FLIGHT PATH DESIGN PRINCIPLES

Version 1

Effective Date: 01 October 2020

CONTENTS

1. DEVELOPMENT OF THE PRINCIPLES

We have developed the Flight Path Design Principles (Principles) to provide a basis for designing and developing the flight paths that we will implement and operate.

They are the result of national consultation with community, industry and government stakeholders, and are consistent with international global practices.

2. PURPOSE

We need to cater for the changing nature of aircraft operations, air traffic growth, airport expansion and advances in aviation technology, while keeping aviation safety as our first priority.

We need to manage the impacts of aviation activities and this requires a careful balance of ensuring safety, operational efficiency, protecting the environment and minimising the effects of aviation noise on the community, wherever practicable.

The Principles guide Airservices design, development and decision-making regarding flight paths and their implementation.

In this document we provide an overview of each Principle, including their context within flight path changes, how we consider, apply and monitor them, and the overarching governance that applies. We have included additional sources of information, and noted cases where the Principle may not apply.

3. FLIGHT PATHS

The term 'flight path' is used to refer to the mapped three-dimensional corridor within which aircraft flying under the Instrument Flight Rules (IFR)[1] are expected to operate most of the time. Flight paths can be a number of kilometres wide, rather than the single lines depicted on flight charts (maps). Aircraft may fly differently within these corridors for a range of reasons, including aircraft performance (including type, speed and weight), and navigation systems. Aircraft may deviate from flight paths for a range of reasons, including weather and operational requirements. In controlled airspace[2], this will be at the approval of air traffic control (ATC).

Instrument Flight Rules (IFR)[3], are rules which allow properly equipped aircraft to be flown in all weather conditions, by reference to aircraft instruments.

General aviation operators, including helicopters, commonly fly Visual Flight Rules (VFR)[4] where the pilot uses visual references to the ground or water rather than flying on a set flight path designed by Airservices.

Similarly, how a flight training circuit is flown and its location is not determined by Airservices. Rather it must be conducted in accordance with Civil Aviation Safety Authority (CASA) rules.

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[1] Instrument flight procedure design and IFR are procedures and rules which enable aircraft to operate in all weather conditions, including when navigation by visual references is not possible

[2] Controlled airspace in Australia is actively monitored and managed by ATC. To operate in controlled airspace, an airspace user must first receive a clearance from ATC. ATC gives priority to emergency operations.

[3] Instrument flight procedure design and IFR are procedures and rules for how aircraft are to be operated when visual reference cannot be used for navigation by pilots.

4 Visual Flight Rules (VFR) are procedures and rules for how aircraft are to be operated when the pilot uses visual references such as to the ground or water to fly

4. APPLICATION OF THE PRINCIPLES

4.1. Why does Airservices make changes to flight paths?

We may make changes to flight paths for a variety of reasons including:

- Safety and/or efficiency enhancements to respond to current or forecast increases in volume or changes to aircraft operations at a location
- Safety and/or efficiency improvements based on feedback from ATC, airlines and/or pilots
- Directives from the Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) and or Civil Aviation Safety Authority (CASA)
- Community-suggested safe and feasible noise improvements
- Recommendations from CASA airspace reviews
- Recommendations from CASA compliance audits and re-validation of flight procedures
- Technological advancements in aircraft navigation or aircraft performance
- Airport infrastructure changes resulting in new or changing flight paths.

4.2. Flight Path Change Process

We undertake a multi-step flight path change process, dependent on the scale and breadth of the change. A number of screening and assessment steps are involved to progress a flight path change proposal to implementation. These ensure that the flight paths are safe, operationally feasible, and meet our environmental responsibilities. The changes involve a range of stakeholder engagement activities and all feedback is considered before we progress to final flight path design development.

Airservices Community Engagement Framework (CEF) has been developed to provide a rigorous process for delivery of community engagement activity for flight path and associated airspace changes, and should be read in conjunction with this document.

4.3. Overall Considerations

- The Principles supersede the guiding principles in *Airservices Commitment to Aircraft Noise Management* (2013) and any earlier documents.
- Once ensuring safety and compliance, we will consider all other Principles holistically and will not look at any one Principle in isolation.
- The Principles apply to future changes and will not be applied retrospectively to flight paths that are currently implemented nor to projects that have commenced at the time of publication.
- The Principles only apply to flight paths designed by Airservices. Other organisations, certified by CASA, are able to design flight paths within Australia and they are not obligated to apply the Principles.
- There may be situations where the Principles cannot be applied due to legislative requirements.
    - The Principles do not vary the Long Term Operating Plan (LTOP) for Sydney (Kingsford Smith) Airport and associated airspace[5, 6] and in applying the Principles all LTOP requirements will be maintained.

5 Air Services Act 1995 - subsection 16(1) - Direction concerning the Sydney Airport long term operating plan, https://www.legislation.gov.au/Details/F2009B00158

6 Sydney Airport Community Forum, The Long Term Operating Plan (LTOP) https://sacf.infrastructure.gov.au/ltop

- The Principles do not vary legislated airport curfew acts[7].

- There are a number of constraints and considerations that mean that the Principles may not be able to apply to all flight path changes. For example, flight path design can be constrained by the location of an airport and the runway/s orientation, the local weather and meteorological conditions, the natural and/or urban terrain, aircraft performance and/or navigation capability, or the existing air traffic network and airspace architecture.
- There may be situations were application of one Principle impacts on the application of another Principle. For example avoiding overflight of noise sensitive sites, may result in reduced efficiency, and therefore impact on the environment through increased fuel burn and emissions.
- Aircraft noise is an inevitable by-product of aircraft operations and it is not possible to guarantee any suburb, group or individual exemption from aircraft noise exposure.

4.4. Weighting of Principles

- Safety is our most important consideration and all flight path changes must be compliant.
- The Safety and Compliance Principles must always apply.
- The remaining Principles are not weighted.
- All other Principles are considered equally in the flight path change process, noting that all Principles may not apply to every flight path change.
- The order in which Principles appear or use of the word ‘consider’ does not reflect importance or weighting.

5. REPORTING

We commit to transparency and accountability by reporting on how the Principles have been considered and applied, and if they have not been applied, the reasons for this.

For each new flight path or airspace change we will report on how the Principles have been considered and applied, and if they have not been applied, the reasons for this. The format of this report may vary based on the scale and breadth of the change.

Reports will be made available through the relevant project page on Engage Airservices at the commencement of our engagement.

7 Department of Infrastructure, Transport, Regional Development and Communications, https://www.infrastructure.gov.au/aviation/environmental/curfews/index.aspx

6. FLIGHT PATH DESIGN PRINCIPLES

Safety and Compliance Principles

Safety of air navigation must be the most important consideration.

Flight path design must comply with Australian and International design standards, and cater for the range of aircraft that will operate on the flight paths.

Noise and Community Principles

Consider concentrating aircraft operations to avoid defined noise sensitive sites.

Consider potential impacts on social, economic and cultural values of communities and locations, including Indigenous and other heritage places.

Where high-density residential areas are exposed to noise, consider flight path designs that distribute aircraft operations, so that noise can be shared.

Where noise exposure is unavoidable, consider Noise Abatement Procedures that adjust aircraft operations to reduce noise impacts, including consideration of the time of these operations.

Consider current and expected future noise exposure when designing flight paths.

Efficiency and Environmental Principles

Consider Matters of National Environmental Significance, other sensitive habitats, and registered heritage sites.

Design flight paths that deliver operational efficiency and predictability, and minimise the effect on the environment through reducing fuel consumption and emissions.

Operational Principles

Design flight paths to facilitate access to all appropriate airspace users.

Consider flight paths that optimise airport capacity, and meet future airport requirements.

Consider flight paths that optimise overall network operations, including consideration of operations at adjacent airports.

Consider innovation and technology advancements in navigation and aircraft design.

7. SAFETY AND COMPLIANCE PRINCIPLES

Safety of air navigation must be the most important consideration.

Overview

The *Air Services Act 1995* requires that Airservices, "*In exercising its powers and performing its functions, must regard the safety of air navigation as the most important consideration*".

When considering flight path design, safety is assured through:

- separation of aircraft from each other according to flight rules and the type of air traffic service provided
- clearance between aircraft and terrain and/or man-made obstacles
- segregation of aircraft operations
- the ability of aircraft to operate safely within their performance envelope
- minimising operational complexity.

The safety of air navigation ensures the safety and protection of aircraft passengers and communities under the flight paths.

It is important to note that, to ensure safety or due to operational requirements, aircraft may be cleared by air traffic control (ATC) to operate on routes other than the published flight path.

Application

We assure the design is safe through:

- meeting Civil Aviation Safety Authority (CASA) criteria for flight path design, and airspace separation and containment
- meeting International Civil Aviation Organization (ICAO) criteria adopted by CASA for application in Australia
- quality assurance processes documented in accordance with *Civil Aviation Safety Regulations 1998 Part 173 – Instrument Flight Procedure Design*
- applying design validation methods including:
    - airline simulator testing and validation to ensure the fly-ability of the procedures, as appropriate
    - ATC simulator testing and validation to ensure that ATC workload is achievable
    - flight validation of instrument flight procedures.

Monitoring

We monitor the safety performance of air navigation through our Safety Management System (SMS). CASA monitors Airservices performance and conducts regulatory audits of our air navigation service delivery, flight path design management, and our SMS.

We monitor airport and other developments which may impact on the published flight paths, and ensure these are managed to protect the safety of aircraft on those flight paths.

We conduct periodic maintenance reviews of instrument flight procedures every three years, which includes flight re-validation.

Policies, Legislation, Standards and Guidance

- *Air Services Act 1995*
- *Airports (Protection of Airspace) Regulation 1996*
- *CASA Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedures Design (2016)*
- *Civil Aviation Safety Regulations (CASR) 1998 Part 173 – Instrument flight procedure design*
- *ICAO Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS)*
- *ICAO Doc 9905 Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual*

Sources of Information

Our Aeronautical Information Service (AIS) provides the online material and publications that display flight paths, instrument flight procedures and aerodrome charts
https://www.airservicesaustralia.com/aip/aip.asp

Exclusions

There are many other parties with a range of responsibilities for managing aviation safety within Australia, including CASA, Australian Transport Safety Bureau (ATSB), airlines and operators, pilots, airports, and aircraft manufacturers.

These parties are also responsible for elements of aviation safety, outside of Airservices obligations to the safety of aviation navigation.

Federally leased airports must manage prescribed airspace approved by Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) and this cannot be infringed upon. The prescribed airspace establishes protection from obstacles at and around airports in the interests of the safety, efficiency or regularity of existing or future air transport operations.

Airports are also responsible for other hazard management including animals and bird-life.

Flight path design must comply with Australian and International design standards, and cater for the range of aircraft that will operate on the flight paths.

Overview

In designing flight paths, we must comply with the Civil Aviation Safety Authority (CASA) regulations and standards, and International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs), Manuals and documentation.

ICAO is a United Nations specialised agency, established by Member States in 1944 to manage the administration and governance of International Civil Aviation. Australia is a Member State of ICAO and supports the global priorities, strategic objectives and development of international standards for the aviation industry.

ICAO produces SARPs which are intended to achieve a measure of international uniformity, however they do not preclude the development of national standards which may be more stringent.

CASA have mandated that flight path design in Australia must comply with the ICAO SARPs for instrument flight procedure[8] design.

In accordance with *CASR Part 173,* CASA has certified Airservices as an organisation permitted to design approach and departure procedures for aircraft operating under Instrument Flight Rules (IFR)[1]. The certification process requires that Airservices appoint a Chief Designer to manage flight path design and a team of qualified designers.

We give authority for aircraft in controlled airspace[9] to fly instrument flight procedures, while CASA approves the design of airspace and high altitude flight paths (routes).

Application

We must ensure that the instrument flight procedures are designed in accordance with any applicable standards set out or referred to in *ICAO Doc 8168 PANS-OPS, ICAO Doc 9905 RNP AR* and any applicable standards set out in the *CASA Manual of Standards (MOS) Part 173.*

We design flight paths that are suitable for the range of aircraft that are capable of operating at an airport or aerodrome, dependent on the length and width of the runway. Aircraft performance differences influence the range of flight path designs.

In designing flight paths, we will consider elements including terrain and obstacle clearance, meteorological conditions, aircraft performance, climb gradients, descent profiles, speeds, rate of turn, angle of bank (turning movement) and the airspace available to safely contain the procedure.

Monitoring

Prior to publication, we ensure that flight path designs are compliant through independent verification of the design by a second qualified designer. Then CASA conducts flight validations to ensure procedures are safe and flyable and that they meet applicable design standards.

We conduct regular maintenance reviews of published instrument flight procedures to ensure ongoing obstacle protection and compliance with any changes to the standards.

CASA conducts routine compliance audits on Part 173 providers, including Airservices, to ensure compliance with regulations and standards.

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8 Instrument flight procedure design and IFR are procedures and rules for how aircraft are to be operated when visual reference cannot be used for navigation by pilots.

9 Controlled airspace in Australia is actively monitored and managed by air traffic control (ATC). To operate in controlled airspace, an airspace user must first receive a clearance from ATC. ATC gives priority to emergency operations.

CASA is responsible for the review of rule sets in Australia, and it convenes Aviation Safety Advisory Panels (ASAPs) to consider rule changes and conducts consultation with Airservices, aviation industry and the public, through Notice of Proposed Rule Making (NPRM).

ICAO convenes the Instrument Flight Procedures Panel (IFPP) to regularly review design standards and practices. The IFPP is composed of experts involved in the design of instrument flight procedures or the operational use of these procedures and associated requirements with background in both conventional and performance based navigation (PBN). CASA is the Australian member of the IFPP and our Chief Designer is an advisor to CASA for this purpose.

Policies, Legislation, Standards and Guidance

- *CASA Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedures Design (2016)*
- *Civil Aviation Safety Regulations 1998 Part 173 – Instrument flight procedure design*
- *ICAO Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS)*
- *ICAO Doc 9905 Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual*
- *ICAO Doc 9906 Quality Assurance Manual for Flight Procedure Design*

Sources of Information

Our Aeronautical Information Service (AIS) provides the online material and publications that display flight paths, instrument flight procedures and aerodrome charts
https://www.airservicesaustralia.com/aip/aip.asp

Exclusions

There are other organisations in Australia certified by CASA to design instrument flight procedures. These organisations are required to consult with Airservices ATC for flight paths that will operate in controlled airspace, however we are not required to verify these designs. They are subject to CASA's standard flight validation processes.

We provide the publication services for flight paths and charts, and these organisations must comply with these publication processes, including the requirement to provide a completed environmental assessment.

Department of Defence (Defence) design instrument flight procedures for operations by military aircraft at military controlled airports. Defence is not subject to certification by CASA. Their designs are approved and validated by Defence, and their instrument flight procedures are published in Defence documentation. We are not required to verify these designs.

8. NOISE AND COMMUNITY PRINCIPLES

Consider concentrating aircraft operations to avoid defined noise sensitive sites.

Overview

Under the *Air Services Act 1995,* Airservices has an obligation to provide environmentally responsible services by minimising the environmental impact of aircraft operations, including the impact of aircraft noise.

We consider noise sensitive sites (also referred to as noise sensitive receivers) when designing proposed flight path changes.

Noise sensitive sites[10] can include:

- residential buildings
- schools and places of education including pre-schools and child care centres
- hospitals, aged care facilities and other health-related facilities
- places of worship
- places of temporary residence including hotels and motels
- public recreational buildings.

We recognise that the sensitivity of noise sensitive sites to aircraft noise may vary due to the time of day, and the type of activity undertaken at that site and any existing management or mitigation measures in place.

It may be impractical to completely avoid noise sensitive sites, especially if sites are already in proximity to airports, or if flight paths are constrained by terrain, obstacles or other airspace restrictions.

Application

We consider the impact of aircraft operations on noise sensitive sites up to approximately 60 kilometres (35 nautical miles) from a runway.

In our consideration we recognise that rural and urban communities may be impacted by aircraft operations differently.

We design flight paths to avoid noise sensitive sites wherever practicable, to reduce aircraft noise impacts. Where these impacts cannot be avoided we engage with communities in accordance with our procedures and guidelines.

Monitoring

We monitor and report on aircraft utilisation of runways and flight paths through the use of specialised aircraft noise monitoring equipment, databases and information systems contained in our Noise and Flight Path Monitoring System (NFPMS).

[10] Australian Standard AS2021:2015 (Acoustics - Aircraft noise intrusion - Building siting and construction)

Policies, Legislation, Standards and Guidance

- *Air Services Act 1995*
- *Australian Standard AS2021:2015 (Acoustics - Aircraft noise intrusion - Building siting and construction)*

Sources of Information

Information from Airservices NFPMS is available on our website through WebTrak https://www.airservicesaustralia.com/aircraftnoise/webtrak/

Exclusions

State, Territory and Local Governments are responsible for land use planning around airports through zoning, subdivision control, and comprehensive planning actions.

The National Airports Safeguarding Framework (2018) is a national land-use planning framework that aims to improve community amenity by minimising aircraft noise-sensitive developments near airports and improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning decisions through guidelines being adopted by jurisdictions on various safety-related issues.

In Australia there are no regulations which specify a maximum, allowed level of aircraft noise. Airservices does not have any powers of enforcement to cease an aircraft from operating due to its noise impacts.

Consider potential impacts on social, economic and cultural values of communities and locations, including Indigenous and other heritage places.

Overview

Aircraft operations play a vital role in Australia's economy, and support the development of social and cultural activities by connecting people, tourism and regions.

We consider the impact of aircraft operations on communities and locations up to approximately 60 kilometres (35 nautical miles) from a runway.

In our consideration we recognise that rural and urban communities may be impacted by aircraft operations differently.

In accordance with the definitions in the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, we give consideration of people and communities; heritage values, and their social, economic and cultural aspects when conducting flight path design.

Cultural values in this context are those which are defined in Local and State Government documentation, including planning, zoning and strategic vision statements.

Locations documented as having social, economic or cultural importance, or locations of national environmental significance are listed in the following sources:

- Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool
- State and Territory Heritage Registers
- State Aboriginal and Torres Strait Islander Cultural Heritage Registers
- Local Government urban and community planning documents.

It may be impractical to avoid areas of social, economic or cultural value, especially if sites are in proximity to airport operations, or flight paths are constrained by terrain, obstacles or other airspace.

Application

We conduct research to identify social, economic and culturally important values and sites to ensure that these are considered from the beginning of the flight path change process. Wherever practicable, flight paths are designed to minimise the impact of the change.

We may also rely on research conducted by third parties that has been approved by relevant State and/or Federal Government.

We undertake an environmental assessment screening process for all changes to aircraft operations to identify changes that require a more comprehensive Environmental Impact Assessment (EIA).

Monitoring

The DAWE has a range of enforcement mechanisms for managing suspected or identified instances of non-compliance and for reviewing the compliance of referred projects.

Policies, Legislation, Standards and Guidance

- *Environment Protection and Biodiversity Conservation Act 1999*

Sources of Information

Referrals under the *EPBC Act* are published on the DAWE *EPBC Act* Notices database.

Exclusions

In Australia there are no regulations which specify a maximum, allowed level of aircraft noise. Airservices does not have any powers of enforcement to cease an aircraft from operating due to its noise impacts.

Where high-density residential areas are exposed to noise, consider flight path designs that distribute aircraft operations, so that noise can be shared.

Overview

Under the *Air Services Act 1995,* Airservices has an obligation to provide environmentally responsible services by minimising the environmental impact of aircraft operations, including the impact of aircraft noise.

Flight path designs can be used to distribute aircraft operations and noise across multiple areas. Distribution does not mean there will be an equal number of aircraft over each area, rather that areas may be provided periods of respite from aircraft noise, within the constraints of a range of considerations including, traffic demand and weather.

Distribution may be achieved by:

- introducing multiple Standard Instrument Departures (SIDs) or Standard Instrument Arrivals (STARs), for example separating jet and non-jet SIDs/STARs
- designing separate approach/arrival procedures for varying aircraft navigation technology, for example providing standard and 'Smart Tracking'[11] approaches
- using Noise Abatement Procedures (NAPs) to indicate preferred flight track and/or runway modes of operation that aim to reduce noise impacts for communities.

However, air traffic control (ATC) may clear aircraft to operate on a route other than the published flight path, to ensure safety or due to operational requirements.

Application

We engage with stakeholders, including community, aircraft operators, airlines, and the airport operator to develop flight paths which consider varying aircraft performance and navigation technology, and apply NAPs to minimise the effect of aircraft operations on the environment, including aircraft noise.

We use national population data, and State and Local Government land-use planning and zoning information, to identify residential areas.

We use the term 'high density' to refer to any 'built up areas', including cities, towns, villages and suburbs.

Monitoring

We monitor and report on aircraft utilisation of runways and flight paths through the use of specialised aircraft noise monitoring equipment, databases and information systems contained in our Noise and Flight Path Monitoring System (NFPMS).

11 'Smart Tracking' also known as Required Navigation Performance Authorization Required (RNP AR) procedures are flight paths with strict navigation performance requirements that rely on satellite based navigation and are only available to Civil Aviation Safety Authority (CASA) approved aircraft and pilots

Policies, Legislation, Standards and Guidance

- *Air Services Act 1995*
- *Civil Air Navigation Services Organization (CANSO) and Airports Council International (ACI) Managing the Impacts of Aviation Noise (2015)*
- *International Civil Aviation Organization (ICAO) Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS)*

Sources of Information

Our Aeronautical Information Service (AIS) provides the online material and publications that display flight paths, instrument flight procedures and aerodrome charts
https://www.airservicesaustralia.com/aip/aip.asp

Information from Airservices NFPMS is available on our website through WebTrak
https://www.airservicesaustralia.com/aircraftnoise/webtrak/

Exclusions

The number, type, destination and origin of aircraft planned to operate on each flight path is determined by a range of factors including, airport and airline agreements, airline and operator flight scheduling, and fleet mix.

State, Territory and Local Governments are responsible for land use planning around airports through zoning, subdivision control, and comprehensive planning actions.

The National Airports Safeguarding Framework (2018) is a national land-use planning framework that aims to improve community amenity by minimising aircraft noise-sensitive developments near airports and improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning decisions through guidelines being adopted by jurisdictions on various safety-related issues.

In Australia there are no regulations which specify a maximum, allowed level of aircraft noise. Airservices does not have any powers of enforcement to cease an aircraft from operating due to its noise impacts.

Where noise exposure is unavoidable, consider Noise Abatement Procedures that adjust aircraft operations to reduce noise impacts, including consideration of the time of these operations.

Overview

Under the *Air Services Act 1995,* Airservices has an obligation to provide environmentally responsible services by minimising the environmental impact of aircraft operations, including the impact of aircraft noise.

Noise Abatement Procedures (NAPs) are designed to minimise the impact of aircraft noise on the community by reducing noise at the airport during ground operations and noise generated during the arrival and departure phases of flight.

NAPs can include:

- preferred flight track and/or runway modes of operation
- Noise Abatement Departure Procedures (NADP) such as directing aircraft to depart over water at night
- approach procedures such as Continuous Descent Operations[12] (CDO) and low power, low drag techniques
- modified flight path angles to adjust climb gradients
- restrictions on engine run-ups (a type of engine check) and/or ground equipment use.

Communities near airports may be sensitive to operations at different times of the day and night. To minimise the noise impacts on these communities NAPs may also include requirements regarding time of operations, including nominating the preferred runway use.

In all cases, safety considerations take priority over NAPs.

The appropriateness of NAPs depends on a range of factors including:

- the physical lay-out of the airport and its surroundings
- airport and airspace capacity, particularly during high demand periods.

It may be impractical to use NAPs if they generate delay and congestion, that can contribute directly to noise and emission impacts. Appropriate consideration of all potential environmental impacts is required in developing and reviewing NAPs.

Application

Airservices is responsible for the development and review of NAPs in consultation with stakeholders, including aircraft operators, airlines, the airport operator and community.

NAPs are implemented by air traffic control (ATC) or other responsible parties (for example airports or airport owners e.g. Councils), and may be varied by ATC or pilots, subject to weather conditions and operational requirements.

12 CDO is an aircraft operating technique, enabled by airspace and instrument procedure design, which allows arriving aircraft to descend continuously using minimum engine thrust and low drag settings.

Monitoring

We monitor and report on aircraft utilisation of runways and flight paths through the use of specialised aircraft noise monitoring equipment, databases and information systems contained in our Noise and Flight Path Monitoring System (NFPMS).

NAPs reporting may include information on preferred runway use and use of 'Smart Tracking'[13] approaches.

We conduct reviews on the use and effectiveness of NAPs.

Policies, Legislation, Standards and Guidance

- *Air Services Act 1995*
- *Civil Air Navigation Services Organization (CANSO) and Airports Council International (ACI) Managing the Impacts of Aviation Noise (2015)*
- *ICAO Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS)*
- *International Civil Aviation Organization (ICAO) Doc 9829 Guidance on the Balanced Approach to Aircraft Noise Management*

Sources of Information

Our Aeronautical Information Service (AIS) provides the online material and publications that include NAPs https://www.airservicesaustralia.com/aip/aip.asp

Information from Airservices NFPMS is available on our website through WebTrak https://www.airservicesaustralia.com/aircraftnoise/webtrak/

Exclusions

Aircraft operators are responsible for *Fly Neighbourly Agreements*, which are a voluntary agreement negotiated between aircraft operators and communities or authorities that have an interest in reducing the disturbance caused by aircraft within a particular area.

Curfews at federally leased airports are imposed by Federal legislation and regulated by DITRDC (through the *Airports Act 1996*).

Operators of non-federally leased airports, including private airports, may limit operations during certain hours through different means. This could be through setting operating hours or through State legislation or Local Government approvals.

In Australia there are no regulations which specify a maximum, allowed level of aircraft noise. Airservices does not have any powers of enforcement to cease an aircraft from operating due to its noise impacts.

[13] 'Smart Tracking' also known as RNP AR procedures are flight paths with strict navigation performance requirements that rely on satellite based navigation and are only available to Civil Aviation Safety Authority (CASA) approved aircraft and pilots

Consider current and expected future noise exposure when designing flight paths.

Overview

Airservices considers the noise impacts of proposed flight path changes against current aircraft noise exposure. Current noise exposure is determined by considering the current aircraft operations in the area, including the type, frequency, altitude and noise levels of these operations.

When designing new flight paths, we review the flight path designs within approximately 60km of the aerodrome against current populations, future development of residential areas, and other noise sensitive sites.

Long term forecasts of future aircraft noise levels around airports are presented in Australian Noise Exposure Forecast (ANEF) charts. ANEFs are mandatory for all federally-leased airports as part of their Master Plans under the *Airports Act 1996*. ANEFs may also be required by State or Local Governments for non-federally leased airports. ANEFs are technically endorsed by Airservices to ensure their accuracy and are primarily used for land use zoning purposes by State, Territory and Local Governments.

Application

We use data sourced from our Noise and Flight Path Monitoring System (NFPMS) and our air traffic control (ATC) system to determine current exposure to aircraft noise.

Noise levels and sound exposure are assessed using a suite of metrics, which have been informed by best practice in other noise-generating industries, for example LA_{max}[14] and 'Number Above'[15], noise metrics. We also conduct estimates of the population potentially affected by changes in aircraft noise levels.

We assess the expected future noise exposure, using forecast growth in aircraft movements, and information gained through industry intelligence.

We use State and Local Government land-use planning and zoning to identify current and future land uses, and together with current aircraft operations data, design flight paths to minimise community noise exposure, where practicable.

We undertake an environmental assessment screening process for all changes to aircraft operations to identify changes that require a more comprehensive Environmental Impact Assessment (EIA).

Monitoring

We monitor and report on aircraft utilisation of runways and flight paths through the use of specialised aircraft noise monitoring equipment, databases and information systems contained in our NFPMS.

Permanent and temporary noise monitoring can be undertaken for a range of reasons including to:

- determine the contribution of aircraft noise to the overall noise that a community is exposed to
- provide information to the community about aircraft noise and operations
- help local authorities make informed land planning decisions (though decisions can only be refined through the use of monitoring data, not completely overturned)

[14] LA_{max} is the maximum sound level that an A-weighted sound pressure level reaches during a period of measurement.

[15] 'Number above' noise metrics describe the number of aircraft noise events above a certain noise level, e.g. 70 decibels (dB(A)). These are expressed as N70-x, where x is the number of noise events (e.g. 1, 5, 10, 20 or 50) above that noise level. These metrics are usually displayed as contours, with grading from high numbers of noise events to low numbers of noise events.

- inform estimates of the impact of changes in ATC procedures – including changes designed to reduce noise impacts of aircraft
- validate noise modelling.

We conduct Post-Implementation Reviews (PIRs) for all flight path changes where community engagement is undertaken to ensure the assessment of predicted noise exposure was accurate and that the assumptions and methodologies used continue to be correct and 'fit for purpose'.

Policies, Legislation, Standards and Guidance

- *Air Navigation (Aircraft Noise) Regulations 2018*
- *Airports Act 1996*
- *Australian Standard AS2021:2015 (Acoustics - Aircraft noise intrusion - Building siting and construction)*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise (2013) (Qld)*

Sources of Information

Information from Airservices NFPMS is available on our website through WebTrak https://www.airservicesaustralia.com/aircraftnoise/webtrak/

ANEFs are published in federally-leased airport Master Plans and are available on airport websites.

Exclusions

Noise monitoring is not undertaken to determine compliance with aircraft noise regulations as there are no regulations which specify a maximum, allowed level of aircraft noise. Airservices does not have any powers of enforcement to cease an aircraft from operating due to its noise impacts.

State, Territory and Local Governments are responsible for land use planning around airports through zoning, subdivision control, and comprehensive planning actions.

The National Airports Safeguarding Framework (2018) is a national land-use planning framework that aims to improve community amenity by minimising aircraft noise-sensitive developments near airports and improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning decisions through guidelines being adopted by jurisdictions on various safety-related issues.

9. EFFICIENCY AND ENVIRONMENTAL PRINCIPLES

Consider Matters of National Environmental Significance, other sensitive habitats, and registered heritage sites.

Overview

Under the *Air Services Act 1995,* Airservices has an obligation to provide environmentally responsible services by minimising the environmental impact of aircraft operations. Airservices must comply with the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*.

The *EPBC Act* is the Australian Government's central piece of environmental legislation. In conjunction with States and Territories, it provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the *EPBC Act* as Matters of National Environmental Significance (MNES). There are nine MNES:

- world heritage properties
- national heritage places
- wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- nationally threatened species and ecological communities
- migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mining)
- a water resource, in relation to coal seam gas development and large coal mining development.

Other sensitive areas which are likely to contain important habitat for consideration by the *EPBC Act* listed threatened biota (the plant and animal life of a particular region or period) and migratory species or state-listed threatened biota, include:

- nationally important wetlands
- State Forests
- National Parks
- other Conservation Reserves listed under State legislation.

The *EPBC Act* applies to any group or individual whose actions may have a significant impact on the environment.

Under Section 28 of the *EPBC Act*, approval is required for an action taken by Airservices anywhere in the world that is assessed as *likely* to have a significant impact on the environment.

'Significant impact' has particular meaning within the *EPBC Act*, and is an impact which is "important, notable, or of consequence, having regard to its context or intensity". Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.

Application

We undertake an environmental assessment screening process for all changes to aircraft operations to identify changes that require a more comprehensive Environmental Impact Assessment (EIA).

Specifically to flight path changes, the EIA process will determine whether it is *likely* to have a *'significant impact'* on MNES, other sensitive habitats and registered heritage sites. The EIA assesses flight path changes across four categories: aircraft noise, fuel burn and emissions, biodiversity and other *EPBC Act* matters (such as potentially affected noise sensitive sites and communities).

Wherever practicable, we seek to avoid changes that would be *likely* to have a 'significant impact' to the environment, as defined under the *EPBC Act*.

Where avoidance of potentially significant impact is not practicable, we are required to refer the change to the Commonwealth Minster for the Environment for advice, and to consider the advice before making a decision. The advice may require formal assessment under the *EPBC Act*, or it may include a range of conditions to apply to the proposal.

We can also use Environmental Impact Statements (EIS) for airport developments, which are legislated under State assessment and approval processes, as the basis from which to seek advice from the Minister. This can also occur through bilateral agreements between State and Federal Governments.

Monitoring

Airservices conforms to the *ISO 14001:2015 Environmental Management Systems* to monitor and report on aircraft activities as directed by the Minister.

Under the *EPBC Act* the Department of Agriculture, Water and the Environment (DAWE) has a range of enforcement mechanisms for managing suspected or identified instances of non-compliance and for reviewing the compliance of referred projects.

Policies, Legislation, Standards and Guidance

- *Air Services Act 1995*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *ISO 14001:2015 Environmental Management Systems*

Sources of Information

MNES appear on the *EPBC Act lists*. These lists are maintained and updated by the DAWE. Referrals under the *EPBC Act* are published on the DAWE *EPBC Act* Notices database.

Exclusions

Actions on Commonwealth land in Australian Government leased airports are subject to the *Airports Act 1996* and are the responsibility of airports. The *Airports Act* requires airports to prepare Master Plans, Major Development Plans (MDPs) and Airport Environmental Strategies.

Under the *EPBC Act*, the Minister has authority over the nine defined MNES but does not have the power to regulate impacts on matters such as air quality, noise, odour, general amenity or animals that are not listed as threatened or endangered under the *EPBC Act*.

These environmental matters are the responsibility of the relevant State Government to consider during any state assessment and approval process within State land.

Design flight paths that deliver operational efficiency and predictability, and minimise the effect on the environment through reducing fuel consumption and emissions.

Overview

Airservices plays an important role in facilitating and supporting improvements in aviation efficiency.

We work with regulatory authorities, airports, operators, and other air navigation services providers to improve Air Traffic Management (ATM), reduce fuel burn and emissions to collectively minimise the impact on the environment and community.

International Civil Aviation Organization (ICAO) encourages the use of performance based navigation (PBN), which uses the navigation capabilities of modern aircraft to enable more efficient airspace management solutions compared with conventional navigation.

Our flight path and airspace design methods rely on PBN to create flight paths that maintain reliable all-weather operations even at challenging airports, while reducing congestion, helping conserve fuel, protecting the environment, and reducing the impact of aircraft noise.

Application

To facilitate operational efficiency, flight path design initiatives may include:

- arrivals with Continuous Descent Operations[16] (CDO) which prevent aircraft having to use additional power to 'level out', reducing fuel burn and emissions
- departures with Continuous Climb Operations[17] (CCO) which enable aircraft to reach their optimum flight level without interruption, reducing fuel burn and emissions, as a large proportion of fuel burn occurs during the climb phase
- arrivals and departures with laterally predictable flight paths, speed restrictions and vertical separation requirements which allow aircraft operators, airlines, and pilots to configure aircraft flight management systems for departures and arrivals in advance, reducing fuel burn and emissions
- 'Smart Tracking'[18] approaches with curved flight paths, reducing aircraft flight time and track miles
- more direct flight paths for busier routes, resulting in greater net reductions in fuel and emissions
- 'race track' route systems between cities to improve safety and efficiency of the air route network.

Monitoring

We use an aviation environmental analysis tool with fuel burn and emissions modelling capability, to improve decision-making and help identify future emission reduction measures.

We work with airlines to identify the most effective way to remove constraints that cause unnecessary fuel burn and minimise aviation emissions.

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[16] CDO is an aircraft operating technique, enabled by airspace and instrument procedure design, which allows arriving aircraft to descend continuously using minimum engine thrust and low drag settings.

[17] CCO is an aircraft operating techniques, enabled by airspace and instrument procedure design, which allows departing aircraft to climb continuously using optimum climb engine thrust and climb speeds until reaching cruising level.

[18] 'Smart Tracking' also known as RNP AR procedures are flight paths with strict navigation performance requirements that rely on satellite based navigation and are only available to Civil Aviation Safety Authority (CASA) approved aircraft and pilots

Policies, Legislation, Standards and Guidance

- *Australia's Air Traffic Management Plan 2017*
- *ICAO Destination Green (2013)*
- *ICAO Doc 9750 ICAO Global Air Navigation Plan 2016-2030*
- *Managing the Carbon Footprint of Australian Aviation (2017)*

Sources of Information

Our Aeronautical Information Service (AIS) provides the online material and publications that display flight paths, instrument flight procedures and aerodrome charts
https://www.airservicesaustralia.com/aip/aip.asp

Exclusions

There are many other parties with responsibility for efficiency and emissions actions within Australia, including airlines and aircraft operators, airports, and aircraft manufacturers.

Airlines are responsible for fleet upgrades and operational procedures to minimise fuel use, including reduction in weight of cabin items and reduction of engine ground running time.

It is an aircraft operator/owners responsibility to ensure their aircraft meets emissions regulations under *ICAO Annex 16: Environmental Protection, Volume II – Aircraft Engine Emissions* and the *Air Navigation (Aircraft Engine Emissions) Regulations 1995.*

We implement a range of ATM measures, which fall outside the design of flight paths, to improve fuel efficiency such as flexible flight tracks, improved air traffic control (ATC) sequencing and management of aircraft on the ground.

10. OPERATIONAL PRINCIPLES

Design flight paths to facilitate access to all appropriate airspace users.

Overview

Airservices designs air routes, flight paths and airspace in accordance with the *Airspace Act 2007* and *Airspace Regulations 2007,* taking into account the need for protection of the aviation environment, efficient and equitable use of airspace, and national security.

To ensure equitable access to the airspace, flight paths and airspace design must accommodate the range of airspace users, which can include both flying and non-flying activities:

- flying operations can include scheduled flight operations, military, emergency, freight, charter, helicopter, drones, and general and recreational aviation flights
- non-flying activities can include weapons firing, explosive demolition, and protection of areas of national security.

An appropriate airspace user, or 'eligible airspace user' as defined by the Civil Aviation Safety Authority (CASA), is an operator or organisation that can operate within the designated airspace, obtaining permission from the airspace controlling authority (e.g. Airservices for controlled airspace).

In designing flight paths, we balance the requirement between the cost to operators and the volume of controlled airspace needed to contain certain operations, with the need to maintain other users access to airspace.

Flight paths can be designed to specifically accommodate particular aircraft operations, using the latest technology where available. They can also be designed to avoid restricted and danger areas, both flying and non-flying.

The airspace controlling authority is determined by the CASA Office of Airspace Regulation (OAR), which manages the regulation of the airspace in Australia and designates different types of airspace, that are defined by a lateral and vertical limits, including:

- Controlled airspace[19]
- Uncontrolled airspace[20]
- Prohibited, Restricted or Danger areas.[21]

[19] Controlled airspace in Australia is actively monitored and managed by air traffic control (ATC). To operate in controlled airspace, an airspace user must first receive a clearance from ATC. ATC gives priority to emergency operations.

[20] Operations in uncontrolled airspace do not require a clearance from ATC. The majority of light aircraft and helicopters operate outside or underneath controlled airspace.

[21] A Prohibited Area (PA) is designated for reasons of military necessity to prohibit the flight of aircraft over the area. A Restricted Area (RA) is where aircraft movements are reduced to those with certain specified permissions. Examples of a RA include airspace around weapons firing, military flying, communication facilities emitting high-intensity radiated fields, explosive ordnance demolition, aerobatic displays and air shows, and police activities.

A Danger Area (DA) is designated where an activity within or over the area is a potential danger to aircraft flying over the area. Examples include flying training, gliding competitions, parachuting activities, mine blasting, high velocity plume rise (gas or exhaust) and small arms firing.

Application

We must ensure that flight paths for Instrument Flight Rules (IFR)[22] operations subject to ATC are located in controlled airspace, taking into account applicable navigation tolerances and required safety buffers. In some cases this may require a change in the lateral and/or vertical limits of the controlled airspace.

Changes to controlled airspace require approval from CASA OAR, however in some cases, additional airspace is not available as it is administered by another airspace authority, such as Defence.

We consult with aviation industry stakeholders to ensure any changes we make to the controlled airspace meets their needs and is equitable.

Monitoring

CASA works closely with Airservices to ensure that the needs of all airspace users are properly considered, the provision of Air Traffic Management (ATM) services is coordinated, and the administration of Australia's airspace is both safe and efficient.

CASA OAR conducts aeronautical studies and airspace reviews to ensure airspace is safe and appropriate for those who use it and to determine when airspace may require amending, for example due to a significant increase in traffic volume.

Policies, Legislation, Standards and Guidance

- *Airspace Act 2007*
- *Airspace Regulations 2007*
- *CASA Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedures Design (2016)*
- *Civil Aviation Safety Regulations 1998 Part 173 – Instrument flight procedure design*

Sources of Information

Our Aeronautical Information Service (AIS) provides the online material and publications that display flight paths, instrument flight procedures and aerodrome charts
https://www.airservicesaustralia.com/aip/aip.asp

Airspace regulation, including the airspace change process and airspace reviews, is available on the CASA website.

Exclusions

CASA has sole responsibility for the regulation of the design of all Australian-administered airspace. Airservices is not able to impose changes upon airspace that is administered by other authorities, for example Defence.

[21] Instrument flight procedure design and IFR are procedures and rules for how aircraft are to be operated when visual reference cannot be used for navigation by pilots.

Consider flight paths that optimise airport capacity, and meet future airport requirements.

Overview

We play an important role in facilitating and supporting aviation efficiency by working in collaboration with regulatory authorities, airports and aircraft operators and other air navigation services providers.

At major airports, capacity enhancement seeks to improve the efficiency and use of existing infrastructure, in consultation with the airport users and community, to increase runway capacity to address the challenge of airport congestion and delay.

It also includes design and development of airspace management solutions for new infrastructure, including new or extended runways, and in some cases, new airports.

We consider airport passenger growth forecasts and future airport developments, for example new runways, in the development of flight paths to ensure they meet future demand.

Application

To optimise airport capacity and meet future airport requirements, flight path design initiatives may include:

- defined, predictable and repeatable flight paths which facilitate use of an Air Traffic Flow Management (ATFM) system for managing airport capacity
- Standard Instrument Departures (SIDs) that allow aircraft to turn as soon as possible after departure, allowing the next departing aircraft to be given 'take-off' clearance sooner
- Standard Instrument Arrivals (STARs) with set speeds at certain waypoints, leading to uniform spacing of aircraft on arrival flight paths
- separated SID and STAR procedures, allowing air traffic control (ATC) to efficiently direct aircraft to depart, while maintaining a safe distance from arrivals
- separate jet and non-jet SIDs, to allow slower non-jet aircraft to depart on separate flight paths and faster following jet aircraft to depart with reduced or no delay
- vertically-guided stabilised approaches[23] to reduce the frequency of missed approaches and therefore delays for departing and/or arriving aircraft.

Monitoring

We use an ATFM system to identify and manage demand and capacity imbalances. We provide access to this system for aircraft operators, airports and aviation groups to assist in a collaborative approach to managing airport congestion and delays.

Policies, Legislation, Standards and Guidance

- *Civil Aviation Safety Authority (CASA) Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedures Design (2016)*
- *Civil Aviation Safety Regulations 1998 Part 173 – Instrument flight procedure design*

[23] Vertically-guided approaches use satellite or other navigation technology to alert a pilot or aircraft about any lateral or vertical changes from the planned flight path. This makes it more likely an approach to land will be flown in a stabilised manner.

- *ICAO Doc 9426 Air Traffic Services Planning Manual*
- *International Civil Aviation Organization (ICAO) Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS)*

Sources of Information

Our monthly Air Traffic Management (ATM) network performance reports, including reports at major airports, are available at https://www.airservicesaustralia.com/publications/reports-and-statistics/atm-network-performance/

Passenger growth forecasts are published in Airport Master Plans and available on airport websites.

Exclusions

There are many other parties with responsibility for airport capacity within Australia, including airports, airlines and aircraft operators.

Airports are responsible for on ground changes to enhance airport capacity such as additional runways, lengthening or widening of existing runways, construction of taxiways that allow for faster entry and exit to the runway and upgrades to airport terminal capacity.

Aircraft operators are responsible for ensuring their aircraft vacate the runway following landing using the fastest possible method.

The number and type of aircraft which operate on each flight path is determined by the flight scheduling and fleet mix of airlines and aircraft operators, and airport gate scheduling.

Consider flight paths that optimise overall network operations, including consideration of operations at adjacent airports.

Overview

We are responsible for managing the overall efficiency of air traffic network operations within Australia.

Growth in air traffic impacts the effectiveness and efficiency of existing services, air routes and flight paths, while increased demand at major airports influences the overall performance of the air traffic network.

We play an important role in facilitating and supporting improvements in network efficiency by working in collaboration with regulatory authorities, airports, operators and other air navigation services providers to improve the processes and practices of air traffic control (ATC), airport operators and airlines.

We also consider the effect of operations on neighbouring airports, particularly where airports are located in close proximity, and seek to optimise overall network operations.

Application

To ensure predictability of aircraft movements, optimise aircraft sequencing, and enhance overall network operations, flight path design initiatives may include:

- different flight paths to each runway end to allow for seasonal weather variations
- ‘race track’ route systems between cities to reduce route congestion
- where there is an unavoidable intersection of routes, placing the intersection where there is already a large altitude difference between the routes, to ensure a smoother flow of aircraft operations
- placing holding patterns on arrival routes to facilitate Air Traffic Flow Management (ATFM) and reduce overall delay
- defined, predictable and repeatable flight paths which facilitate use of an ATFM system for managing airport capacity
- providing multiple entry and exit points for routes so that it is easier for ATC to manage aircraft at busy times
- prioritising the location of busy routes when designing an overall route structure.

Monitoring

We use an ATFM system to identify and manage demand and capacity imbalances. We provide access to this system for aircraft operators, airports and aviation groups to assist in a collaborative approach to managing overall air traffic network operations.

Policies, Legislation, Standards and Guidance

- *Civil Aviation Safety Authority (CASA) Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedures Design (2016)*
- *Civil Aviation Safety Regulations 1998 Part 173 – Instrument flight procedure design*
- *ICAO Doc 9426 Air Traffic Services Planning Manual*
- *International Civil Aviation Organization (ICAO) Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS)*

Sources of Information

Our Aeronautical Information Service (AIS) provides the online material and publications that display flight paths, instrument flight procedures and aerodrome charts
https://www.airservicesaustralia.com/aip/aip.asp

Our monthly Air Traffic Management (ATM) network performance reports are available at
https://www.airservicesaustralia.com/publications/reports-and-statistics/atm-network-performance/

Exclusions

There are many other parties with responsibility for airport capacity within Australia, including airports, airlines and aircraft operators, which can impact on overall network operations.

The number and type of aircraft which operate on each flight path is determined by airlines, airport and operator flight scheduling and fleet mix.

We undertake a range of ATM measures, which fall outside the design of flight paths, such as flexible flight tracks, improved ATC sequencing and management of disruptions caused by weather.

Consider innovation and technology advancements in navigation and aircraft design.

Overview

The aviation industry is constantly changing and evolving as existing aviation technology is refined and new technologies emerge.

We have a responsibility to support the emergence of new aviation technology by providing flight paths for enhanced navigation and aircraft design. This may include changes to existing aircraft such as the use of satellite based navigation systems, or catering to new aircraft types such as unmanned aircraft systems, hybrid and electric aeroplanes.

Importantly, advances in navigation performance have enabled changes in airspace design, separation standards, route spacing, airport access, instrument flight procedure design and Air Traffic Management (ATM).

These changes form a significant part of the overall modernisation of Australia's airspace and deliver improvements in safety and operational efficiency.

Application

We work in collaboration with the Australian Government, Civil Aviation Safety Authority (CASA), airports and aircraft operators to enable the implementation of new technology.

Flight path designs to enable modern aircraft navigation technology may include:

- barometric vertical navigation[24] (BARO-VNAV) approaches enabling guided descent to landing without the need for on-ground navigation facilities
- 'Smart Tracking'[25] approaches with curved flight paths to fly with greater accuracy than approaches using conventional navigation means
- Vertically and horizontally guided approaches utilising enhanced satellite navigation, such as Ground Based Augmentation system (GBAS) [26] and Satellite Based Augmentation System (SBAS) [27].

Our flight path designs also consider the opportunities and requirements of emerging technologies such as Unmanned Aerial Vehicles, commercial drones, aerial taxis and space vehicles.

Monitoring

We conduct regular maintenance reviews of published instrument flight procedures to ensure ongoing obstacle protection and compliance with any changes to the standards.

CASA conducts routine compliance audits on Part 173 providers, including Airservices, to ensure compliance with regulations and standards.

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[24] Vertically-guided approaches use satellite or other navigation technology to alert a pilot or aircraft about any lateral or vertical changes from the planned flight path. This makes it more likely an approach to land will be flown in a stabilised manner.

[25] 'Smart Tracking' also known as RNP AR procedures are flight paths with strict navigation performance requirements that rely on satellite based navigation and are only available to CASA approved aircraft and pilots.

[26] GBAS, known Honeywell SmartPath in Australia, is a satellite-based precision landing system that uses Global Positioning System (GPS) signals to provide aircraft with very precise positioning guidance during the final stages of an approach.

[27] SBAS is a navigation system that uses both space-based and ground-based infrastructure to improve the accuracy of Global Navigation Satellite System (GNSS) signals, such as GPS. GBAS and SBAS are technologies that utilise differing methods to improve the accuracy and integrity of Global Navigation Satellite System (GNSS) – derived positions. This enables aircraft to conduct high-precision vertically and horizontally guided approaches to landing in all weather conditions.

Policies, Legislation, Standards and Guidance

- *CASA Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedures Design (2016)*
- *Civil Aviation Safety Regulations 1998 Part 173 – Instrument flight procedure design*
- *ICAO Doc 9905 Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual*
- *International Civil Aviation Organization (ICAO) PANS-OPS Doc 8168 Procedures for Air Navigation Services – Aircraft Operations*

Sources of Information

Our Aeronautical Information Service (AIS) provides the online material and publications that display flight paths, instrument flight procedures and aerodrome charts
https://www.airservicesaustralia.com/aip/aip.asp

Exclusions

There are many other parties with responsibility for aviation innovation and technology advancements within Australia, including CASA, aircraft manufacturers, airlines and operators.

Aircraft manufacturers are responsible for designing aircraft with improved navigation technologies or the development of new types of aircraft.

Airlines are responsible for fleet upgrades, adoption of new navigation technology and training of operators to use this technology.

CASA regulates new aircraft types, for example drones, and the use of new technology on aircraft within Australia.

11. ABBREVIATIONS

Abbreviation	Name
AIS	Aeronautical Information Service
ANEF	Australian Noise Exposure Forecast
ASAP	Aviation Safety Advisory Panel
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATSB	Australian Transport Safety Bureau
BARO-VNAV	Barometric vertical navigation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations
CCO	Continuous Climb Operations
CDO	Continuous Descent Operations
Cth	Commonwealth of Australia
DAWE	Department of Agriculture, Water and the Environment
Defence	Department of Defence
DITRDC	Department of Infrastructure, Transport, Regional Development and Communications
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
GBAS	Ground Based Augmentation System
GNSS	Global Navigation Satellite System
ICAO	International Civil Aviation Organization
IFPP	Instrument Flight Procedures Panel
IFR	Instrument Flight Rules
MDP	Major Development Plan
MNES	Matters of National Environmental Significance
MOS	Manual of Standards
NADP	Noise Abatement Departure Procedure
NAP	Noise Abatement Procedure
NFPMS	Noise and Flight Path Monitoring System
NPRM	Notice of Proposed Rule Making
OAR	Office of Airspace Regulation
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations
PBN	Performance Based Navigation
PIR	Post-Implementation Review
Qld	Queensland
RNP AR	Required Navigation Performance Authorization Required
SARPs	Standards and Recommended Practices
SBAS	Satellite Based Augmentation System
SID	Standard Instrument Departure

Abbreviation	Name
SMS	Safety Management System
STAR	Standard Instrument Arrival

12. REFERENCES

- *Air Navigation (Aircraft Engine Emissions) Regulations 1995 (Cth)*
- *Air Navigation (Aircraft Noise) Regulations 2018*
- *Air Services Act 1995 (Cth)*
- *Airports (Protection of Airspace) Regulation 1996 (Cth)*
- *Airports Act 1996 (Cth)*
- *Airservices Commitment to Aircraft Noise Management (2013), Airservices Australia*
- *Airspace Act 2007 (Cth)*
- *Airspace Regulations 2007 (Cth)*
- *Australia's Air Traffic Management Plan 2017 (Cth)*
- *Australian Standard AS2021:2015 (Acoustics - Aircraft noise intrusion - Building siting and construction)*
- *CASA Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedures Design (2016)*
- *Civil Air Navigation Services Organization and Airports Council International Managing the Impacts of Aviation Noise(2015)*
- *Civil Aviation Safety Regulations 1998 Part 173 – Instrument flight procedure design*
- *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
- *ICAO Annex 16: Environmental Protection, Volume II – Aircraft Engine Emissions*
- *ICAO Destination Green (2013)*
- *ICAO Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS)*
- *ICAO Doc 9426 Air Traffic Services Planning Manual*
- *ICAO Doc 9750 ICAO Global Air Navigation Plan 2016-2030*
- *ICAO Doc 9829 Guidance on the Balanced Approach to Aircraft Noise Management*
- *ICAO Doc 9905 Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual*
- *ICAO Doc 9906 Quality Assurance Manual for Flight Procedure Design*
- *ISO 14001:2015 Environmental Management Systems*
- *Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise (2013) (Qld)*
- *Managing the Carbon Footprint of Australian Aviation (2017), Department of Infrastructure and Regional Development (Cth)*
- *National Airports Safeguarding Framework (2018), Department of Infrastructure, Transport, Regional Development and Communications (Cth)*