Australian Government

Department of Infrastructure, Transport, Regional Development and Communications

National Strategic Airspace

NATIONAL AVIATION POLICY ISSUES PAPER

May 2021

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National Strategic Airspace

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Executive summary

Purpose

The purpose of this paper is to form the basis of open and transparent discussion to support the development of a national strategic approach for the administration of Australian airspace. This paper aims to:

- clarify the basis upon which Australian airspace is administered, designed and classified;
- outline a number of possible options for airspace classification and airspace design;
- articulate consequential issues associated with potential airspace solutions; and
- inform the Australian Government's broader approach to airspace management (together with the National Emerging Aviation Technologies Policy concurrently being developed).

Introduction

Over the next decade, traditional and non-traditional aviation activities will increasingly need to operate within the same airspace, which is rapidly evolving due to economic, social and technological developments. It has become clear that Australian airspace operations will involve a mix of significantly different aircraft types and performance characteristics. This will include traditional jet and prop aircraft passenger services (including ultra-long haul aircraft), helicopters, sport and recreational aircraft, remotely piloted aircraft systems (RPAS) activities, and in the near future, electric or hybrid advanced air mobility (AAM) using electric vertical take-off and landing (eVTOL) aircraft. As such, the existing safe and efficient airspace system that has served Australia well for many years will need to evolve to accommodate this rapidly changing airspace environment.

In addition to increasing numbers and new airspace entrants, air traffic management technology is also changing. Airservices Australia (Airservices) and the Department of Defence (Defence) will commence commissioning a new air traffic management system in 2023. The use of satellite and digital technology within aviation is becoming more deeply embedded and there is increasing system communication between aircraft themselves and airports, enabling further enhancements in the approach to airspace and air traffic management.

The first step in this process will be the development of a national approach for the administration, design and classification system to be used for Australian airspace. This will ensure that Australian airspace remains fit for purpose and that safety is the number one priority for the Australian aviation industry and the Australian Government. It will also ensure the impacts and risks associated with drones and advanced air mobility (AAM) aircraft - other than safety risks – are addressed, while having regard to the broader approach to airspace management.

The Civil Aviation Safety Authority (CASA) will develop and implement the national approach to airspace management through the Australian Future Airspace Framework (AFAF) including an associated implementation plan. The AFAF will underpin necessary legislative and regulatory changes and will guide the operational approach taken by CASA and Australia's two air navigation services providers (ANSP) Airservices and Defence, including the future procurement and roll-out of technology.

As the basis for a long-term policy direction, this paper complements the Australian Airspace Policy Statement (AAPS) – a legislative instrument that is reviewed every three years and outlines the Government's short-term policy priorities for CASA regarding the administration and regulation of airspace. Consultation on the draft AAPS is currently underway.

This paper is designed to promote discussion with industry and the opportunity to provide feedback regarding Australia's future airspace policy direction and objectives, which will inform future iterations of the AAPS and, coupled with the National Emerging Aviation Technologies Policy concurrently being developed, will inform the Australian Government's broader approach to airspace.

A summary of the proposals for discussion are located in Appendix 1 with detailed wording and information contained in the body of the report.

Have your say

The Australian Government invites written submissions addressing any component of this discussion paper including the proposed approach to airspace classification and design and broader airspace management.

To guide the development of submissions, a recommended starting point is to consider the proposals for airspace classification, low level airspace, airspace design and consequential discussion points.

Submissions or questions should be provided no later than **16 July 2021** to:

Director, Airspace and Future Technology
Department of Infrastructure, Transport, Regional Development and Communications
Email: airspacepolicy@infrastructure.gov.au

Alternatively, send via post to: GPO Box 594, CANBERRA ACT 2601

What are the next steps?

Outcomes of this consultation process will inform development of AFAF and an associated implementation plan, and will identify any necessary legislative and regulatory changes. It will also inform the Government's broader approach to airspace being developed as part of the NEAT policy.

The Australian Government may consider options for further targeted engagement with particular groups or organisations prior to finalising a national policy statement or the development of resulting plans. Any legislative or regulatory change processes to implement policy outcomes will also include separate consultation processes consistent with Australian Government processes.

Operational context

The airspace that Australia manages covers 11 per cent of the world's airspace, second only to the United States. The airspace is aligned to Annex 11 – Air Traffic Services (Annex 11) of the International Civil Aviation Organization's (ICAO) Convention on International Civil Aviation (1944) (Chicago Convention) requirements and has remained relatively stable over a number of years.

Figure 1: A graphical representation of Australian administered airspace[1]

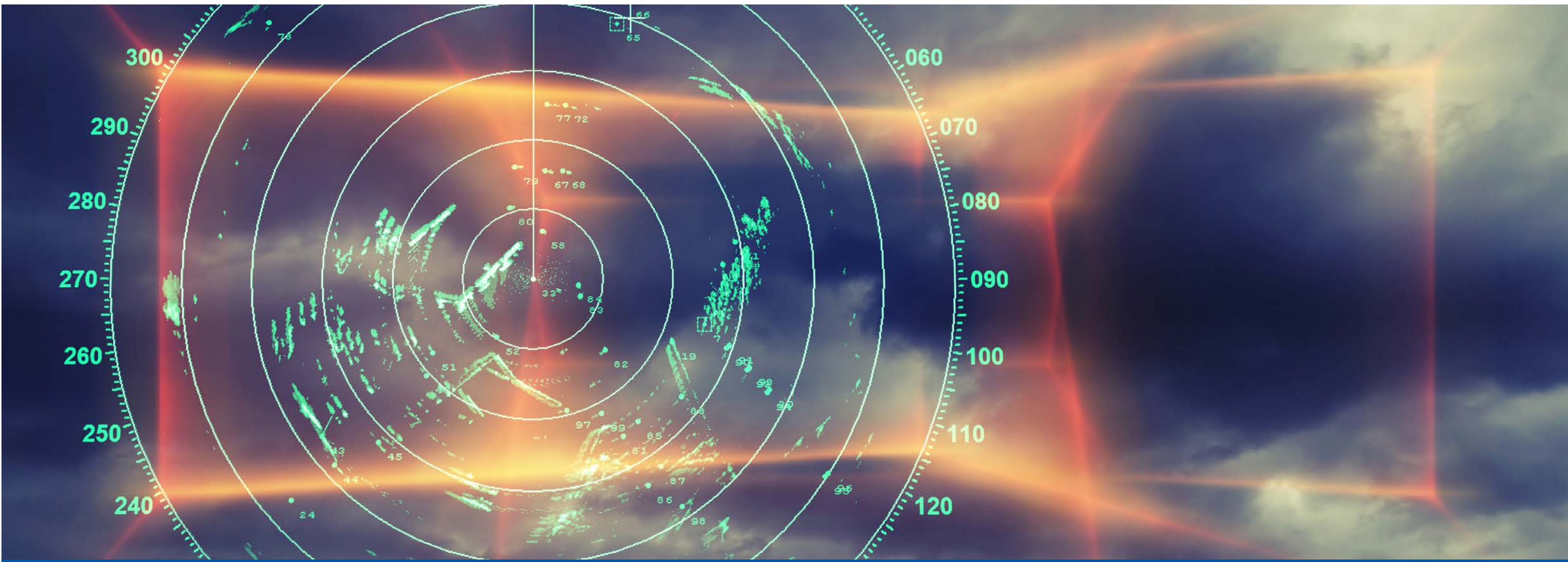
The Minister for Infrastructure, Transport and Regional Development administers aviation legislation, including the *Airspace Act 2007*, *Civil Aviation Act 1988*, the *Airservices Act 1995* and corresponding regulations, supported by policy advice regarding aviation and airports (including aviation safety and airspace) from the Department of Infrastructure, Transport, Regional Development and Communications (the Department).

Australian administered airspace is regulated by CASA under the *Airspace Act 2007*. As Australia's ANSPs, Airservices and Defence are responsible for the provision of air traffic services, which includes the provision of air traffic management, control and flight information services within Australian administered airspace.

In accordance with the ICAO Global Air Navigation Plan (GANP) and the Aviation System Block Upgrades (ASBUs) considerations in relation to the management of airspace include:

- dynamic airspace configurations[2];
- improvements in the overall management of airspace including restricted / reserved areas and dynamic mobile areas[3];
- the concept of flexible use of airspace[4]; and
- the management of real time airspace data. [5]

Australia sets the direction and safety objective within airspace through a range of documents including the Australian Airspace Policy Statement (AAPS), the State Safety Program (SSP), the National Aviation Safety Plan (NASP) and the National Air Navigation Plan (NANP). The relationship between international and national documentation can be found in Appendix 2.



Current operations and airspace users

The current airspace administration, architecture and supporting services are safe and effective for current users but there may be difficulties in accommodating future users to permit them to operate to their full potential or flexible operations for current users should the Australian airspace system remain as the status quo.

Passenger transport services

The Government considers the safety of passenger transport services as the first priority in airspace administration.[6] The Government is also committed to ensuring the appropriate levels of airspace classification and air traffic services, which protect regional aerodromes served by passenger transport services or flights, conducted for hire or reward, or are otherwise publicly available. They also include cargo and medical transport operations. Passenger transport services also include helicopters. New regulations to come into effect soon will encapsulate both charter and regular public transport operations with such activities operating over all areas of Australia as well as international flights.

General aviation

General aviation is the part of the aviation industry that engages in activity other than commercial air transport services or charter operations. It currently includes flying training, photography, surveying, search and rescue and pleasure flying and is found all over Australia and in different Australian airspace classes.

Sport aviation

Sport aviation covers almost half of the aircraft operating in Australia and involves around 40,000 participants and 9,000 aircraft. Sport aviation involves a wide range of activities including parachute aircraft, ultralight aircraft, recreational ballooning, gliders, hang gliders, weight shift microlights, powered and non-powered paragliders and gyroplanes to name a few. This area of aviation also provides a proving ground for new aviation concepts and technology. Sport aviation is found operating in all areas of Australia and is an integral part of the Australian aviation system.

Recreational unmanned aircraft

Recreational unmanned aircraft includes many different types of unmanned aircraft that range from remotely controlled model aircraft and helicopters to drones and other less common unmanned aircraft such as free balloons and kites. They also include model jet aircraft with speeds up to 250 km/h or faster and model aircraft weighing up to 150 kg. Most model aircraft are operated at model aircraft clubs. However, they can be operated at other locations in compliance with the Civil Aviation Safety Regulations 1998 Part 101.

Rocketry operations

Rockets are already facilitated within the Australian airspace system. No standard solution exists as a number of technical variables inform the trajectory which is used to define the airspace required for safe operations.

New commercial entrants

The world of aviation is rapidly developing with technologies being developed to support current and new aircraft. Operations involving new commercial entrants are already being undertaken in Australian airspace.

Remotely piloted aircraft (Drones)

Under the CASR Part 101, drones are currently exempt from the VFR and IFR flight rules. This means that the class of controlled airspace is currently irrelevant to their operation and all that is required, dependent on location and height of the operation, is that authorisation from ATC is received for entry into controlled airspace. However, in the future, certain drones may be classified as operating under the VFR or IFR flight rules. In controlled airspace, the purpose of ATC is to prevent a collision between aircraft. However, given that drones are currently exempt from the flight rules, except if captured by CASR Part 172, the ATC can determine how this is undertaken, again making the class of controlled airspace irrelevant. Discussions in relation to Class G airspace are specifically relevant in relation to drone operations.

Advanced air mobility

Advanced air mobility will involve using revolutionary new eVTOL aircraft to undertake new transport operations previously not serviced or under-serviced by traditional aviation. Whilst similar operations have been undertaken by conventional helicopters in some urban areas around the world, the development and introduction of quieter, cheaper and possibly more efficient eVTOL aircraft will potentially lower the operating price point to enable a viable transport alternative for many people in our cities and regional areas. It is anticipated that these operations will commence with piloted and remotely piloted aircraft. Eventually it is expected that, as the technology gains greater acceptance, the operations will all transition to be remotely piloted.

Whilst piloted, these aircraft need to fit within the existing regulatory structure. A number of Australian airports already have published helicopter routes and it may be possible for these to be utilised for eVTOL operations. A discussion in relation to Class D control zones is relevant in relation to these operations as it could facilitate an increase in volume of movements whilst maintaining safety of operations. Alternate technical solutions or procedures are likely to be required at a point in the future to provide traffic and flow management. The discussion in relation to Class G airspace is relevant to ensure safe operations are maintained.

Space operations

High-powered and hobby rockets are already facilitated within the Australian airspace system. Rockets that are capable of reaching 100 km above the earth's surface are now being facilitated through ongoing work by the Australian Space Agency and CASA and are not dependent on the classification of airspace. However, they will continue to require airspace risk assessments to ensure the safety of these activities.

High altitude operations

High altitude operations are currently being conducted above 60,000 feet above mean sea level (AMSL). The operations include high altitude balloons such as Loon, hyper jets, high altitude long endurance unmanned aircraft (HALE) and some pseudo satellite aircraft. All such aircraft require a transit to and from their operating altitude with some ascending under their own power plant and others being taken aloft attached to a high altitude balloon before being unleashed to conduct their operation. It is expected that there will be many more high altitude operations as the technology for such operations improves. This will necessitate the establishment of processes for the transit of such aircraft through the lower airspace and for certain operations conducted at the higher levels close to 60,000 feet AMSL and up to 100 km.

Scope

Airspace organisation and management is one element of the Air Traffic Management (ATM) system. For further information on the interrelationships, refer to Appendix 3. This paper discusses aspects of future airspace classification and design, to the extent currently understood. The outputs of this paper will be dynamic in nature and will continue to evolve as user requirements, government objectives, technology and airspace requirements are considered. The AFAF will also be guided by and continue to evolve through ongoing airspace risk assessments conducted by CASA.

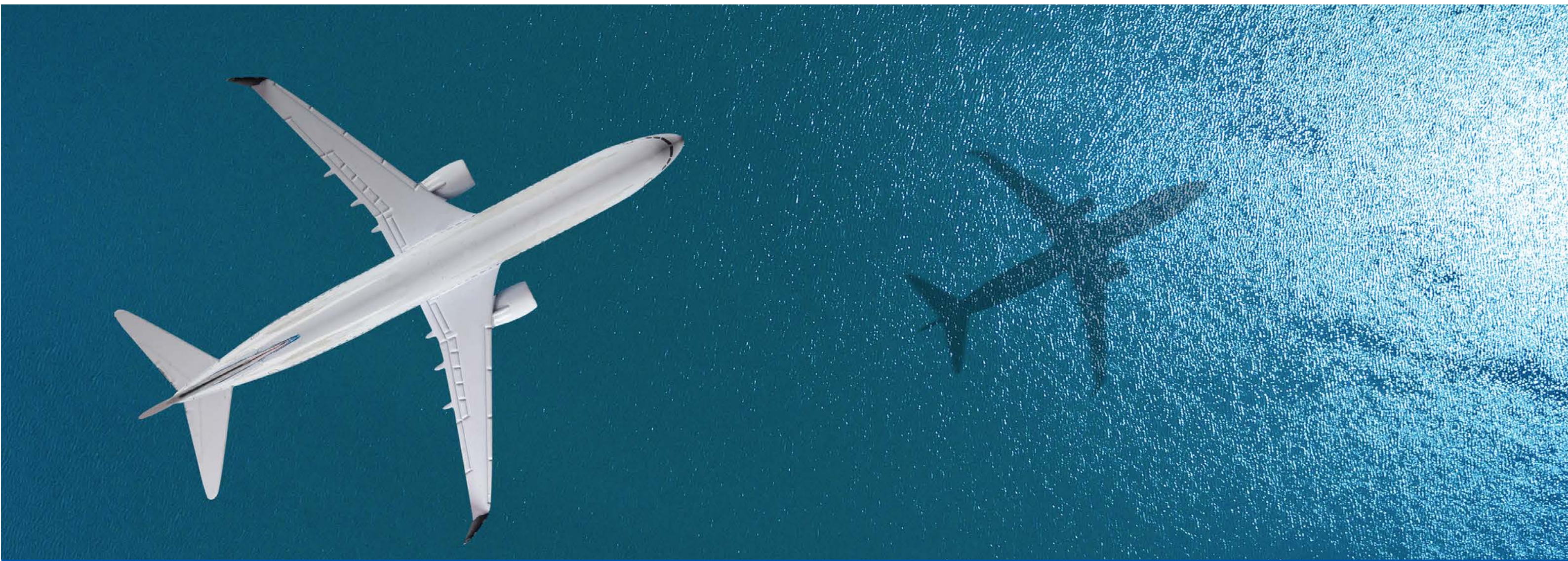
Airspace protection issues, such as protection of Obstacle Limitation Surfaces, are considered to be out of scope for this discussion.

Assumptions

As this discussion paper is considering a long-term direction for Australia, a number of assumptions have been made:

- Government expectations of CASA will support a consideration of multiple factors when determining the class of airspace to be implemented, using "as low as reasonably practicable" (ALARP) methodology to achieve an acceptable level of safety performance (ALoSP).
- Legislation and regulations can be changed to facilitate safe, efficient and effective outcomes, or newly identified outcomes where required.
- Facility limitations, such as frequency coverage, can be overcome but will be subject to industry consultation if the cost impacts negatively on an ALoSP solution.

- Policy decisions and the AFAF will take into account the ICAO GANP and Global Aviation Safety Plan (GASP).
- The expectations contained in the Global Air Traffic Management Operational Concept (GATMOC), used as the framework for the key performance areas in the Manual on Global Performance of the Air Navigation system, will be taken into account (refer to Appendix 4).



Technical background

Defence and Airservices are in a joint venture for the next ATM system. To realise the benefits that can come from dynamic sectorisation, a capability of the new ATM system, there is a requirement to standardise airspace to the maximum extent possible. Airservices is reviewing airspace as part of the requirements for the new system and this work, under their airspace modernisation program, will be an input into the framework discussions.

The Government expects that Australia's airspace administration will be consistent with the objectives and priorities identified in the GASP and the GANP. Australia's airspace architecture and administration is generally aligned with the ICAO prescribed airspace classes and associated levels of service as set out in Annex 11 (refer to Appendix 5). Australia has an additional speed restriction in Class D airspace and instrument Flight Rules (IFR) aircraft north of 65˚S are considered to have an ongoing flight information request and receive traffic information on other IFR flights and known Visual Flight Rules (VFR) flights in Class G airspace.

To facilitate seamless ANS operations, consideration is also given to the eleven Key Performance Area system expectations, derived from the GATMOC expectations, as well as a number of general performance-oriented requirements. On a regional level, consideration is given to the performance objectives developed by the Asia/Pacific Seamless ATM Planning Group.[7] One of the Preferred Aerodrome/Airspace and Route Specifications performance objectives relates to airspace classification. In summary, the objective is to classify airspace consistent with Annex 11 and apply as follows:

a. Upper remote enroute airspace with Air Traffic Services (ATS) high frequency (HF) radio or controller pilot data link communications and outside the coverage of ground-based surveillance coverage should be classified as Class A;

b. Upper serviced (or potentially serviced) enroute airspace – by direct (not dependent on a Communication Service Provider (CSP)) ATS communications and surveillance should be classified as Class A, or if there are high level general aviation or military VFR operations: Class B or C; and

c. Lower serviced (or potentially serviced) enroute airspace – by direct (not dependent on a CSP) ATS communications and surveillance should be classified either Class C, D or E as determined by safety assessments.

In order to facilitate future ASBUs contained in the GANP,[8] such as large scale cross border free route airspace (FRTO-B2/3) there is a need to be cognisant of airspace in neighbouring Flight Information Regions (FIRs). Most of the neighbouring FIRs to the Australian airspace commence Class A airspace at FL245.

For facilitation of other future ASBUs, such as continuous descent operations (APTA-B0/4 & APTA-B1/4) and continuous climb operations (APTA-B0/5 & APTA-B1/5), there is a need to have a consistently designed airspace with airspace steps. These initiatives are designed to save fuel and as such have an economic benefit as well as reducing greenhouse gas emissions.

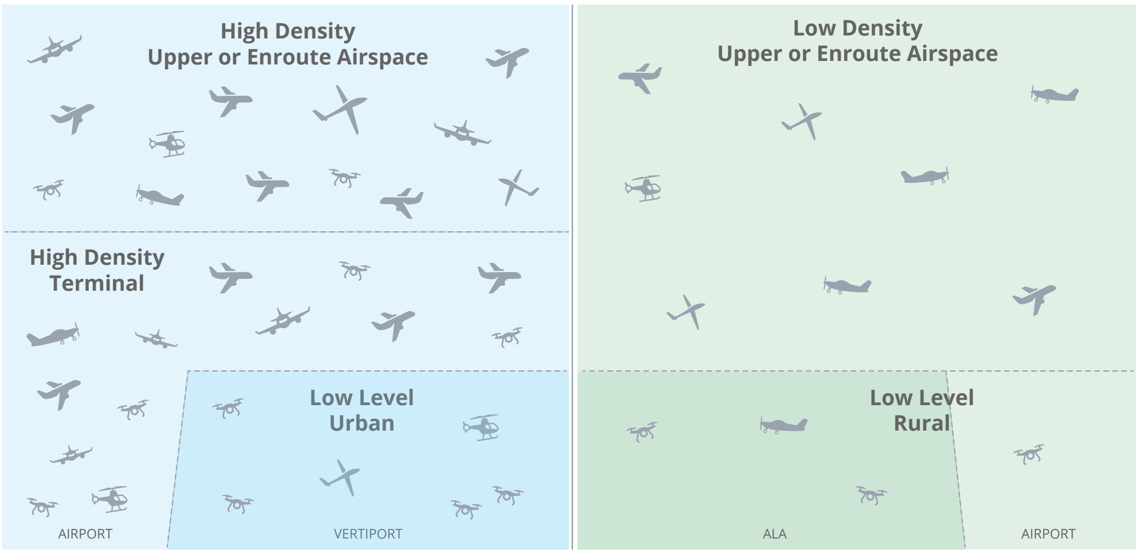
The Asia/Pacific Seamless ANS Plan (A/PSANSP) is silent in respect of terminal airspace or control zone classification. Annex 11 requires that those portions of controlled airspace where an Air Traffic Control (ATC) service will be also be provided to VFR flights shall be designated as Classes B, C or D airspace. This requirement captures the terminal airspace and the control zone. Class B airspace is considered less restrictive than Class A airspace; Class C airspace less restrictive than Class B airspace, etc.[9]

ICAO recommends that when the lower limit of a control area is higher then 3,000FT above mean sea level it should coincide with a VFR cruising level, this will ensure that there is at least 500FT between aircraft operating at the common level and IFR aircraft.

Technical and procedural solutions are also options that can be deployed within different classifications of airspace. Current examples in Class G airspace include common traffic advisory frequencies, certified air/ground radio services (CA/GRS), aerodrome flight information service and broadcast areas. Future scenarios may also consider transponder/ADS-B requirements and broadcast zones for example. These additional requirements permit the airspace to be managed to an ALoSP without the need to reclassify the airspace

These technical considerations for airspace then need to accommodate the broad range of users and the environments in which they are operating. Airspace classification and design needs to encompass all these elements whilst considering the expectations outlined in the GATMOC.

Figure 2: An indication of traffic diversity and complexity, that can exist within the airspace. Traffic is dynamic in nature and airspace classification is used to manage risk to ALoSP



Technical considerations

In formulating proposals for future airspace classifications in Australia current known scenarios, operations, technical constraints and operational equipment issues will be taken into account. In addition to the expectations outlined in the GATMOC, the GANP, the RANP and the A/PSANSP the following points were considered:

- Australia is developing a framework for the use of airspace classifications but has no current published framework. CASA currently assesses changes through a risk-based approach, which is consistent with policy detailed in the AAPS and the regulations.
- Airspace Design Guidelines and the Australian Airspace Concept documents have been on the CASA Office of Airspace Regulation (OAR) strategic works plan since October 2017 along with the Australian Airspace Strategy since November 2017. The concept and the strategy have been further developed by CASA and are now being combined into the AFAF.
- A university research paper is being developed to support the risk assessments underpinning the AFAF by providing a new airspace risk methodology to enable the incorporation of the ICAO Key Performance Areas into airspace design considerations.
- Safety, as the most important consideration, protection of the environment, efficient use of and equitable access to airspace for all users of the particular airspace and national security are the current considerations for CASA when determining airspace class.
- Economics, efficiency of operations and a standardised approach have not been the drivers for airspace reform within Australia.

- Airservices is subject to a direction under section 16 of the *Air Services Act 1995* (MAVN13/04),[10] which details a level of service against a class of airspace that is not consistent with the responsibilities of CASA during its assessment of risk and authorisation of airspace class.
- Airservices has been developing an airspace modernisation program to achieve the benefits from the new ATM system but the linkage to the AFAF work being undertaken by CASA is still to be connected. It is intended that the outcomes of this discussion paper will facilitate such linkages while the AFAF is further developed.
- VFR aircraft must not conduct a flight at a height above FL200 if the pilot does not have CASA's approval to conduct the flight at a height above that level.[11] The base of Class A airspace does not align with this requirement.
- Continental airspace on the east coast and overhead Adelaide, Darwin, Alice Springs and Perth above FL180 is classified Class A. The remaining continental airspace and oceanic airspace within the Australian administered FIRs is classified as Class A above FL245.
- Class C airspace is generally declared to manage the risk associated with the arrival and departure paths for controlled aerodromes and at busier locations is the basis of the control zone, the airspace directly surrounding the aerodrome.
- At regional and secondary metropolitan aerodromes, excluding Essendon, the control zone and immediate airspace steps are Class D.
- Class E airspace is utilised in the enroute airspace above FL125 or A085 and to protect the arrival and departure paths for regional aerodromes. There is also lower level Class E airspace at Broome and Avalon and outside of tower hours at Rockhampton and Mackay.
- IFR aircraft in class G airspace, north of latitude 65S, receive an ongoing flight information request and traffic information on other IFR flights and known VFR flights.
- Australia currently does not require the fitment and use of transponders in Class D airspace.
- Smaller RPA will probably not be equipped with conventional aviation surveillance equipment.
- There are physical limitations to the see-and-avoid rule to ensure no collision between aircraft operating in Class G airspace, which could be improved with the use of surveillance equipment such as ADS-B, transponders or other technical means being developed.

Proposals for airspace classification

To meet the expectations of the ATM community[1], refer to Appendix 4, the following proposals provide alternatives that could be adopted to standardise Australian airspace design and determine government policy. These proposals are not to be seen as finite choices but rather starting points for discussion. Alternate solutions that provide improved outcomes for industry, whilst maintaining airspace safety, can be provided in response to this paper.

Class of airspace – Upper airspace

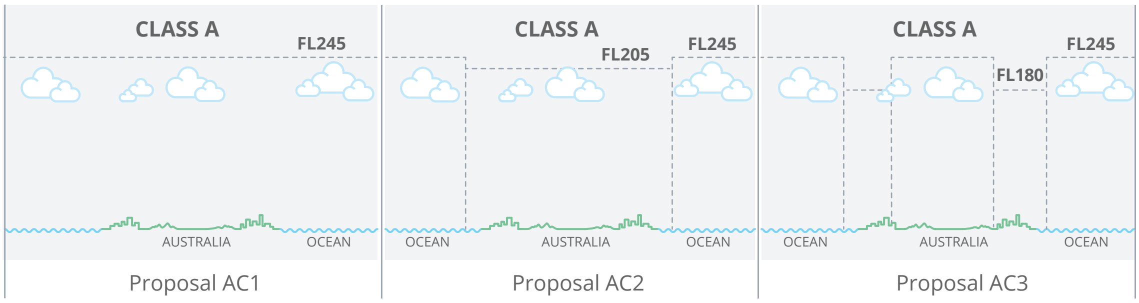
AC1. Class A airspace to be established and associated service to be provided in the airspace above FL245 across the Australian administered FIRs;

AC2. Class A airspace to be established and associated service to be provided in the oceanic airspace above FL245 and continental airspace above FL205 across the Australian administered FIRs; or

AC3. The current Class A airspace architecture status quo to be retained, with the airspace established and associated service provided above FL180 over Australian continental airspace on the east coast, Adelaide, Darwin, Alice Springs and Perth areas and above FL245 over the remaining Australian administered airspace.

1 The various organisations comprising the ATM community are: the Aerodrome community, Airspace providers, Airspace users, the ATM service providers, the ATM support industry, ICAO, Regulatory authorities and States.[25]

Figure 3: Upper level airspace proposals



Rationale

All three proposals align with A/PSANSP direction and at FL245 align with the majority of neighbouring FIRs. The Class A airspace protects high-level passenger operations in the cruise phase of flight.

Proposal AC1 provides a consistent base to the airspace, which simplifies charting, and knowledge of what rules are applicable in the airspace being transited. Proposal AC1 also provides increased access to airspace for VFR flights in the east coast and Perth area where Class E airspace underlies the Class A airspace with base FL180.

Proposal AC2 increases the access for VFR flights but without the simplification provided by proposal 1. Proposal AC2 also lowers the base of Class A over the entire continent to the maximum height for VFR flight without CASA approval, which will simplify charting and knowledge of what rules are applicable in the airspace being transited but not to the extent of proposal AC1.

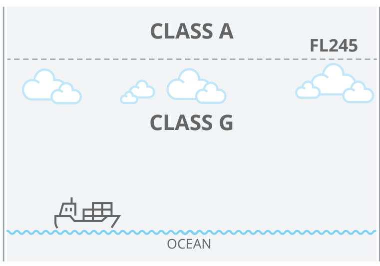
Proposal AC3 retains the status quo, which is considered acceptably safe but does not realise the benefits contained in proposals AC1 and AC2.

Class of airspace – Enroute oceanic airspace

AC4. Airspace below the oceanic Class A airspace across the Australian administered flight information regions to be classified as Class G unless Class E, D, C or B has been determined to maintain an ALoSP. Align the level of service in Class G oceanic airspace with the enroute continental airspace; or

AC5. Enroute oceanic airspace status quo to be retained as Class G.

Figure 4: Enroute oceanic airspace proposal



Rationale

This aligns with the majority of neighbouring FIRs, though it is not as consistent as the Class A airspace. The A/PSANSP objectives are silent in respect of this airspace and there is no evidence to indicate any safety issues exist. The level of service provided north of latitude 65°S is higher than that specified in ICAO Annex 11.

The particulars of the service in Australian Class G airspace are published in Section 9 of the Airspace Regulations 2007 and in the AIP. In Australia north of latitude 65°S IFR flights are considered to have ongoing flight information request and receive traffic information on other IFR flights and known VFR flights. VFR flights are able to request a flight information service. The *Air Services Act 1995* requires Airservices to provide the air traffic service. The Air Services Regulations 2019 include the provision of advice and information that is necessary for the safe and efficient conduct of flights as part of that air traffic service. The CASR Part 172 Manual of Standards then places the provision of that information on the ANSP, especially in respect to directed traffic to IFR aircraft who are leaving controlled airspace. To provide consistency in Class G airspace in Australian administered airspace, it is proposed that the particulars of the service provided in oceanic Class G remain in line with any decision made for enroute continental Class G airspace.

Proposal AC5 is similar to AC4 but that any decision in relation to the service provided in oceanic Class G will be addressed separately to decisions made for enroute continental airspace.

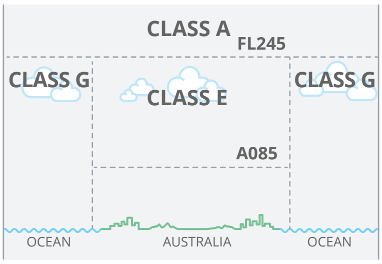
Class of airspace – Enroute continental airspace

Refer also to low level airspace proposals.

AC6. Airspace below the continental Class A airspace and above A085 (8,500FT AMSL on a local pressure setting) be classified as Class E (unless Class D, C or B has been determined to maintain an ALoSP).[2]

As this will result in 8,500FT of Class G airspace, it is proposed that the current level of service provided be retained. Regulations may need to be reviewed to support new entrants, the particulars of the service provided re-defined or systems integrated to address how information on new entrants being supported by new technology can operate within the airspace safely.

Figure 5: Enroute continental airspace, Class E base A085, proposal

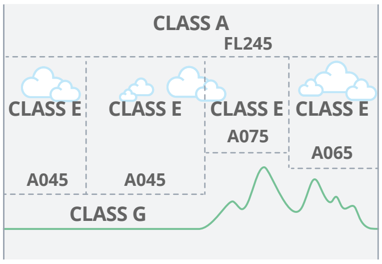


Note: Diagram is illustrative only and does not indicate all classes of airspace in use or options for upper airspace.

2 This level nominally provides 1,000FT clearance with terrain in Australia. Confirmation and agreement of no towers on the top of Mount Kosciusko required to reduce the LSALTs from Cooma.

AC7. Airspace below the continental Class A airspace be segmented based on grid LSALT and existing FIA boundaries be classified as Class E (unless Class D, C or B has been determined to maintain an ALoSP). The boundaries should also be in line with traffic density, surveillance and VHF coverage and should be charted using existing conventions. The Class G service be aligned with ICAO with flight information being available on request only with regulatory change considered and the particulars of the service provided be published in the AIP to support this;

Figure 6: Enroute continental airspace, GRID LSALT, proposal



Note: diagram is illustrative only and does not indicate all classes of airspace in use or options for upper airspace

AC8. Airspace below continental Class A airspace above 1,500FT above ground level (AGL) be classified as Class E (unless D, C or B has been determined to maintain an ALoSP). The Class G service be aligned with ICAO with flight information being available on request only with regulatory change considered and the particulars of the service provided be published in the AIP to support this;

Figure 7: Enroute continental airspace, Class E base 1,500FT AGL,proposal

Note: diagrams are illustrative only and do not indicate all classes of airspace in use or options for upper airspace.

AC9. Airspace below the continental Class A airspace be classified as Class E unless D, or C has been implemented in accordance with current determinations. Rationalise the low level Class E airspace at Rockhampton, Mackay, Avalon, to enable IFR aircraft to become airborne without a clearance. Review the Class E airspace at Broome to align with Karratha if it maintains an ALoSP. As this will result in 8,500FT or 12,500FT of Class G airspace, it is proposed that the current level of service provided be retained. Regulations will need to be considered to support new entrants, the particulars of the service provided re-defined or systems integrated to address how information on new entrants being supported by new technology can operate within the airspace; or

AC10. Airspace below the continental Class A airspace be classified as Class E, D, or C in accordance with current determinations. As this will result in 8,500FT or 12,500FT of Class G airspace, it is proposed that the current level of service provided be retained. Regulations will need to be considered to support new entrants, the particulars of the service provided re-defined or systems integrated to address how information on new entrants being supported by new technology can operate within the airspace.

Rationale

Class E airspace provides an additional protection to IFR aircraft from other IFR aircraft that does not exist in Class G, and permits VFR flights. Australia has already determined, unless a higher level of service has been determined on a risk basis, that some level of Class E airspace is required below the Class A airspace over continental Australia. This also aligns with the current SSP in having airspace to support safe operations.

Proposal AC6 provides a consistent base of Class E airspace across Australia. This proposal would lower the base of Class E airspace where the base is currently FL125 resulting in increased services to IFR aircraft. There may be a set of VFR aircraft that are affected by the transponder requirements for Class E airspace. This has not been quantified for the purposes of this paper but the result may be that VFR aircraft not fitted with a transponder will have fewer available levels in the Class G airspace. A review of surveillance and VHF coverage[12] indicates that coverage at A085 does not exist over the entire continental Australia, VHF ground based equipment or potentially satellite VHF would need to be commissioned. This has not been costed for the purposes of this paper. The consistent level would simplify charting and knowledge of what rules are applicable in the airspace being transited. As the proposal results in 8,500FT of Class G airspace, the proposal retains the current level of service. There is no evidence that the Class G airspace is not at an ALoSP. RPAS and eVTOL pose a challenge in the low level Class G airspace, as it may be known that they are operating but they are unlikely to be visible to other aircraft. The information provided in 'enroute oceanic airspace' details the current situation and the considerations needed to be given to the regulations, the provision of service or systems that would be required to support these entrants and maintain an ALoSP for manned flight.

Proposal AC7 would provide increased services to IFR aircraft but is a pragmatic approach based on the infrastructure already in place in Australia. The geographic boundaries could be aligned with current Class E boundaries and a small number of levels based on grid LSALTs be chosen. Charting to be aligned with current systems. This proposal would not require any infrastructure changes. Any reduction in the base of the Class E airspace may again affect VFR aircraft due to the transponder requirements in the airspace. As this proposal would need to be further developed with the implementation plan, the size of the impact is unknown. It is proposed that Class G would align with ICAO provisions and therefore consideration of supporting regulations and determinations would be required. This change may affect the workload of controllers in the Class E but be offset by reduction in service in the remaining Class G and hence potentially be cost neutral to industry in respect of Airservices charges. It would also mean that low level RPAS and eVTOL would not need to interact with the ATM system unless entering another class of airspace, potentially reducing the interaction or need for systems.

Proposal AC8 is aligned with some international jurisdictions. Switzerland commences at 2,000FT AGL and the Class G is aligned with ICAO in relation to the provision of service. Note: until recent alignment with European Union rules Switzerland did not permit IFR aircraft into the Class G airspace without specific approvals. This provides the greatest increase in services to IFR aircraft and correspondingly is likely to have the greatest impact on VFR aircraft not currently fitted with a transponder. This has not been quantified for the purposes of this paper but the result may be that VFR aircraft not fitted with a transponder remaining at lower levels in the Class G airspace. Placing the base of Class E at 1,500FT AGL may permit IFR aircraft to depart a location without an ATC clearance and maintain compliance with CAR 178 – Minimum height for flight under IFR. Planning Chart Australia indicates that, if this proposal was deployed across Australia, it is likely to have a higher cost impact than proposal AC6 as VHF coverage is less at this level. Surveillance is also limited at this level[13] and as such procedural separation would be required. A number of locations in Class G airspace also have standard instrument departures that include levels above 1,500FT AGL. To fly these procedures on IFR would require the clearance to be issued prior to departure. Some of those locations do not have VHF coverage on the ground. Countries where low level Class E airspace is applied across the airspace, in many cases, do not chart the base of the Class E. If not consistently applied across Australia, charting will need to indicate changes to the base of Class E airspace and, dependent on terrain, solutions determined on how to chart the interaction for locations with Class C steps based on above mean sea level (AMSL). As per proposal AC7 the Class G would align with ICAO, flight information service available on request.

Proposal AC9 retains the status quo but addresses some unusual scenarios, which will improve standardisation. This proposal AC9 is considered to retain an ALoSP. The proposal does not provide increased services to IFR aircraft and therefore potentially has no impact on Airservices staffing arrangements resulting in no cost implications for industry. Class G would be as per proposal AC6.

Proposal AC10 retains the status quo, which is considered to provide an ALoSP. The proposal does not provide increased services to IFR aircraft and therefore potentially has no impact on Airservices staffing arrangements resulting in no cost implications for industry. Class G would be as per proposal AC6.

Class of airspace – Terminal airspace

In this document 'terminal control area' is a generic term describing airspace surrounding an airport, excluding the control zone, where a decision has been made that an ATC service will be provided to IFR flights.

AC11. Terminal airspace be classified as Class E, D, C or B as required to maintain an ALoSP; or

AC12. Terminal airspace be classified as Class E, D, C or B as required to maintain an ALoSP but the first step that abuts the control zone should be the same class as the control zone to enable seamless lateral entry.

Note: dependent on the base of enroute control area, first step may be Class E

Rationale

Proposal AC11 retains the status quo, which is considered to provide an ALoSP. It does not provide standardisation, which may have an impact on the ability to realise benefits in the new ATM system. This proposal may be impacted by the discussion enroute continental airspace and the classification of terminal airspace may need to be reviewed post the outcome of this discussion.

Proposal AC12 also retains the status quo but the first step provides flexibility to new eVTOL entrants (refer to the section Class of Airspace – Control Zones for rationale).

The class chosen for the airspace is dependent on a number of factors including the level of service to be provided to VFR aircraft. Two examples are provided:

- Sydney Terminal Control Area (excluding the control zone): the airspace is currently Class C as there has been a determined need to separate IFR to IFR aircraft and IFR to VFR aircraft during the arrival and departure phase of flight. The air traffic control capacity currently exists for VFR to VFR to manage their own separation based on the provision of traffic information. When the Western Sydney International (Nancy-Bird Walton) Airport opens the controlled airspace available to VFR aircraft could become more constrained. It is likely at that time that an assessment may dictate that the terminal airspace may need be changed to Class B, where VFR to VFR separation is provided, to maintain an ALoSP. However, a review of VFR traffic may indicate that above A085, this may not be required and Class C airspace may be appropriate. A balance will need to be struck as to the number of airspace classes used and accessibility of the airspace. Consistency of levels used in the design modules should be as consistent as possible across the country so that human factors are considered for pilots to ensure that any possible change is understood.
- Camden is currently surrounded by Class G airspace. The Western Sydney International (Nancy-Bird Walton) Airport airspace design will overlie the Camden zone when implemented. As a use case it still requires consideration. There are very limited IFR movements at Camden, therefore in selecting airspace there are limited opportunities where there is a need to protect IFR from IFR. This is a location where potentially Class E airspace designed to protect the approach could overlie the control zone until it abuts the Sydney Class C terminal airspace. This would not restrict VFR operations, which make up the majority of Camden's movements.

A review of international practice indicated that the United States of America (USA) classifies complex high-density airspace as Class B, example Los Angeles. Class B requires all aircraft to be separated but at Los Angeles access for VFR is provided through special flight rules areas where an ATC clearance is not required but specified rules must be complied with.[14]

As RPAS and eVTOL operations expand within the Australian environment, selection of airspace class will be critical to provide the level of safety expected by the travelling public but also to provide flexibility, possibly without the need for special conditions as detailed for Los Angeles.

Class of airspace – Control zones

The Control Zone (designated CTR on aeronautical charts) is the volume of controlled airspace around an airport which extends from ground to a specified upper limit to protect air traffic operating to and from that airport.

AC13. All civil control zones in Australia to be classified Class D unless location specific circumstances dictate a different class is required to achieve ALoSP; or

AC14. The current class of airspace for control zones be retained and new control zones be classified D, C or B as determined to maintain an ALoSP.

Rationale

Under ICAO, Class E cannot be utilised for a control zone and therefore is not provided as a proposal in this discussion paper. Classes of controlled airspace are utilised to protect IFR flights to the level of the relevant class. This includes protection of the IFR flight on final approach and departure. As the controller does not control VFR aircraft in Class E, if this class was used for the control zone, the controller would not be able to protect an IFR flight on final approach or departure.

In respect of international best practice, Australia has traditionally looked towards the USA airspace system. To facilitate the increased flexibility required for growth and new entrants, whilst maintaining the safety of the system, other airspace systems need to be considered.

Proposal AC13 facilitates a standardised approach to class of airspace utilised for control zones and facilitates new entrants. This proposal aligns with Japan, United Kingdom and Germany.

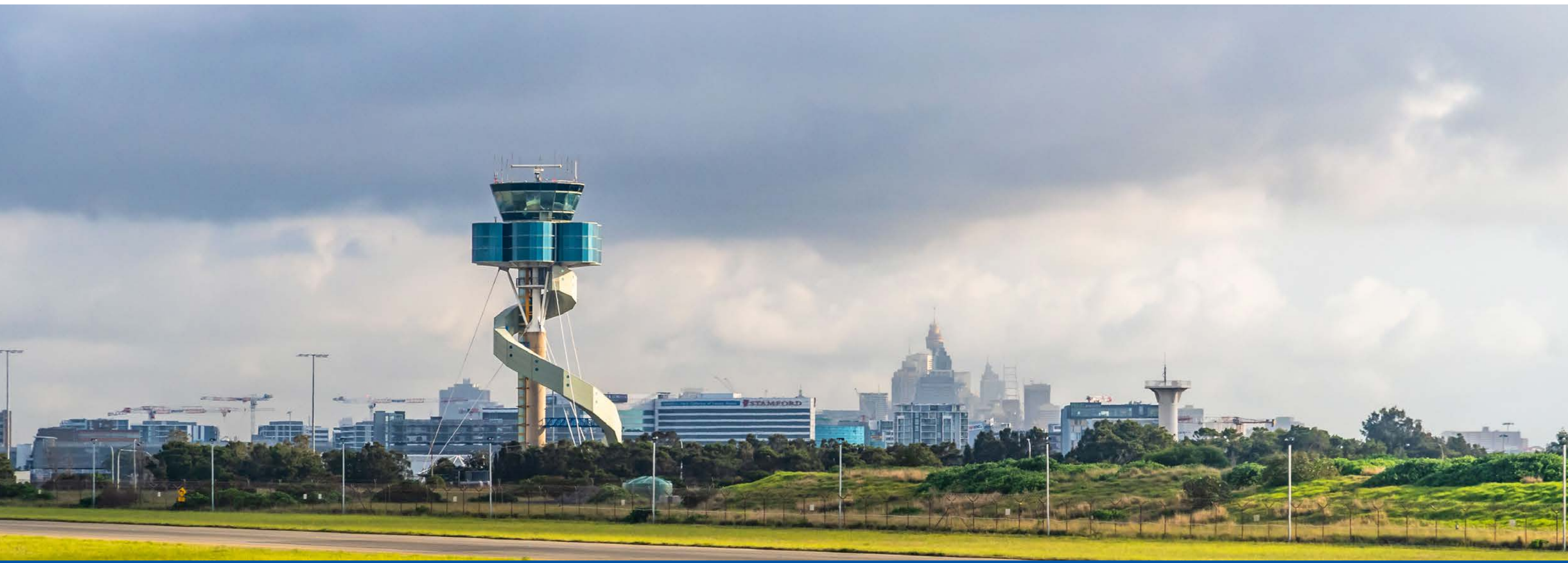
Class D airspace requires all aircraft to obtain a clearance, which provides control of entry by the ATC and hence manages the risk. In the case of London, Heathrow Airport, which reclassified the airspace to Class D in 2014, additional requirements also apply such that all aircraft are required to be transponder equipped. To access the 'inner area' (close proximity to the runway) prior permission by telephone is required. Commercial traffic in and out of Heathrow have priority. This change was seen as striking the best balance between VFR and Special VFR access and ensuring a safe and efficient air traffic environment.[15]

The classification of the control zone as Class D means that IFR to IFR aircraft are separated in accordance with the standards in ICAO Doc 4444 Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM). VFR and IFR traffic are not separated but, under ICAO Annex 11, the controller is required to provide a control service to prevent a mid-air collision. This is normally done via the provision of traffic information but could also be done by segregating manned flight paths from airways for future eVTOL and UAM operations.

The selection of Class D airspace for the control zone, in the identified countries, is not strictly based on safety but is a balance between safety, access, efficiency and economics. The argument is to manage the risk to an ALoSP. As the face of entrants in the industry changes and the demand for access to airspace increases, the traditional solution as utilised in Australia, is potentially no longer practicable with risks needing to be mitigated whilst facilitating growth in all sections of the industry.

Proposal AC14 retains the status quo, which is considered acceptably safe but does not easily provide for new entrants. The current system aligns with the USA.

Currently Australia utilises Class C and D airspace for control zones. The airspace modernisation program being proposed by Airservices is currently considering Class B airspace at Sydney and Melbourne.[16] Hobart control zone is in the process of being reclassified as Class C airspace.[17]
The airspace classification is assigned based on the higher service level, which equates to a lower level of risk. This assignment of classes is consistent with North America. The USA classify complex high-density airspace as Class B, example Los Angeles. This solution has potential limitations as new entrants may require access to the airspace for destinations that exist in the control zone or the terminal buildings at the airport itself. Regulatory solutions may be required to facilitate new entrants, especially eVTOLs, into Class C or B control zones as the separation standards utilised by controllers in this class of airspace could limit the number of aircraft in the zone at any one time, which may not support the expected number of aircraft to make such a service viable.



Proposals for low level airspace

The impact of the growth of RPAS and eVTOL operations in Australian airspace requires consideration in classifying airspace or determining the procedures to be applied in the airspace. In analysing input to this paper for policy consideration and the AFAF, input to the National Aviation Policy Issues Paper on Emerging Aviation Technologies (NEAT) will also be taken into account. This section repeats some previous work and provides additional proposals to stimulate discussion. Australia does not currently have any airspace designated as low-level airspace. However, the AFAF is considering such airspace to support RPAS and eVTOL operations. Input from this paper will serve to provide further considered opinions on the efficacy of such airspace. Aspects to consider are the heights of current manned aircraft operations either over urban or rural areas, locations of aerodromes and helicopter landing sites, critical infrastructure protection and other community concerns that will be raised out of the NEAT paper.

The NEAT proposed approach to policy development indicates:

- Airspace integration – The Australian Government, in partnership with industry, is considering the development of a UTM system that would support a combination of centralised government services and industry-provided services that will facilitate access to airspace by relevant RPAS and eVTOL aircraft whilst mitigating a wide range of risks and impacts, not only airspace risks but others such as security, noise and privacy.
- Electric Vertical Take-Off and Landing Vehicles – The Australian Government will work with all relevant stakeholders to develop measures for safe, efficient, considerate and reliable eVTOL operations in a competitive market that supports safe, efficient and equitable access for all airspace users of the relevant airspace.

Condsideration of these issues are also taking place at an international level. The European Union: U-space is a set of new services relying on a high level of digitalisation and automation of functions and specific procedures designed to support safe, efficient and secure access to airspace for large numbers of drones. U-space is an enabling framework designed to facilitate any kind of routine mission, in all classes of airspace and all types of environment - even the most congested - while addressing an appropriate interface with manned aviation and air traffic control.[18]

To meet the expectations of the ATM community, refer to Appendix 4, the following proposals provide alternatives that could be adopted to facilitate drone and eVTOL access, dependent on equipment fitment, in Australian airspace whilst maintaining an ALoSP to form government policy. These proposals are not to be seen as finite choices but rather starting points for discussion. Alternate solutions that provide improved outcomes for industry, whilst maintaining airspace safety, can be provided in response to this paper.

Low-level airspace

LL1. Standardised procedures be implemented for all airspace classifications:

- at or below 400FT AGL;
- within current airspace classifications;
- outside of 3NM from a controlled aerodrome;
- CASR 101 is the basis for drone operations;
- manned aircraft take-off or landing or specific low level approvals; or

LL2. To maintain an ALoSP, areas of airspace be declared with appropriate procedures:

- at or below 400FT AGL;
- within current airspace classifications;
- outside of 3NM from a controlled aerodrome;
- CASR 101 is the basis for drone operations;
- manned aircraft take-off or landing or specific low level approvals;
- procedures documented to take into account the operating environment, e.g. traffic management, right of way for manned aircraft, etc...;
- interaction with air traffic system; or

LL3. A new class of airspace be established and charted when required and levels of service to maintain an ALoSP:

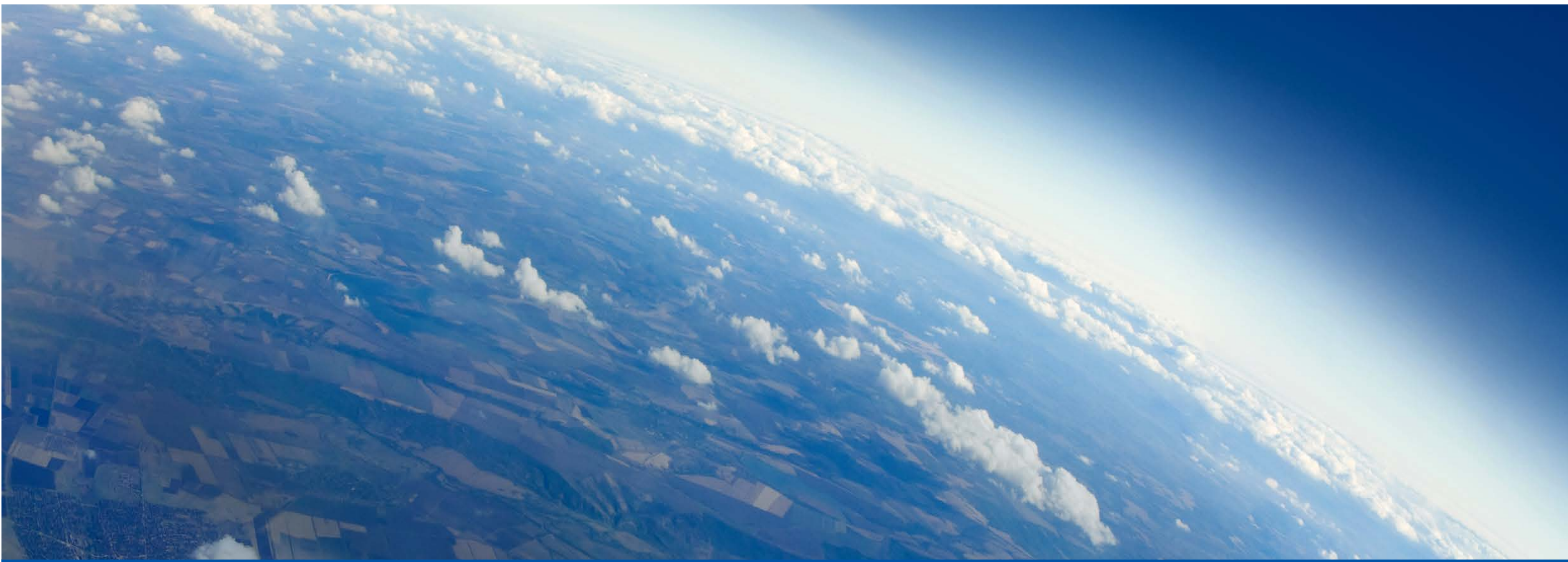
- at or below 400FT AGL;
- could build on LL1 or LL2.

Rationale

Proposal LL1 builds on current legislation for drones but incorporates interactions with manned aviation and determines the level of services provided. This proposal has limitations in that in some locations it may not be required due to low density of traffic and in other locations may not maintain an ALoSP.

Proposal LL2 builds on current legislation for drones but additional procedures and/or services are provided only where analysis indicates it is required to maintain an ALoSP. By declaring the airspace, CASA can publish procedures that are appropriate to the circumstance, e.g. local traffic arrangements, aerodromes with CA/GRS. This permits differentiation of procedures dependent on the density of traffic and the operating environment. Unlikely that regional areas would require this designation.

Proposal LL3 builds on accepted airspace conventions but is not aligned to ICAO and is not consistent with current international practice, which is using technological and procedural solutions in existing airspace. It also provides a single solution that may not be appropriate in regional locations. Could be used as an enhancement of LL2 with LL1 applying outside of charted areas.



Proposals for airspace design

Airspace design is the planning of routes, waypoints, holding patterns and instrument procedures within the airspace classes to ensure efficiencies in flight miles, savings on fuel use and flight miles, separation standards, containment of instrument flight rules and safety. It consists of the volumes and shapes of the various classes of airspace and works with the airspace classification to ensure an ALoSP is achieved.

Airspace design in Australia has varied over the years and as a result there is incomplete standardisation in relation to control area steps or control zones. Regulatory compliance issues exist with the protection of instrument approaches to controlled aerodromes and consideration of future ICAO ASBUs such as continuous climb operations and continuous descent operations have not been incorporated yet.

In formulating proposals for future airspace design in Australia current known scenarios, issues, constraints and the different operating environments were taken into account. In addition to the expectations outlined in the GATMOC, the GANP, the RANP and the A/PSANSP the following points were considered:

Control zones

- Currently there is no standardised design of control zones within Australia nor upper level assigned to those control zones. It is acknowledged that due to the local conditions such as; close proximity of some aerodromes, terrain, traffic, instrument approaches, aircraft category circling areas and departure requirements, consistency will not always be possible. Despite this, a basic framework could be valuable, with local variations implemented and explained where necessary. There is also currently no standardised reference point for control zones from which each zone is measured. Some control zones are based on the runway threshold, some based on a navigation aid and some based on the aerodrome reference point. Refer to Appendix 6 for a list of the Australian civil control zones and their respective reference points.

- CASR Part 173 requires that instrument approaches to controlled aerodromes be contained in controlled airspace. Appendix 6 provides details on civil control zones within Australia and their compliance in containing Required Navigation (RNAV) approaches. As an example, Camden is surrounded by Class G airspace. ICAO Annex 11 permits this situation but the airspace is required to contain the instrument approach under CASR Part 173 and this requirement is not currently being met.
- ICAO Annex 11 states that the lateral limits of control zones shall encompass at least those portions of the airspace, which are not within control areas, containing the paths of IFR flights arriving at and departing from aerodromes to be used under instrument meteorological conditions. The lateral limits of a control zone shall extend to at least 5NM from the centre of the aerodrome or aerodromes concerned, in the directions from which approaches may be made.[9]
- Utilising this information, to contain a 3˚ slope straight in instrument approach, in the vertical plane, a control zone would need to extend to 5NM from the threshold if the first control area step was 1,000FT above terrain and was not a usable IFR level. Alternately it would need to extend to 6.5NM from the threshold if the first control area step was 1,500FT above terrain. Conventional navigation approaches, retained as part of the backup navigation network (BNN), have larger containment areas than RNAV and Instrument Landing System (ILS) approaches. Australia has implemented a GNSS mandate for IFR aircraft and RNAV approaches were implemented as part of this change. This is in line with the GANP performance based navigation elements. The category of aircraft that operate at the location also needs to be considered in the design. The circling area for a category D aircraft requires 5.2NM, whilst a category C aircraft requires 4.1NM.
- Internationally there is no consistent approach in the design of control zones. For a Class D control zone the USA normally place the upper limit 2,500FT above the airport elevation.[19] A review of the Canadian Designated Airspace Handbook[20] indicated that the calculations were based above the aerodrome elevation and then rounded but there was no consistent methodology apparent. The airspace explanation chart indicated 3,000FT but this was not supported by evidence in the Canadian Designated Airspace Handbook.
- Though control zones exist in Europe the thinking has transitioned to the European Route Network Improvement Plan where the focus is on the terminal airspace as an entity, not as individual elements such as the control zone. The intent though remains unchanged with only the airspace necessary to contain the terminal routes being designated as terminal airspace so as not to constrain the operation of non-participating (usually VFR) flights.[21]A review of the United Kingdom's control zones does not provide a consistent height but London and Gatwick appear to be 2,000FT above ground level rounded up to the VFR level.[22]

Terminal control area

- In this document, terminal control area is a generic term describing airspace surrounding an airport where a decision has been made that an air traffic control service will be provided to IFR flights. There is currently no consistent lateral or vertical design of airspace surrounding the control zone. As per a control zone, there are many parameters that affect the design of terminal control area, including the need to protect the instrument approaches. As a result, each design will be unique, but a basic framework could be agreed to ensure designs are as standardised as possible.
- Terminal Control Areas need to be of sufficient size to contain the controlled traffic around the busier aerodromes.[23] This includes the lateral and vertical path. Traditionally in Australia this is a fixed airspace design. The airspace may be active, dependent on tower hours but once activated, the airspace is as published on the charts and in the Australian Designated Airspace Handbook. Europe has proposed a further improvement in that 'airspace configurations' may be activated depending on the runway configuration in use at a particular time.[21] The 'airspace configuration' refers in this case to the terminal routes, associated airspace structures and ATC sectorisation. To also drive efficiency in the design Europe is transitioning to performance based route structures with the terminal control area and are including Continuous Climb Operations (CCO) and Continuous Descent Operations (CDO) in the design.
- Canada provides some general guidance indicating that airspace will normally be designed in a circular configuration, centred on the geographic coordinates of the primary aerodrome. The outer limit of the Terminal Control Area should be at 45NM radius from the aerodrome geographic coordinates based at 9,500FT AGL, with an intermediate circle at 35NM based at 2,200FT AGL and an inner circle at 12NM radius based at 1,200FT AGL.[24]
- ICAO Annex 11 indicates that the lower limit of a control area shall be established at a height above the ground or water of not less than 700FT.[9] It should be noted that this does not provide a usable IFR level in Class G airspace.
- The European guidelines are clear in this respect that, *"to the extent possible, where the terminal airspace is surrounded by uncontrolled airspace, the protected airspace of designated terminal routes and holding areas are to be contained within the terminal airspace in both the lateral and vertical plane"*. [21]
- The vertical depth of the steps will then determine lateral distance of the step. Rough calculations would indicate that 1,000FT vertical steps would be at 3NM intervals with 2,000FT steps at 6NM intervals. These calculations vary in reality as the vertical containment is based on the threshold but the steps are based on the DME or ARP and at some locations appear rounded.
- A review of locations indicate that the inner steps tend to have 1,000FT steps in close proximity, then 2,000FT steps and increasing vertical steps at 36NM.
- Terminal containment needs to be considered. Regardless of height or distance, the steps should permit instrument approach containment and continuous climb or descent operations.

Enroute control area

- In this document 'enroute control area' is a generic term describing airspace, excluding control zones and terminal control areas, where a decision has been made that an ATC service will be provided to IFR flights. The design of enroute control areas will be primarily determined through the options discussed in the previous section 'Class of Airspace – Enroute Continental Airspace' except for two areas of discussion.
  - When an assessment of the ALoSP determines that Class E airspace does not provide sufficient protection and the airspace is to be classified as Class D, C or B.
  - Dependent on the base of Class E consideration is required for locations that do not require a controlled aerodrome but where an IFR separation service has been determined as being required. A current example of this are the steps descending into Ayers Rock / Connellan (YAYE) airport. A CA/GRS is provided at the airport, which is currently assessed as an appropriate level of risk control for the airspace in the vicinity of the airport, but a determination was made that an IFR separation service was potentially required in the arrival and departure phase of flight. The lower level was decided following consultation with industry and is above the commencement of the instrument approach.
- The design for enroute airspace could provide efficiencies by considering continuous climb and descent operation such that aircraft are not transiting airspace class steps. This would provide consistency from the terminal area design to enroute airspace. There is currently no consistent design across Australia. To the north of Sydney, the Class C control area steps, outside of the terminal area tend to include a FL125 step and a FL155 step with Class A commencing at FL180. Between Sydney and Melbourne there is continual Class C with a base of FL125. Melbourne to Adelaide has a wide Class C step at FL125 before transitioning to Class A at FL245 but on the Adelaide side transitions to Class A FL80 before a Class C step at FL125. Perth and Darwin have a similar step design to Adelaide.

To meet the expectations of the ATM community, refer to Appendix 4, the following proposals provide alternatives that could be adopted to standardise Australian airspace design and influence government policy. These proposals are not to be seen as finite choices but rather starting points for discussion. Alternate solutions that provide improved outcomes for industry, whilst maintaining airspace safety, can be provided in response to this paper.

Airspace design – Control zones

AD1. The basis for control zone design to be:

- 1,000FT above the airport elevation rounded to a VFR level at least 500FT above the IFR level (provides protection for an aircraft in the circuit if the overlying airspace is Class E)

Note: The impact of the proposed height changes can be seen in Appendix 7.

- 7NM from the runway thresholds (based on the first CTA step being 1,500FT above terrain)
- Width based on the category of aircraft permitted to utilise the airport and the allowance for circling approach

Note: This can be discounted if circling approaches are not permitted at the airport.

- Depictions based on the aerodrome reference point;

AD2. The current control zone designs be retained with the exception that control zones that do not contain instrument approaches be amended to do so as per proposal 1; or

AD3. Retain the current control zone designs without review.

Rationale

Proposal AD1 permits procedural compliance with CASR Part 173 and ICAO Annex 11 and provides a common datum point for measurement. The common datum point may reduce airspace infringements thus increasing safety. An aircraft operating to remain clear of the control zone may not have the threshold data in the system but should have the aerodrome reference in the data set. DME/NDB references should not be the principle reference point, as these are now part of the backup navigation network. In some cases proposal AD1 will reduce the size of the control zone and in other cases there will be an increase.

Note: The zone may be controlled by the aerodrome tower or an approach control unit, e.g. if this proposal is accepted Archerfield tower may control to 1,500FT with Brisbane approach controlling the remainder of the zone to facilitate both Archerfield and Brisbane traffic.

Proposal AD2 does not provide standardisation but addresses the containment issue for instrument approaches. This will result in the increase of some control zones without a decrease in larger zones such as Adelaide.

Proposal AD3 retains the status quo and all known issues.

Airspace design – Terminal control area

AD4. The basis for terminal control area design to be:

- The first step to be 1,500FT above terrain (based on 7NM control zone)
- The vertical increments for control area steps should be 1,000FT until 8,500FT
- Continuous climb and descent gradients and instrument approach procedures protected;

AD5. The terminal control area designs be retained with the exception that designs that do not contain instrument approaches be amended to do so; or

AD6. Retain the current terminal control area designs without review.

Rationale

Proposal AD4 provides for standardisation as far as possible whilst containing instrument approach procedures (CASR Part 173) and facilitating continuous climb and descent procedures which create fuel efficiencies and hence facilitates reduction in greenhouse gases. Placing the steps at 1,000FT increments provides more airspace to other users below the steps without affecting the aircraft they are designed to protect.

Note: The base of Class E and the level of protection will affect the number of vertical increments required.

Proposal AD5 generally retains the status quo but provides for CASR Part 173 compliance.

Proposal AD6 retains the status quo with all known issues.

Airspace design – Enroute control area

AD7. The basis for enroute control area design, in addition to the Class E airspace discussion, to be:

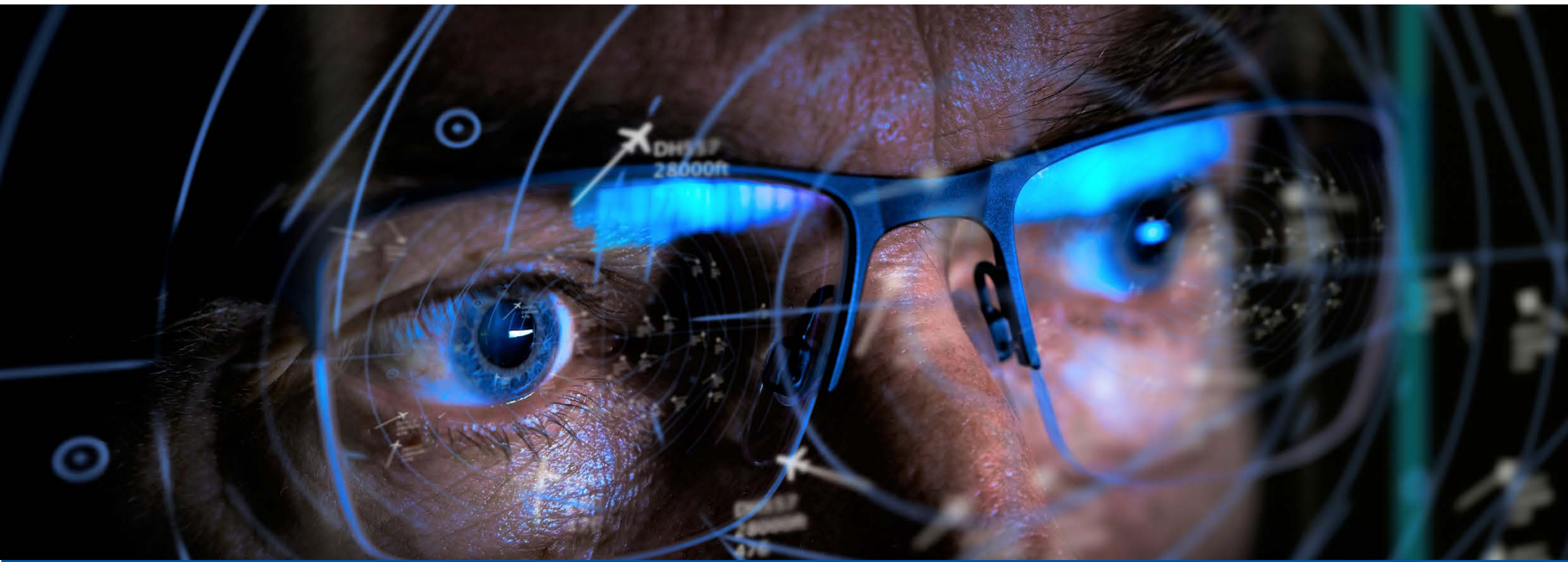
- The vertical increments for control area steps outside the terminal control area design be 4,000FT until the base of Class A airspace with continuous climb and descent gradients protected
- Where IFR arrivals/departures are required to be protected for a certified aerodrome in Class G airspace the vertical increments should be 1,000FT below 8,500FT (dependent on the base of Class E airspace); or

AD8. Retain the current enroute control area designs without review.

Rationale

Proposal AD7 provides for standardisation as far as possible whilst containing facilitating continuous climb and descent procedures, which create fuel efficiencies and hence facilitates reduction in greenhouse gases. Placing the steps at 4,000FT increments is roughly consistent with current practice and should not affect users below the steps or users the steps are designed to protect.

Proposal AD8 retains the status quo with all known issues.



Consequential discussion points

Whilst identifying proposals for airspace design and classification the following discussion points have been included in the paper for further consideration from either a policy direction, design or related issue perspective. Performance Based Navigation (PBN), continuous climb and descent, air routes and track miles and ATC vectoring are all issues that the respondent may consider. The issues listed below are not seen as a definitive list of issues and respondents can raise additional points for consideration.

1. Safety, though the prime determinant, is not the only determining element for the choice of airspace class and the assessment should be, that given all the factors, the risk is reduced in accordance with ALARP principles to achieve an ALoSP.

   Rationale – this approach needs to be taken to facilitate changes in traffic caused by new entrants into the system.

2. On completion of the AFAF, rescind the *Air Services Act 199*5 Section 16 Direction No. 4 of 2004, which determines a level of service provision.

   Rationale – the AFAF will analyse the outcomes of this discussion paper and will consider them in accordance with the GATMOC expectations and the key performance areas derived from them. The AFAF will then be the document that provides the class of airspace and service to be provided. The direction will no longer be required and/or will not be consistent with the framework and will not be in line with CASA regulatory delegations.

3. Where a surveillance service is provided in a control zone, fitment and use of a transponder is required unless alternate solutions are in place, e.g. airways for RPAS/eVTOL or VFR flights.

Rationale – this aligns with the UK requirement for the use of Class D for control zones. Makes use of surveillance and if the base of Class E is lowered then the impact is minimal as the fitment and use of a transponder is a requirement in Class E.

4. Airservices sectorisation could be reviewed for consistency, including but not limited to:
   - Consistent upper limit of surveillance terminal areas (Cairns, Brisbane, Melbourne – FL180, Perth & Adelaide – FL245, Sydney – FL280)
   - Regional towers (currently either A045 or A055)

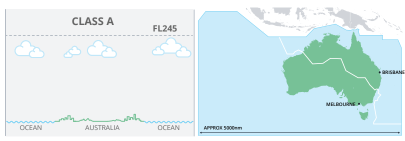
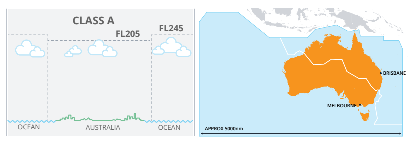
   Rationale – this would provide greater understanding by pilots as to what frequency they should utilising. Additionally, if free route airspace is introduced or user preferred routing expanded in the Class A airspace it is potentially not appropriate for the terminal area to be involved with these flights.

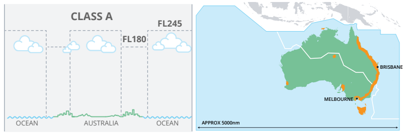
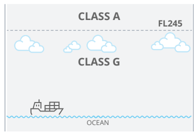
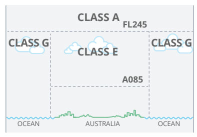
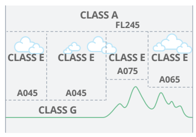
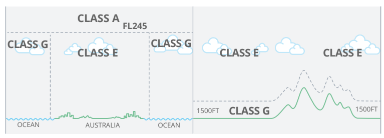
Appendices

Appendix 1 – Summary of proposals

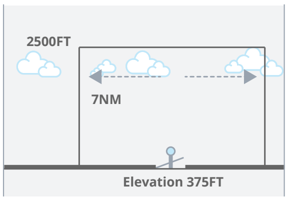
These proposals are not to be seen as finite choices but rather starting points for discussion. Alternate solutions that provide improved outcomes for industry can be provided in response to this paper.

Note: Diagrams are illustrative only and do not indicate all classes of airspace in use or airspace options.

Summary of proposals			
Class of airspace – Upper airspace			
AC1	Class A	The airspace to be established and the service provided above FL245 within the Australian administered FIRs.	
AC2	Class A	The airspace to be established and the service provided above FL205 over Australian continental airspace and above FL 245 over the Australian administered oceanic airspace.	

Summary of proposals			
AC3	Class A	Retain the current configuration with the airspace established and the service provided above FL180 over Australian continental airspace on the east coast, Adelaide, Darwin, Alice Springs and Perth areas and above FL245 over the remaining Australian administered airspace.	
Class of airspace – Enroute oceanic airspace			
AC4	Class G[3]	Consistent with current airspace design, the service to be provided in the airspace below the oceanic Class A airspace across the Australian administered FIRs.	
AC5	Class G	Consistent with current airspace design but any change in the level of service provided in continental Class G will not automatically apply to oceanic Class G.	
Class of airspace – Enroute continental airspace			
Proposals are the default position unless Class D, C or B has been determined to maintain an ALoSP			
AC6	Class E/G	The service to be provided below the continental Class A airspace above A085 be as per Class E. Current service arrangements for Class G below the Class E. Work to continue to determine how new entrants fit within the Class G airspace service provision.	
AC7	Class E/G	The service to be provided below the continental Class A and above the highest grid LSALT, within the existing FIA boundaries, to be Class E. Align the Class G service below the Class E with ICAO, with flight information being available on request only.	
AC8	Class E/G	The service to be provided below the continental Class A and above 1,500FT AGL to be Class E. Align the Class G service below the Class E with ICAO, with flight information being available on request only.	
AC9		Current airspace classifications and service provision be retained. The Class E airspace at Rockhampton, Mackay, Avalon, Broome and Karratha be reviewed. Work to continue to determine how new entrants fit within the Class G airspace service provision.	
AC10		Current airspace classifications and service provision be retained. Work to continue to determine how new entrants fit within the Class G airspace service provision.	

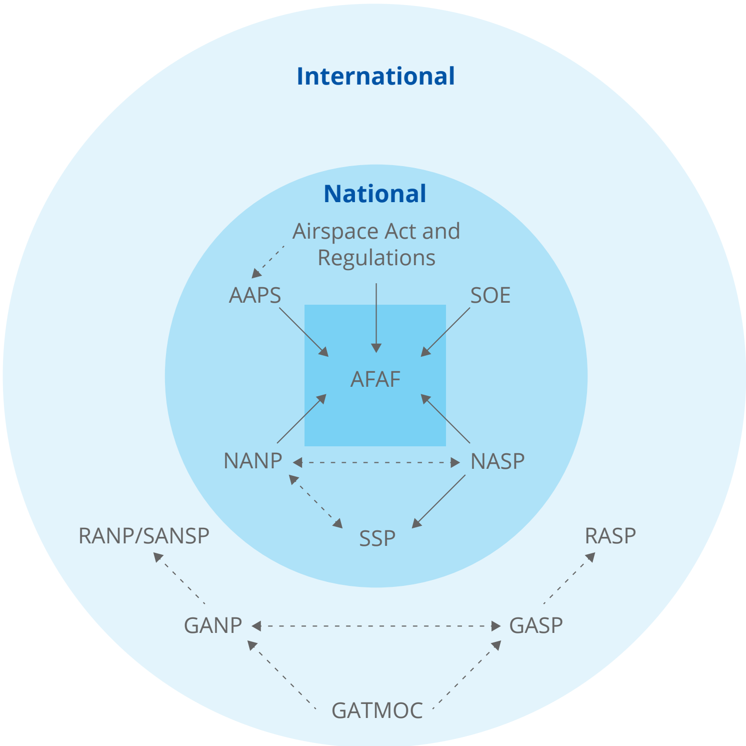
2 In Australia north of 65°S IFR flights are considered to have on ongoing flight information request and receive traffic information on other IFR flights and known VFR flights. VFR flights are able to request a flight information service.

Summary of proposals		
Class of airspace – Terminal airspace		
AC11		The level of service to be as per Class E, D, C or B as required to maintain an ALoSP.
AC12		The level of service to be as per Class E, D, C or B as required to maintain an ALoSP, but the first step that abuts the control zone should be the same class as the control zone to enable seamless lateral entry.
Class of airspace – Control zones		
AC13	Class D	The service to be provided for all civil control zones.
AC14	Class C/D	The current level of service be retained.
Low level airspace		
LL1	Standardised procedures be implemented for airspace: • at or below 400FT AGL • within current airspace classifications • outside of 3NM from a controlled aerodrome; • drones in line with current operating requirements specified in CASR 101; • manned aircraft take-off or landing or specific low level approvals	
LL2	To maintain an ALoSP, areas of airspace be declared with appropriate procedures: at or below 400FT AGL • within current airspace classifications • outside of 3NM from a controlled aerodrome • CASR 101 base operating standard for drones; • manned aircraft take-off or landing or specific low level approvals; • procedures documented to take into account the operating environment, e.g. traffic management, right of way for manned aircraft, etc...; • interaction with air traffic system	
LL3	A new class of airspace be established, e.g. Class H, levels of service determined and charted when required to maintain an ALoSP.	
Airspace design – Control zones		
AD1	The basis for control zone design to be: • 1,000FT above the airport elevation rounded to a visual flight rules (VFR) level at least 500FT above the IFR level • 7 nautical miles (NM) from the runway thresholds • Width based on the category of aircraft permitted to utilise the airport and the allowance for circling approach • Distances and charting to be based on the aerodrome reference point.	
AD2	Retain the current control zone designs with the exception that control zones that do not contain instrument approaches be amended to do so as per proposal 1.	
AD3	Retain the current control zone designs.	

Summary of proposals	
Airspace design – Terminal control area	
AD4	The basis for terminal control area design to be: • The first step to be 1,500FT above terrain (based on 7NM control zone) • The vertical increments for control area steps should be 1,000FT until 8,500FT • Continuous climb descent gradients and instrument approach procedures protected
AD5	The terminal control area designs be retained with the exception that designs that do not contain instrument approaches be amended to do so
AD6	The current terminal control area designs be retained without review.
Airspace design – Enroute control area	
AD7	The basis for enroute control area design, in addition to the Class E airspace discussion, to be: • The vertical increments for control area steps outside the terminal control area design be 4,000FT until the base of Class A airspace with continuous climb and descent gradients protected. • Where IFR arrivals/departures are required to be protected for a certified aerodrome in Class G airspace the vertical increments should be 1,000FT below 8,500FT (dependent on the base of Class E airspace).
AD8	The current enroute control area designs be retained without review.

Appendix 2 – Document relationships

Relationship between International and National documents



The international documents influence the direction taken by Australia. Consideration is given to both the global and regional priorities in determining the outcome for Australian industry. The AFAF is only one of a number of outputs of the NANP and the NASP.

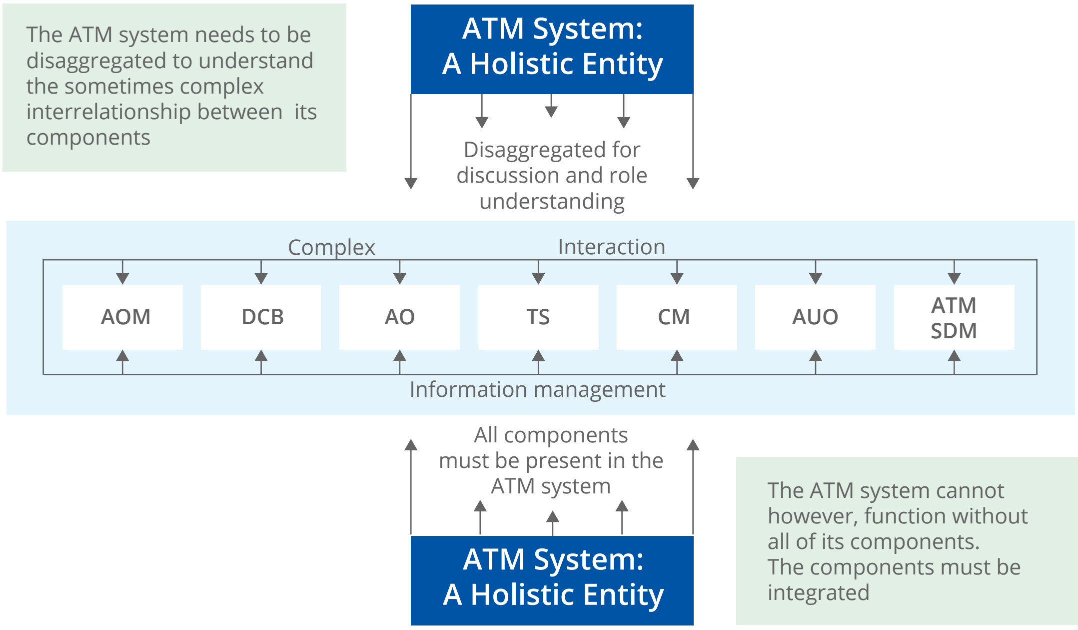
* The NANP will replace Australia's ATM Plan 2017.

GATMOC	Global Air Traffic Management Operational Concept (ICAO Doc 9854)
GANP	Global Air Navigation Plan (ICAO Doc 9750)
GASP	2020-2022 Global Aviation Safety Plan (ICAO Doc 10004)
RANP	Asia and Pacific (APAC) Air Navigation Plan
A/PSANSP	Asia/Pacific Seamless Air Navigation Services Plan
RASP	Regional Aviation Safety Plan
SSP	State Safety Program
NANP	National Air Navigation Plan
NASP	National Aviation Safety Plan
AAPS	Australian Airspace Policy Statement
SOE	Statement of Expectations
AFAF	Australian Future Airspace Framework

APPENDICES

Appendix 3 – Air Traffic Management system

The seven ATM concept components[25]



AOM	Airspace organization and management
DCB	Demand/capacity balancing
AO	Aerodrome operations
TS	Traffic synchronization
CM	Conflict management
AUO	Airspace user operations
ATM SDM	ATM service delivery management

Appendix 4 – GATMOC expectations[25]

Key to the operational concept is a clear statement of the expectations of the ATM community. These expectations stem from efforts to document ATM "user requirements". The expectations hereafter are interrelated and cannot be considered in isolation. Furthermore, while safety is the highest priority, the expectations are shown in alphabetical order.

APPENDICES

Access and equity

A global ATM system should provide an operating environment that ensures that all airspace users have right of access to the ATM resources needed to meet their specific operational requirements and that the shared use of airspace by different users can be achieved safely. The global ATM system should ensure equity for all users that have access to a given airspace or service. Generally, the first aircraft ready to use the ATM resources will receive priority, except where significant overall safety or system operational efficiency would take precedence, or national defence considerations or interests dictate that priority be determined on a different basis.

Capacity

The global ATM system should exploit the inherent capacity to meet airspace user demands at peak times and locations while minimizing restrictions on traffic flow. To respond to future growth, capacity must increase, along with corresponding increases in efficiency, flexibility and predictability, while ensuring that there are no adverse impacts on safety and giving due consideration to the environment. The ATM system must be resilient to service disruption and the resulting temporary loss of capacity.

Cost-effectiveness

The ATM system should be cost-effective, while balancing the varied interests of the ATM community. The cost of service to airspace users should always be considered when evaluating any proposal to improve ATM service quality or performance. ICAO policies and principles regarding user charges should be followed.

Efficiency

Efficiency addresses the operational and economic cost-effectiveness of gate-to-gate flight operations from a single-flight perspective. In all phases of flight, airspace users want to depart and arrive at the times they select and fly the trajectory they determine to be optimum.

Environment

The ATM system should contribute to the protection of the environment by considering noise, gaseous emissions and other environmental issues in the implementation and operation of the global ATM system.

Flexibility

Flexibility addresses the ability of all airspace users to modify flight trajectories dynamically and adjust departure and arrival times, thereby permitting them to exploit operational opportunities as they occur.

Global interoperability

The ATM system should be based on global standards and uniform principles to ensure the technical and operational interoperability of ATM systems and facilitate homogeneous and non-discriminatory global and regional traffic flows.

Participation by the ATM community

The ATM community should have a continuous involvement in the planning, implementation and operation of the system to ensure that the evolution of the global ATM system meets the expectations of the community.

Predictability

Predictability refers to the ability of airspace users and ATM service providers to provide consistent and dependable levels of performance. Predictability is essential to airspace users as they develop and operate their schedules.

Safety

Safety is the highest priority in aviation, and ATM plays an important part in ensuring overall aviation safety. Uniform safety standards and risk and safety management practices should be applied systematically to the ATM system. In implementing elements of the global aviation system, safety needs to be assessed against appropriate criteria and in accordance with appropriate and globally standardized safety management processes and practices.

Security

Security refers to the protection against threats that stem from intentional acts (e.g. terrorism) or unintentional acts (e.g. human error, natural disaster) affecting aircraft, people or installations on the ground. Adequate security is a major expectation of the ATM community and of citizens. The ATM system should therefore contribute to security, and the ATM system, as well as ATM-related information, should be protected against security threats. Security risk management should balance the needs of the members of the ATM community that require access to the system, with the need to protect the ATM system. In the event of threats to aircraft or threats using aircraft, ATM shall provide the authorities responsible with appropriate assistance and information.

Appendix 5 – ICAO airspace classes[9]

Class	Type of flight	Separation provided	Service provided	Speed limitation*	Radio communication requirement	Subject to an ATC clearance
A	IFR only	All aircraft	Air traffic control service	Not applicable	Continuous two-way	Yes
B	IFR	All aircraft	Air traffic control service	Not applicable	Continuous two-way	Yes
	VFR	All aircraft	Air traffic control service	Not applicable	Continuous two-way	Yes
C	IFR	IFR from IFR IFR from VFR	Air traffic control service	Not applicable	Continuous two-way	Yes
	VFR	VFR from IFR	1) Air traffic control service for separation from IFR 2) VFR/VFR traffic information (and traffic avoidance advice on request)	250 kt IAS below 10,000FT AMSL	Continuous two-way	Yes
D	IFR	IFR from IFR	Air traffic control service, traffic information about VFR flights (and traffic avoidance advice on request)	250 kt IAS below 10,000FT AMSL[4]	Continuous two-way	Yes
	VFR	Nil	IFR/VFR and VFR/VFR traffic information (and traffic avoidance advice on request)	250 kt IAS below 10,000FT AMSL	Continuous two-way	Yes
E	IFR	IFR from IFR	Air traffic control service and, as far as practical, traffic information about VFR flights	250 kt IAS below 10,000FT AMSL	Continuous two-way	Yes
	VFR	Nil	Traffic information as far as practical	250 kt IAS below 10,000FT AMSL	No[5]	No
F	IFR	IFR from IFR as far as practicable	Air traffic advisory service; flight information service	250 kt IAS below 10,000FT AMSL	Continuous two-way	No
	VFR	Nil	Flight information service	250 kt IAS below 10,000FT AMSL	No	No
G	IFR	Nil	Flight information service	250 kt IAS below 10,000FT AMSL	Continuous two-way	No
	VFR	Nil	Flight information service	250 kt IAS below 10,000FT AMSL	No	No

* When the height of the transition altitude is lower than 10,000FT AMSL, FL100 should be used in lieu of 10,000FT.

4 Australia – additional speed restriction applies
5 Australia - VHF is required

APPENDICES

APPENDICES

Appendix 6 – Australian Civil Control Zones

Location	Height	Elevation (FT)	Lateral limits[6]	Current airspace class	First CTA step	RNAV approach contained
Adelaide	SFC – 1,500	20	11NM based on DME	Class C	C LL 1,500, C LL 2,500	Yes
Brisbane	SFC – 3,500	13	7NM based on RWY Threshold	Class C	C LL 1,000, C LL 1,500	Yes
Cairns	SFC – 1,500	10	7NM based on RWY Threshold	Class C	C LL 1,000, C LL 1,500, C LL 2,500, C LL 3,500	Yes
Canberra	SFC – 3,500	1886	8NM based on YSCB/AD	Class C	C LL 3,500	Yes
Darwin	SFC – 1,000	103	7NM based on RWY Threshold	Class C	C LL 1,000, C LL 2,500 (D288A)	Yes
Essendon	SFC – 1,500	282	In YMML control zone	Class C	C LL 1,500	Yes
Gold Coast	SFC – 1,500	21	7NM based on DME	Class C	C LL 1,500, C LL 2,500	Yes
Melbourne	SFC – 1,500	434	8NM based on YMML/AD, 6NM/9NM near Essendon	Class C	C LL 1,500	Yes
Perth	SFC – 1,500	67	11NM based on DME	Class C	C LL 1,500, C LL 2,000	Yes
Sydney	SFC – 2,500	21	8.5NM based on DME[7]	Class C	C LL 500, C LL 1,000, C LL 1,500, C LL 2,000, C LL 2,500	Yes
Albury	SFC – 2,000	539	7/8NM based on YMAY/AD	Class D	D LL 2,000	Yes
Alice Springs	SFC – 3,500	1789	10.1/9.9NM based on YBAS/AD	Class D	D LL 3,500	Yes
Archerfield	SFC – 1,500	65	3NM based on YBAF/AD	Class D	C LL 1,500, C LL 2,000, C LL 2,500, C LL 3,500	No
Avalon	SFC – 2,500	35	8NM based on YMAV/AD	Class D	E LL 1,500	Yes
Bankstown	SFC – 1,500	34	3/2NM based on YSBK/AD	Class D	SY CTR, C LL 2,000, C LL 2,500	No
Broome	SFC – 2,600	57	9 NM based on DME	Class D	D LL 1,000	Yes
Camden	SFC – 2,000	230	2NM based on YSCN/AD	Class D	D LL 4,500	No

6 Lateral limits are a summary for discussion purposes, zones vary in shape due to other considerations. Refer Designated Airspace Handbook for accurate descriptions. (Information valid 21 May 2020)

7 Sydney control zone is truncated to permit Class C LL 500 steps to permit the exclusion of coastal and harbour traffic

Location	Height	Elevation (FT)	Lateral limits[6]	Current airspace class	First CTA step	RNAV approach contained
Coffs Harbour	SFC – 1,000	18	7NM based on YCFS/AD	Class D	D LL 1,000, E LL 8,500	Yes
Hamilton Island	SFC – 1,000	15	6/7/9NM based on DME	Class D	D LL 1,000, D LL 1,500, D LL 2500, D LL 4,500	Yes
Hobart	SFC – 1,500	13	8/9NM based on YMHB/AD	Class D	D LL 1,500, E LL FL125	Yes
Jandakot	SFC – 1,500	99	3NM based on YPJT/AD	Class D	PH CTR, C LL 1,500, C LL 2,000	No
Karratha	SFC – 1,000	32	11/16NM based on DME	Class D	D LL 1,000, D LL 2,000	Yes
Launceston	SFC – 1,500	562	8NM based on DME	Class D	D LL 1,500	Yes
Mackay	SFC – 1,000	19	6NM based on DME	Class D	D LL 1,000, E LL 8,500	Yes
Moorabbin	SFC – 2,500	55	3NM based on YMMB/AD	Class D	C LL 2,500 C LL 4,500	No
Parafield	SFC – 1,500	57	3NM based on NDB	Class D	AD CTR, EDN CTR, C LL 1,500, C LL 2,500	No
Rockhampton	SFC – 1,000	36	7NM based on RWY Threshold	Class D	D LL 1,000	Yes
Sunshine Coast	SFC – 1,500	15	8NM based on DME	Class D	D LL 1,500, C LL 4,500, C LL 8,500, E LL 8,500	Yes
Tamworth	SFC – 3,500	1334	9/11NM based on DME	Class D	D LL 3,500	Yes
Townsville	SFC – 1,500	18	7NM based on RWY Threshold	Class C	C LL 1,500	Yes

Appendix 7 – Proposal Impact on Civil Control Zones

Location	Height	Elevation (FT)	Proposed change
Adelaide	SFC – 1,500	20	SFC – 2,500
Brisbane	SFC – 3,500	13	SFC – 2,500
Cairns	SFC – 1,500	10	SFC – 2,500
Canberra	SFC – 3,500	1886	Nil
Darwin	SFC – 1,000	103	SFC – 2,500
Essendon	SFC – 1,500	282	SFC – 2,500
Gold Coast	SFC – 1,500	21	SFC – 2,500
Melbourne	SFC – 1,500	434	SFC – 2,500
Perth	SFC – 1,500	67	SFC – 2,500
Sydney	SFC – 2,500	21	Nil
Albury	SFC – 2,000	539	SFC – 3,500
Alice Springs	SFC – 3,500	1789	Nil
Archerfield	SFC – 1,500	65	SFC – 2,500
Avalon	SFC – 2,500	35	Nil
Bankstown	SFC – 1,500	34	SFC – 2,500
Broome	SFC – 2,600	57	SFC – 2,500
Camden	SFC – 2,000	230	SFC – 2,500
Coffs Harbour	SFC – 1,000	18	SFC – 2,500
Hamilton Island	SFC – 1,000	15	SFC – 2,500
Hobart	SFC – 1,500	13	SFC – 2,500
Jandakot	SFC – 1,500	99	SFC – 2,500
Karratha	SFC – 1,000	32	SFC – 2,500
Launceston	SFC – 1,500	562	SFC – 2,500
Mackay	SFC – 1,000	19	SFC – 2,500
Moorabbin	SFC – 2,500	55	Nil
Parafield	SFC – 1,500	57	SFC – 2,500
Rockhampton	SFC – 1,000	36	SFC – 2,500
Sunshine Coast	SFC – 1,500	15	SFC – 2,500
Tamworth	SFC – 3,500	1334	Nil
Townsville	SFC – 1,500	18	SFC – 2,500

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