b. 8x Fire Fighter c. 1x Senior Officer (90min) d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 9 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Expected **Consequence**: Major **Classification**: High	1. Immediate modification to Category 9 minimum resource specification: **a. 2x Officer** b. 8x Fire Fighter **c. 1x Senior Officer (20-45min)** d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 9 with additional ancillary equipment associated with additional officer inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Moderate **Classification**: Medium	1. Immediate modification to Category 9 minimum resource specification: a. 2x Officer **b. 10x Fire Fighter** c. 1x Senior Officer (20-45min) d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 9 with additional ancillary equipment associated with additional officer and fire fighters, inclusive of CABA. f. Anticipated realistic arrival time for supporting resources. 2. Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. 3. **For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Possible **Consequence**: Moderate **Classification**: Medium

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Melbourne – Existing minimum / proposed-state spec 1 / proposed-state spec 2

	Existing minimum specification (2+8)		Proposed-state specification 1 (1+2+8)		Proposed-state specification 2 (1+2+10)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	**2.** Existing category 9 minimum resource specifications: a. 2x Officer b. 8x Fire Fighter c. 1x Senior Officer (90min) d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 9 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Expected **Consequence**: Major **Classification**: High	**4.** Immediate modification to Category 9 minimum resource specification: **g. 2x Officer** h. 8x Fire Fighter **i. 1x Senior Officer (20-45min)** j. 3x primary attack vehicle k. Equipment as per AFFM-09 CAT 9 with additional ancillary equipment associated with additional officer inclusive of CABA. l. Anticipated realistic arrival time for supporting resources. **5.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. **6. For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Moderate **Classification**: Medium	**4.** Immediate modification to Category 9 minimum resource specification: g. 2x Officer **h. 10x Fire Fighter** i. 1x Senior Officer (20-45min) j. 3x primary attack vehicle k. Equipment as per AFFM-09 CAT 9 with additional ancillary equipment associated with additional officer and fire fighters, inclusive of CABA. l. Anticipated realistic arrival time for supporting resources. **5.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. **6. For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

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Brisbane – Existing minimum / proposed-state spec 1 / proposed-state spec 2

	Existing minimum specification (2+8)		Proposed-state specification 1 (1+2+8)		Proposed-state specification 2 (1+2+10)	
Hazard Title	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**	**Control Measures**	**Risk Classification**
Hazard 1 Reduced ability (margins of safety) for the ARFFS to achieve operational objectives.	**1.** Existing category 9 minimum resource specifications: a. 2x Officer b. 8x Fire Fighter c. 1x Senior Officer (90min) d. 3x primary attack vehicle e. Equipment as per AFFM-09 CAT 9 f. Anticipated realistic arrival time for supporting resources.	**Likelihood**: Expected **Consequence**: Major **Classification**: High	**1.** Immediate modification to Category 9 minimum resource specification: **a. 2x Officer** b. 8x Fire Fighter **c. 1x Senior Officer (20-45min)** a. 3x primary attack vehicle (4th vehicle is required due to 2 stations) d. Equipment as per AFFM-09 CAT 9 with additional ancillary equipment associated with additional officer inclusive of CABA. e. Anticipated realistic arrival time for supporting resources. **2.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. **3. For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Likely **Consequence**: Moderate **Classification**: Medium	**1.** Immediate modification to Category 9 minimum resource specification: a. 2x Officer **b. 10x Fire Fighter** c. 1x Senior Officer (20-45min) b. 3x primary attack vehicle (4th vehicle is required due to 2 stations) d. Equipment as per AFFM-09 CAT 9 with additional ancillary equipment associated with additional officer and fire fighters, inclusive of CABA. e. Anticipated realistic arrival time for supporting resources. **2.** Implementation (over time) of all remaining mitigation measures as defined in the relevant TRA. **3. For locations assessed as 'unsupported' only** – an additional 2 fire fighters arriving onscene no greater than 45 minutes.	**Likelihood**: Possible **Consequence**: Minor **Classification**: Low

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