AIRSERVICES AUSTRALIA

AIR TRAFFIC MANAGEMENT GROUP

Safety
Customer Value
Operational Excellence

ATM PLANNING

SERVICE DELIVERY BASELINE 2004

"…without exception, everybody is responsible for safety …"

1 Overview

Introduction

The purpose of this document is to capture a snap shot of Airservices Australia as of 2004, the corporate structure underpinning service delivery, services delivered, supporting high level practises/policies and the physical systems used.

Australian Obligation as an ICAO Contracting State

Australia is a signatory to the International Civil Aviation Organisation [ICAO] Chicago Convention. This document prescribes those aviation services which should be provided by a contracting state for international aircraft operations.

The detail of these regulatory requirements and service provision is provided in ICAO guidance documentation comprising Annexes and operational documents.

The Australian Government has delegated the provision of services and regulation to several agencies.

Department of Transport and Regional Services

The primary role of the Aviation and Airports Policy Division of the Department of Transport and Regional Services is to advise the Government on the policy and regulatory framework for the Australian aviation and airports industries.

The division manages the continuing relationship between the Government and the Civil Aviation Safety Authority (CASA), Airservices Australia (Airservices) Australia's airlines and airports. It also manages Australia's participation in the work of the International Civil Aviation Organization (ICAO) and provides the secretariat for the International Air Services Commission (IASC). The Division also provides aviation security policy advice, as well as developing, monitoring and auditing aviation security standards including any additional security measures required during heightened threat situations.

Civil Aviation Safety Authority [CASA]

CASA has the function of conducting the safety regulation of the following, in accordance with the Civil Aviation Act (19)and regulations:

- Civil air operations in Australian territory and the operation of Australian aircraft outside Australian territory; by means that include the following:
- :developing and promulgating appropriate, clear and concise aviation safety standards;
  - developing effective enforcement strategies to secure compliance with aviation safety standards;
  - issuing certificates, licences, registrations and permits;
  - conducting comprehensive aviation industry surveillance, including assessment of safety-related decisions taken by industry management at all levels for their impact on aviation safety;
  - conducting regular reviews of the system of civil aviation safety in order to monitor the safety performance of the aviation industry, to identify safety — related trends and risk factors and to promote the development and improvement of the system;
  - conducting regular and timely assessment of international safety developments.

: CASA also has the following functions:

- encouraging a greater acceptance by the aviation industry of its obligation to maintain high standards of aviation safety, through:
  - comprehensive safety education and training programs; and
  - accurate and timely aviation safety advice; and
  - fostering an awareness in industry management, and within the community generally, of the importance of aviation safety and compliance with relevant legislation;
  - promoting full and effective consultation and communication with all interested parties on aviation safety issues.
- co-operating with the Australian Transport Safety Board in relation to the investigation of aircraft accidents and incidents;
- any functions conferred on CASA under the Civil Aviation (Carriers' Liability) Act 1959, or under a corresponding law of a State or Territory;
- any functions conferred on CASA under the Air Navigation Act 1920;
- any other functions prescribed by the regulations, being functions relating to any matters referred to in this section;

- promoting the development of Australia's civil aviation safety capabilities, skills and services, for the benefit of the Australian community and for export;
- providing consultancy and management services relating to any of the matters referred to in this section, both within and outside Australian territory;
- any functions incidental to any of the functions specified in this section.

CASA may, under a contract with a foreign country or with an agency of a foreign country, provide services for that country or agency in relation to the regulation of the safety of air navigation or any other matter in which CASA has expertise. Those services may include conducting safety regulation in relation to foreign aircraft under the law of a foreign country.

CASA's functions do not include responsibility for aviation security.

Australian Transport Safety Board [ATSB]

The Australian Transport Safety Bureau (ATSB) is Australia's prime agency for the independent investigation of civil aviation accidents, incidents and safety deficiencies.

The ATSB performs its aviation related functions in accordance with the provisions of Annex 13 to the Convention on International Civil Aviation (Chicago Convention 1944) which have been incorporated into Part 2A of the Air Navigation Act 1920. Part 2A contains ATSB authority to investigate air safety occurrences and safety deficiencies.

In addition to investigating accidents, incidents and safety deficiencies, the ATSB investigates factors that could lead to a deterioration of safety standards. For example, the investigation into aviation fuel contamination affecting thousands of smaller aircraft at the end of 1999, that highlighted a range of safety deficiencies in global aviation fuel standards and refining.

The ATSB also participates as an accredited representative on investigations of accidents and serious incidents involving Australian-registered aircraft overseas. In accordance with Annex 13, from time-to-time the ATSB assists other overseas agencies in the investigation of accidents and serious incidents that do not involve Australian-registered aircraft.

Airservices Australia

Airservices Australia ‘s roles, duties and obligations are defined in the Air Services Act of 1995.

Air Services Act 1995

The Act establishes a body called Airservices Australia, with functions relating to aviation, and for related purposes, and describes or points to the services that Airservices Australia is to provide.

Division 2 - Section 8 of the Air Services Act 1995 specifies Airservices Australia’s functions and powers as:

- providing facilities to permit safe navigation of aircraft within Australian-administered airspace;
- promoting and fostering civil aviation in Australia;

Services

Airservices Australia provides the following services, for the purpose of giving effect to the Chicago Convention or otherwise for purposes relating to the safety, regularity or efficiency of air navigation:

- air traffic services;
- an aeronautical information service;
- rescue and fire fighting services;
- an aeronautical radio navigation service;
- an aeronautical telecommunications service;
- cooperating with the ATSB in relation to the investigation of aircraft accidents and incidents;
- carrying out activities to protect the environment from the effects of, and the effects associated with, the operation of Commonwealth jurisdiction aircraft;
- any functions prescribed by the regulations in relation to the effects of, and effects associated with, the operation of Commonwealth jurisdiction aircraft;
- any functions conferred on Airservices Australia under the Air Navigation Act 1920;
- any other functions prescribed by the regulations, being functions relating to any of the matters referred to in this subsection;

- providing consultancy services and management services relating to any of the matters referred to in this subsection;
- any functions incidental to any of the above functions.

Airservices Australia may provide its services and facilities both within and outside Australian territory.
Subject to subsection 9(1) and section 16, the extent to which Airservices Australia provides services and facilities is subject to Airservices Australia's discretion.

Any service or facility that Airservices Australia has power to provide may be provided by Airservices Australia under a contract.

Airservices Australia Area of Responsibility

Airservices Australia is responsible for providing, the services as prescribed in the Air Services Act in, Australian sovereign airspace and international areas as assigned by ICAO (oceanic airspace outside continental Australia). All this is airspace is designated the Australian Flight Information Region (FIR) by ICAO. This is divided into airspace managed by Melbourne ATC Centre designated the Melbourne FIR and airspace managed by Brisbane ATC Centre designated the Brisbane FIR. In addition Brisbane Centre provides air traffic control services in the upper portion of the Honiara FIR, under a contract with the Government of the Solomon Islands.

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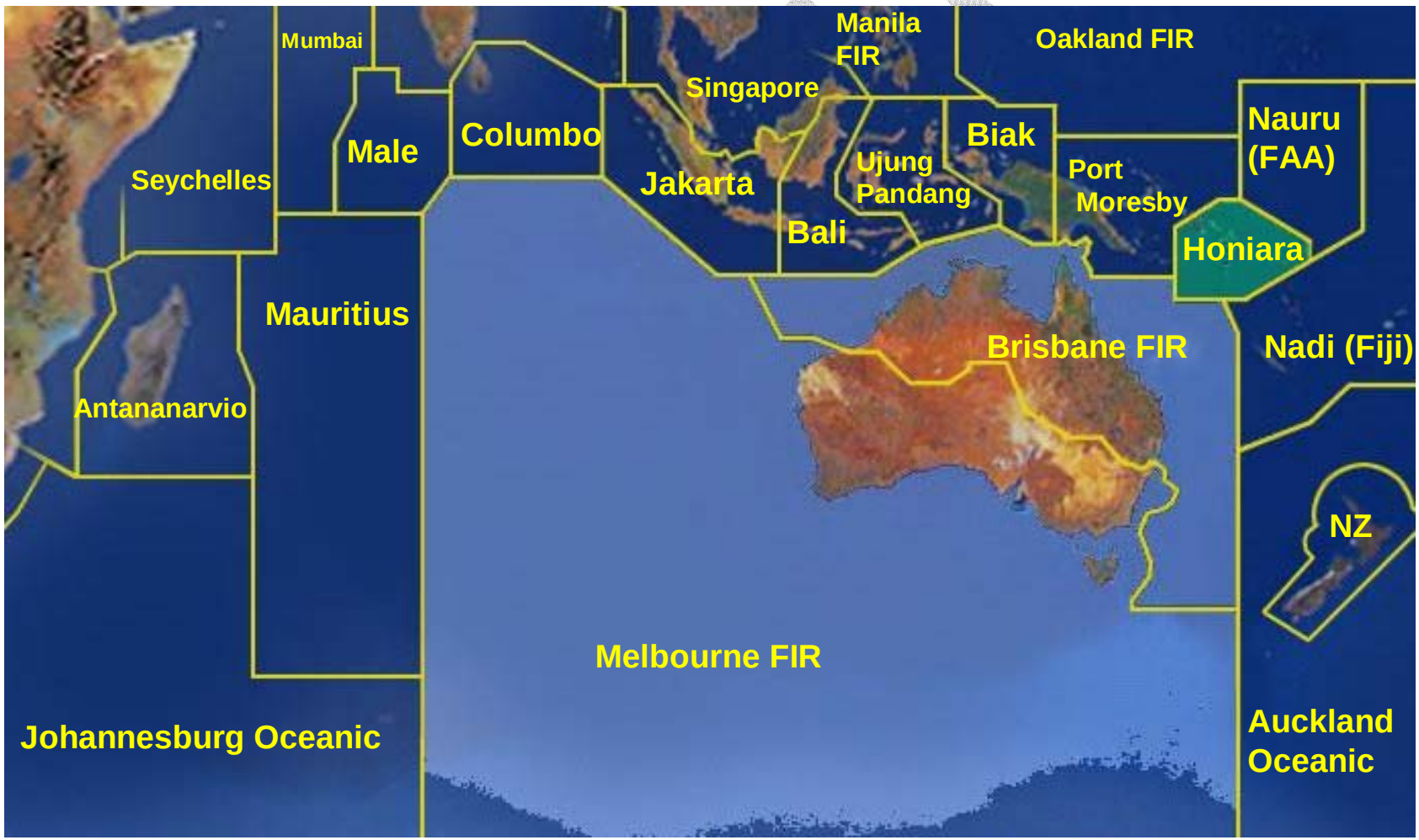
Map of Responsibility Area



Overview of Functions of Airservices Australia

In acquitting its function, Airservices Australia as well as providing the services as listed in the following paragraph, provides management of Australian Airspace jointly with the Department of Defence [DoD]. Details are provided in section 2 of this document under Airspace Management.

Overview of Services Provided

The Air Services Act specifies services that are to be provided by Airservices Australia as follows:.

Environmental Services - [Airservices act 1995 part 1 d]
Airspace Management (ICAO annex 11 defines these activities)
Air Traffic Services [ATS] - [Airservices act 1995 part 1b (i)]
Air Traffic Control
Flight Information Service
Alerting Service
Aeronautical Information Service [AIS] - [Airservices act 1995 part 1b (ii)]
Aeronautical radio navigation service - [Airservices act 1995 part 1b (v)]
Aeronautical telecommunications service - [Airservices act 1995 part 1b (vi)]
Rescue and fire fighting services - [Airservices act 1995 part 1b (iii)]

Environmental Services

The objective of Environmental Services is to:

Carry out activities to protect the environment from the effects of, and the effects associated with, the operation of Commonwealth jurisdiction aircraft. [Air Services Act 1995

Air Traffic Services [ATS]

The Objective of Air Traffic Services shall be to:

Prevent collision between aircraft
Prevent collision between aircraft on the manoeuvring area and obstructions on that area
Expedite and maintain an orderly flow of air traffic
Provide advice and information useful for the safe and efficient conduct of flights
Notify appropriate organisations regarding aircraft in need of search and rescue aid and assist such organisations as required
[ICAO Annex 11]

Aeronautical Information Service [AIS]

The objective of the aeronautical Information service is to
Ensure the flow of information necessary for safety, regularity and efficiency of international air navigation.
[ICAO Annex 15 – Aeronautical Information Service]

Aeronautical Radio Navigation Service

The objective of radio navigation is to provide:
A radio navigation service intended for the benefit of and for the safe operation of aircraft. This is the provision of radio navigation aids such as Non Directional Beacons (NDBs), Very high frequency Omnidirectional Radio Ranging equipment (VORs), Instrument Landing Systems (ILS) and Distance Measuring Equipment (DME).

Telecommunications

The objectives of a telecommunication service are to provide:

- a telecommunication service between specific points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services. [Ground – ground communications such as leased telecom lines, microwave channels etc]
- a mobile service between ground stations and aircraft stations, or between aircraft. [Air – Ground – Air communications and Air – Air primarily Very High Frequency (VHF) radio and some High Frequecy HF radio], and,
- a broadcast service intended for the transmission of information relating to air navigation. [generally VHF]

(In ICAO documentation Telecommunications includes the provision of radio navigation services. Under the Air Services Act, navigation is listed separately. These services are enablers for the provision of other services. Telecommunications is therefore not listed as a service delivered to clients.)

2 Airspace Management and Environment

2.1 Airspace Architecture

Air traffic control services, including in-flight traffic information, are dependent on airspace classifications which define service level. (See following description) Airspace classification is generally static but can be varied by appropriate instrument and notification by Aeronautical Information Publications or Notices to Airmen (NOTAMS).

The airspace classification system is defined by ICAO and allows identification of the services provided within defined airspace volumes. It also allows the pilot to identify what services will be provided where and the conditions that must be met to access those services. Instrument Flight Rules (IFR) are the rules which apply to aircraft which plan and are capable of operating in all weather conditions, (for example public transport and large aircraft) and require pilot certification, specific aircraft equipment and ground facilities. Visual Flight Rules (VFR) allow aircraft to operate by visual reference to the ground and as such require a lower level of training and equipment.

The current airspace management architecture conforms in with ICAO recommendations. It was approved by the Board of the [Civil Aviation Authority in November 1994 and implemented in April 1995. The application of these classifications was determined by the Directorate of Air Safety Regulation [now - CASA] through research and consultation.

Airspace Description 2004

The current airspace architecture encompasses Classes A, C, D, E, and G. The main features of the current architecture are outlined in tables and descriptions in other documents. Within this system, Air Traffic Services are provided by air traffic control (in both controlled and non-controlled airspace]. Air traffic control services are provided either by non-radar procedural control or by radar control.

On-request Flight Information Services (FIS), advisory and information services, are provided through a function known as Flightwatch [AusFIC].

2.1.1.1 Class A Airspace

Class A airspace has been declared in support of the implementation of Reduced Vertical Separation Minima [RVSM]. In this airspace, only IFR flights that are RVSM capable are normally permitted., Other IFR flights may be accommodated at ATC discretion. VFR flights are not permitted. All flights wishing to operate within Class A airspace required to submit flight notification and are subject to ATC clearance...

It is currently promulgated in the Australian FIR Oceanic areas(to 45 degrees South) between Flight Level (FL)285 – FL460 (twenty eight thousand five hundred feet and forty six thousand feet- ICAO uses feet as a measure of altitude) and in the rest of the FIR between FL285 and FL600.

2.1.1.2 Class C Airspace

In Class C airspace, IFR flights are separated from other IFR flights and from VFR flights. VFR flights are permitted, but a separation service is not provided between VFR flights. All flights are subject to ATC clearance and must submit flight notification to ATS.

All flights wishing to operate within Class C airspace are subject to ATC clearance and required to submit flight notification to ATS.

Class C airspace is promulgated as follows:

- Airspace promulgated in upper airspace over continental Australia, extending from FL245 to FL285. A large proportion of this airspace is outside of radar coverage.
- Airspace within radar coverage along the east coast of Australia, between FL185 and FL285.
- Control area steps associated with controlled aerodromes. At those locations where a radar terminal approach service is provided, these control zones are also Class C airspace.

2.1.1.3 Class D Airspace

In Class D airspace, IFR flights are separated from other IFR flights, and receive a separation service in respect of VFR flights. VFR aircraft are permitted in Class D airspace, but are not provided with separation from other VFR flights. VFR flights receive a separation service in respect of IFR flights.

All flights wishing to operate within Class D airspace are subject to ATC clearance.

Class D airspace is controlled airspace and is promulgated in terminal areas, the control zones and associated control area steps up to 4500 feet AMSL [3500 feet AMSL at Maroochydore] above ten regional tower locations - Alice Springs, Hobart, Launceston, Albury, Coffs Harbour, Tamworth, Maroochydore, Mackay, Hamilton Island and Rockhampton.

2.1.1.4 Class E Airspace

Within Class E airspace, IFR flights are separated from other IFR flights. To the extent possible, based on the ability of ATC to know where VFR flights are, IFR flights are provided with traffic information about VFR flights and are provided with traffic avoidance advice on request. VFR flights are not separated from IFR or other VFR flights. VFR flights may request radar information if within radar coverage.

IFR flights are subject to ATC clearance and must submit flight notification to ATS. VFR flights are not subject to clearance. In Class E airspace, all aircraft capable of powering an SSR transponder must carry and operate such a transponder.

Class E airspace is controlled airspace and is generally between FL180 and FL245 in non radar areas ,8500 feet (Flight Level is only used above ten thousand feet) and FL180 in radar surveillance areas and with steps down to Class D airspace at controlled airports where Class D airspace is established.

2.1.1.5 General Aviation Aircraft Procedures [GAAP] Zones

Within GAAP zones associated with Moorabbin, Bankstown Archerfield Parafield and Jandakot airports, in visual conditions, all aircraft are treated as VFR, and receive only runway separation. In instrument weather conditions IFR flights are separated from other IFR flights.
Flight notification is not required.. Traffic information and circuit sequencing is provided.

Generally the zones are about 2 to 3NM in radius and extend to 1500 feet AGL Class F Airspace
There is no Class F airspace in Australia.

2.1.1.6 Glass G Airspace

Within Class G airspace, Directed Traffic Information (DTI) services are provided by air traffic control, and a flight information service is provided by Flightwatch, some DTI is provided by third party communications using Flight Watch VHF or HF frequencies.

All IFR flights receive these services VFR flights may receive flight information services or traffic alerts on-request, but are not routinely provided with flight following service, and are not routinely provided with traffic information on any other flights.

Class G airspace is non-controlled airspace, and covers those volumes not otherwise classified as controlled airspace Classes A, C, D, E or GAAP.

IFR flights are not subject to ATC clearance but must submit flight notification to ATS. VFR flights are not subject to ATC clearance.

2.2 Air Route Structure

Terminal Area Route Structures All terminal area published Standard Terminal Arrival Routes (STAR) procedures are linked to the runway threshold The terminal area route structures around the major capital city aerodromes serviced by radar are based on the use of charted Standard Instrument Departures [SIDs] and STARs.. The design policy for the current structure was agreed with industry and published in 1994. Some minor amendments to the STAR policy have been made over the last few years.

At locations with Terminal Control Units (TCUs) that have been based on structured airspace, greater reliance is placed on procedural based SIDs to manage jet aircraft and Turbo Prop routes. Radar SIDs are used to manage non jets and less trafficked routes.

2.2.1.1 Standard Instrument Departures [SIDs]

- The primary purpose of SIDs is to provide terrain and obstacle clearance. This is achieved by the use of climb gradients.
- SIDs are based on ground based Navigation aids to allow all IFR aircraft to use them. SIDs listed as RNAV still use ground based navigation aids until sector Lower Safe Altitudes are reached. [Full RNAV and or GPS SIDs are not yet available]
- Secondary applications are;
  - the development of separation assurance principles,
  - airspace constraints
  - environmental requirements

2.2.1.2 SID Interception of Flight Planned Route

- SIDs generally intercept flight planned tracks within 30 miles of departure

2.2.1.3 SID Design Policy

The design policies and procedures for SIDs are provided in ICAO Pans Ops Doc 8168-OPS/611. Australian SIDs are based on conventional navigation systems until terrain clearance is achieved. At some locations,Area Navigation (RNAV) procedures are then used for air traffic management purposes. RNAV departure procedures based on RNAV VOR/DME, RNAV DME/DME, basic Global Navigation Satellite System (GNSS) or Required N avigation Performance (RNP) criteria are now available in Pans Ops

2.2.1.4 Standard Terminal Arrival Routes

The primary purpose of STARs is to provide tracking guidance from entry to the terminal area to an initial approach fix or a point from which a visual approach and landing can be made. Secondary applications are the development of separation assurance principles, airspace constraints and environmental requirements

2.2.1.5 STAR Termination

All TCUs, except Sydney utilise STARs that provide guidance to the arrival runway without requiring route clearance intervention by air traffic control. Generally, published STAR procedures provide opportunity for STAR termination via an instrument approach. At some locations, under specified conditions, procedures are utilised that allow flexibility in STAR termination that takes account of meteorological conditions, community preferred flight paths or high priority traffic.

2.2.1.6 Application of Vertical Navigation Requirements [VNAVs]

Vertical flight path altitude requirements are a result of SID/STAR flight path segregation and/or alignment of flight profiles to assist with sequencing. There are VNAV requirements for arriving aircraft in each TMA, except Canberra.

2.2.1.7 Constant Descent Arrivals/Approaches

During 2002, audits were carried out on all major airports to evaluate STAR procedures against Constant Descent Arrivals/Approaches. Due to the variations in descent profiles, particularly in the arrival phase of flight, a mid range descent profile was used [B767-300].

Action plans have been developed to align STARS to "CDA" where possible. Variations will still occur due to the complexity of traffic on separation assurance, and balancing large volume departure tracks with low volume arrival tracks. Major work is required for Sydney.

Introduction of arrival and departure area procedures that provide absolute priority, in terms of vertical flight paths, to arriving over departing aircraft is anticipated to result in economic disadvantages to departing aircraft. [Contrary to common belief, a departing aircraft levelled off for say 10 Nm on departure will burn more fuel for the total flight than one levelled of for 10 Nm on arrival.]

2.2.1.8 STAR Design Policy

Existing systems are based on the use of TAAATS and a mix of aircraft equipage that is generally but not totally RNAV capable. Design principles for STARs are detailed in the Airservices Australia STAR Policy. STARs are designed to meet standard route requirements not instrument approach criteria.

Area Route Structure

Australia's route structure is based on RNAV capability for high level flights while maintaining a route structure based on ground based navigation aids for medium to low level flights.

2.2.1.9 High Level Route Structure

With the major population based on the eastern seaboard areas and a large internal land mass, Australia has been able to develop a route structure that is loosely based on direct city pair tracking. The majority of high level aircraft movements occur on the eastern and south eastern seaboard, with medium to long haul flights connecting with the major cities in the north and north-west.

2.2.1.10 Eastern Seaboard

A ”race track” route structure connects the major cities along the eastern sea board. The route structure is based on the application of radar separation and not intentionally procedurally spaced tracks. Tracks are basically a great circle between terminal area exit and entry points, modified so that:

- Routes will pass over a conventional navigation aid if this does not add excessive extra distance. [Note: Historically ground based navigation aids were located near direct city pair tracks wherever possible]
- Application of radar separation standards is facilitated.
- Tracks, where practicable, remains within radar coverage.

A recent review of these tracks concluded that little can be gained by realignment of routes with out increasing real time surveillance coverage [Radar, ADS-B] which would allow removal of some “bends” that are in place to maintain the aircraft within radar coverage. The less restrictive radar separation outweighs any extra distance to be flown.

2.2.1.11 Continental Australia – Asia Interface

“T” routes were introduced into continental Australia approximately 15 years ago. Tracking via these routes required the aircraft to meet special Australian RNAV requirements. These requirements basically aligned with RNP 10 which is now internationally standardized. In the last 5 years, considerable work has been undertaken, in conjunction with airlines, to introduce routes that allow variations on the flight paths between city pairs and FIR entry/exit gates to allow for seasonal variations in weather patterns.

2.2.1.12 Oceanic [Eastern]

Flights vary between medium and long haul. A fixed route structure is generally in place between Australia and neighboring states. The route structure between Australia and New Zealand has been recently been reviewed to take advantage of the RNP10 status of this airspace. User preferred routes (UPRs) between Australia and the western seaboard of the USA have been available to FANS 1 equipped aircraft for several years

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2.2.1.13 Indian Ocean – Mauritius/Johannesburg FIRs

UPRs are used between Australia and South Africa .

2.2.1.14 Low Level Route Structure

The low level route structure is still basically ground aid based. All major city airports, by influence of the terminal gate structure, create a two way route structure for high density tracks. Other medium to high density areas, such as the mid north coast of New South Wales have some two way route structures. Diversion tracks are in place into and out of non radar airports, where needed.

2.3 Environmental Services and Responsibilities

Introduction

Airservices Australia's Environmental Services division provides environmental information, improved ATM environmental practices and effective communication of environmental information to the public.

The Airservices act 1995 part (d) specifies that part of Airservices Australia responsibilities is; carrying out activities to protect the environment from the effects of, and the effects associated with, the operation of Commonwealth jurisdiction aircraft;

Areas of Responsibility

The Environment Services Branch is responsible for:

- providing information, advice and services (including environmental assessments, noise impact modelling and aircraft noise certification) to Government, Airservices Australia's management, and to external parties in order to ensure that Airservices Australia fulfils its environmental obligations under the:
  - Air Services Act 1995;
  - Environment Protection (Impact of Proposals) Act 1974 (now superseded) or Environment Protection and Biodiversity Conservation Act 1999; and,
  - Ministerial Direction and other applicable local, state and federal environmental legislation.
- providing environmental information, advice and services to industry in furtherance of Airservices Australia's commercial objectives; and,
- developing and progressing the corporate environment policy of Airservices Australia and providing corporate leadership in promoting environmental awareness and education within Airservices Australia.

Environment Services' general responsibilities to the government and community under legislation and Ministerial Directions include:

- The provision of information and advice on environmental matters, especially aircraft noise, to the Minister, Members of Parliament and Parliamentary Committees;
- Assistance to the Department of Transport and Regional Services (DoTARS) and other agencies in the furtherance of government policy on aviation / environment matters, including the development of new legislation;
- The provision to state and local government agencies, the public and government-endorsed airport consultative bodies, of information and advice on environmental matters related to aircraft operations;
- The provision of delegated officers for the purposes of administering regulations under the Air Services Act and Air Navigation Act;
- The development of new environmental regulations and procedures pursuant to the Air Services Act 1995;
- Operation of a Noise and Flight Path Monitoring System (NFPMS) and associated technical advisory capability, and promote the development of aviation environmental measurement expertise within Australia; and,
- Participation in the development of aviation-related environmental standards, particularly for aircraft noise.

Environmental Services Provided

Administrative Support to Regulations

Environmental Services fulfil several important governmental regulatory functions and provide associated services through the submission of Noise Certification applications and the provision of guidelines for the Production of Noise Contours for Australian Airports.

Services to Airport Owners and Developers

2.3.1.1 Measurement of Aircraft Noise

Environment Services has specialised capabilities in the measurement, analysis and assessment of environmental noise from aircraft operations, whether in the immediate vicinity of airports, at more remote locations, or training areas. Our capabilities are based on extensive experience, precision equipment, a broad knowledge of aircraft operational procedures and noise generation characteristics

2.3.1.2 Noise Monitoring and Forecasting

A noise and flight path monitoring system has been established to monitor the operations of aircraft around Australia's major airports. This records the flight path and altitude of each aircraft operating to and from the airport, the noise levels produced by individual aircraft, and the general background noise. The data is used to produce aircraft noise exposure contours, using the Integrated Noise Model, for use in land use planning, for checking effectiveness of proposed noise abatement operational procedures, and for checking compliance with such procedures. Environment Services has broad experience in producing quality Australian Noise Exposure contour charts using the latest version of the FAA-developed Integrated Noise Model with staff trained in the USA

2.3.1.3 Environmental Assessments

Under relevant State and Federal legislation an airport owner is required to assess the environmental impact of airport development proposals. Environment Services has extensive experience in assessing aircraft noise impacts using such tools as the noise and flight path monitoring system, aircraft movement data bases, the Integrated Noise Model and other computer-based software.

2.3.1.4 Consultancy Services

Environment Services has long and extensive experience in aircraft noise measurement, monitoring and modelling, and direct involvement in formulation and development of standards aimed at reducing the environmental impact of aircraft noise. We have the capability to provide accurate information on aircraft noise levels and the compatibility of those noise levels with community amenity. We can forecast the likely impact of aircraft movements on proposed and existing land uses.

2.3.1.5 Aircraft Movement Data

To assist in planning, Environmental Services can provide data on aircraft movements at most major Australian airports with numerous analytical tools capable of retrieving and manipulating aircraft movement data.

2.3.1.6 Radio – Frequency Radiation Hazard Assessment

Airservices has extensive experience in the measurement and assessment of exposure to EMR fields associated with radio and radar transmission equipment. Environmental Services can carry out measurement surveys and assess and advise on the occupational and public exposure to and protection from the effects of such fields.

2.3.1.7 Emissions Assessment

Environment Services can provide emissions modelling to assess air quality at civil and military airports. The model is used to produce an inventory of emissions generated by sources on and around airports, and to calculate pollutant concentrations in these environments.

Services to Aircraft Owners and Operators

Environment Services offer the following important service to the owners, operators and/or manufacturers of aircraft:

2.3.1.8 Noise Certification

Regardless of its size, purpose or ownership, every aircraft operating in Australia is required to comply with the Air Navigation (Aircraft Noise) Regulations under the Commonwealth's Air Navigation Act. Unless it has been continuously on the Australian Civil Aircraft Register since 6 December 1990, an aircraft may not operate in Australia unless it is noise certificated to the standards set out in the relevant chapter of the International Civil Aviation Organization's (ICAO) Annex 16 Volume 1, or has a permit to operate without a noise certificate, or has been assessed as being in an exempt category.

Aircraft noise certification is a specialised procedure, combining elements of noise measurement and analysis, aircraft performance, aircraft tracking, and meteorological measurement. Environment Services is the only organisation in the region with the experience to carry out such testing.

3 AERONAUTICAL INFORMATION SERVICE [AIS]

The objective of the Aeronautical Information Service is to ensure the flow of information necessary for the safety, regularity and efficiency of international air navigation. [ICAO Annex 15 – Aeronautical Information Service]

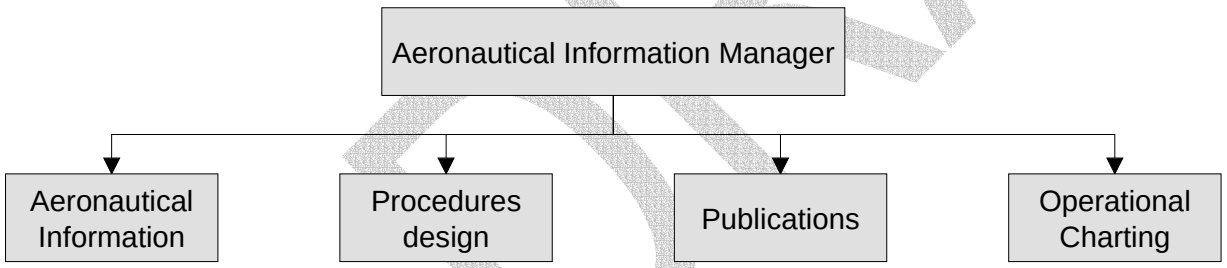
3.1 Provision of Aeronautical Information Services

Aeronautical Information is provided by two groups within Air Traffic management division of Air Services Australia:

- Customer Value & Business Development Branch. Aeronautical Information Management. [CV&BD – AIM]
- Brisbane Centre. Australian Flight Information Centre [AusFIC].

Both groups are part of Air Traffic Management Division.

Customer Value Structure



Australian Flight Information Centre Structure [AusFIC]

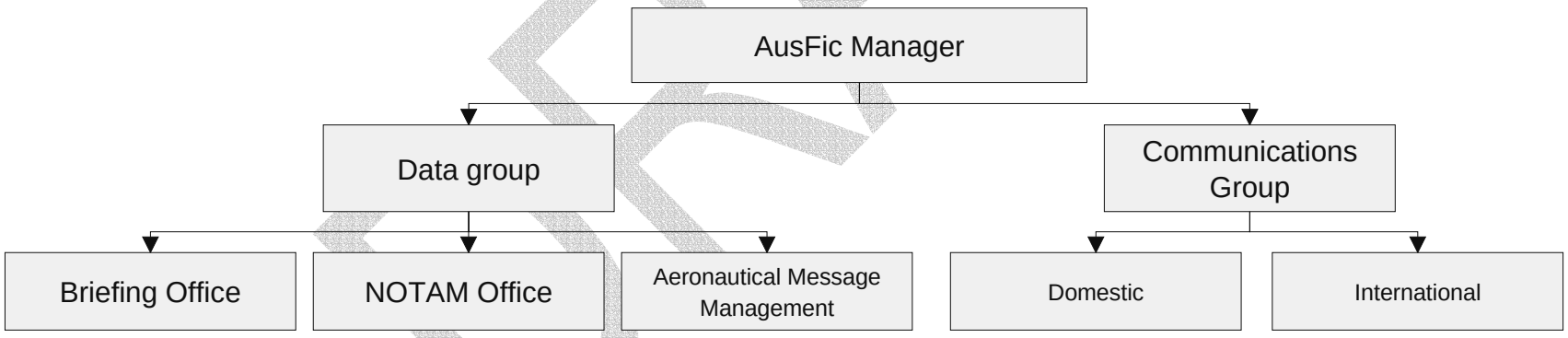
In order to assist Airservices Australia in discharging its responsibilities under ICAO Annexes 10, 11, 12 & 15, AusFIC provides services to the Australian and International aviation community, via two streams of expertise:

- **Data**

  The Data Group supports a number of computer based systems to provide services to the aviation industry.
  - Pre-flight Pilot Briefing and Flight Notification processing
  - Notice to Airmen (NOTAM) Management

  They also provide a supporting service, Aeronautical Message Management

- **Communications**
  - In-flight briefing and relay communications services through High Frequency (HF) and Very High Frequency (VHF) networks
  - Nominated Search and Rescue Time (SARTIME) management



3.2 AIS Services Provided – Service, Description, Provided By, Delivery Method

Aeronautical Information Publication "Books"

AIP Australia comprises a set of documents which provides operational information necessary for the safe and efficient conduct of national (civil) and international air navigation throughout Australia and its Territories.

Service	Description	Provided by	Deliver Method
AIP Book • General [GEN] • En-Route [ENR] • Aerodrome [AD]	Rules and operating procedures for pilots	[CV&BD – AIM] Aeronautical Information	The AIP text is issued in two hard cover binders and includes the Aeronautical Information Circular (AIC) and AIP supplement text, dividers and 12 month amendment service.
AIP Supplement(s)	SUPS include operational information appropriate to the AIP. A SUP is published when the information is of a temporary nature and requires advanced notification. SUPs indicating major changes affecting air operations.	[CV&BD – AIM] Aeronautical Information	Issued in hard copy. Usually issued under the ICAO Aeronautical Information Regulation and Control (AIRAC) requirement which stipulates that implementation occurs on a specific AIRAC date.
Aeronautical Information Circular [AIC]	AICs contain information of a technical nature and are generally educational giving advance notice of new facilities, services, procedures etc.	[CV&BD – AIM] Aeronautical Information	Issued in hard copy. On Internet Web site
AIP En-route Supplement [ERSA]	The ERSA is a joint military/Airservices publication which contains information vital for planning a flight and for the pilot in flight. It includes pictorial	[CV&BD – AIM] Aeronautical Information	ERSA is available in spiral bound or loose leaf format and can be supplied with or without the Runway Distance Supplement

Service	Description	Provided by	Deliver Method
	presentations of all licensed aerodromes and is amended every 12 weeks. Other information includes aerodrome physical characteristics, hours of operation, visual ground aids, air traffic services, navaids, lighting, MTAF and CTAF, aerodrome operators' details and any changes applicable		
Runway distance Supplement	The Runway Distance Supplement provides take-off and landing distances data and supplementary data for all licensed aerodromes. It is amended at the same time as the ERSA.	[CV&BD – AIM] Aeronautical Information	

Aeronautical Information Publications "Charts"

Service	Description	Provided by	Deliver Method
AIS Data management	Central data management. Creation and storage of core data required for map publication	[CV&BD – AIM] Aeronautical Information	Available in hardcopy or soft copy. Data is provided to other service providers such as Jeppersen.
AIP Designated Airspace Handbook		[CV&BD – AIM] Aeronautical	Issued in hard copy and or soft copy

Service	Description	Provided by	Deliver Method
		Information	
AIP Charts: • Visual Terminal • Visual Navigation chart	VTCs provide both aeronautical and topographical information at a scale of 1:250,000 for VFR operations in the vicinity of major aerodromes. VNC Topographical information at a scale of 1:500,000. Controlled airspace and Flight Information Area boundaries. VHF area frequencies for contacting ATS. MBZ and CTAF details Designated Remote Area and Restricted/Danger Areas	[CV&BD – AIM] Operational Charting [Updates].	Issued in hard copy
AIP Charts: • Enroute Low • Enroute High • Terminal area • Planning chart Australia	The ERC (L) are drawn to various scales to accommodate significant air traffic route areas and show controlled airspace, prohibited, restricted and danger areas, air routes, ATS and radio-navigation services. The ERC (H) are designed to provide selected information similar to that of the ERC (L) series and are primarily for use by aircraft operating on transcontinental and intercapital routes at FL200 and above. For use in terminal areas, these charts provide airspace, air-routes, prohibited, restricted, and danger areas, navigation aids and radio	[CV&BD – AIM] Aeronautical Information	Issued in hard copy

Service	Description	Provided by	Deliver Method
	frequencies. They are designed to display aeronautical information at a larger scale for easier use in congested areas. Scale varies for each chart.		
AIP Charts: [Aerodrome] • Departure & Approach Procedures	The charts connected with all instrument departure and approach procedures, also contain information on Noise Abatement Procedures, if applicable, for all locations.	[CV&BD – AIM] Procedures design	Hard copy. Contained in two separate packages called DAP East and DAP West. DAPs

Notices to Airmen [NOTAMS]

Service	Description	Provided by	Deliver Method
NOTAM Management	Notices To Airmen	AusFIC [NOTAM Office]	Distributed via AFTN. Available on request via internet connection or ▪ Fax [AvFax] ▪ Voice briefing

Pre Flight Information Service

Service	▪ Description	Provided by	Deliver Method
Pre Flight Information Service	Provides a pre flight briefing and flight notification service ▪ Area location briefing	AusFIC [Briefing Office]	On request ▪ Pilot direct access via internet ▪ Pilot direct access to Fax

Service	▪ Description	Provided by	Deliver Method
	▪ Specific Pre-Flight Information Bulletin [SPFIB] ▪ First light last light information		message ▪ Voice briefings via telephone
Flight Plan Submission	▪ Flight Plan Acceptance ▪ SAR Time	AusFIC [Briefing Office]	▪ Phone ▪ Fax ▪ Internet ▪ AFTN ▪ NAIPS terminals

Information required for in-flight Information Service

Service	Description	Provided by	Deliver Method
Information required for in-flight Information Service	NOTAMS, Weather, Hazard information	AusFIC [Data Group & NOTAM Office]	Air Traffic Services responsibility to distribute. ▪ AFTN ▪ AFTN connection to TAAATS ▪ Phone ▪ Fax ▪ Internet

3.3 AIS Systems

Aeronautical Data Management System [ADMS]

The Aeronautical Data Management Service (ADMS) is Airservices Australia's repository for static aeronautical data.

AIP – Desk Top Publisher

AIL – Template Plotter

Micro Station

National Aeronautical Information Processing System [NAIPS]

NAIPS is a centralised computer system located in Brisbane. It supports a country-wide area network of workstations (or terminals) which connect to the main system via the Packet Switched Network (PSN).

Pilots using their home terminals or PCs can access NAIPS via the Public Switched Telephone Network (PSTN) using dial-up modems. NAIPS is also accessible by internet for the submission of Sartime and ICAO Flight Notification and for obtaining Briefing Material. NAIPS also interconnects with the AvFax system allowing pilots to obtain information from the NAIPS database by fax. NAIPS is the main AIS and MET database repository for pilot access.

NAIPS integrates with other NAS facilities to provide the following ATS functions:

- To automate the management of the Australian NOTAM Office (NOF)
- To provide Aeronautical Information Service (AIS) & Meteorological (MET) database.
- To provide a Briefing and Specific Pre-Flight Information Bulletin (SPFIB)
- To calculate route sector winds and temperatures for any airways routes
- To provide users with the ability to submit SARTIME and ICAO Flight Notifications which, after being validated by the Briefing Office, is sent via AFTN to relevant ATS units including TAAATS.

Aeronautical Information Services/Meteorological Services [AIS/MET]

The AIS/MET database is used to store AFTN messages and is used in a similar way to NAIPS, except with reduced functionality. The briefing and NOTAM staff can use the AIS/MET system to raise NOTAMS and submit flight plans. SITA also has a direct connection into the database and Avfax is also able to source data from these nodes if NAIPS is not available. The database is used internally in the AIS/MET system for supplying data to DecTalk (MetBrief), AERIS, VOLMET and non login based web access for briefing data (NAIPS requires login due to flight plan submission).

Aviation Facsimile Service [AVFAX]

The Aviation Facsimile Service (AvFax) is a briefing service provided to the aviation community by AusFIC. AvFax is an automated voice response system designed to provide pilots with current NOTAM and MET data as well as meteorological charts.
Up to sixteen incoming calls can be simultaneously processed by the system into request messages which are transmitted to the NAIPS database server. Regular briefings can also be automatically scheduled by the system operator. Once the requested data has been received from the database, it is compiled into the necessary format for transmission to the caller's nominated fax number. All AIS (including NOTAM) and MET data is received from NAIPS apart from charts and graphical data which are either fed into the system using a standard fax machine or received directly from the Bureau of Meteorology via an electronic interface. The ability to simultaneously send thirty two fax transmissions helps ensure callers receive their data in a timely manner.

Met Briefing [DecTalk]

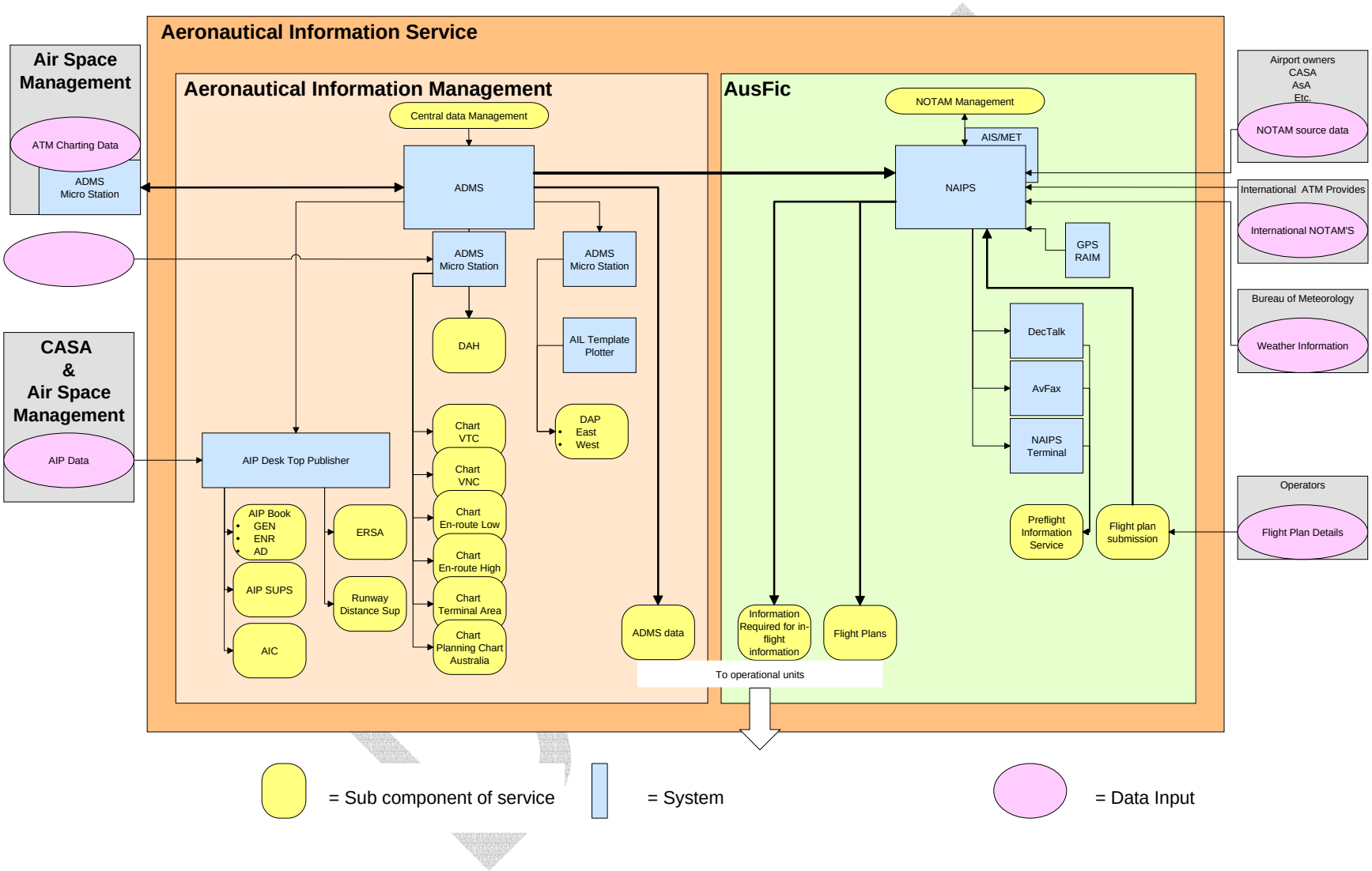
The metbrief node runs the DecTALK interface through the telephone network. Six (6) DecTALK cards currently provide this service.. The usage of this system is low

GPS Receiver Autonomous Integrity Monitoring [GPS-RAIM]

The Monitoring (RAIM) Prediction System is used to predict RAIM availability at specified aerodromes in Australia and neighbouring countries. The GPS is a worldwide satellite radio navigation system used extensively for air navigation. In order to perform a non-precision approach (NPA) at a particular airport using a GPS receiver, RAIM must be available in that area.

RAIM availability is determined by the number and geometry of satellites visible to a user at a given location and is thus dependent on GPS satellite outages. The RAIM system is notified of any satellite outages and is able to calculate RAIM availability from this data. Pilots can request to have this information supplied as part of their pre-flight briefings obtained from NAIPS by a briefing officer, AvFax or the Internet.

System to Service Link



3.4 Decision Support Systems

Arrivals and Departures Information Database [ADID]

The ADID system acts as a communication interface between Radar Data Processing Units (RDPUs) and a number of airport information systems. The ADID consolidates information received from the various airport information systems and passes it to the RDPUs as required. The ADID also sends information about arrival and departure events to a number of airport information systems.

Spot Flight

4 AERONAUTICAL TELECOMMUNICATIONS

Aeronautical Telecommunications ICAO Annex 10			
Service	**Description**	**Comment**	**Provided by**
Aeronautical fixed Service	A telecommunication service between specific points provided primarily for the safety of air navigation and for the regular, efficient and economical operations of air services.	Aeronautical fixed telecommunications network [AFTN] Managed as part of AusFIC Aeronautical Message Management	Air Traffic Management Division. AusFIC
Aeronautical mobile service	A mobile service between aeronautical stations and aircraft stations, or between aircraft stations.	VHF Data Link AusFIC provides third party	Air Traffic Management Division. [ATM] Air Traffic Control [ATC] AusFIC

Aeronautical Telecommunications ICAO Annex 10			
Service	**Description**	**Comment**	**Provided by**
		HF international and domestic communications for ATC. VHF VHF, UHF, HF	 Airport Services Department of Defence
Aeronautical radio navigation service	A radio navigation service indented for the benefit and for the safe operation of aircraft	Ground based navigation aids VOR NDB DME ILS GPS RAIM prediction service	Air Traffic Management Division. [ATM] Air Traffic Control Airport Services Department of Defence Privately owned [AusFIC]
Aeronautical broadcasting service	A broadcast service intended for the transmission of information relating to air navigation	Limited to meteorological information see below	

5 AIR TRAFFIC SERVICES [ATS]

5.1 Objectives of Air Traffic Services [ATS]

The Objective of the Air Traffic Services shall be to [ICAO Annex 11] :

- Prevent collision between aircraft
- Prevent collision between aircraft on the manoeuvring area and obstructions on that area
- Expedite and maintain an orderly flow of air traffic
- Provide advise and information useful for the safe and efficient conduct of flights

Notify appropriate organisations regarding aircraft in need of search and rescue aid and assist such organisations as required

5.2 Where ATS is provided

Air Traffic Services are provided by Airservices Australia in:

- All sovereign airspace
- International airspace as assigned by ICAO
- Upper level Honiara airspace under contract

5.3 Provision of Air Traffic Services

Air Traffic Services [ATS] is provided by two groups within Airservices Australia:

- Air Traffic Management
- Airport Services

Air Traffic Services are also provided by Department of defence through the RAAF

Air Traffic Management

Air Traffic Management Division is divided into:

- Sydney Operations
  - Sydney TCU and Sydney Tower

- Melbourne Centre
  - Area control services in Melbourne FIR
  - Melbourne TCU, and Canberra TCU within Melbourne Centre
  - Adelaide TCU
  - Perth TCU
- Brisbane Centre
  - Area control services in Brisbane FIR
  - Area control services in high level Honiara FIR [Under contract]
  - Brisbane and Coolangatta TCU [within Brisbane Centre]
  - Cairns TCU
  - AusFIC Communications group flight watch service

Airport Services

Within Airport Services, Air Traffic Control Operations provides aerodrome services, at controlled airports, except for Sydney Tower, joint user airports and military airports; Air Traffic Control Operations is further subdivided into four groups as listed below.

Eastern Towers		**Northern Towers**		**Southern Towers**		**Western Towers**	
Archerfield	GAAP	Cairns	Radar	Albury	Regional	Adelaide	Radar
Bankstown	GAAP	Hamilton Island	Regional	Avalon	Regional	Alice Springs	Regional
Brisbane	Radar	Mackay	Regional	Canberra	Radar	Jandakot	GAAP
Camden	GAAP	Maroochydore	Regional	Essendon	Radar	Parafield	GAAP
Coffs Harbour	Regional	Rockhampton	Regional	Hobart	Regional	Perth	Radar
Coolangatta	Radar			Launceston	Regional		
Tamworth	Regional			Melbourne	Radar		
				Moorabbin	GAAP		

Department of Defence [RAAF]

Department of Defence provides aerodrome services at:

Joint user airports	Defence Airports	Defence airports [Activated when required]
Darwin	Amberley	Curtin
Townsville	East Sale	Scherger
	Edinburgh	Woomera
	Pearce	Learmonth
	Nowra	
	Oakey	
	Richmond	

5.4 Air Traffic Services – Function Definitions

[Description of services is contained in part 4.5]

Approach Control

The provision of air traffic control service for those parts of controlled flights associated with arrival or departure, in order to accomplish functions/objectives as per Airservices Australia Regulations.

Aerodrome Control

The provision of air traffic control service for aerodrome traffic, except for those parts of flights covered by approach control, in order to accomplish functions/objectives as per Airservices Australia Regulations.

Area Control

The provision of air traffic control service for controlled flights, except for those parts of such flights covered by the approach Control or Aerodrome Services in order to accomplish functions/objectives as per Airservices Australia Regulations.

Flight Information Service

A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flight.

Alerting Service

A service provided to notify appropriate organisations regarding aircraft in need of search and rescue aid and assist such organisations as required.

Determination of level of service

Level of service is dependent on airspace classification [See part 2 airspace]. There is no numerical criteria specified that dictates what airspace classifications are required and therefore the level of ATS which are to be provided. Historically, experience and political dictates have determined where and what services are provided.

Service Delivery

CASA regulations require that to deliver Aerodrome Control, Approach Control or Area control the ATM provider's operator is required to hold an Air Traffic Control Licence with the appropriate ratings and endorsements. The issuing of these licences is a CASA function delegated to Airservices Australia.

Flight Information service can be provided by a person not holding an ATC licence. Within Airservices Australia AusFIC takes the primary role for supplying Flight Information with Air Traffic Control providing air-ground-air Flight Information where that information is not accessible from AusFIC.

At regional and Secondary Controlled Airports, Approach and Aerodrome Services are provided by the same group and, in many cases, by the same controller.

Certified Air/Ground Radio Service [CA/GRS]

A Certified Air/Ground Radio Service is an aerodrome-based radio information service, which may be provided at non-controlled aerodromes. It is not an Airservices Australia provided air traffic service.

UNICOM

Universal Communication is a non ATS communication service provided on the MBZ or CTAF frequency. It is not an Airservices Australia provided air traffic service.

5.5 Method of Service Delivery

Mode of Operations

The major determinate of Air Traffic Services which are provided fall into two broad categories:

- Radar [Real Time Surveillance – Radar and/or ADS-B] systems which provides position information at an accuracy, update rate and latency presented on a plan view display allowing real time evaluation of separation; and
- Procedural [Voice position reporting/ADS-C]. Procedural control is accomplished by using aircraft position reports, voice or ADS-C, to update the flight plan record of the aircraft.]. Note. ADS-C provides computerised position reports this information then used to provide procedural separation. Within TAAATS information is presented on a plan view display.
- Towers use paper flight strips.

5.5.1.1 Radar Coverage Areas

Radar coverage in Australia extends principally from 250 Nm north of Cairns down the east and south east coast around to 250 Nm west of Adelaide. [Known as the 'J-curve'] Coverage is also available round Perth and Darwin/Tindal [Fig. 1 below shows low-level radar coverage (up to 12,500 feet). High level Radar coverage extends to 250 Nm from the centres of the low cover diagrams.

Radar coverage derives from both Civil and Military radar sites. It should be noted that in a number of instances the radar coverage within the J-curve extends significantly beneath controlled airspace. In some cases the radar coverage extends to ground level.

High-density terminal areas [Adelaide, Brisbane, Cairns, Canberra, Darwin, Melbourne, Perth and Sydney] are provided with primary radar coverage to 50NM radius. The remaining civil radar coverage in Australia is provided by Monopulse Secondary Surveillance Radar [MSSR] with duplicated SSR coverage in major airport TMAs.

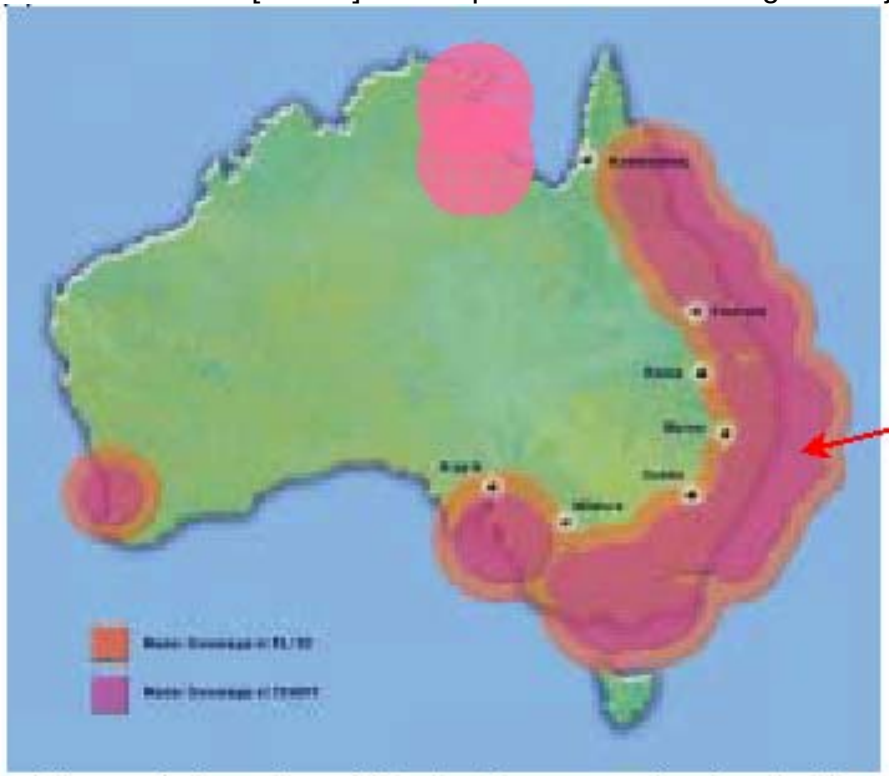


Figure 1: Low-level Radar Coverage in Australia

Combination of Modes of Operations

Controllers may provide separation services using more than one method while operating in a designated position.
Eg. High level radar separation, Low level procedural separation and Traffic Information in radar gaps.

Controllers may be required to operate high level radar sectors with low level procedural sections.
At major Australian airports, Approach and Aerodrome Services are provided by separate ATC groups.

Service Delivery Methods Combinations

<table>
<tr><th></th><th colspan="3">Continental</th><th>Oceanic</th></tr>
<tr><th></th><th>Radar</th><th colspan="2">Procedural</th><th></th></tr>
<tr><td>Area</td><td>Area Control Radar/Procedural Radar High Level/Radar and procedural low level [Area-R]</td><td colspan="2">Area Control Procedural [Area-P]</td><td>Area Control Procedural Oceanic [Area-O]</td></tr>
<tr><td>Approach</td><td>Approach Control Radar [APP-R]</td><td rowspan="2">Approach/ Aerodrome Control [APP/ADC] #1</td><td>N/A</td><td rowspan="2">N/A</td></tr>
<tr><td>Aerodrome</td><td>Aerodrome Control Radar [ADC-R]</td><td>Aerodrome Control GAAP [GAAP]</td></tr>
</table>

#1: At some Procedural airports, a Tower Situational Aerodrome Display [TSAD] based on radar information is supplied to provide situational awareness but is not authorized to be used to provide separation.

5.6 Service Description

Air Traffic Control

Service	Objective	Description	Comment
Separation Aerodrome	Prevent collision between aircraft on the manoeuvring area and obstructions on that area	Joint Controller pilot responsibility on aprons and taxiways. Runway separation standards for Departures and Landings.	Application of Aerodrome standards requires a high level of judgment and knowledge of aircraft performance.
Separation Radar	Prevent collision between aircraft	Application of radar distance standards combined with vertical separation standards. Vertical may be via pilot reports but more typically by using verified mode C altitude	Radar standards are simple in nature. With aircraft on self navigation Controllers need to be able to predict ahead. When being radar vectored requires high to medium level of judgment. During the arrival and departure stage of flight knowledge of aircraft performance is required.
Separation Procedural	Prevent collision between aircraft	Application of vertical and horizontal separation. Horizontal standards are further divided in to lateral and longitudinal standards.	Procedural control involves a large number of standards and conditions under which the standards can be applied. In excess of 150 permutations exist without considering that each lateral conflict area is unique.
Separation Procedural [ADS-C]	Prevent collision between aircraft	Application of procedural standards but using a data link to obtain information.	Removes areas where errors can be made. Automation of position reports reduces Controllers workload. There are some standards tailored to ADS-

Service	Objective	Description	Comment
			C. ADS-C update rate is not high enough to consider this technology as real time
Sequencing	Expedite and maintain an orderly flow of air traffic	Organisation of arriving aircraft into a logical order considering their relative position and performance. Organising departing aircraft into an efficient departure order.	Use Maestro in Sydney. Maestro being installed in Melbourne and Brisbane. Manual means at other airports
Traffic Information	Prevent collision between aircraft by providing situational awareness.	Information passed to pilots on other aircraft considered to be a potential collision risk. Conditions laid down in MATS given to prevent collision between aircraft	Provided by ATC either as a stand alone function or combined with separation.

Flight Information Service

Service	Objective	Description	Comment
Flight Information Service	Provide advise and information useful for the safe and efficient conduct of flights	Information on: pre Volcanic activity, Volcanic eruptions Volcanic Ash clouds	Information collated and held by AusFIC. See Aeronautical Information Service. The intent is that AusFIC – Flight Watch [Communication group] is the primary provider. FIS can also be obtained through all ATC units workload permitting.
		Information concerning: Radioactive materials	

Service	Objective	Description	Comment
		Toxic chemicals Released into the atmosphere	AusFIC does not have Australia wide VHF coverage but does have HF coverage. Aircraft without HF obtain information via ATC. DoD also provides FIS in their area of coverage when not available via Flight Watch.
		Information on changes to serviceability of navigation aids	
		Information on changes of; Aerodromes Associated facilities Including movement areas	
		Information on unmanned balloons	
		Wether conditions reported or forecast at destination and alternative aerodromes	
		Collision hazards in C, D, E, F & G airspace	
		Any other information likely to affect safety.	
		Weather Surveillance	Provided from BOM weather radar
		Navigation assistance [Radar Position]	Provided when request

Flight Information Service Broadcast Meteorological Information

Service	Description	Provided by	Deliver Method
Automatic Terminal Information Service [ATIS]	At specific aerodromes, information required by aircraft prior to take-off or landing is broadcast automatically and continuously.	Air Traffic Control ATM & Airport Services Department of Defence	Broadcast on NDB and/or VOR and/or Dedicated VHF ATIS form part of the tools fro providing Aerodrome Services. While listed here it is part of providing ATS.

Service	Description	Provided by	Deliver Method
Automatic En Route Information Service [AERIS]	En-route information service continuously broadcasting routine metrological reports [METAR]	AusFIC [Data Group]	Broadcast routine from a network of VHF transmitters. [Service aimed at medium to high traffic density areas]
Automatic Weather Information Broadcast [AWIB]	Broadcasts of actual weather conditions from Bureau of Meteorology AWS equipment or specific AWS that have met BOM standards.	Bureau of Meteorology Private [aerodrome owners]	Phone VHF and or UHF at some locations
VOLMET	Provides meteorological information for Australian major international aerodromes including Townsville.	AusFIC [Data group]	HF

Emergency Service

Service	Objective	Description	Comment
Alerting Service	Notify appropriate organisations regarding aircraft in need of search and rescue aid and assist such organisations as required	When an aircraft remains within controlled airspace, SAR following is automatic. When not contained fully within controlled airspace pilot may nominate a SAR time. A Central SAR [CenSar] computerised system is used to hold SAR times.	For all aircraft provided with air traffic control services In so far as practicable, to all aircraft having filed a flight plan or otherwise known to air traffic services To any aircraft known or believed to be the subject of unlawful interference

In flight Emergencies	Immediate response to assist aircraft with an in-flight emergency	Put into action pre determined action to assist pilot	Controllers undertake regular training for this service
Airport Emergencies	Immediate response to assist aircraft with an emergency within the vicinity of the airport.	Put into action pre determined action.	Regular combined exercise are carried out.

Services

Separation Aerodrome	No	No	No	No	Yes	Yes	Yes
Separation Radar	Yes	No	No	Yes	No	No	No
Separation Procedural	Yes	Yes	Yes	No	No	Yes	No
Separation Procedural [ADS-C]	No	Yes	Yes	No	No	No	No
Traffic Information	Yes	Yes	No	Yes	No	Yes	Yes
Sequencing [Arrival & departure]	Yes	No	No	Yes	Yes	Yes	Yes
Flight Information Service	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Alerting Service	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In flight Emergencies	Yes	Yes	Yes	Yes	No	Yes	Yes
Airport Emergencies	No	No	No	No	Yes	Yes	Yes

GAAP = General Aviation Airport
Note: All radar positions can and do use a limited number of procedural standards.

Services Available at Airports

Airports	Class C		Class D		Class G		GAAP	
	Controlled		Controlled		Not controlled		Controlled	
	IFR	VFR	IFR	VFR	VFR	IFR	IFR	VFR
Separation Aerodrome	Yes	Yes	Yes	Yes	N/A	N/A	Yes	Yes
Separation Radar	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Separation Procedural	N/A	N/A	Yes	N/R	N/A	N/A	N/R	N/R
Traffic Information	Ye[1]	Yes [1]	Yes [2]	Yes [1]	Yes [3]	Yes [3]	Yes	Yes
Sequencing [Arrival & departure]	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A
Flight Information Service	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Alerting Service	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In flight Emergencies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Airport Emergencies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

N/A = Not Available
N/R = Not Required
Yes [1] = Passed when required to enhance safety, situational awareness or in an emergency.
Yes [2] = Traffic information provided on VFR aircraft and under conditions [1]
Yes [3] = Not passed when airport is MTAF or CTAF

Services Available in Area Airspace

[Not terminal]

Area			Class C airspace		Class E airspace		Class G airspace	
	IFR	**VFR**	**IFR**	**VFR**	**IFR**	**VFR**	**IFR**	**VFR**
Separation Radar	N/A	No [1]	Yes	Yes	Yes	N/R	N/R	N/R
Separation Procedural	Yes	No [1]	Yes	Yes	Yes	N/R	N/R	N/R
Separation Procedural [ADS-C]	Yes	No [1]	Yes	Yes*	N/A	N/A	N/R	N/R
Traffic Information	N/R	No [1]	Yes [2]	Yes [2]	Yes [3]	Yes [4]	Yes	Yes [4]
Sequencing [Arrival & departure]	N/R	No [1]	Yes	Yes	Yes	Yes [5]	Yes [5]	Yes [5]
Flight Information Service	Yes	No [1]	Yes	Yes	Yes	Yes	Yes	Yes

Area			Class C airspace		Class E airspace		Class G airspace	
	IFR	**VFR**	**IFR**	**VFR**	**IFR**	**VFR**	**IFR**	**VFR**
Alerting Service	Yes	No [1]	Yes	Yes	Yes	Yes	Yes	Yes
In flight Emergencies	Yes	No [1]	Yes	Yes	Yes	Yes	Yes	Yes

N/A = Not Available
N/R = Not Required
No [1] = VFR not allowed in Class A airspace
Yes * = Very unlikely that a VFR aircraft would have the equipment
Yes [2] = Passed when required to enhance safety, situational awareness or in an emergency.
Yes [3] = Traffic passed on known VFR
Yes [4] = Traffic passed on request as a one off service
Yes [5] = Aircraft sequenced into controlled airports

5.7 Conditions to Access Services

Class C Airports

Class C Zone	Flight Category	Requirements
Operational	Al	Clearance required all aircraft except in emergency Clearance required to enter manoeuvring area Request changes to Flight plan Track horizontally and vertically as per clearance Maintain continuos VHF communications Slot time required at Sydney airport Landing time allocation for aircraft within a prescribed distance/time of Major airports. Operators depart at their discretion to meet the time.
	IFR	Flight Plan Plan to track via SID/STAR #1
	VFR	Flight plan and or short details Plan via Visual reporting points and or VFR lanes
Communications	All	VHF Clearance available by Data Link to companies thence via ACARS to aircraft
Navigation	IFR	Minimum Equipment List as specified in AIP. RNAV/GPS preferred as a move is being made to gain efficiency by designing STARS and SIDS [Above sector LSALT] for RNAV/GPS use only.
	VFR	Visual navigation
Surveillance	All	SSR. IFR must have Mode C. Mode C preferred for VFR.

1 = Many SIDs require R Nav capability above sector LSALT,
Many STARS required R Nav capability until intercepting IAL or Visual termination.

Class D Airports

Class D	Flight Category	Requirements
	All	▪ Clearance required all aircraft except in emergency ▪ Clearance required to enter manoeuvring area ▪ Request changes to Flight plan ▪ Track horizontally and vertically as per clearance ▪ Maintain continuos VHF communications
	IFR	▪ Flight Plan ▪ Plan to depart using SID
	VFR	▪ Flight plan and or short details ▪ Plan via Visual reporting points and or VFR lanes if published on VTC
Communications	All	▪ VHF
	IFR	▪ Minimum Equipment List as specified in AIP. Ground based aids to take priority over GPS. Note GPS is optional.
	VFR	▪ Visual
Surveillance	All	▪ Voice position report. ▪ All aircraft equipped with a transponder must activate that transponder when operating in any radar or non-radar] Australian airspace [except General Aviation Aircraft Procedures (GAAP) airports

GAAP Airports

GAAP	Flight Category	Requirements
Control Zone & associated Steps Class C	All	▪ Clearance required all aircraft except in emergency ▪ Clearance required to enter manoeuvring area ▪ Request changes to Flight plan ▪ Track horizontally and vertically as per clearance ▪ Maintain continuos VHF communications
	IFR	▪ Flight Plan ▪ Flight must operate VMC unless zone declared IMC
	VFR	▪ Flight plan and or short details ▪ Plan via Visual entry points
Communications	All	▪ VHF
Navigation	All	▪ Visual
	IFR	▪ Only when zone IMC; Minimum Equipment List as specified in AIP. Ground based aids to take priority over GPS. Note GPS is optional.
Surveillance	All	▪ Voice position report ▪ All aircraft equipped with a transponder must activate that transponder when operating in any radar or non-radar] Australian airspace **[except General Aviation Aircraft Procedures (GAAP) airports**

Class A Airspace

Area - Class A	Flight Category	Requirements
Operational	IFR	▪ Must submit Flight Plan ▪ Require ATC clearance ▪ Must request ATC approval for changes to flight plan ▪ Plan via fixed routes except FANS1/A aircraft on USA to Australia flights where flight planning via User Preferred Routes [UPRs] is available. ▪ UPRs to be introduced in Tasman airspace during 2003
	VFR	▪ Not allowed In Airspace
Communications	IFR	▪ VHF for flights over Australian Sovereign airspace and within approximately 250 Nm of the coast. ▪ Oceanic High Frequency [HF] Communications. Controller Pilot Data Link [CPDLC] preferred but is not compulsory.
Navigation	IFR	▪ Domestic RNAV and or GPS if planning via high level RNAV route structure. Otherwise Minimum Equipment List as specified in AIP. ▪ Oceanic Ability to navigate to Required Navigation Performance 10 Nautical Miles [RNP 10]. Lesser ability must have Minimum Equipment List and concession to enter airspace. Note concession is provided by controller dependent on traffic density. ▪ Ability to meet requirements of Reduced Vertical Separation Minimum [RVSM]. If not compliant concession may be provided by controller dependent on traffic density.
Surveillance	All	▪ SSR with mode C within radar coverage. ▪ Outside radar coverage manual voice position reports. Automatic Dependent Surveillance – Contract [ADS-C] preferred but is not compulsory.

Class C Airspace

Area – Class C	Flight Category	Requirements
Operational	IFR	▪ Must submit Flight Plan ▪ Must obtain ATC clearance ▪ Must request ATC approval for changes to flight plan ▪ Plan via fixed routes
	VFR	▪ Must submit Flight Plan ▪ Must obtain ATC clearance ▪ Must request ATC approval for changes to flight plan
Communications	All	▪ VHF ▪ HF when VHF does not allow continuous communication with ATS at all stages of flight ▪ Controller Pilot Data Link [CPDLC] available in non radar areas but is not compulsory.
Navigation	IFR	▪ RNAV and or GPS if planning via high level RNAV route structure. Otherwise Minimum Equipment List as specified in AIP.
	VFR	▪ Visual ▪ Night VMC requires Minimum Equipment List as specified in AIP
Surveillance	All	▪ SSR with mode C within radar coverage. ▪ Non radar areas Manual voice position reports. Automatic Dependent Surveillance – Contract [ADS-C] preferred but is not compulsory. ▪ All aircraft equipped with a transponder must activate that transponder when operating in any radar or non-radar] Australian airspace.

Class E Airspace

Area – Class E	Flight Category	Requirements
Operational	IFR	▪ Must submit Flight Plan if planning to operate IFR ▪ Must obtain ATC clearance to operate IFR ▪ Must request ATC approval for changes to flight plan if operating IFR. ▪ May operate to VFR rules in VMC including operating at VFR levels. ▪ Plan via fixed routes for IFR portion of flight.
	VFR	▪ Nil
Communications	IFR	▪ VHF ▪ HF when VHF does not allow continuous communication with ATS at all stages of flight
	VFR	▪ VHF [listening watch] ▪ HF when operating in designated remote areas. AS specified in AIP
Navigation	IFR	▪ Minimum Equipment List.
	VFR	▪ Visual ▪ Night VMC requires Minimum Equipment List as specified in AIP
Surveillance	IFR	▪ SSR with mode C if flight will enter radar areas. ▪ Non radar areas Manual voice position reports. Automatic Dependent Surveillance – Contract [ADS-C] preferred but is not compulsory.
	VFR	▪ SSR with mode C if flight will enter radar areas
	All	▪ All aircraft equipped with a transponder must activate that transponder when operating in any radar or non-radar] Australian airspace [except General Aviation Aircraft Procedures (GAAP) airports

Class G Airspace

Area – Class G	Flight Category	Requirements
Operational	IFR	▪ Plan via fixed routes for IFR portion of flight. ▪ Maintain communication with ATC ▪ Advise ATC of intent and any changes to intent.
	VFR	▪ Nil
Communications	IFR	▪ VHF ▪ HF when VHF does not allow continuous communication with ATS at all stages of flight
	VFR	▪ VHF [listening watch] ▪ HF when operating in designated remote areas. AS specified in AIP
Navigation	IFR	▪ Minimum Equipment List.
	VFR	▪ Visual ▪ Night VMC requires Minimum Equipment List as specified in AIP
Surveillance	IFR	▪ Non radar areas Manual voice position reports. Automatic Dependent Surveillance – Contract [ADS-C] preferred but is not compulsory.
	VFR	▪ SSR with mode C recommended if flight will enter radar areas
	All	▪ All aircraft equipped with a transponder must activate that transponder when operating in any radar or non-radar] Australian airspace [except General Aviation Aircraft Procedures (GAAP) airports

Traffic Management and Demand/Capacity Balancing

5.7.1.1 Strategic Traffic Capacity Management

The major traffic limiting factor within Australia is runway arrival and departure capacities. While some feeder sectors reach near capacity, mitigators are in place to control this and they do not become the limiting factor.

Airservices Australia is not allowed to dictate the time for which a flight can be planned to operate. Strategic planning for management of traffic volumes only occurs at Sydney. At other locations traffic advisory fuel is advised based on predicted traffic levels and predicted arrival/departure rates. At most airports flights departing within a set time interval from the airport are advised to obtain a landing time and in this way absorb any delay on the ground by regulating their departure time. When Airwork flights can carry out instrument or circuit training is controlled by use of priorities detailed in AIP.

Inefficiencies do occur regularly in peaks where traffic exceeds capacity.

Sydney has a Government imposed cap to share noise during core operational hours. Many airports, including Sydney, have noise abatement procedures, and curfews.

5.7.1.2 Sydney Strategic Traffic Capacity Management

For Sydney airport, a Government introduced system of slot time allocation is used. This is managed by an independent organisation using agreed operating procedures. Airservices Australia's component in the process is a system called "Central Traffic Management System [CTMS]" Sydney airport acceptance rates are programmed into the system on a strategic basis based on meteorological forecast and other runway limiting factors such as runway works. Information is provided from other major airports to allow total flight segment times to be calculated. Airlines provide their proposed flight schedules. These schedules are then modified to balance with the acceptance rates using the agreed rules. The airlines then advise their pilots of the operating conditions for the flight. Airservices Australia Air Traffic Control is not advised of these conditions.

5.7.1.3 Brisbane and Melbourne Strategic Traffic Capacity Management

CTMS has been extended to Brisbane and Melbourne but only to the extent of providing information. This allows greater accuracy in the prediction of traffic advisory fuel. No slot allocation systems are in place. Traffic advisory fuel is advised based on historical traffic levels and predicted arrival/departure rates.

5.7.1.4 Tactical Traffic Capacity Management

The Australian method of tactical flow is based on estimated times at the runway threshold, to determine priority and then individual aircraft flow instructions to regulate the time at which the aircraft will enter the terminal area, aiming at a predetermined threshold time. Stand spacing through gates, either time or distance, is only used if it meets with the above principles. Holding is only used as a last resort with speed control being the primary method used. TAAATS has allowed much earlier determination of sequence and therefore more flow requirements are applied during the cruise phase of flight.

A tactical computer based traffic sequencing tool known as Maestro has been introduced at Sydney. It operates in a very simular manner to manual flow management, using a natural landing time to determine the landing order, and then calculates a sequence landing time. This is then extrapolated back to determine a time at a fix point approximately 45 Nm from Sydney. The flow controller can amended sequence order and assigned runway. Aircraft position in the sequence can be locked in. It is planned to extend Maestro to both Brisbane and Melbourne during 2003.

Area Sectors – Workload Management

Area control does not place limitations on traffic flow. However some Positions feeding major airports can exceed capacity if action is not taken. There is no automated system in place to allow monitoring and control of this. TAAATS and Maestro have allowed earlier flow action to take place with en-route cruise sectors participating in flow control.

5.8 Sectorisation

Area Operational Structure

5.8.1.1 Sectors

Historically Airservices Australia has used the term *Sector* to designate a volume of airspace that is managed by one air ground operator [excludes third party communications]. To manage this volume one or more operator positions may have been used; Eg. Radar plus procedural. Procedural plus co-ordinator. It is noted that in some countries a sector refers to a volume of airspace that may have several air ground operators. In Australian terms this is called a *Group.* [A grouping of air ground operators]. With the previous hard wired system to TAAATS, combining sectors could only occur when the traffic levels of the sum of the sectors reached a level where it could be handled by one air ground operating position.

5.8.1.2 TAAATS Area Logical Positions

TAAATS documentation uses a term Logical position. A logical position can either be an Executive or Planner position. Executive directly manage aircraft [Air ground] while planners carry out pre planning and or co-ordination tasks. While still defined in Eurocat 2000 data, very few Planner positions are used, and then these are mainly activated when external to TAAATS actions are required such as military exercises.

A logical position can manage several TAAATS Eurocat 2000 data defined sectors. The efficiency of area control can be looked at as being the number and hours of logical position staffing rather than the number of sectors defined in data. Experience with TAAATS has developed a practices where several more sectors may be defined than the number of logical positions available and workload balancing can be carried out by allocation of the sectors to Logical positions.

Jurisdiction and flight data posting of flight plan information to logical positions is based on sector volumes rather than city pairs. Therefore "TAAATS sector volumes" are used to capture the different service requirements in different airspace categories. A TAAATS sector volume may be made up several sub volumes. Limitation on the number of sub volumes and sectors that can be defined and the limited ability of the Voice Switch system to carry different role sets has limited application of these practices. Present TAAATS hardware upgrade will decrease the Eurocat 2000 limitation. The voice switch system will still impose restrictions.

Terminal Area Logical Positions

Operating positions within terminal airspace are based on function as apposed to airspace volumes. The function may have an associated volume but the size shape and location may depend on the operating mode. The volume of airspace is in effect one "sector" made up of several sub-volumes. Logical Positions are used in terminal areas however the way in which Jurisdiction and posting of Flight plan information is based on Operating Mode [Runway nomination, IFR or VFR, day or night, curfew non curfew, etc.] and planned flight path.

5.9 ATS Systems

Audio and Control

The Audio and Control system allows control tower operators to communicate via bearers and radio to aircraft and other ATC centres.

Control and Maintenance Monitoring [CMM]

CMM is a maintenance system which provides technical Control and Maintenance Monitoring to EUROCAT 2000 system. The CMM provides the remote control and monitoring capability. It is a suite of purpose designed applications implemented running Compaq personal computers with the IBM OS/2 Warp operating system.

EUROCAT

Eurocat 2000 is an integrated Air Traffic Management system which provides facilities for the provision of efficient air traffic management services in the Australian airspace. Eurocat 2000 is a distributed computer system implemented on Compaq AlphaServer hardware. The system is integrated via a combination of local and wide area private networks, with inputs from radar and weather sensors, pilot briefing, aeronautical messaging, and other aircraft positioning systems such as Automatic Dependant Surveillance (ADS).The current services supported by the Eurocat system include:

- RDP. Radar Data Processing
- FDP. Flight Data Processing
- HMI. Human-Machine Interface
- AGDP. Air-Ground Datalink Processing (ADS, CPDLC, and PDC)
- AIP. Aeronautical Information Processing.
- TFMS. Tactical Flow Management System (Maestro)
- ADDP. Air Defence Data Processing.
- FPCP. Flight Plan Conflict Probe**. [Not operational**]
- External Interfaces (e.g. Avcharges)
- REC & ASPB. Recording and Air Situation Playback.
- DAF & EVAT. Data Analysis Facility and Evatracal track analysis function.
- DPP. Adaptation Data Management.
- ATG. Air Traffic Generator for Simulation.

Flight Data Search System [FDSS]

The FDSS is a stand alone computer based system which provides a repository for AFTN traffic for the channel it is connected to. It also provides the capability of searching for relevant information based on field information extracted from the messages.

Tower Data Processing and Display System [TDPDS]

The TDPDS allows operators to maximise the number of aircraft that can be managed during periods of peak traffic density or of reduced visibility by providing them with radar information to supplement or substitute for visual references. The display includes Radar information relating to vehicles and aircraft. This information is derived from a Surface Movement Radar (SMR) and Terminal Area Radar (TAR).

Time

The TAAATS time system provides UTC time information for EUROCAT and other systems.

Tower Situational Awareness Tool [TSAT]

The TSAT system is an independent PC based display system that displays system radar data received from Eurocat. It can also display Bypass radar tracks direct from a local radar.

Ultimate Fall Back [UFB]

UFB is a fallback display system which provides ATC staff with basic ATM functionality in the event of a Eurocat system failure. Two basic functions are provided, an electronic flight strips display and an Air Situation Display. A UFB station is installed in each Executive/Planner Eurocat Workstation in both Centres and all TCUs but not at towers or simulators.

Voice Recording

ICAO require all communications between air traffic controllers and aircraft to be recorded. In Australia this requirement is met by the Voice Recording System. This system records each operator's incoming and outgoing communications onto a dedicated channel on a voice log recorder.

Voice Switch Control and Monitoring System [VSCMS]

The prime function of the VSCMS is to provide the interface between the Air Traffic Control Operators and peripheral systems and sub-systems that are required to manage air traffic movements around Sydney (Kingsford Smith) Airport. The VSCMS provides an integrated communications network as well as control and monitoring facilities for tower air-traffic controllers.

Voice Switching and Control System [VSCS]

AWANET VSCS is installed in all TAAATS ATM facilities and AUSFIC (except SY Tower which has VSCMS). This system provides the controller with access to ground to ground, VHF air-ground-air communication systems and telephone.

Automatic Enroute Information Service [AERIS] & [VolMet]

Provides broadcasted weather services via VHF (AERIS) or HF (VolMet).

Electronic Strip Display Systems [ESDS]

The ESDS is a computer based system which provides a repository for AFTN traffic for the channel it is connected to. It provides an automatic strip generation function and capabilities for the user to effectively manage those strips. It also provides the capability of searching for relevant information based on field information extracted from the messages.
The system has three 'pages' of functionality:

- The Inactive Strips Page - this is where the newly generated automatic (and manually) created strips are placed. The Flight Information Officer (FIO) can create, edit and activate the strips from this page. Upon receiving an Air Report matching one of the Inactive Strips, the strip concerned is moved automatically into the Active Strip List.
- The AFTN Page - this is where the FIO can search for any of the AFTN messages sent or received by the system.
- The Active Strips Page - This is where the strips representing the in-flight aircraft are placed in time order to make it easy for the FIO to see their present and imminent workload.

The FIO can send SELCAL codes to AIRCRAFT, send Air Reports (ARPs) based on in-air position reports and manage all activities associated with the flight leg represented by the strip.

Centralised Search and Rescue System [CenSAR]

CENSAR is a networked, computer based system which is used to provide a single national database repository of all active and pending Search and Rescue Time (SARTIME) flights in Australia. The CENSAR system receives flight movement messages, which contain SARTIME information, from the Aeronautical Fixed Telecommunications Network (AFTN). The SARTIME, aircraft identification, departure and destination aerodromes is extracted from the flight movement message and stored in the database for further processing. Upon a SARTIME becoming expired the system will automatically alert the user to start either the Communications Check or INCERFA (Uncertainty) phases of search and rescue.

Voice Switching and Control System [VSCS]

AusFIC uses Brisbane TAAATS VSCS. The system provides the operator with access to ground to ground include telephone and VHF air-air-ground communications. The system also provides the audio for HF communications.

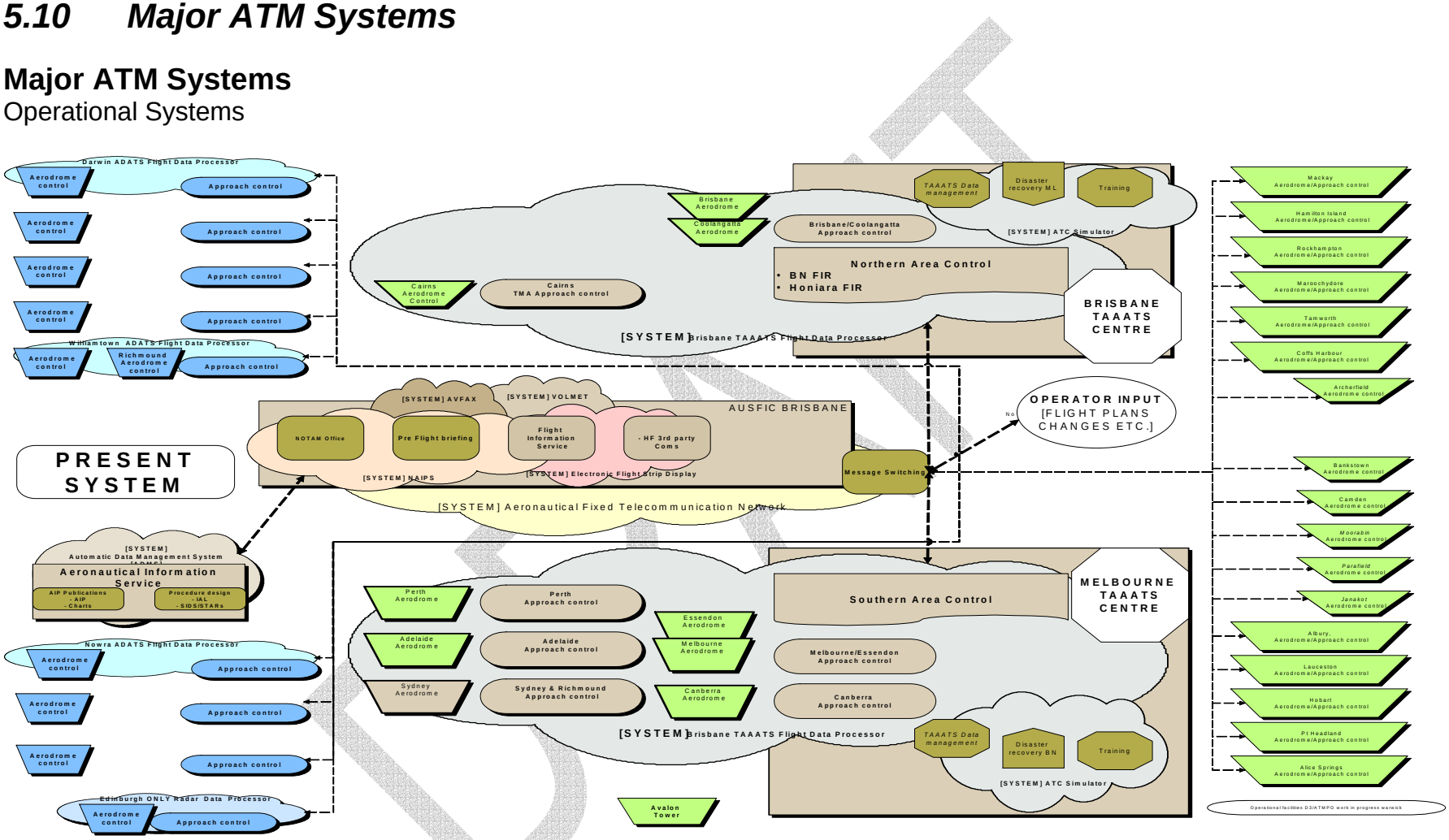
HF Controls

Controls the settings of the HF communications

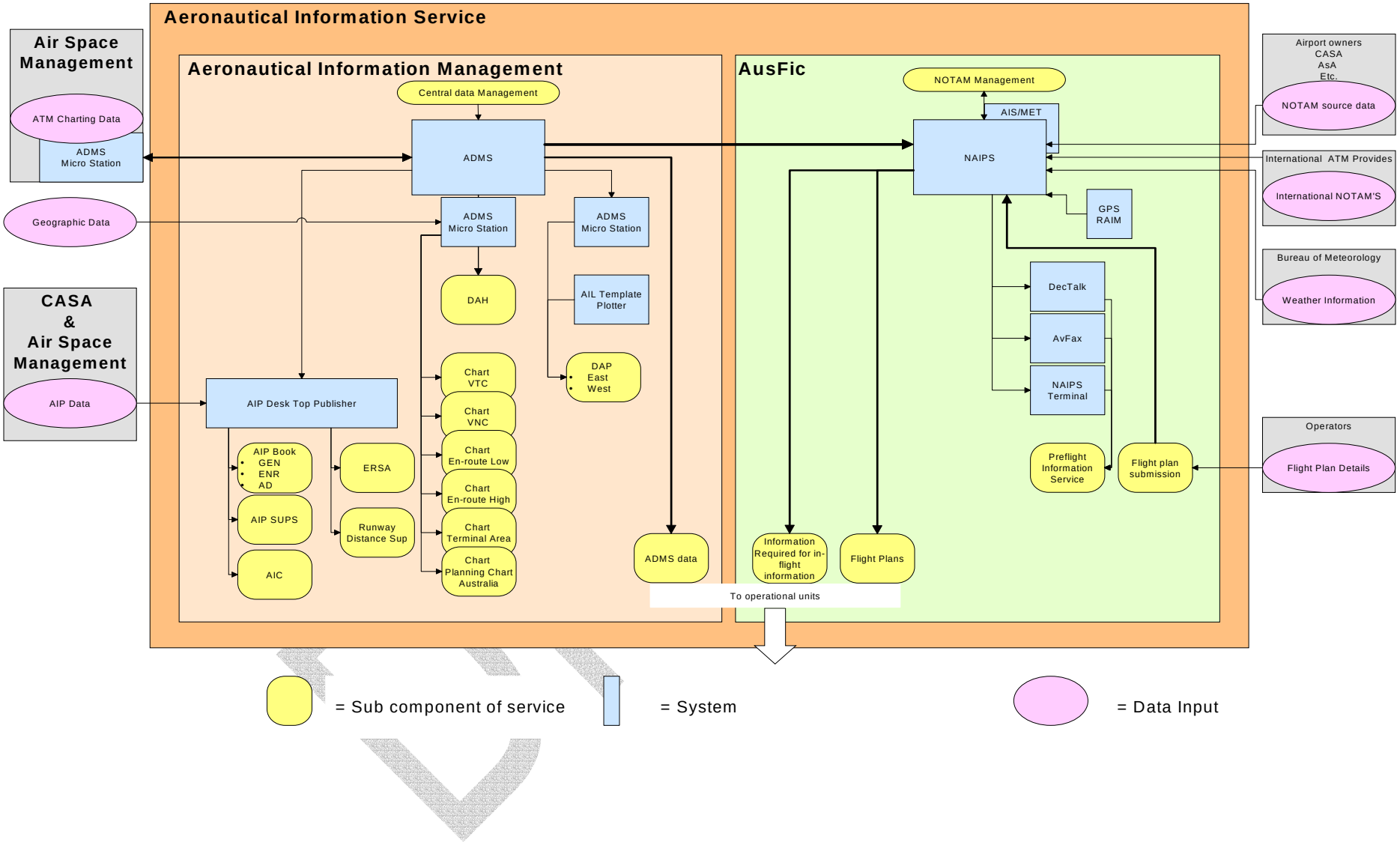
5.10 Major ATM Systems

Major ATM Systems

Operational Systems



5.11 AIS – System to Service Interaction


Aeronautical Information Service
Air Space Management
ATM Charting Data
ADMS Micro Station
Geographic Data
CASA & Air Space Management
AIP Data
Aeronautical Information Management
Central data Management
ADMS
ADMS Micro Station
ADMS Micro Station
DAH
AIL Template Plotter
DAP
East
West
Chart VTC
Chart VNC
Chart En-route Low
Chart En-route High
Chart Terminal Area
Chart Planning Chart Australia
AIP Desk Top Publisher
AIP Book
GEN
ENR
AD
AIP SUPS
AIC
ERSA
Runway Distance Sup
ADMS data
AusFic
NOTAM Management
AIS/MET
NAIPS
GPS RAIM
DecTalk
AvFax
NAIPS Terminal
Preflight Information Service
Flight plan submission
Information Required for in-flight information
Flight Plans
To operational units
Airport owners CASA AsA Etc.
NOTAM source data
International ATM Provides
International NOTAM'S
Bureau of Meteorology
Weather Information
Operators
Flight Plan Details
= Sub component of service
= System
= Data Input

6 AERONAUTICAL RADIO NAVIGATION SERVICE

Aeronautical Radio Navigation Service **ICAO Annex 10**			
Service	**Description**	**Comment**	**Provided by**
Aeronautical radio navigation service	A radio navigation service indented for the benefit and for the safe operation of aircraft	Ground based navigation aids VOR NDB DME ILS GPS RAIM prediction service	Air Traffic Management Division. [ATM] Air Traffic Control Airport Services Department of Defence Privately owned [AusFIC]