Australian Government

Australia's Air Traffic Management Plan

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Contact us

Director - Publishing and Communications
Communications Branch
Department of Infrastructure and Regional Development
GPO Box 594
Canberra ACT 2601
Australia

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

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Chapter 1: Introduction

Air Traffic Management (ATM) is defined by the International Civil Aviation Organization (ICAO) as the "dynamic, integrated management of air traffic and airspace — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions"[1].

The international aviation planning framework has been set out by ICAO with the formation of the Global Air Navigation Plan (GANP) and the Global Aviation Safety Plan (GASP). As well as setting key policy principles for ICAO States to follow, the GANP and the GASP emphasise the need for Regions and individual ICAO States to develop their own regional and national ATM plans and State Safety Programmes.

Australia's Air Traffic Management Plan (ATMP) outlines Australia's current ATM system and the roles and responsibilities of government agencies and industry. It also sets out Australia's key challenges, priorities and short, medium and long term initiatives in ATM planning. Importantly, the future initiatives outlined in the ATMP are designed to enhance and maintain Australia's air navigation system; delivering safety, efficiency, capacity and environmental benefits to the aviation industry and the community.

The ATMP supports Australia's State Safety Programme which outlines Australia's aviation safety framework and, along with the Australian Airspace Policy Statement, helps determine Australia's key national ATM policy objectives and provides guidance to Australian Government agencies and industry in future ATM planning and investment.

As a signatory to the Convention on International Civil Aviation (the Chicago Convention) the ATMP confirms Australia's commitment to consistency with ICAO Standards and Recommended Practices (SARPs). Where Australian practices differ from SARPs, Australia will formally file a difference with ICAO.

The ATMP also supports one of ICAO's key air navigation objectives; increased capacity and improved efficiency in the global civil aviation system.

The ATMP has been prepared cognisant of the often significant rate of change in global ATM technology and procedures and the need to facilitate the Australian aviation industry's take-up of these developments. Australian and international experience does however, point to the need for establishing sufficient lead times to allow Government agencies and industry to transition safely and effectively in response to changes in communications, navigation and surveillance (CNS), and ATM practices and procedures.

The ATMP has been prepared by the Australian Government Department of Infrastructure and Regional Development (the Department), in consultation with other Government agencies, the aviation industry and the community, and will be reviewed at least every five years.

[1] Global Air Traffic Management Operational Concept 2005

Chapter 2: Overview – Roles and Responsibilities

ATM in Australia is carried out through a collaborative arrangement between a number of Government agencies and the aviation industry.

The Australian ATM system includes:

- communications and navigation, which is undertaken by a range of aircraft operators, on instruction from air navigation service providers in ICAO airspace Classes A to G;
- air and ground traffic surveillance, undertaken by Airservices Australia (Airservices) and the Department of Defence (Defence) through the Royal Australian Air Force (RAAF);
- meteorological information primarily provided by the Bureau of Meteorology (BOM);
- safety regulation by the Civil Aviation Safety Authority (CASA) and Defence;
- efficient management of on-ground operations by airport operators;
- the timely and reliable exchange of information between all participants;
- the designation of prohibited, restricted and danger areas for accommodating activities that may be incompatible with routine flying operations; and
- the safe and efficient management of airspace and air traffic flow.

Supporting Australian legislation and policy documents, which define and guide the roles and responsibilities of each participant in the Australian ATM system, are outlined in Chapter 3.

Airservices Australia - Airservices

Airservices is Australia's principal civil air navigation service provider (ANSP). The functions of Airservices are outlined in the *Air Services Act 1995* and include the provision of air navigation services, aeronautical information, and aviation rescue and fire fighting services. Airservices is a government owned statutory authority, fully funded by industry through a five-year pricing agreement.

The Minister for Infrastructure and Transport, on behalf of the Australian Government, outlines the priorities for Airservices in a publicly available Statement of Expectations (SOE).

The Government expects that Airservices regard the safety of air navigation as the most important consideration in performing its functions. Additionally, as outlined in the SOE, the Government expects that Airservices will:

- progress implementation of a new national air traffic system;
- work with the Department, CASA and Defence in providing advice on options for enhancing the level of safety and efficiency of Australian controlled airspace, including at major regional airports;
- work with the Department and CASA in modernising airspace protection policy;
- assist in implementing the Government's environmental objectives; and

- undertake effective and ongoing engagement and consultation with the community, industry and Government on the development and implementation of any significant changes to air traffic services.

Airservices works collaboratively with Australia's other ANSP, Defence, on major reforms, airspace design and procedures to ensure a harmonised, national approach to ATM. Airservices develops a corporate plan which sets out its key initiatives, including those related to ATM, over a rolling five-year period which is updated annually.

Department of Defence - Defence

Defence, primarily through the RAAF, provides air navigation services and infrastructure as well as air traffic services and rescue and firefighting services at military air bases. Defence also maintains a fleet of aircraft of comparable size to civil national carriers.

Defence, in cooperation with Airservices, manages required military airspace to meet operational and national security requirements, while safely and efficiently servicing the transit of civilian aircraft. Defence provides air traffic services for civil aircraft transiting military controlled airspace and restricted areas surrounding all airbases, as well as controlling all aircraft at joint-user airports at Darwin and Townsville and facilitating civil aviation at RAAF Base Williamtown.

The Australian Defence Force (ADF) is undertaking significant modernisation of its piloted and unpiloted aircraft fleet, supported by investment in its ATM platforms, which will provide significantly greater capability, endurance and range than the ADF currently possesses. This investment will facilitate the many military activities which require the integration of multiple high-cost, low-endurance aircraft into Australian airspace.

Civil Aviation Safety Authority - CASA

CASA's primary role, as outlined in the *Civil Aviation Act 1988*, is the safety regulation of civil aviation operations in Australia and of Australian registered aircraft operating overseas.

In fulfilling its responsibilities, CASA sets, audits and enforces safety standards, and promotes industry awareness and understanding of aviation standards and safety issues.

The Government, through the Minister for Infrastructure and Transport, outlines its priorities for CASA in a publicly available SOE. These expectations reaffirm that CASA should continue to focus on aviation safety as its highest priority.

CASA is updating Australia's regulatory framework to provide safety measures that:

- can be found in one place;
- meet international best practice;
- are based on lessons learned from the past;
- are responsive to advances in global aviation;
- are developed in close consultation with industry; and

- provide achievable transition times to ensure industry is well placed to meet the new standards.

CASA's priorities regarding ATM are:

- the development of standards, rules and operational concepts for ATM technologies and procedures as appropriate;
- the use of safety and risk assessment approaches;
- meeting ICAO ATM SARPs (with any differences appropriately lodged) and international harmonisation; and
- training and education of CASA staff and industry.

CASA develops a corporate plan which sets out its key initiatives, including those related to ATM, over a rolling four-year period which is updated annually.

Under the *Airspace Act 2007* and Airspace Regulations 2007, CASA, through the Office of Airspace Regulation (OAR), has primary responsibility for the administration and regulation of Australian-administered airspace. A significant role for the OAR is to conduct regular reviews of the appropriateness of airspace classifications, air traffic services and facilities.

Australian Transport Safety Bureau - ATSB

The ATSB is Australia's independent transport safety investigation agency.

In terms of ATM, the ATSB's investigation of aviation accidents and incidents can help identify safety issues for appropriate follow-up safety actions by Government aviation agencies and the aviation industry.

The ATSB is also involved in safety data recording, analysis and research, as well as raising safety awareness and facilitating safety action through a range of communication and education activities.

Bureau of Meteorology - BOM

The BOM operates under the *Meteorology Act 1955.* Under the Chicago Convention, the BOM is also Australia's designated Meteorological Authority and is required to ensure that aeronautical meteorological services are provided in accordance with the Annexes to the Chicago Convention.

Weather observations, forecasts and warnings for aviation in Australia are made in accordance with the SARPs set out in Chicago Convention's *Annex 3 – Meteorological Service for International Civil Aviation.* Any differences required to tailor the requirement in the Annex to the Australian environment are notified to ICAO. In fulfilling this mandate, the BOM works closely with Airservices and CASA.

Meteorological observations and/or an Aerodrome Weather Information Service (AWIS) can be provided by a third party where the Director of Meteorology (or someone approved by CASA) has given approval under Civil Aviation Regulation (CAR)120. Apart from the BOM, there are currently a number of third party service providers authorised to supply, install, maintain and/or operate an

Automatic Weather Station (AWS) and AWIS in Australia to standards required by the Meteorological Authority for use by aviation.

Department of Infrastructure and Regional Development - the Department

The Department provides policy advice to the Government in relation to airspace and air traffic management matters, including advice on Airservices and CASA's strategic direction, their planning, financial and operational performance, and their governance frameworks.

The Department prepares, in consultation with other Government aviation agencies, industry and the community, the Australian Airspace Policy Statement for approval by the Minister of Infrastructure and Transport. The Department chairs the Aviation Policy Group (APG) and Aviation Implementation Group (AIG), which are Government aviation agency coordination forums on airspace and ATM matters, amongst other aviation issues.

Industry

The aviation industry, including aircraft and aerodrome operators, also plays key roles in Australia's ATM system.

These roles include providing safe, efficient and cost effective aircraft operations, investment in air navigation and communications systems and equipment (which increasingly relies on satellite-based technology) and the attraction, training and retaining of skilled personnel.

Aerodrome operators also support ATM through investment in ground-based systems which enhance the safety and efficiency of aircraft operations.

To ensure a fully effective and efficient ATM system it is important that industry and Government work collaboratively to provide the necessary standards, services, facilities, equipment and specialised personnel to meet Australia's future ATM requirements.

Coordinating/Consultation Forums

Aviation Policy Group (APG) and Aviation Implementation Group (AIG)

The APG brings together the Secretary of the Department (Chair), the Chief Executive Officer of Airservices, the Chief Executive Officer of CASA and the Chief of Air Force to provide a forum for effective inter-agency policy coordination and consultation on aviation-related issues including airspace and ATM.

The APG is not a decision making group as each individual agency retains their respective legislative and regulatory responsibilities and authority.

The AIG is a working group of senior officials from each APG agency. It is responsible for coordinating and following up issues identified by the APG including preparing coordinated advice and reports back to APG for consideration.

The APG and AIG also take advice and input from other Government and industry organisations, including the ATSB, the BOM and the Australian Strategic Air Traffic Management Group (ASTRA).

Australian Civil-Military Air Traffic Management Committee - AC-MAC

Airservices and Defence have established the AC-MAC as a harmonisation forum to oversee synchronisation and collaboration of Australia's civil and military ATM and aviation rescue and firefighting services, including their enabling facilities and infrastructure.

Airspace and Infrastructure Users Group

The Airspace and Infrastructure Users Group is a joint CASA/aviation community forum for the development of regulations and standards pertaining to airspace, air traffic control, communications/navigation/surveillance/air traffic management (CNS/ATM) and aerodromes.

The Group provides advice to CASA on the Airspace Regulations 2007 and the following Civil Aviation Safety Regulation 1998 (CASR) Parts:

- Part 65 - Air traffic services licensing;
- Part 139 - Aerodromes and aviation rescue and fire fighting;
- Part 143 - Air traffic services training providers;
- Part 171 - Aeronautical telecommunication service and radio navigation service providers;
- Part 172 - Air traffic services providers;
- Part 173 - Instrument flight procedure design; and
- Part 175 - Aeronautical information management.

Australian Strategic Air Traffic Management Group - ASTRA

ASTRA is the peak industry advisory body dedicated to participation in the development of an optimum ATM system for Australia. It comprises industry stakeholders including representatives of aircraft and airport operators from a range of industry sectors, staff associations, Airservices and observers from other Government agencies.

ASTRA facilitates industry consideration of a range of aviation issues and provides a forum to help develop coordinated industry advice on ATM issues for APG and AIG.

Bureau of Meteorology (BOM) Consultations

The BOM undertakes regular consultation with industry through the annual BOM/Aviation Industry Consultative Meeting and associated specific working groups on a range of topics such as matters related to ATM and airspace management. Participants in these groups include Airservices, CASA, the Department, Defence and various aviation industry sectors.

Airservices and the BOM also consult regularly through the Bureau of Meteorology/ Airservices Australia Working Group. This group provides a forum for consultation and exchange of

information on all aspects of aviation meteorological services and reports directly to the Bureau of Meteorology/Airservices Australia Steering Group.

The Steering Group reviews advice and recommendations from the Working Group to ensure consistent policy on all aspects of aviation meteorological services in line with ICAO requirements and Government legislation. The Steering Group also reviews and makes recommendations to their respective Executive on the 'Memorandum of Understanding between the Australian Bureau of Meteorology and Airservices Australia for the provision of Meteorological Services in support of Civil Aviation'.

Regional Airspace and Procedures Advisory Committees - RAPACs

RAPACs are primarily state/territory-based forums, coordinated and facilitated by CASA. RAPACs provide a forum for civil-military airspace users, Government/private aviation organisations, air navigation and communication service providers, and other stakeholders to discuss aviation matters, including airspace and procedures of regional and/or national importance.

Further information can found on the CASA website at www.casa.gov.au/airspace/standard-page/regional-airspace-and-procedures-advisory-committees

Chapter 3: Key ATM Policy and Reference Documents

Australia's ATMP is consistent with Australia's aviation safety objectives set out in Australia's State Safety Programme and the specific airspace and air traffic management policies outlined in the Australian Airspace Policy Statement. The ATMP also recognises Australia's international responsibilities to produce an Aeronautical Information Publication (AIP) to inform air traffic users.

State Safety Programme

Annex 19 of the Chicago Convention requires contracting States to develop and implement a State Safety Programme.

Australia's State Safety Programme can be found on the Department's website at www.infrastructure.gov.au/aviation/safety

Australian Airspace Policy Statement - AAPS

The Australian Airspace Policy Statement (AAPS) outlines the Australian Government's objectives and strategies for civil airspace administration.

The Government considers the safety of passenger transport services as the first priority in airspace administration.

The AAPS outlines specific airspace policy objectives:

- support for ICAO's GASP, GANP, the Global Air Traffic Management Operations Concept (GATMOC) and use of ICAO airspace classifications;
- the appropriate level of ATM services at regional aerodromes regularly served by passenger transport services, as determined by CASA; and
- effective cooperation between CASA and Australia's ANSP; Airservices and Defence.

The AAPS outlines the Government's airspace strategy which is risk based, engendering evidence based decision making and supported by robust data collection and analysis in determining Australia's future airspace needs.

The AAPS sets out airspace criteria thresholds (e.g. passenger and aircraft movement numbers) which act as triggers for aeronautical risk reviews to be carried out by CASA, in consultation with the public, industry and other Government agencies.

Further information on the AAPS can be found on the Department's website at www.infrastructure.gov.au/aviation

Aeronautical Information Publication - AIP

Contracting States to the Chicago Convention are required to provide a document which records the State's aeronautical information, known as the Aeronautical Information Publication (AIP).

The details of air traffic services, including the manner in which the services are provided, are published in the Australian AIP for:

- a flight information area or a flight information region;
- a control area or a control zone;
- airspace of any class; and
- a controlled aerodrome.

The Assessment of Flight Priorities (AFP) is published in Australia's AIP. The AFP sets out how Airservices' and Defence's air traffic controllers undertake aircraft operations to ensure safe, efficient and orderly management of air traffic.

Further information on the Australian AIP can be found at www.airservicesaustralia.com/publications/aeronautical-information-package-aip

Chapter 4: Key Challenges, Priorities and Objectives

Challenges Ahead

Australia will continue to face many safety, efficiency, capacity and environmental challenges in the future management of our airspace.

To meet these challenges, Government agencies and industry will need to invest in new and upgraded infrastructure and equipment, the ongoing maintenance of ATM facilities and systems, and in recruiting, training and retaining skilled personnel to perform ATM functions.

Demands on ATM system capacity

The Australian major airline passenger market has experienced strong growth over the last decade.

The Bureau of Infrastructure, Transport and Regional Economics (BITRE) forecasts that growth will continue over the next fifteen years, but with variations between different aviation sectors. A steadying of growth in regional Australia with a reduction in demand from the resources sector will require an ongoing assessment of the appropriateness of the level of services provided.

Growth in recent years at some capital city airports such as Sydney, Brisbane, Melbourne and Perth has placed pressure on ATM infrastructure capacity. This has already seen a number of efficiency initiatives put in place by Airservices, airport operators and airlines; for example, the Airport Capacity Enhancement program and the Air Traffic Flow Management initiatives.

In the near future, Brisbane Airport will complete a parallel runway while Melbourne and Perth Airports also have advanced plans for new parallel runways, necessitating a review of ATM and airspace arrangements. A future Western Sydney Airport will increase capacity in the Sydney Basin and also require appropriately updated ATM and airspace arrangements.

It will be important that in planning for future civil aviation capacity requirements, the geographical location of some of our major civil airports near military air fields will require continuing close cooperation between Airservices, Defence and industry to ensure mutually beneficial results are achieved in meeting both civil and military aviation demand.

Surveillance

Australia’s area of ATM responsibility covers 11 per cent of the world’s airspace, with vast volumes and distances across continental and oceanic airspace.

Australia has become an early adopter of satellite based technologies to provide surveillance coverage and navigation over large parts of the continent where previously there was no surveillance coverage. Australia mandated the installation of Automatic Dependent Surveillance – Broadcast (ADS-B) Out by all Australian Instrument Flight Rules (IFR) regular public transport, charter and aerial work aircraft by February 2017, which provided a significant improvement to surveillance for the vast majority of air passenger transport operations in Australia.

While some visual flight rules (VFR) aircraft are adopting this technology, ongoing challenges to delivering more efficient services will continue where IFR and VFR aircraft operations mix around the country including in and out of our regional airports.

Remotely Piloted Aircraft Systems - RPAS

Australia continues to see increased ownership and application of RPAS. Over the next five years covered by this plan, RPAS are expected to have an increasingly significant operational role in the aviation industry in both civil and military applications with vast numbers of potential users across a broad range of industries including agriculture, emergency services, photography and research.

As the roles of RPAS are defined and developed and the technology continues to undergo rapid development, the challenge is to ensure the appropriate regulation of RPAS use in a manner that ensures the safety of other airspace users and the community while supporting the innovative solutions and productivity gains RPAS can bring.

Automated sense-and-avoid capability in RPAS will potentially provide a technology driver for self-separation with other aircraft. While such a concept is still in development, the increased demand for RPAS operations in all types of airspace will need to be safely facilitated and not adversely affect “traditional” modes of aircraft operations.

CASA will continue to monitor global developments as to how future airspace may be used to permit certain RPAS operations, including the development of technology for ‘beyond visual line of sight’ operations, and will adopt appropriate procedures to safely manage such operations.

CASA in June 2015 announced the terms of reference for a review of aviation safety regulation of RPAS which will provide CASA with a firm basis on which to articulate and implement future aviation safety regulatory policy and the further development of regulations applying to RPAS.

Infrastructure and Technology

Investment in new infrastructure and technology by Government agencies and industry will continue to be required to ensure a safe, efficient and continuously improving ATM system.

Increasingly sophisticated aircraft have the ability to operate more flexibly and safely. The challenge is for future ATM systems to support this innovation in a timely and responsive manner, while balancing the costs and rate of change impacts on industry and ATM service providers alike.

In line with the GANP, GASP and GATMOC, a strategic approach will need to be taken to transition ATM systems from those used to control aircraft on the basis of knowing where they are, and estimating where they will be, to a trajectory based concept where present and intended aircraft positions will be known with higher degrees of accuracy.

To support this increasing use and reliance on technologically advanced systems, the Department is participating in an intragovernmental working group examining the use of the radio spectrum in Australia, with a view to ensuring that the use of spectrum in aviation activities is safeguarded as a public good.

Workforce Capability

While investment in infrastructure and technology will increase the capacity and capability of our ATM system, air traffic facilities and services ultimately are operated and overseen by skilled aviation personnel. Air traffic controllers, pilots and aviation specialist and support staff will need to participate in ongoing training to operate more advanced ATM systems.

ICAO recognises a shortage of skilled aviation professionals is developing and is encouraging States to establish programmes to recruit and train the next generation of aviation professionals, including in ATM.

To recruit and maintain skilled ATM personnel will create challenges for Airservices and Defence, as Australia's ANSPs; and for CASA as the aviation safety regulator.

Environmental Impacts

While modern aircraft are increasingly quieter and more efficient than their predecessors, greater numbers of aircraft movements especially over urban areas in ajor cities will continue to present environmental challenges for ATM in Australia.

Airservices has been working in collaboration with regulatory authorities, airports and airlines to improve the efficiency of ATM and to ensure Australia's aviation industry is minimising its impact on the environment and remains environmentally sustainable.

It is also important to note that any proposed changes to existing operations, including the development of new airports, runways or procedures, require detailed consultation with the community and industry before they are finalised and implemented.

A number of measures have been adopted to improve operational efficiency and reduce aviation emissions and noise impacts, including continuous descent approaches, smart tracking and FlexTracks, airport capacity enhancement, an advanced surface movement guidance and control system, and the use of less environmentally sensitive flight paths.

At the ICAO Assembly meeting in October 2016, agreement was also reached to introduce a global offsetting and reduction scheme for international aviation to control carbon dioxide emissions and Australia has supported the commitment to implement that agreement.

Global Priorities

Global Air Navigation Plan - GANP

The Global Air Navigation Plan 2016-2030 (GANP 5th Edition) is an ICAO document that provides guidance to States to increase the capacity and improve the efficiency of the global civil aviation system and implement the GATMOC.

The GANP articulates ICAO's ten key air navigation policy principles (see Appendix A):

1. Commitment to the implementation of ICAO's Strategic Objectives and Key Performance Areas;
2. Aviation safety is the highest priority;
3. A tiered approach to air navigation planning;
4. The Global Air Traffic Management Operational Concept (GATMOC);
5. Global air navigation priorities;
6. Regional and State air navigation priorities;
7. Aviation system block upgrades (ASBUs), modules and roadmaps;
8. Use of ASBU blocks and modules;
9. Cost benefit and financial issues; and
10. Review and evaluation of air navigation planning.

The GANP applies a rolling 15-year strategic methodology to support a globally harmonised air navigation system. It guides States in leveraging existing technologies and anticipating future developments based on operational objectives agreed by the State in consultation with industry.

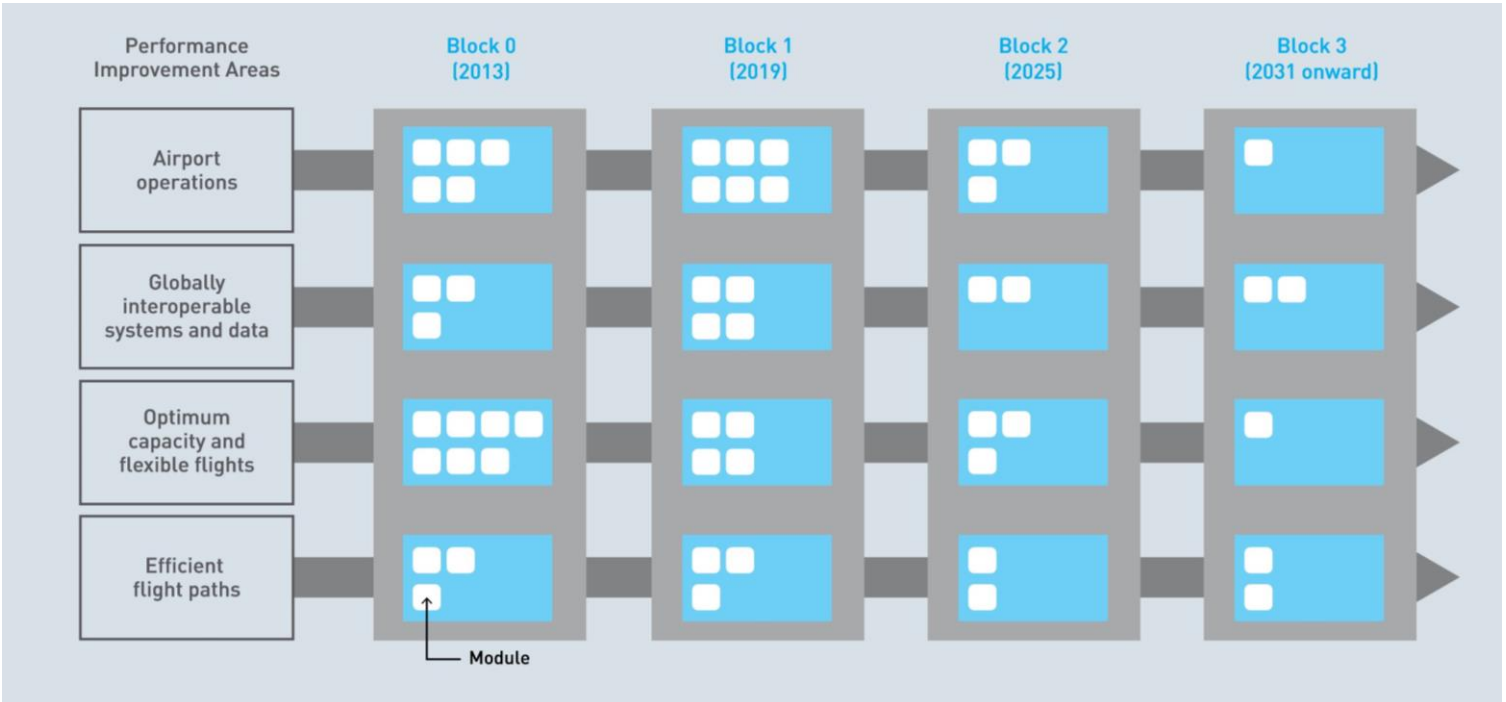
This is done through a series of ASBUs, a methodology which allows States to advance their air navigation capacities based on their specific operational requirements.

ASBUs are divided into four performance improvement areas:

- Airport operations;
- Globally interoperable systems and data;
- Optimum capacity and flexible flights; and
- Efficient flight paths.

Each performance area has four blocks which contain a number of modules (see Figure 1).

Figure 1 GANP 5th Edition – Aviation System Block Upgrade schematic



Importantly, individual States determine which modules in each block are applicable to their environment then work through the blocks, upgrading their systems in a globally cohesive manner. A particular initiative may be completed in a single block, or may be progressively implemented across a number of blocks.

In addition, ICAO is developing a comprehensive plan for the development of SARPs and guidance material to support the use of ASBUs.

Australia is working towards implementing the ASBU blocks and modules that align with our operational ATM priorities and circumstances. To assist in this task, Airservices has implemented four operational groups, incorporating representatives of the aviation industry, to guide the work required in the four performance areas. Australia is also working with our neighbours to further develop and implement the coordinated Asia-Pacific Seamless ATM Plan which will guide member States within the region with their ATM planning.

Australia has already implemented or commenced the implementation of a number of the technologies and practices contained in Block 0 and Block 1. These include:

- Air Traffic Flow Management/Collaborative decision making;
- Performance Based Navigation (PBN) Approach;
- Air Traffic Services (ATS) surveillance;
- ATS Surveillance with data integrated;
- ADS-Contract and Controller Pilot Data Link Communications (CPDLC);
- ATS Inter-facility Data Link Communications (AIDC);
- Aeronautical Information Management;
- Strategic civil-military coordination; and
- Tactical civil-military coordination.

In addition to the GATMOC, two further ICAO documents which support the implementation of the GANP are the:

- Manual on Air Traffic System Requirements (ICAO Doc 9882); and
- Manual on Global Performance of the Air Navigation System (ICAO Doc 9883).

Global Aviation Safety Plan - GASP

The Global Aviation Safety Plan 2017-2019 (GASP 2nd Edition) sets out the global air navigation safety objectives, including specific milestones and priorities to be addressed by State and regional aviation safety planners.

To support this work, the GASP provides a framework to assist States and Regions in making improvements to safety and outlines implementation strategies and best practice guidance material to assist in tailoring solutions to address the global objectives and priorities.

The GASP outlines short, medium and long-term objectives:

By 2017: Progress towards implementation of a State Safety Programme.

By 2022: Full implementation of the ICAO State Safety Programme framework.

By 2028: Advance safety oversight system including predictive risk management.

The GASP also sets out three global safety priorities:

1. Improving runway safety;
2. Reducing the number of controlled flights into terrain (CFIT) accidents; and
3. Reducing the number of loss of control in-flight (LOC-I) accidents.

It also notes four emerging priorities:

1. Global flight tracking;
2. Remotely piloted aircraft systems;
3. Space transportation; and
4. Risks arising from conflict zones.

Australia's ATMP and the State Safety Programme are consistent with the policy principles and priorities outlined in the 2017-2019 GASP.

Global Air Traffic Management Operational Concept - GATMOC

Australia supports closer alignment with the vision of an integrated, harmonised and globally interoperable ATM system, as presented by ICAO in its GATMOC (Doc. 9854).

GATMOC outlines the concept of an integrated, global ATM system based on clearly established operational requirements. GATMOC is intended to guide the high-level implementation of communication, navigation, surveillance and air traffic management technologies by providing a description of how the emerging and future air navigation system should operate.

The concept components of GATMOC include airspace organisation and management, aerodrome operations, demand and capacity balancing, traffic synchronisation, conflict management, airspace user operations and ATM service delivery management.

Asia-Pacific Regional Priorities

Australia participates in, and will continue to support, numerous regional fora and initiatives to work towards a seamless airspace across the Asia-Pacific Region. For example, Australia is an active participant in the Asia-Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) and associated activities.

The role of APANPIRG is to facilitate coordinated planning in the Asia-Pacific Region. The Regional Air Navigation Plan provides a framework for transition to a unified environment utilising the research and experiences of other regions such as Europe and North America.

Australia will continue to assist in the development of ATM capabilities by our regional partners. Australia works closely with our neighbours, Indonesia and Papua New Guinea, under formal development programmes. Australia also provides assistance to other regional neighbours when requested and where the capacity and resources to assist are available.

Australia's Priorities

Safety will always be the most important consideration in Australia's ATM system and this requirement is included in legislation covering the operations of Airservices and CASA.

The Australian Government's other key policy priorities for our ATM system are:

I. Effective use of, and investment in, technology, infrastructure and services.
II. Alignment with ICAO SARPs.
III. Civil-military ATM harmonisation.
IV. Regional air traffic services based on risk assessment
V. The recruitment, retention and training of skilled personnel.
VI. Effective management of environmental impacts from aviation operations.

I. Effective use of, and investment in, technology, infrastructure and services

The majority of Australia's current civil air traffic infrastructure assets are owned and managed by Airservices. In upgrading and expanding Australia's ATM infrastructure, Australia will continue to adopt advanced technologies and international standards.

The decision to adopt technology applications will continue to be on the basis of well-developed safety cases, appropriate risk analyses, the development of detailed operational concepts and robust implementation plans factoring in the costs and benefits of these applications and their application to the Australian aviation environment.

Australia supports the wider application and use of modern surveillance technology, including satellite based technologies such as ADS-B and the Global Navigation Satellite System (GNSS).

However, as is the case in other leading aviation countries, Australia will maintain a robust ground-based backup surveillance capability, including radar, to protect against vulnerabilities during transition to this new technology.

The wider adoption of advanced technology is integrally linked with the transition from route-based navigation using terrestrial navigation aids to area navigation using satellite navigation.

The adoption of these applications will not only enhance aviation safety but can also generate efficiency, capacity and environmental benefits.

Future ATM technological capabilities will support:

- a national satellite and ground based efficient and flexible ATM system utilising air-to-ground data link surveillance for air traffic separation;

- aircraft utilising satellite navigation as the primary means of navigation, without the need to resort to ground based aids in normal situations;
- the ability of air traffic surveillance to provide traffic conflict avoidance; and
- more efficient airspace and air route designs.

Defence has commenced the process of significantly upgrading its infrastructure that supports the provision of air navigation services. This includes upgrading or replacing control towers and airfield systems buildings at its twelve locations that provide permanent air traffic services. In addition, Defence is replacing its existing primary and secondary radars at nine sites and is investing in ADS-B ground stations at a number of locations. These assets provide surveillance data to both Defence and Airservices and enhance the overall national surveillance capability.

Further information on Australia's current and planned used of technology and adoption of Performance Based Navigation (PBN) and other operational and capacity enhancements is outlined in Appendix 2.

OneSKY

Airservices and Defence are currently collaborating on the installation of a harmonised national ATM system which will provide safe, efficient operations with increased capacity. The OneSKY Australia program is focused on managing the forecast growth in traffic movement in Australia and will also bring opportunities for greater harmonisation of civil and military aviation procurement, the provision of services and training and has significant potential safety, operational and financial benefits for both civil and military aviation users.

As part of this program, Airservices and Defence are working towards an integrated civil-military air traffic system (CMATS). This system will enable a new level of safety, more flexible use of airspace, and operational and cost efficiencies, while also reducing delays for the travelling public and providing opportunities to improve environmental outcomes.

Airservices is also integrating the Terminal Control Unit (TCU) functions of Adelaide and Cairns into the two major national air traffic service centres in Melbourne and Brisbane respectively. This consolidation will support the implementation of OneSKY.

OneSKY is scheduled to commence the transition to CMATS in 2018. Further information on the OneSKY Australia program can be found on the Airservices website at www.airservicesaustralia.com/projects/onesky-australia

II. Alignment with ICAO SARPs

ICAO continues to encourage all States to better plan the enhancement of safety, environmental and operational efficiency of future ATM and navigation systems to assist in eventual global harmonisation.

In particular, Australia supports the ICAO initiatives of:

- precision navigation enhancing aviation safety and also allowing more efficient use of airspace;
- instrument approach procedures that provide vertical guidance, enabling significant safety and service enhancements at aerodromes;

- tracking of flights through flight regions at no less often than every 15 minutes;
- enhanced collision risk mitigation primarily through the expansion of air traffic surveillance, including the wider application of satellite based surveillance technology; and
- navigation capabilities that support optimum aircraft routes, reducing fuel burn with attendant economic and environmental benefits.

As outlined in the Australian Airspace Policy Statement (AAPS), Australia supports the use of the internationally-recognised ICAO airspace classification system (Class A to G airspace) in airspace administration.

Any deviations from the SARPs will be well justified, documented and formally notified to ICAO as a filed difference.

III. Civil-Military ATM harmonisation

Both Defence and Airservices acknowledge that Australia's airspace is a national resource. Airspace is a critical enabler to national imperatives including national security, the environment, the economy and public safety. The flexible use of airspace (FUA) is essential to ensure Australia's airspace is continually optimised to meet increasing demand, the requirements of new platforms and expanding infrastructure. Australia will take advantage of emerging technologies which eliminate barriers to FUA without impacting aviation safety.

The further adoption of FUA will be supported where it maximises the use of available airspace volumes while maintaining the required segregation for non-compatible activities.

The implementation of CMATS under the OneSKY program will enable significantly greater situational awareness for both Airservices and Defence air traffic control. The integrated systems will facilitate safety and efficiency of operations in line with future airspace system concepts. Airservices is working in collaboration with Defence to design and implement the system and is leading the procurement of the new ATM system.

Building on the work of CASA and Defence, the Office of Airspace Regulation (OAR), in collaboration with Airservices and industry, will continue to identify opportunities for more flexible use of civil and Defence administered airspace.

Defence and the OAR continually review restricted areas and Defence managed airspace to identify airspace volumes which can be released for civilian use or disestablished if no longer required for Defence purposes.

IV. Regional air traffic services based on risk assessment

A specific Government airspace policy objective is the provision of appropriate levels of air traffic services at regional aerodromes regularly served by passenger transport services, based on the outcome of risk assessments conducted by CASA.

CASA uses the passenger and aircraft movements criteria contained in the AAPS as a trigger for completing a risk review of airspace classification. These reviews are undertaken in consultation with Airservices, other Government agencies, industry and the community.

Airservices continually monitors growth in aviation activity at regional locations. Using the criteria contained within the AAPS as a guide, Airservices undertakes detailed analyses of the current and future aviation activity at regional aerodromes to facilitate planning for the introduction of appropriate infrastructure and the development and implementation of appropriate procedures.

Based on this work, Airservices is undertaking key initiatives at a number of regional aerodromes, including:

- additional ADS-B ground stations;
- further implementation of required navigation performance (RNP) Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs); and
- increased use of electronic surveillance for situational awareness in regional towers.

V. The recruitment, retention and training of skilled personnel

Airservices and Defence will continue to enhance their workforce planning and skills development for their respective ATM workforces. These initiatives include:

- tailoring training qualifications to meet specific needs;
- development of skills and capacity to meet future technology and services;
- diversifying the workforce;
- increasing employee engagement;
- developing strong leaders;
- innovative recruitment campaigns;
- developing an Indigenous employment strategy; and
- removing barriers to employment for people with a disability.

Industry will also need to continue to invest in workforce planning and appropriate skills development and maintenance, including training in modern aircraft and airport navigational, communications and surveillance equipment.

VI. Effective management of environmental impacts from aviation operations

As well as safety and efficiency benefits, modern ATM systems can enable improved management of environmental impacts (noise and emissions) from aviation operations.

The Government will continue to expect that Airservices will assist in implementing the Government's environmental initiatives.

Airservices' current five-year Environmental Strategy (2014-2019) outlines Airservices' proposed broad actions in the areas of aircraft noise, aircraft emissions and the natural environment. Initiatives which will have major impacts on environmental improvements include PBN, RNP and FlexTracks. Further information on Airservices Environmental Strategy can be found on the Airservices website at www.airservicesaustralia.com/environment

An example of the types of projects Airservices has been working on to achieve environmental outcomes are continuous descent operations (CDO) and continuous climb operations (CCO).

CDO and CCO, made possible through the increasing use of PBN, can achieve significant reductions in environmental impacts. CDOs allow aircraft to descend to final approach using minimum thrust settings. This not only saves fuel and therefore greenhouse gas emissions, but also decreases noise levels around airports. Similarly, CCOs also reduce the amount of fuel used during take-off and the amount of noise generated.

Australia participates in the Asia and South Pacific Initiative to Reduce Emissions (ASPIRE). ASPIRE was created to reduce the impact of aviation on the environment by reducing greenhouse gas emissions through technological innovation and best practice ATM.

Similar in nature, the Indian Ocean Strategic Partnership to Reduce Emissions (INSPIRE) was formed as a collaborative network of partners and peer organisations dedicated to improving the efficiency and sustainability of aviation across the Arabian Sea and Indian Ocean Region. Australia has User Preferred Routes in the Indian and Southern Indian Ocean that allow operators to flight plan the most efficient route for their use. This airspace has been in place for a number of years and provides benefits to airspace users every day.

The Government is committed to the effective distribution of information and effective consultation with the community on ATM environmental issues.

The wider application of advanced ATM technology and procedures must be consistent with the Government's policy of fairer noise sharing for communities living in the vicinity of airports and near flight paths. In this regard, community benefits can be realised by the use of PBN technology, such as the use of time of day flight paths to share noise more equitably where this can be done safely.

Airservices and Defence will continue to consult with the community and industry on the development and implementation of significant changes to air traffic services. The independent Aircraft Noise Ombudsman (ANO) will also continue to oversee Airservices' and Defence's handling of aircraft noise enquiries and complaints, monitor and review consultation arrangements and make recommendations for improvements where necessary.

Industry also has an important role to play in the reduction of aircraft emission and noise impact in operations. Australian airlines are investing heavily in aircraft which are quieter, use less fuel and in some cases, use alternative fuel options.

In addition, Australia's major airlines provide 'opt in' carbon neutral initiatives for passengers and freight for both domestic and international flights. The Government commends industry for these initiatives and encourages further innovations to reduce the impact of air travel on the environment.

Future Objectives

Consistent with ICAO's approach of setting out short, medium and long-term objectives, Australia has set out a number of objectives in relation to continuous improvement in our future ATM system as outlined below. Given the rapid pace of change in ATM, Australia will focus heavily on its short and medium term objectives while having regard to the long-term objectives in the GANP.

Short Term (2017-2020)

- Full implementation of CASA's GNSS based surveillance and navigation mandates.
- Roll out of approach with vertical guidance (APV) approaches using Baro-VNAV at identified aerodromes around Australia.
- Airservices and CASA continue to progress a range of work items under the ICAO Separation and Airspace Safety Panel (SASP) including:
- new standards and procedures for parallel runway operations that include the use of GNSS Landing System and RNP;
- new PBN separation minima for approved aircraft; and
- continuing to contribute to the development of new ADS-B separation minima for oceanic and remote airspace.
- Airservices and Defence will continue to develop the integrated Civil-Military Air Traffic System (CMATS) to improve operational safety and efficiency, and manage the increasingly complex civil-military airspace requirements.
- Consistent with the Future Airspace System (FAS) operating concept, develop the Brisbane Extended Manoeuvring Area preliminary design and airspace concept. Future design work will potentially cover new runways at Melbourne, Perth and Western Sydney airports and a regional concept of operations.
- Australia continues to work through ICAO on practical measures to manage greenhouse gas emissions from international aviation such as operational improvements, aircraft and engine technology uptake, emissions standards, alternative fuels, ATM improvements and national action plans. These initiatives are expected to have flow-on effects for domestic aviation.
- Airservices and Defence will develop a national infrastructure redundancy plan, catering for business continuity and national security requirements.
- Airservices and the BOM will continue to develop a framework for meteorological input into efficient and effective ATFM for major, secondary and regional airports.
- Implementation of the ICAO meteorological information exchange model (IWXXM).
- Support for SBAS test bed trial in Australia.
- Complete an aviation safety review of RPAS operations.
- Airservices will continue to investigate and support GBAS development, through the International GBAS Working Group.

Medium Term (2021-2025)

- Emerging technologies and their different uses will be supported by flexible design of performance based regulations to support delivery of safety and efficiency outcomes.
- Continued use of PBN which will require appropriate regulatory standards, education and training programmes to ensure the safe use of satellite-based technology.
- Airservices' and Defence's CMATS will achieve final operational capability.
- With OneSKY implementation, develop a single flight information region for Australia.
- Full implementation of a collaborative, information-based service by Airservices.
- Continued work with ICAO on practical measures to manage the greenhouse gas emissions from international aviation.
- APV procedures available at all airports served by passenger transport operations.
- Maximise use of electronic surveillance of traffic by either aircraft or the air navigation service provider for operations in controlled airspace.
- Use of ADS-B as an alternative to multilateration for parallel runway monitoring.

Long Term (2026-2030)

- Trajectory based control for all appropriate flights.
- Realisation of predictive risk management capability.
- APV guidance for all Australian IFR runways.
- Implementation of an ATM Network Operations Plan by Airservices, in consultation with other Government agencies and industry.

Appendix 1

ICAO's Ten Key Air Navigation Policy Principles

1. Commitment to the implementation of ICAO's Strategic Objectives and Key Performance Areas.

ICAO Regional and State air navigation planning will cover each of ICAO's Strategic Objectives and all 11 ICAO Key Performance Areas.

2. Aviation safety is the Highest Priority

In air navigation planning and in establishing and updating individual Air Navigation Plans, ICAO Regions and States will give due consideration to the safety priorities set out in the Global Aviation Safety Plan (GASP).

3. Tiered approach to air navigation planning

ICAO's Global Aviation Safety Plan and Global Air Navigation Plan will guide and harmonize the development of ICAO Regional and individual State air navigation plans.

ICAO regional air navigation plans, developed by the Planning and Implementation Regional Groups (PIRGs), will also guide and harmonize the development of individual State Air Navigation Plans.

When developing their Regional Air Navigation Plans, PIRGs should address their intra- and inter-regional issues.

4. Global Air Traffic Management Operational Concept (GATMOC)

The ICAO endorsed GATMOC (Doc 9854) and companion manuals, which include, inter alia, the Manual on Air Traffic Management System Requirements (Doc 9882) and the Manual on Global Performance of the Air Navigation System (Doc 9883), will continue through their evolution, to provide a sound global conceptual basis for global air navigation and air traffic management systems.

5. Global air navigation priorities

ICAO should develop provisions, supporting material and provide training in line with the global air navigation priorities described in this plan.

6. Regional and State air navigation priorities

ICAO Regions, subregions and individual States through the PIRGs should establish their own Air Navigation priorities to meet their individual needs and circumstances in line with the Global Air Navigation Priorities.

7. Aviation System Block Upgrades (ASBUs), Modules and Roadmaps

The ASBUs, Modules and Roadmaps form a key Attachment to the GANP, noting that they will continue to evolve as more work is done on refining and updating their content and in subsequent development of related provisions, support material and training.

8. Use of ASBU Blocks and Modules

Although the GANP has a global perspective, it is not intended that all ASBU Modules be applied around the globe.

When the ASBU Blocks and Modules are adopted by regions, subregions or States they should be followed in close accordance with the specific ASBU requirements to ensure global interoperability and harmonization of air traffic management.

It is expected that some ASBU Modules will be essential at the global level and therefore may eventually be the subject of ICAO mandated implementation dates (minimum path).

9. Cost-Benefit and Financial issues

The implementation of air navigation measures, including those identified in the ASBUs, can require significant investment of finite resources by ICAO Regions, subregions, States and the aviation community.

When considering the adoption of different Blocks and Modules, ICAO Regions, subregions and States should undertake cost-benefit analyses to determine the business case for implementation in their particular region or State. The new guidance material on cost benefit analyses will assist States in implementing the GANP.

10. Review and Evaluation of Air Navigation Planning

ICAO should review the GANP every three years and, if necessary, all relevant air navigation planning documents through the established and transparent process.

The appendices to the GANP should be analysed annually by the Air Navigation Commission to ensure they remain accurate and up to date.

The progress and effectiveness of ICAO Regions and States against the priorities set out in their respective regional and State Air Navigation Plans should be annually reported, using a consistent reporting format, to ICAO. This will assist regions and States in adjusting their priorities to reflect actual performance and address any emerging air navigation issues.

Appendix 2

Current and Future ATM Initiatives

Satellite based technology

GNSS

Global Navigation Satellite System (GNSS) refers to the constellation of satellites which transmit positioning and timing data to earth. The Global Positioning System (GPS) is an example of a GNSS.

Australia is committed to the adoption of GNSS to enhance safety and efficiency in Australia's airspace, in line with ICAO Assembly Resolution A37-11. GNSS is used to support ADS-B, en route, terminal and non-precision approach navigation capability.

Satellite services are well suited to the Australian environment, with its large geographical area and low population density. Australia began adopting and implementing the use of GNSS in 1994, approving the use of GPS to assist in the navigation of Australia's vast airspace and continues to mandate measures which will harness the benefits of GNSS.

ADS-B

Australia mandated the installation of ADS-B Out by all Australian Instrument Flight Rules (IFR) regular public transport, charter and aerial work aircraft by February 2017 providing a significant improvement to surveillance for the vast majority of air passenger transport operations in Australia.

The benefits of ADS-B include:

- significantly improved surveillance coverage;
- voice reporting no longer required within ADS-B coverage;
- enabling more aircraft to operate safely in the same volume of airspace;
- greater flexibility in allocating preferred levels/altitudes;
- improved incident, emergency and search and rescue response; and
- the ability for organisations to efficiently track their aviation related assets and operations in real-time.

Additionally, ADS-B In (ADS-B reception by aircraft) can be used as a pilot situational awareness tool and enabler of new operations using airborne separation assurance/collision avoidance systems.

These initiatives will continue to move Australia away from a dependency on ground based surveillance infrastructure, however, a basic network of ground based navigation aids will form a back-up navigation network, which is intended to run until at least 2025.

ADS-C

Automatic Dependant Surveillance-Contract (ADS-C) is used in oceanic and remote continental en route airspace for automated position reporting and datalink communications. This has enabled reduced separation standards and user preferred routes for suitably equipped aircraft.

Throughout Australian airspace, passenger aircraft are now tracked by Airservices every 14 minutes using ADS-C, supporting global tracking. This can be increased to near real time if the aircraft deviates from its cleared route or as required by either the pilot or air traffic control.

GBAS

Ground Based Augmentation System (GBAS) is a GNSS augmentation system. GBAS and its precision approach application, the GBAS Landing System (GLS), is recognised by ICAO as a potential future replacement for current instrument landing systems (ILS). GBAS systems have the potential to reduce flight delays and increase capacity in all weather conditions.

Australia participates in the International GBAS Working Group, which examines practical technical and implementation issues regarding use of the technology.

Airservices commenced GBAS operations at the Category I level at Sydney Airport in 2014 using a proprietary system called Honeywell SmartPath, which is the only GBAS system to receive US Federal Aviation Administration system design approval. Future GBAS work will focus on validating the operational benefits of the system and contributing to the development of Category III ICAO SARPs. Development of these SARPs will guide the specifications for developing and supporting Category III technology.

GBAS is expected to be commissioned at Melbourne Airport by mid-2017. Airservices will then consider extending the GBAS network to suitable airports around Australia, after undertaking cross-industry cost/benefit analyses.

SBAS

Satellite Based Augmentation Systems (SBAS) augment GNSS in terms of accuracy, integrity, continuity and availability and can meet the operational requirements set by ICAO for the most critical phases of flight, particularly approach and landing operations.

On 17 January 2017, the Government announced that it will invest $12 million in a two-year program looking into the future of positioning technology in Australia. The program will test SBAS technology and Geoscience Australia (GA) with the Cooperative Research Centre for Spatial Information, have called for organisations from a range of industries, including aviation, to participate in the test-bed.

Further information on the SBAS test-bed project can be found on Geoscience Australia's website at www.ga.gov.au

Performance Based Navigation - PBN

ICAO has indicated that PBN implementation should be the highest priority for air navigation as published in the GANP.

Australia is transitioning from route navigation based on terrestrial navigation aides to area navigation based on GNSS as the enabling technology and ICAO PBN as the regulatory framework. PBN defines aircraft navigation requirements in terms of the accuracy, integrity, continuity and functionality required for the proposed operations. PBN improves safety and facilitates the planning of and operations on optimal flight routes.

PBN is used for all phases of flight, including en route, terminal, non-precision approach, approach with vertical guidance (APV), instrument procedure design, and is the basis for new air traffic separation standards. CASA and Airservices will continue to implement airspace and procedure design to facilitate maximum use of PBN.

PBN encompasses two broad area navigation families: area navigation (RNAV) and required navigation performance (RNP).

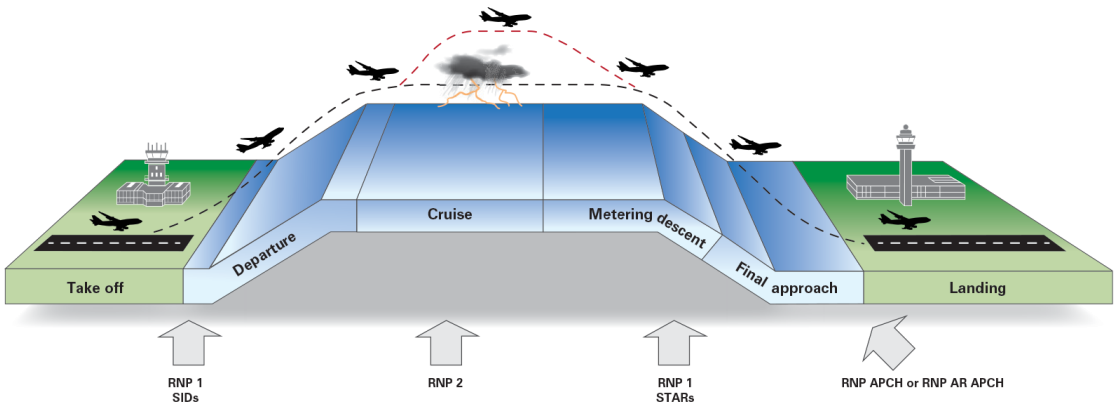
RNP navigation specifications require on-board performance monitoring and alerting, whereas the RNAV specifications do not; rather performance is monitored with radar.

Consistent with the Australian PBN Implementation Plan, the standard navigation specifications to be progressively implemented are:

- Oceanic en route – RNP 4 where capable, otherwise RNAV 10/RNP 10
- Continental en route – RNP 2
- Terminal instrument flight procedures (SID and STAR) – RNP 1
- Non-precision approach operations – RNP APCH

ICAO is currently developing SARPs for future RNP applications in all phases of flight and it is expected further benefits will be realised as the international aviation community adopts them.

The following diagram shows the various phases and components of PBN.



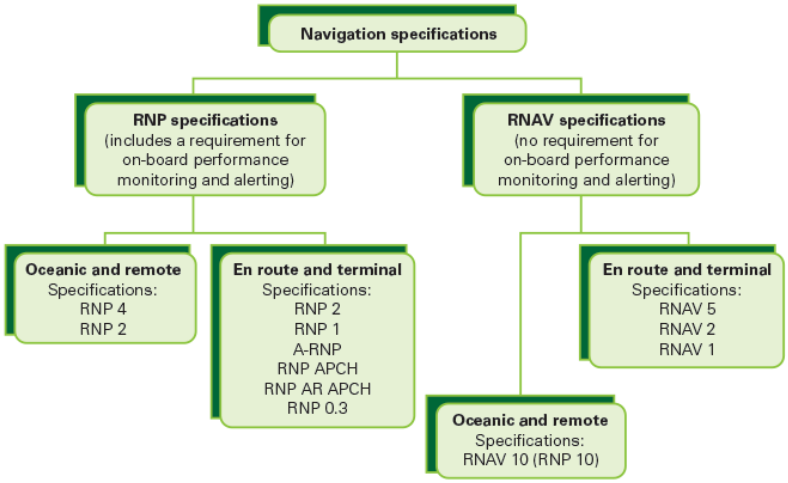


Figure 2 CASA -- What is performance based navigation (PBN)?

Further information on PBN can be found on CASA's website at www.casa.gov.au

Approach with Vertical Guidance - APV

APVs are instrument approach procedures which provide continuous lateral and vertical guidance. The introduction of APV has been identified by the ICAO as a significant measure to reducing accidents involving Controlled Flight into Terrain (CFIT) for all ICAO States.

One of the means of achieving APV is through the implementation of Barometric Vertical Navigation (Baro-VNAV) approach procedures. The policy on the rollout of Baro-VNAV approach procedures in Australia has been finalised and is available on the Department's website at www.infrastructure.gov.au/aviation/atmpolicy/baro-vnav.aspx

Airservices, in coordination with CASA, has also published a list of more than 100 initial candidate aerodromes. Other locations are also identified for implementation of Baro-VNAV procedures subject to final confirmation that these meet the necessary requirements for supporting Baro-VNAV procedures. Airservices will regularly update the aerodromes list available on its website to report on progress with the rollout of Baro-VNAV procedures at www.airservicesaustralia.com/projects/implementation-of-approaches-with-vertical-guidance

Off Air Route Operations

Off air route operations allow aircraft to fly more efficient routes, rather than along fixed lines. Airservices continues to implement FlexTracks and User-Preferred Routes (UPRs).

FlexTracks are routes between specific city pairs, published daily by Airservices. They are designed with regard for forecast wind conditions and to maximise aircraft fuel efficiency.

A UPR is a track generated by an Aircraft Operator for a specific flight to take advantage of meteorological conditions to reduce the cost of the flight. Due to the significant complexity this brings to traffic separation, UPR operations are currently limited to areas of low traffic density in

oceanic airspace. The future introduction of automated delegated conflict detection technology will enable the broader application of UPR in Australian airspace.

Trajectory Based Operations - TBO

Trajectory Based Operation (TBO) represents a shift from the past and present concept of controlling aircraft based on the basis of knowing where they are, and estimating where they will be in the future, to knowing both present and intended positions to high degrees of accuracy – and sharing that information.

The TBO concept envisages that aircraft will fly four dimensional trajectories (the fourth being 'time') as agreed at the system level while giving consideration to overall network efficiency. The current air traffic control environment will require the capability to negotiate trajectory directly with aircraft systems. TBO will improve throughput, flight efficiency, flight times, and network predictability through better coordination of aircraft operations.

Collaborative Decision Making - CDM

Understanding that coordination and cooperation between many stakeholders is required to create a sustainable system, Airservices is implementing an ICAO initiative referred to as Collaborative Decision-Making (CDM).

An important component of ATM demand and capacity balancing is the smooth and efficient management of aircraft in the airport environment. Airservices will continue to implement a number of airport based initiatives designed to enhance air traffic flow management (ATFM) to manage delays for all airspace users, without compromising safety.

Airport CDM (A-CDM) seeks to improve operational efficiency by sharing information between airport operators, airlines, ground handlers and air traffic control. With access to greater information in real time, participants can make more reliable decisions regarding resource management and can make or request changes to flight schedules.

A-CDM will build upon the existing Ground Delay Program, which identifies when an air traffic demand/capacity imbalance occurs in a pre-tactical timeframe and allows aircraft to be held on the ground at the point of departure, rather than in an airborne holding pattern. This has improved predictability and has saved airlines fuel costs and reduced greenhouse gas emissions in the environment.

Meteorological CDM (MET CDM) has been introduced in Melbourne and Brisbane and has demonstrated improvements to operational predictability. It will brought into Sydney and Perth to provide operational benefits to airline customers. MET CDM also forms a part of the overall A-CDM concept, in that it predicts runway capacity based on refined weather forecasts.

Airport Capacity Enhancement (ACE) Program

Airservices is continuing with the national Airport Capacity Enhancement (ACE) program in collaboration with airport and industry stakeholders. ACE addresses growing demand at Australia's major airports identifying opportunities on a location by location basis to increase the utilisation of existing infrastructure to increase runway capacity. These opportunities focus on the areas of:

- improving arrival spacing;

- standardising terminal speeds;
- reducing runway occupancy times and pilot response times; and
- improving communication between airport partners.

To date, ATM initiatives have been implemented in Sydney, Melbourne, Perth and Brisbane and a strategic plan has been developed for Adelaide.

A similar programme has been developed for Sydney through the Sydney Airport – Air Traffic Management Strategic Planning Group (SASPG). Sydney Airport is generally acknowledged to have reached capacity at peak times and the SASPG, comprising Airservices, airport and airport user representatives, works collaboratively to identify and implement actions to improve the flow of traffic through Sydney Airport. More information on the program can be found on Airservices website at http://www.airservicesaustralia.com/services/airport-capacity-enhancement-ace/

Airport Slot Management

Coordination of airport slots is one of the primary mechanisms for airports to manage aviation demand, and have proven effective in contributing to the orderly management of air traffic and enhanced utilisation of aviation infrastructure and overall airport capacity. It is important to note, slot management schemes coordinate gate movements at an airport, but do not manage runway capacity or operations.

Coordination of both domestic and international slots occurs at Sydney, Brisbane, Perth, Adelaide and Darwin Airports. At Melbourne, Cairns and Gold Coast Airports only international slots are coordinated. The slot management system in place at Sydney (Kingsford Smith) Airport is the only demand management system regulated by the Government and this occurs through the *Sydney Airport Demand Management Act 1997*. Each of the other slot management systems are implemented by the respective airports, with the close collaboration of Airservices and industry. The Government is supportive of airports implementing demand management systems where benefits would be realised by airlines and the travelling public.

Information Management

The ATM community increasingly depends on the provision of timely, relevant, accurate, accredited and quality-assured information in order to collaborate and make informed decisions.

Information flows will be supported by System Wide Information Management (SWIM), through an interconnected set of domain systems providing or consuming information, including human users and aircraft. Through SWIM, information is made available and processed through services which need to conform to applicable standards and be registered so that they are accessible. This will improve information management and information sharing.

Integrated Tower Automation Suite (INTAS) is a fully harmonized suite of ATC tools that provides Airservices controllers with a common, modern set of key ATC systems and capabilities in a single customizable platform to meet both the current and future demands of aviation and industry users. INTAS replaces the traditional paper-based console with a number of touch screen monitors. All tower data and communication is accessed via these touch screens. It also integrates electronic flight strips, operational data management, digital automatic terminal information services, voice communication control system and the electronic surveillance system.

Aviation Weather Services

The BOM's Aviation Weather Service is committed to enhance the safety, regularity and efficiency of national and international aviation operations through the provision of accurate, timely and relevant information for aerodromes and en route operations.

The BOM provides meteorological services for civil aviation and Defence in Australia in accordance with the SARPs set out in Annex 3 of the Chicago Convention and Australian requirements. These include meteorological observations and reports, forecasts, hazardous weather advisories and warnings, climatological information and environmental intelligence.

In support of an efficient and effective ATM system, the BOM has embedded meteorologists in the Sydney TCU and the Airservices National Operations Centre (NOC) and is implementing meteorological input into Airservices Air Traffic Flow Management (ATFM) system.

The BOM is implementing the outcomes of the 2014 aerodrome forecast (TAF) review which established a methodology for determining the criteria under which aerodromes would receive a TAF service and the required level of service. The review also recommended upgrades to the meteorological observational infrastructure and enhanced TAF reporting at a number of aerodromes based on thresholds including passenger numbers and aircraft movements.

Upgrades to the meteorological observational infrastructure will also provide additional aviation weather services to industry. The next scheduled review of TAF services is scheduled for the second half of 2017 and every three years thereafter.

In 2015, a review of trend forecasts (TTF) was undertaken by a stakeholder working group. This review proposed that major civil and Defence airports that currently have TTF service should transition from a TTF and six-hourly issued TAF to a three-hourly issued TAF service alone. The final implementation of the TTF review outcomes is the subject of ongoing consideration by the BOM in consultation with Government aviation agencies and industry.

Appendix 3

Acronyms and Abbreviations

AAPS	Australian Airspace Policy Statement
ACE	Airport Capacity Enhancement Project
AC-MAC	Australian Civil-Military Air Traffic Committee
ADCD	Automated Delegated Conflict Detection
ADF	Australian Defence Force
ADIN	Aeronautical Data Interchange Network
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-C	Automatic Dependant Surveillance-Contract
AFP	Assessment of Flight Priorities
AIDC	ATM Inter-facility Data Link Communications
AIG	Aviation Implementation Group
Airservices	Airservices Australia
AIP	Aeronautical Information Publication
ANO	Aircraft Noise Ombudsman
ANSP	Air Navigation Service Provider
APANPIRG	Asia Pacific Air Navigation Planning and Implementation Regional Group
APG	Aviation Policy Group
APV	Approach with Vertical Guidance
ASAS	Airborne Separation Assistance Systems
ASBU	Aviation System Block Upgrade
ASPIRE	Asia and South Pacific Initiative to Reduce Emissions
ASTRA	Australian Strategic Air Traffic Management Group
ATC	Air Traffic Control
ATS	Air Traffic Services
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATMP	Air Traffic Management Plan
ATSB	Australian Transport Safety Bureau
ATSC	Air Traffic Service Centre
Baro-VNAV	Barometric Vertical Navigation
BOM	Bureau of Meteorology
CAOs	Civil Aviation Orders
CAR	Civil Aviation Regulations 1988
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations 1998
CCO	Continuous Climb Operations
CDM	Collaborative Decision Making
CDO	Continuous Descent Operations
CFIT	Controlled Flight into Terrain

CMATS	Civil-Military Air Traffic System
CNS	Communications, Navigation and Surveillance
CPDLC	Controller Pilot Data Link Communications
Defence	Department of Defence
Department	Department of Infrastructure and Regional Development
EGNOS	European Geostationary Navigation Overlay Service
FAS	Future Airspace System
FL	Flight Level
FUA	Flexible use of airspace
GAGAN	GPS Aided Geo Augmented Navigation
GANP	Global Air Navigation Plan
GASP	Global Aviation Safety Plan
GATMOC	Global Air Traffic Management Operational Concept
GBAS	Ground Based Augmentation System
GLS	GBAS Landing System
GNSS	Global Navigation Satellite System
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
INSPIRE	Indian Ocean Strategic Partnership to Reduce Emissions
IWXXM	ICAO Meteorological Information Exchange Model
LNAV	Lateral Navigation
LOC-I	Loss of control inflight
NOC	National Operations Centre
NPRM	Notice of Proposed Rule Making
OAR	CASA Office of Airspace Regulation
OARO	Off Air Route Operations
PBN	Performance Based Navigation
PIRG	Planning and Implementation Regional Group
RAAF	Royal Australian Air Force
RAPAC	Regional Airspace and Procedures Advisory Committee
RNAV	Area Navigation
RNP	Required Navigation Performance
RPAS	Remotely Piloted Aircraft Systems
SARPs	Standards and Recommended Practices
SASP	ICAO Separation and Airspace Safety Panel
SASPG	Sydney Airport – Air Traffic Management Strategic Planning Group
SBAS	Satellite Based Augmentation Systems
SIDs	Standard Instrument Departures
STAR	Standard Terminal Arrival Routes
SOE	Statement of Expectations
TAAATS	The Australian Advanced Air Traffic System
TAF	Aerodrome Forecast
TBO	Trajectory Based Operation
TCAS	Traffic Collision Avoidance System
TCU	Terminal Control Unit

TTF	Trend Forecast
UPR	User-Preferred Routes
VFR	Visual Flight Rules
WAAS	Wide Area Augmentation System