Air Traffic Management

A Strategic Plan for Australia

Volume 2: ATM Operational Futures

2003

Australian ATM Strategic Plan

Document Details

Title: ATM Operational Futures

Version: Volume 2, Edition 2

Creation Date: 19/6/03

Modification Date: 21/8/03

Website: www.astra.aero

Table of Contents

Executive Summary

This volume of the Australian Air Traffic Management (ATM) Strategic Plan describes an ideal future vision of Air Traffic Management. It presents a concept, independent of enabling technologies and applications and describes how ATM will operate in terms of business need, practice and outcomes. The future concept, in articulating an ideal, also represents a target towards which the current system will aspire and forms a basis for the design and development of transitional strategies and migratory planning.

Being an ideal, the concept does not represent the future ATM system at any specific point in time. However, based upon known engineering and operational lead times, systems transition and change management capabilities and economic viability thresholds, the operational horizon is likely to extend beyond 20 years from now.

The focus of the concept, described holistically as the ATM Target Operational Concept is on aircraft operational and economic performance optimisation, consistent with what the airspace user deems to be the best business and/or tactical outcome. In achieving this end, operational constraints and impediments are minimised while safety of the system and security remain assured. New paradigms in conflict management and more sophisticated demand capacity balancing techniques will be key contributors to delivering flight trajectories which most closely align with user preferences.

The scope of the concept is necessarily constrained by existing knowledge levels of present and future ATM systems and capabilities, expanding with time as research and development into prospective ATM systems progress. Equally, the scope of the concept necessarily needs to be guided by the need for global harmonisation and the pace of global and regional evolution.

It will be operational requirements identified and determined from the gap analysis between the ATM Future Target Operational Concept and existing system definition which establishes the new operational requirements. These requirements will in turn define and drive the future Communication, Navigation and Surveillance Architectures.

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CHAPTER 1:
ATM Target Operational Concept

1.1 Introduction

1.1.1 Purpose

An *ATM Operational Concept* is a description of the manner in which the ATM operational architecture delivers services and benefits to users.

The ***ATM Target Operational Concept*** is an ideal future state based upon the current level of knowledge. The Concept has a horizon of 20+ years and will continue to evolve as the knowledge base expands. The Concept does not, however, define implementation, iterations of change, or the timeliness of delivery.

The purpose of this chapter is to identify a ATM Target Operational Concept (TOC) applicable to the Australian ATM environment. This ideal is defined in terms of 'what' is desired independent of whether or not it can be achieved with existing capabilities. As new technologies are developed and refined, future ATM capabilities will be expanded to support this ideal.

1.1.2 High Level Goal

The Concept strives to identify an ideal operating environment in which:

> The ATM system provided flight trajectory is the *user preferred trajectory.*

In this context the *flight trajectory* includes all 4 dimensions (4D) (position in space and time), e.g. beginning when the aircraft is established at the gate for the purpose of the flight until the aircraft has arrived at the destination arrival gate.

1.1.2.1 User Preferred Trajectory

The User Preferred Trajectory (UPT) is normally determined in terms of best business outcome, which considers time, fuel burn, and/or systemic cost. The *UPT* may take into account known and/ or predicted environmental constraints and is described in terms of 4D coordinates and a statement of operational preference. Operational preference indicates the priority for application.

1.1.2.2 ATM System

The ATM System is defined as:

The collective integration of humans, information, technology, facilities and services, on the ground, in the air and in space used to effect ATM.

This definition includes service providers, aerodrome operators, and all airspace users.

The physical entities that define the bounds of the Australian ATM system are:

- all airspace within the Australian sovereign & International Civil Aviation Organization (ICAO) allocated airspace; and
- all aerodromes, airstrips and other points of departure/destination which provide airspace users entry into the system.

1.1.2.3 External System Constraints

There are a range of external system constraints that affect air operations. These can include the performance of the air operator in terms of crew scheduling, the airport ground handling (e.g. baggage services, customs and immigration facilities), aircraft servicing and constraints from a host of other elements. While these system constraints impact the system, they do not directly form part of the ATM System.

1.1.2.4 ATM System Participation

ATM system participation commences at first notification of intent (e.g. schedule, or indication of aircraft activity) and continues until the aircraft is no longer recognised by the ATM system (i.e. aircraft has landed and powered down).

1.1.3 Principles

The following agreed principles reinforce, and are integral to, the ATM Target Operational Concept:

a. Prescribed levels of safety are maintained.

b. All airspace is a resource.

c. All airspace users are known to the ATM system:
   - user to ATM service provider; and / or
   - user to user.

d. Freedom of access to airspace is dependent on:
   - civil and military demand; and
   - visibility of an airspace user to the ATM system.

e. Notification of intent is the basis for the provision of traffic management services.

f. The ATM system is a collaborative system which supports:
   - the free flow of information, with integrity, to enable dynamic and flexible decision making; and
   - seamless transition between service providers.

g. The ATM system is designed to minimise the effects of, and maximise defences against, failure;

h. The human remains ultimately responsible for ATM system performance, which includes:
   - Tactical decisions (either in the application of tactical tools or the input to the formulation of automated tactical response);
   - ATM system design; and
   - System implementation.

i. The ATM system will optimise human performance.

j. The ATM system provides high levels of predictability and reliability, and is highly independent of uncontrollable factors.

k. Any adverse effects on the physical environment are minimised.

l. Strategic management processes, including those of ATS providers, Airport operators and Airspace users are coordinated so as to balance and match capacity and demand, and support the goal of UPTs.

m. The ATM Target Operational Concept is in harmony and compatible with the ICAO ATM Operational Concept and is consistent with global planning.

1.1.4 Assumptions

While the ideal ATM model always remains the goal, the evolution process must accommodate elements over which there is no absolute control or technical mitigation. As such, UPTs may need to be compromised to accommodate traffic separation, national defence and security, including day to day military operations, environmental considerations and weather variables.

1.1.4.1 Priorities

Where the ideal trajectories of two or more aircraft are competing for the same airspace or the same landing area, a priority of access is applied. Given the constraints of regulation, ATM system capacity and conflicting flight trajectories, issues are resolved by collaboration between the conflicting parties or by the intervention of a 3rd party as necessary.

Collaborative prioritisation may be determined between airspace user organisations or within a user organisation, and may be determined strategically or tactically. Default priority will be based either on the “first come” or the “on time first served” principle, except that a landing aircraft will generally have priority for runway occupancy over a competing departing aircraft. However, aircraft without appropriate technology or capabilities may be afforded lower priority.

1.1.4.2 Aircraft

Throughout the planning period, it is not envisaged that aircraft flight characteristics will differ markedly from current production aircraft. However it is anticipated that the aircraft avionics and technology will continue to evolve to support increased integration. The mix of aircraft participating within the ATM system will change and aircraft capacity will increase while, overall, the global fleet will continue to age. Towards the end of the planning period it could be expected that uninhabited aerial vehicles (UAVs), used for military and cargo applications, are likely to appear.

1.1.4.3 Physical Environment

Environmental considerations will have an increasing impact on the ATM system. While improved technology may partly mitigate any negative impact, additional operating constraints may be necessary. Aircraft noise and emissions will continue to be high profile social and political concerns.

1.1.4.4 Regulation

Regulation will continue to be independent of ATM service provision and will prescribe the operating rules supporting safety. Regional and global harmonisation of regulations and practices will continue.

1.1.4.5 Airline Structures

Strong competition and industry rationalisation will continue to reduce the number of operators, strengthen alliances, and encourage the formation of virtual airlines.

1.1.4.6 Alliances

Alliances will continue to be used as a strategic vehicle by airlines to enable global networks and to offer seamless passenger and freight services.

1.1.4.7 Virtual Airlines

The establishment of virtual airlines, in part or in full, involving wet and dry leasing of resources, will provide greater adaptability and flexibility in changing and evolving commercial environments.

1.1.4.8 Civil / Military Cooperation

Both civil and military airspace users will have increasing demands for a finite airspace resource. Requests for access to airspace will be optimised and equitable for all users, and managed dynamically. ATM will support national defence and security as well as day to day military operations. This will be achieved through strong civil/military cooperative processes.

1.1.4.9 ATM Security

Future ATM system security will be a high priority and will be assured through appropriate processes, protocols and procedures.

1.2 ATM Operating Environment

1.2.1 General

The ATM operating environment is characterised by:

- aerodrome architecture;
- airspace architecture;
- air route architecture; and
- ATM services.

The following paragraphs outline these characteristics within the ATM Target Operational Concept.

1.2.2 Aerodrome Architecture

1.2.2.1 Location and Design

Aerodrome location has a significant impact on the ability to provide efficient air traffic management. While the physical location of an aerodrome may be largely determined by political, economic, demographic, topographic and environmental grounds, operational factors should also be considered.

The design and configuration of the aerodrome operational architecture has a profound effect on ATM and aerodrome operational capacity. To optimise ATM objectives, aerodrome design should include all weather capability. Components of aerodrome design which support higher theoretical capacity, reliability and efficiency include:

- runway length appropriate to all user aircraft types;
- multiple runways to provide continuous into wind operations;
- spacing between parallel runways to ensure independent operations;
- taxiway structure which avoids crossing active runways;
- taxiway structure to enable rapid vacation of runways[1];
- taxiway structure which strategically avoids conflict between taxiing aircraft;
- runway/taxiway configuration which minimises taxiing distance;
- efficient apron design;
- situational awareness between all aircraft and ground vehicles;
- the ability for all weather operations without a degradation in aerodrome operational capacity; and
- appropriate landing aids and systems which support all wealth operations.

The protection of designated surfaces in the vicinity of airports currently complies with ICAO

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1. **Ideally, runway geometry will permit runway entry and exit at any location along its length, minimising runway occupancy time and reducing holding areas.**

Annex 14 and it is anticipated that Australia will continue to comply with the Annex. Future aircraft operations and industry needs which will flow from the implementation of the ATM Strategic Plan must also be considered in the future development of Annex 14, or more stringent domestic standards, to accommodate these operations. There will be a balance between civil and military requirements at joint user airfields.

Knowledge of aircraft intent will enhance aircraft and vehicular situational awareness and enable more efficient management of taxiway and movement areas, as well as mitigating the risk of runway incursion.

When one or more of the design components are inadequate to support the desired operational capacity of the aerodrome, ATM procedures, standards and infrastructure are developed to compensate for the operational inadequacies.

The challenge for the ATM system is to ensure that all stakeholders may potentially operate to maximum capacity. As aerodromes are a focal point in the ATM system it is important that aerodrome operators work with other stakeholders to ensure that ground capacity does not become the system constraint. In order to minimise ground based delays, airspace users will increasingly focus on apron and ground management efficiencies by applying movement priorities to achieve the best business outcome.

1.2.3 Airspace Architecture

All airspace is considered as managed and airspace management occurs at strategic, pre tactical or tactical levels. Service level requirements, including third party intervention and/or autonomous separation are considerations.

In order to achieve the most flexible use of airspace, the design and classification system which has historically segregated airspace users and characterised interrelationships, is no longer practiced. Instead, all airspace within the Australian Flight Information Regions (FIRs) is managed flexibly and as an homogeneous resource.

Generally, airspace will be organised and managed to facilitate of autonomous flight unless safety or efficiency dictate the need for third party intervention.

Airspace boundaries, where required, will be adjusted to traffic flows and be designed for seamless operation between FIRs.

Any restriction on access to a particular volume of airspace will be transitory. Airspace management will be flexible, responsive, and sympathetic to traffic flows.

The ATM System must promote situational awareness by users and/or ATM service providers.

1.2.4 Air Route Architecture

There are generally no defined air route structures within the en-route ATM operating environment. Instead, airspace users fly a system flight trajectory which is the UPT modified by the ATM system.

In terminal areas, the UPT may be modified to comply with fixed or dynamic segregated arrival and departure route structure requirements.

1.2.5 Civil / Military Cooperation

1.2.5.1 Basic requirements of ATM

In order to properly train and operate, military aviation needs:

- easy access to airspace and the freedom to operate at any given time, if and when operationally needed;
- special handling by controlling agencies for priority flights (e.g. Air Defence intercept flights), time-critical missions (e.g. humanitarian relief flights) and aircraft which cannot comply with equipment mandates for civil aviation;
- to be able to operate without (ground) control for certain missions; and
- portions of airspace reserved for special manoeuvres and exercises.

1.2.5.2 Increased civil and military airspace users demand for airspace

The airspace over Australia is a finite resource for the use of all airspace operations, both civil and military. Agreements and understanding to manage the competing demands of the various users, therefore, remains necessary to ensure its optimization. The principles of Flexible Use Airspace (FUA) are applied to optimise access, but where conflict of use is unavoidable, priority is principally determined by safety, operational criticality and/or economic impact.

Due to potential emerging national security threats during the planning period and the need for a viable national deterrent and a committed fighting force, the overall requirement for some segregated defence airspace volumes continues to be justified, though their nature will inevitably change. Large temporary volumes to accommodate new generation aircraft, beyond visual range weapons systems, the development of new tactics, and national and multinational exercises will, where possible, be accommodated within FUA.

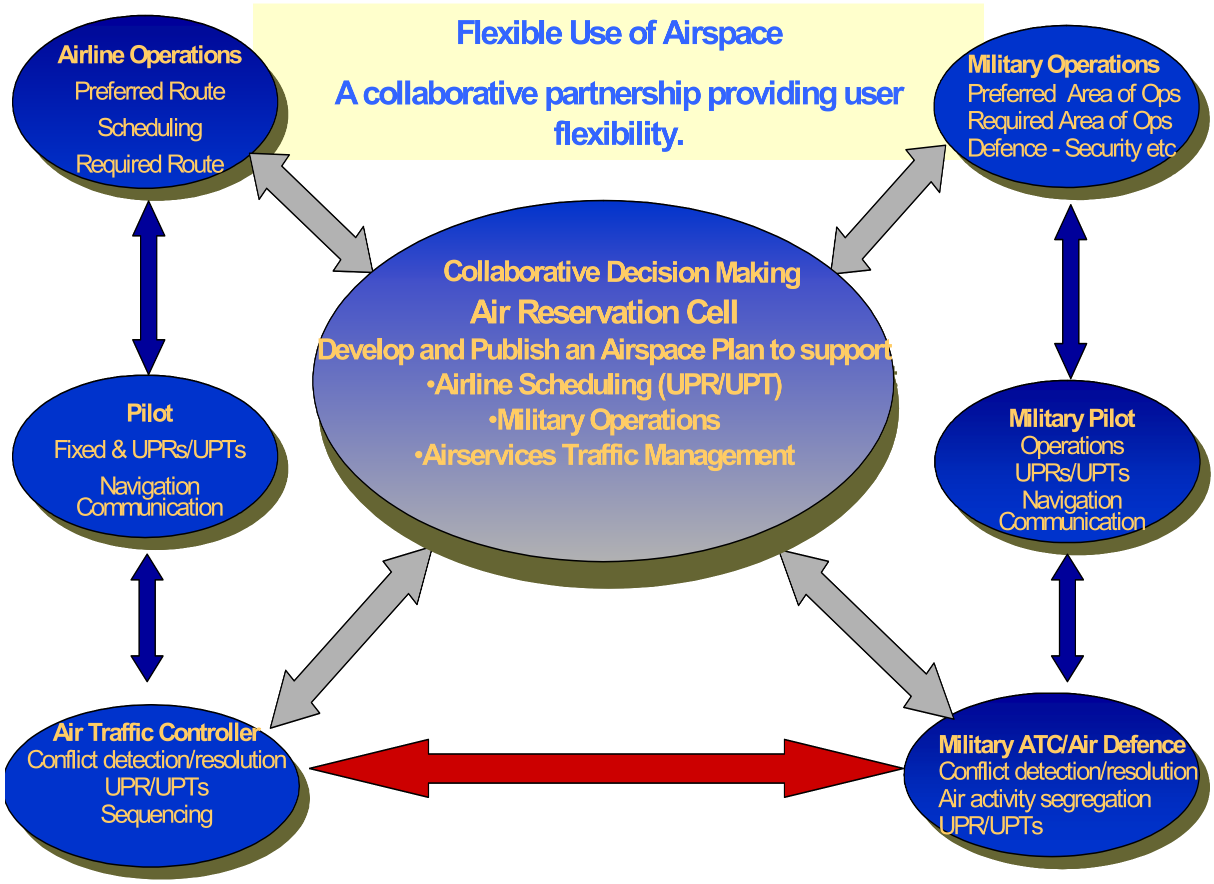
The volatility of military operations and associated traffic are likely to increase due to the potential need to deploy large forces at short notice, as periods of tension and crisis are often neither planned nor foreseeable.

1.2.5.3 The use of airspace needs to be optimised and equitably balanced for all users

There is a patent need for safe co-existence of civil and military operations in common airspace. To satisfy this need, the airspace and ATM Systems must accommodate ever-increasing demands from the commercial and military aviation communities for airspace capacity in terms of volume and time. This is achieved by enhanced Civil/Military co-operation and co-ordination across all ATM related activities, at institutional and operational levels.

The FUA concept (Figure 1.1) addresses this need. Airspace is considered as one continuum and used flexibly on a day-to-day basis. Consequently, any necessary segregation of airspace and air traffic should only be of a temporary nature.

Figure 1.1: Flexible Use Airspace Concept



ATM has an obligation to support national defence and security requirements as well as day-to-day military operations. Strong civil/military co-operation is the means by which this can be achieved.

1.2.6 ATM Services

ATM services include:

a. Traffic Management Services (TMS);

- Trajectory Management;
- Conflict Management, both strategic and tactical; and
- Demand / Capacity Balancing, both strategic and tactical;

b. Decision Information Network; and

c. In-flight Emergency Response.

These services may be mandated or subject to user request and are discussed in later sections of this plan.

1.2.6.1 Demand / Capacity Balancing

Future Traffic Management needs require a more sophisticated, adaptive and dynamic process that operates to finer capacity and time limits. There is a progressive emphasis on the efficient and collaborative management of resources and capacities at airports, in terminal areas and in en-route sectors to meet demand.

Strategic and tactical Demand / Capacity Balancing can be facilitated by a third party service provider.

1.2.6.2 Trajectory Management

Trajectory Management is effected through the strategic or tactical modification of the relevant UPT. Any modifications of the UPT are the minimum required to avert any conflict, meet runway capacity requirements and satisfy the following:

- environmental considerations (e.g. noise / visual / emissions over built up areas or wild life sanctuaries or culturally sensitive areas);
- politically sensitive areas (e.g. gaols, national security, parliamentary);
- other sensitive sites (e.g. scientific equipment, explosives, gas discharges);
- temporary sensitive sites; and
- operating rules.

Priority access (e.g. national defence and security requirements) for any peace time airspace volume is flexibly managed at strategic, pre-tactical and tactical levels to maximise benefits to, and options for, all airspace users within a FUA framework. The determination of priorities considers the cost benefit and strategic imperatives of all potential airspace users.

Depending on the type of operation, the system strives to accommodate the needs of all airspace users in any given volume.

1.2.6.3 Conflict Management

Tactical Conflict Management is provided by existing or new third party services, or autonomously by airspace users acting in collaboration.

Conflict Management provided by a third party service provider is either mandated or on a user request basis, and provided by a single provider in any given operational environment.

Criteria for determining the need of mandated provision of Conflict Management by an ATM service provider are prescribed by the regulatory authorities[2] and are based on:

- traffic levels and complexity;
- system capabilities; and
- environmental compliance and security restrictions.

Where not mandated, responsibility for Conflict Management normally rests with the airspace user. However, the airspace user may request a service from a current or third party ATM service provider.

1.2.6.4 Decision Information Network

The Decision Information Network is based on the strategic and tactical provision and management of shared operational data and can be provided by one or more service provider in the same operational environment.

1.2.6.5 In-Flight Emergency Response

The In-Flight Emergency Response (IFER) Service will be provided by the designated conflict management provider.

2. The current regulatory authorities are CASA and Department of Defence.

1.3 Conflict Management

Conflict Management is provided to mitigate the risk of collision to an aircraft along its trajectory through the ATM system.

Conflict avoidance is achieved through collision risk management which limits the risk of collision between aircraft and hazards to acceptable levels.

1.3.1 Levels of Conflict Management

Conflict management is applied at three layers depending on the nature of the conflict as follows:

a. strategic collision risk management

b. tactical collision risk management

c. collision avoidance

1.3.2 Strategic Collision Risk Management

Strategic Collision Risk Management is the first level of conflict management and is achieved through airspace design, management and Demand / Capacity Balancing.

Strategic Collision Risk Management commences well prior to departure and is designed to minimise reliance on the second level of conflict management.

1.3.3 Tactical Collision Risk Management

Tactical collision risk management can be provided in one or more of the following ways or "modes":

- *Third Party*, by a designated TMS service provider where third party Conflict Management is mandated or requested by an airspace user. In this case, the TMS service provider is contracted to provide collision risk management.
- *Co-operative*, by the airspace user and a designated TMS service provider where responsibility for collision risk management is shared or delegated.
- *Collaborative*, by the airspace users where responsibility is shared by the users. That is, the airspace users detect potential conflicts, and collaboratively determine the conflict solution. In this case aircraft collision risk management is effectively provided by the airspace users relative to each other.
- *Autonomous* (full self separation), where responsibility for collision risk management lies completely with the airspace user. That is, the airspace user detects potential conflicts and hazards, and determines the conflict solution independently of other users and TMS service providers. In this mode there must be no ambiguity as to the agent responsible for separating aircraft and hazards.

Tactical collision risk management involves the following:

a. conflict detection and risk assessment,
b. conflict avoidance (reduction of risk to acceptable level), and
c. solution monitoring.

1.3.4 Conflict detection and Risk Assessment

Collision risk assessment will commence when a flight enters the ATM system and will continue until the flight exits the system.

Collision risk assessment involves the analysis of the four dimensions of the relevant UPTs to determine the level of risk. The essential operational elements, which in combination form the collision detection and risk assessment, are:

- the aircraft's four dimensional position in space;
- the certainty of the position;
- the aircraft's intended trajectory; and
- the relative position of any hazards to the aircraft.

Collision risk assessment dynamically identifies the four dimensional separation minimum, below which the level of risk of collision between an aircraft is considered to be unacceptable, and to which a collision risk reduction process is applied.

1.3.5 Conflict Risk Reduction

Collision avoidance is an important element of ATM system safety management. Airborne Collision Avoidance Systems (ACAS) provide an important "safety net" in the event of strategic or tactical strategic risk management failure. In order that collision avoidance remains inclusive, all aircraft must be known to the system.

Collision risk reduction involves the strategic or tactical modification of the relevant flight trajectories in order to mitigate the risk of collision between an aircraft and other aircraft or hazards, where that risk has been assessed as unacceptable.

Where changes to the flight trajectory are required to mitigate collision risk, these changes will attempt to involve a minimal departure from the UPT. Ideally, this is achieved through modification to one or more of the four dimensions of the trajectory.

Small lateral changes to the flight trajectory generally have the minimal effect on a minimum time or cost UPT. Longitudinal changes to the flight trajectory are achieved through speed changes and can impact on both minimum fuel and minimum time UPTs. A vertical deviation is considered to be a trajectory change that, in general, has the most impact on the UPT, particularly when the trajectory is based on minimum fuel usage.

The UPT will be modified to reduce risk to acceptable levels while taking into account operational preferences and requirements.

Where one or both aircraft subject to TMS have the appropriate capability, the responsibility for resolution of the collision may be shared with or delegated to the airspace user(s)

1.3.5.1 Third Party TMS

Where a third party TMS is applied, the provider will determine collision risk and modify the aircraft(s) trajectory to minimise impact on the aircraft involved.

This will involve a modified trajectory being developed for one or both aircraft involved in the potential conflict. Collaboratively determined prioritisation may apply.

1.3.5.2 Autonomous aircraft

Autonomous aircraft are solely responsible for collision risk assessment and collision risk resolution with other aircraft and hazards.

1.3.6 Solution Monitoring

The system will continue to monitor the solution to ensure risk levels remain acceptable. Appropriate alerts will be generated to initiate determination of a new solution should it be required.

1.4 Demand / Capacity Balancing

1.4.1 General

Demand / Capacity Balancing (DCB) is provided to maximise the ATM system capacity and minimise the effects of ATM system constraints. It is based on the strategic and tactical management of the flow of air traffic throughout the ATM system.

Demand / capacity management or “balancing” is considered in the context of the interdependence of the aerodrome network, as aerodromes are the principle capacity constraints of the Australian ATM system.

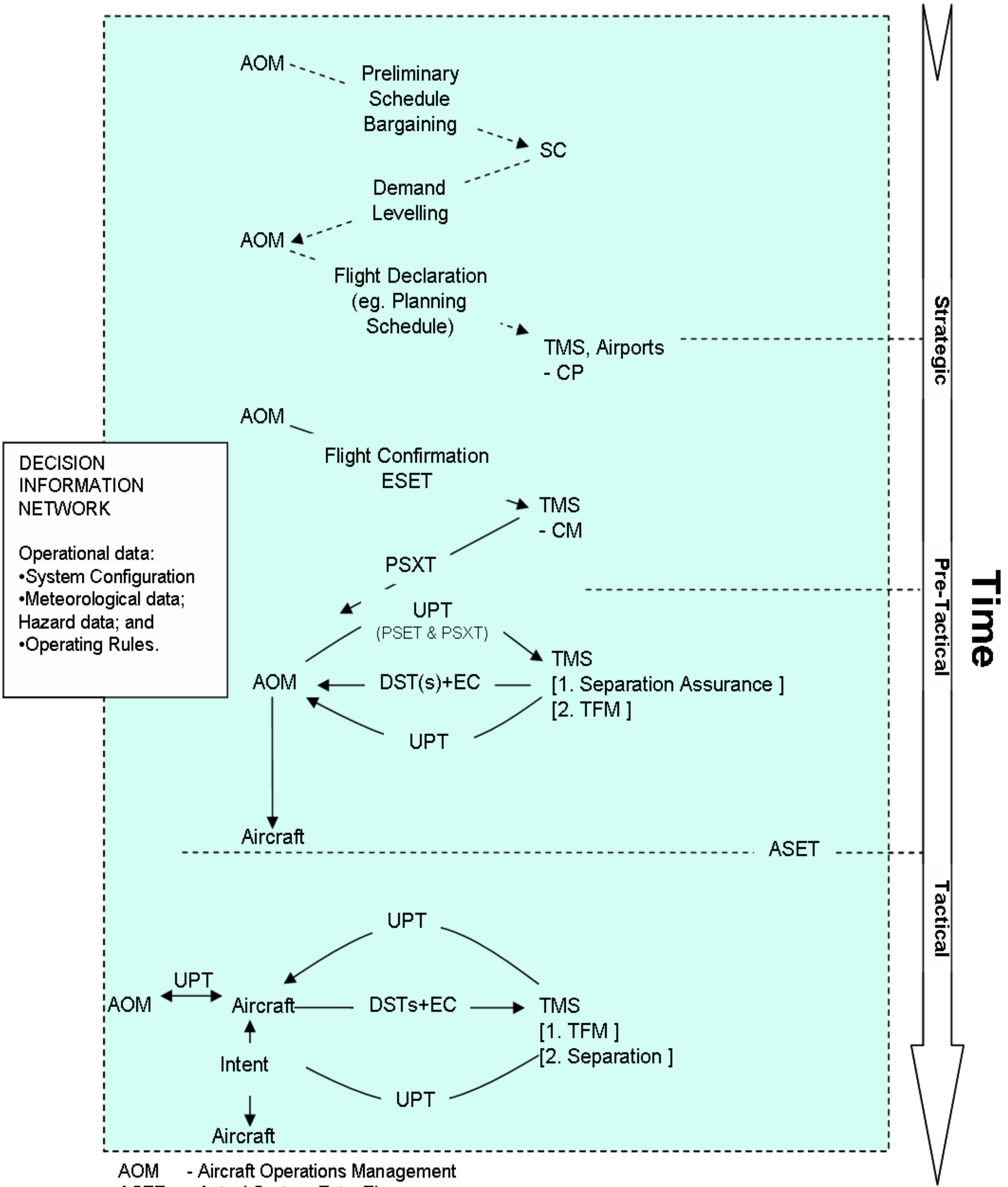
While balancing techniques will be generally based on system predictability, the system must be able to accommodate unplanned situations. The capacity of the overall system and elements of the system are determined by agreed and collaborative processes. Theoretical and demonstrated capacity, while being generally weather independent, will still be affected by uncontrollable events such as turbulence, aircraft emergency or ATM system failure.

Demand / capacity balancing is effected in the following progressive complimentary stages:

- Strategic;
- Pre-Tactical; and
- Tactical.

Figure 1.2. shows the Demand / Capacity Balancing Process.

Figure 1.2: Demand / Capacity Balancing Process



AOM	- Aircraft Operations Management
ASET	- Actual System Entry Time
CM	- Capacity Management (ATM System capacity management)
CP	- Capacity Planning
DST	- Dynamic System Trajectory
EC	- En-route Constraints
EOBT	- Estimated Off-Blocks Time
ESET	- Estimated System Entry Time
PSET	- Programmed System Entry Time
PSXT	- Programmed System Exit Time
SC	- Schedule Coordination
TFM	- Traffic Flow Management
TMS	- Traffic Management Service
UPT	- User Preferred Trajectory

The key aspects of demand / capacity balancing are;

- modification to UPTs minimised.
- balancing is based on system predictability - however the system will accommodate unplanned situations.
- system-wide balancing techniques are used to resolve local demand and capacity balancing problems.
- strategic initiatives require tactical flexibility to provide optimal system availability; and
- demand and capacity balancing takes into account information about current and predicted airspace conditions and projected demand and past performance.

1.4.2 Strategic Demand / Capacity Balancing

Before schedule development, information is collected, shared and processed to develop a theoretical operational capacity envelope, which includes:

- historical demand;
- wind and weather patterns;
- seasonal variations;
- airspace availability and configuration;
- the impact of procedures and standards; and
- system performance and efficiency.

Using this data, the first level, *strategic balancing,* is applied through the application of demand levelling. Demand levelling is a collaborative process between airspace users in which forecast scheduling is rationalised in order to reduce demand peaks within the long-term and predicted aerodrome capacity envelope.

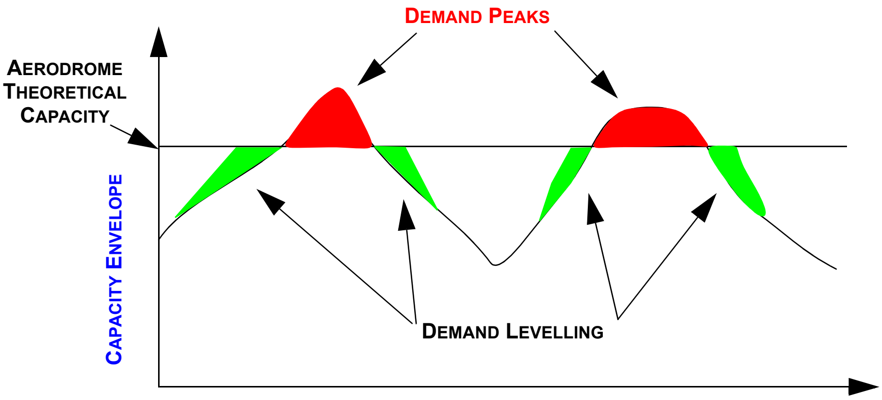
Provisional schedules are periodically assessed and negotiated between airspace users in order to manage long-term aerodrome usage demand against theoretical aerodrome capacity and constraints.

Demand levelling as shown in Figure 1.3 is applied whenever demand exceeds capacity and is always a secondary option to the cost effective increase of capacity.The results of demand levelling are passed to aerodrome operators and 3rd party TMS providers in the form of a flight declaration.

For aerodrome operators, the flight declaration provides strategic advice which will be used in the determination of gate availability and allocation, general parking availability and airport works.

For third party TMS providers, the flight declaration will be used in the determination of resource requirements.

Figure 1.3: Demand Levelling



For an ideal aerodrome configuration the capacity envelope is considered to be a constant as shown in the figure above.

Note:— Before reaching the ideal, the aerodrome capacity envelope will be impacted by physical environmental constraints, aerodrome configuration and weather.

1.4.3 Pre-Tactical Demand / Capacity Balancing

Pre-tactical demand / capacity balancing involves collaborative processes in the adjustment of assets and resources against projected demands. Pre-tactical demand / capacity balancing is concerned in particular with the programming of runway, taxiway, and gate availability. This is a directed process that rationalises near term forecast usage by the allocation of airspace user-specific estimated system exit times (ESXT).

As the near term runway, taxiway and gate usage are influenced by aerodrome configuration, weather and physical environmental constraints, so too is the allocation of airspace user-specific ESXT.

Based on the information provided in the flight confirmation, and other forecasted operational information, the 3rd party TMS service provider will determine the time at which the flight is to arrive at the destination gate to effect the strategic capacity management for the aerodrome. This time is the programmed system exit time (PSXT) and is set relative to the flight confirmation ESXT.

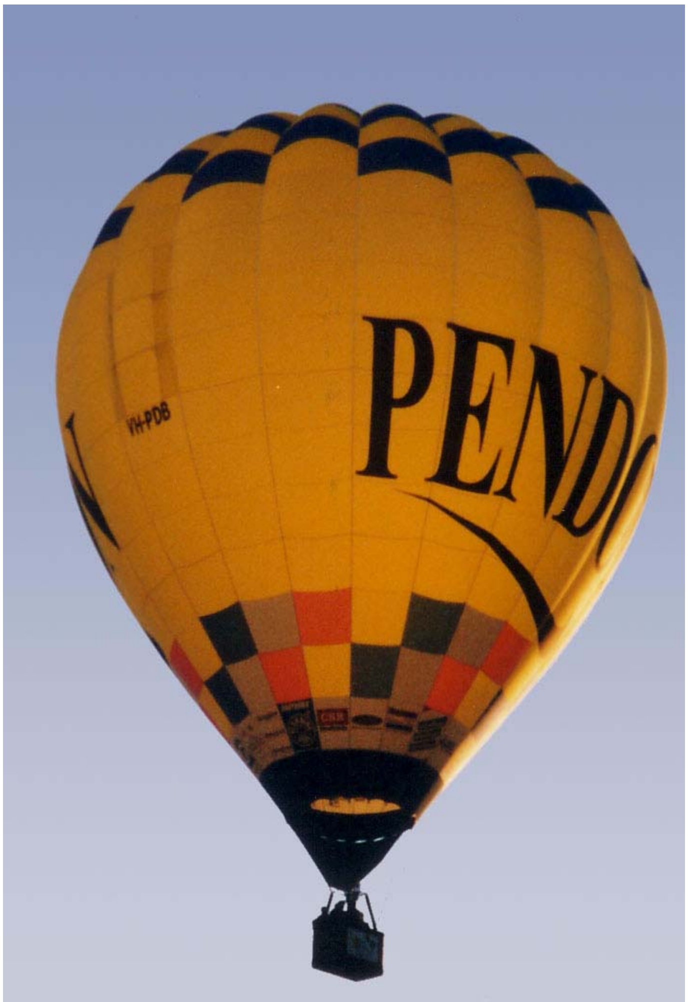
The ideal PSXT, from an airspace user perspective, is one where the PSXT equals the ESXT within an acceptable margin.

Based on the PSXT and the planned UPT, the AOM determines the Programmed System Entry Time (PSET) for the flight. The PSET and the PSXT will replace the Estimated System Entry Time (ESET) and the ESXT respectively in the UPT.

1.4.4 Tactical Demand / Capacity Balancing

Tactical demand / capacity balancing is the real time management of a flight to achieve the PSXT. It is affected through the dynamic update of the flight trajectory and exploits the aircraft's capabilities and quality real time data to modify its trajectory to meet revised requirements. Any unforeseen constraint is addressed to provide minimal departure from the UPT.

Tactical Demand / Capacity Balancing is focused on demand management in the refinement of imbalances and is responsive to weather conditions.



1.5 Decision Information Network

1.5.1 General

The Decision Information Network is based on the strategic and tactical provision of quality assured and timely operational data in support of ATM operations.

The Decision Information Network provides data collection and integration and ensures data quality and integrity, to provide an information-rich planning and operating environment. It involves the best integration of real-time, historical and prospective ATM data and information, and the management, sharing and distribution of that data between and to stakeholders.

Operational data includes:

a. data necessary to support aircraft situational awareness (e.g., traffic information with respect to relevant/proximate trajectories);

b. ATM system component availability (present and future);

c. meteorological data including:

- Actual;
- Forecast;
- Trends; and
- Hazards including volcanic eruptions.

Meteorological data is derived from ground, airborne and space based sensors. The automation of data sensing and collection is key to providing real time data and greater sampling. The general participation by airspace users in the collection and automatic remittance of this data significantly increases its pool and enhances the quality of predictability and forecasting. The availability of comprehensive real-time data also enhances tactical decision making relating to en-route or terminal weather conditions by Aircraft Operations Management, Demand / Capacity Balancing and Conflict Management.

1.6 In-flight Emergency Response

1.6.1 General

The in-flight emergency response (IFER) service is provided to maximise the safety of aircraft passengers, crews and other members of the public affected by airspace users in emergency situations.

1.7 ATM Operations

1.7.1 General

Traffic management in the different phases of flight is achieved through the provision of either mandated or user requested traffic management services. These services are effected through the provision of ATM system prescribed trajectories which modify, as necessary, the UPT.

1.7.1.1 Flight Declaration

The flight declaration, or notice of intent, provides basic flight information advice in advance to the aerodrome operators and, as appropriate, TMS providers.

When prescribed, the flight declaration will comprise, as a minimum, the following elements:

- the departure aerodrome (ESET);
- flight identification;
- aircraft type;
- destination aerodrome; and
- ESXT.

1.7.1.2 Flight Confirmation

Flight confirmation is provided by Aircraft Operations Management (AOM) to a designated TMS service provider and confirms that a flight will take place. This confirmation is the basis for the provision of TMS by a designated TMS provider and establishes the contract between the airspace user and the service provider. The confirmation is to be made at an agreed parameter time prior to the ESET for the flight.

The flight confirmation confirms the basic information provided by the flight declaration and allows for further refinement of this information.

1.7.1.3 Provision of UPT

The UPT provides a detailed statement of intent for the flight and is provided to the designated TMS service provider to open an operational dialogue between the designated TMS service provider and the AOM.

The following additional information is provided with the UPT:

- aircraft unique signature;
- aircraft and flight crew capabilities;
- identification of where TMS provided collision risk management is required in relation to the UPT[3]; and
- a statement of operational preference (see paragraph 1.1.2.1).

3. **This is in effect a pre-flight TMS request.**

On receipt of the UPT, the designated TMS provider assesses the impact that the ATM system configuration, physical environmental compliance, collision risk management and pre-tactical demand / capacity management will have on the UPT. This assessment determines what, if any, modifications to the UPT are required to ensure that it overcomes the identified constraints.

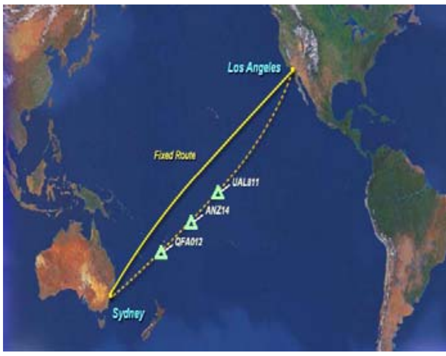
The designated TMS provider, while taking into account the stated operational preference, when appropriate, modifies the UPTs for the departure and the arrival aerodromes and incorporates known en-route constraints.

The AOM will revise aspects of the UPT to obtain the best business outcomes.

Note:— Comparison of this flight trajectory against the UPT contributes to the determination of how well the ATM system meets the high level goal.

1.7.1.4 Trajectory commencement and conclusion

The flight trajectory commences with the aircraft’s first movement from its parked position. The aircraft progresses along its trajectory and concludes when the aircraft stops at its designated parking area and powers down.



1.7.2 Operating Rules

Operating rules impact on UPTs and may:

- Mandate procedures and requirements for carriage of equipment in parts of the ATM environment to support safety and physical environmental considerations.
- Include noise abatement measures to minimise impact on noise sensitive areas during the departure, arrival or taxiing phases of flight, or when conducting engine tests. Similarly there will be operating rules that will ensure compliance with restrictions associated with politically and culturally sensitive areas.
- Include measures to minimise aircraft emissions relating to aircraft profile and performance which may negatively impact on the local aerodrome environment, or result in damage to the atmosphere.
- Facilitate sequencing to aerodromes by prescribing operating patterns for arriving and departing aircraft, as well as runway and taxiway occupancy where no aerodrome risk reduction service is provided.

Other rules define the aircraft's relationship to weather, in particular the relation to cloud base and in-flight visibility.

1.8 Aircraft Operational Management

1.8.1 General

Aircraft Operational Management (AOM) is a generic function by which operational information is managed and operational decisions made for an airspace user by:

- an aircraft operator;
- an independent commercial provider of AOM services; and
- the airspace user.

AOM is responsible for mission planning, dispatch and the operational control of the flight.

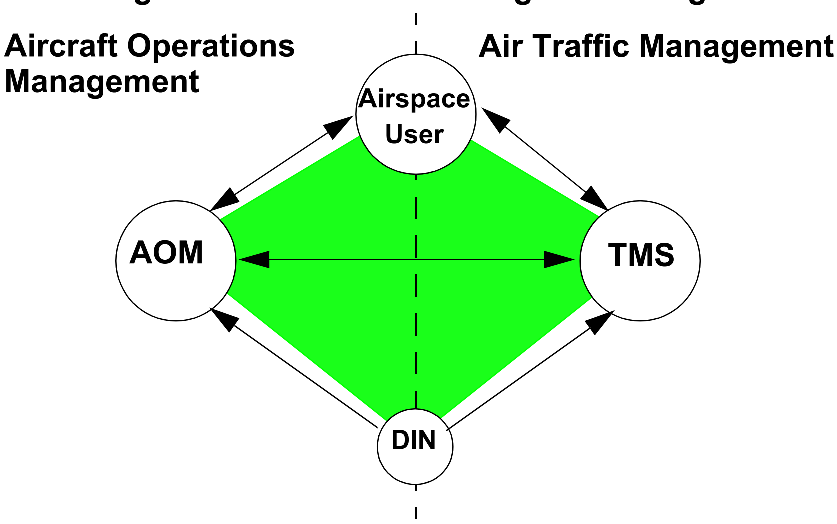
AOM involves the collection, collation, analysis and advice of operational data relevant to the flight. This data is sourced from the collaborative collection and distribution processes provided by the Decision Information Network. The data is used for airspace users strategic and tactical situational awareness and for operational management. The AOM also provides relevant operational data into the ATM system including individual aircraft performance parameters.

AOM is responsible for the initial notice of flight intent, preparation of the UPT, and the interaction with TMS.

AOM will advise the system of any modification operationally required to the current UPT and collaborate on changes in system status and configuration.

AOM has an enhanced role in the intervention and management of the flight with the purpose of achieving best business and operational outcomes. This will be increasingly done in a realtime basis.

Figure 1.4 Collaborative Flight Planning



Airspace users obtain operational information regarding the ATM system availability including the system configuration and any system degradation. In addition both forecast and current weather data will be examined to determine the impact on the flight. This information is sourced from the Decision Information Network.

CHAPTER 2:
ATM Operational Baseline

2.1 Introduction

2.1.1 Purpose

The ***Current Target Operational Concept*** describes the current operational architecture, which is used to identify gaps in current performance and as a baseline for identifying the gap in delivering the ATM Target Operational Concept, as well as the iterations towards that final ideal. As the iterations are realised, they form the basis of a new baseline.

The purpose of this chapter is to identify the current ATM operational architecture applicable to the Australian ATM environment.

2.1.2 Current Baseline

The current operational architecture and ATM system is largely the product of evolutionary and incremental change, having been developed over several decades. As such, it has been largely reactive to industry changes. However, because of the expanding lead times associated with engineering and operational change, and the more comprehensive and global nature of the ATM system architecture. There is an increasing need to emphasise a strategic perspective in the consideration of future ATM systems against current and projected operational goals.

The purpose of the current (baseline) architecture is to establish an operational and performance baseline to be used in constructing and validating models of future ATM applications leading towards the ATM Target Operational Concept.

2.1.3 International Harmonisation

With the growing globalisation of air traffic management and systems, a process of harmonisation with international practice has been pursued for a number of years.

Australia now employs ICAO based standard phraseology in voice and data link communications. Also, procedural and standards prescription follows ICAO PANS/RAC wherever possible.

2.2 ATM Operating Environment

2.2.1 Airspace Organisation and Management

Australian airspace is that airspace where Australia, under its powers of State sovereignty[4] (domestic airspace) and through ICAO based international agreement (international airspace), exercises authority and provides services in support of civil and military aviation. There is no technical upper limit to the airspace volume.

Airservices Australia is the Administrating Authority designated responsible for managing Australian airspace and promulgating the airspace structure in the Designated Airspace Handbook (DAH).

Australian airspace is divided into two Flight Information Regions (FIRs), the Brisbane FIR & Melbourne FIR. Services are also provided by Airservices Australia to the Honiara FIR which consists primarily of international airspace.

Military ATC officers are subject matter experts in relation to airspace management for the Australian Defence Force. This responsibility extends from cooperative management of contingency airspace (on behalf of the Air Commander in Australia) in transition from peacetime to operations other than war (OOTW); to conflict; and to the eventual transition back to peace. Military ATC officers are involved in the creation and management of plans to enable this transition, including the National Airspace Contingency Plan and associated sub-plans.

The Defence Forces are empowered to designate airspace and to prohibit, restrict or control operations within certain airspace. Danger areas are also proclaimed to highlight certain aviation activities (e.g., flying training areas).

The Airservices/ Defence Air Coordinating Committee (ACC) formally examine, coordinate and ratify proposals for new or modified airspace arrangements.

2.2.2 Aerodrome architecture

Aerodrome location and design have a significant impact on the ability to provide efficient traffic management. While the physical location of an aerodrome may be largely determined by political, economic, demographic, topographic and environmental grounds, operational factors should also be considered, such as the immediate airspace volumes needed to support aircraft operation with minimum operating penalty, and operational conflict with other nearby aerodromes.

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4. **Convention on Civil Aviation 1944, Art. 1 & 2.**

The configuration of the operational architecture on an aerodrome has a profound effect on Air Traffic Management and aerodrome operational capacity. The ATM objectives in design should include; the optimization of theoretical capacity, ensuring minimum deviation of capacity regardless of weather, and efficiency in operation. Components of an aerodrome design which support higher theoretical capacity, reliability and efficiency include:

- runway strength, length and design[5] to accommodate all aircraft appropriate to all user aircraft types;
- precision Approaches to all runways or displaced thresholds;
- appropriate instrument and visual aids;
- multiple runways to provide continuous into wind operations;
- multiple parallel runways capable of independent operation[6];
- multiple approaches to facilitate noise sharing;
- taxiway systems that permit unrestricted movement of all aircraft types;
- rapid exit Taxiways. structure to enable rapid vacation of runways;
- taxiway design that minimises runway crossings;
- efficient perimeter road systems to minimise vehicle movements on manoeuvring areas;
- adequate parking facilities/gates;
- adequate ground surveillance for aircraft and vehicles; and
- ability to satisfy low visibility operations.

When one or more of the design components are inadequate to support the desired operational capacity of the aerodrome, ATM procedures, standards and infrastructure are developed to offset and compensate for the operational inadequacies, e.g., land and hold short operations (LAHSO), parallel runway monitor (PRM). (see Terminal Operations, below)

5. **Design is to be relevant for the type of operations e.g. grass surface for light aircraft, the inclusion of operational readiness platform at runway end for military aircraft operations**
6. **Land and Hold Short Operations (LAHSO)**

2.2.3 Airspace architecture

The Australian FIRs are subdivided into volumes based upon varying levels of ATS requirements, and categorised in accordance with the ICAO menu of airspace classifications. Australia currently employs ICAO Classes A, C, D, E and G.

The Australian implementation of Class D and G involves additional services and standards above the level of those prescribed by ICAO. In fact, the Australian application of ICAO class G airspace is more closely aligned to ICAO class F. Australia also employs the non-ICAO GAAP classification at some secondary airports associated with pilot training.

The Civil Aviation Safety Authority (CASA) specifies minimum standards and criteria for different airspace. There are currently no criteria for the establishment of airspace classifications or for the objective establishment of control towers[7]. There are criteria, however, for the disestablishment of control towers.

The basic unit of airspace management is called the airspace 'sector'. The sectorisation of Australian airspace for the purpose of providing air traffic services is based upon historic, workload and traffic flow considerations.

Sectors are either responsible for high altitude or low altitude airspace and traffic, or a combination of both. Sectors of airspace may incorporate several ICAO classifications of service. Sectorisation parameters are not flexible except that one or more sectors can be combined during periods of low traffic density.

Sectors are managed by an executive controller and, depending on the nature of the sector and workload levels, may be supported by a 'planner' who relieves the executive of some of the non-cognitive workload.

The non-dynamic nature of sectorisation is a current impediment to flexible aircraft routes (see below) based on daily or seasonal wind variations.

2.2.4 Air Route Structure

The existing domestic route structures are defined largely by terrestrial navigation aids. Aircraft are required to flight plan via the prescribed route structure (including Flextracks). Routes may be prescribed as one or two way routes. Route definition includes minimum altitude and reporting information, as well as any operational limitations.

While alternative routes may be included in flight notification, there is little flexibility available to pilots to dynamically navigate for economic or operational optimization in controlled airspace. Flextracks, and Dynamic Air Route Planning (DARP) trials in the Pacific, provide a limited exception.

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7. **Manual of Operating Standards, part 1 para. 6.**

2.2.4.1 Structured Terminal Flight Paths

Over the last decade there has been a move away from the ad-hoc, tactical management of arriving and departing aircraft in favour of a more strategic approach through the use of structured flight paths in terminal areas. Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs) are used to link aerodromes to the enroute airways and prescribe navigation requirements. They are also used in support of separation and separation assurance, and traffic flow management. Well designed STARs and SIDs should require minimum intervention from ATC as the management focus moves to conformance monitoring and exception handling rather than a directive control.

The STAR program was developed as a method of reducing pilot/controller workload and air ground communication by providing a pre-planned arrival procedure printed in graphic and narrative form. Well-constructed STARS are simple, understandable and applicable to current air traffic control (ATC) operations. In the arrival phase pilots use the STAR chart as the primary navigational reference.

STARS provide a link from the enroute structure via an instrument approach to the runway threshold. The instrument approach may include a visual segment to intercept a shortened final approach.

The use of a STAR Transition, a published segment used to connect one or more ATS routes to the STAR, is now discouraged and only applied to meet exceptional operational needs

Military and joint user aerodromes do not have the same structured terminal flight paths due to the different aircraft type requirements.

2.3 ATM Services

2.3.1 General

The recognised ATM services currently provided to effect air traffic management include the following:

- a Preflight Briefing Service;
- an Air Traffic Control Service;
- a Air Traffic Flow Management Service; and
- an Advisory / Flight Information Service.

2.3.2 Preflight Briefing Service

The preflight briefing service provides preflight briefing in the form of relevant operational data necessary to support flight planning, and determine the detail necessary to establish flight notification to ATS. Briefing information, derived from NOTAM, meteorological and other information databases, is delivered through several means:

- computer based pre-flight briefing delivery;
- individual telephone briefings from Briefing Officers in response to requests for specific information;
- facsimile service providing meteorological and NOTAM information on a self help / automated basis;
- automated meteorological telephone briefing; and
- flight watch service, providing an in-flight NOTAM and meteorological service where normal briefing services are not available, or when an update is required.

The pre-flight planning process involves the use of aircraft performance data, operational information provided by Aeronautical Information Service (AIS) and forecast and actual data provided by the Meteorological Service to develop an optimum flight profile and parameters within the constraints of airspace, air-route, level and ATFM requirements and restrictions.

The civil aviation regulation CAR 239 prescribes that the pilot in command shall make a careful study of:

- weather reports and forecasts for the route to be followed and at aerodromes to be used;
- airways facilities available on the route to be followed and the condition of those facilities;
- condition of aerodromes to be used and their suitability for the aircraft to be used; and
- Air Traffic Control rules and procedures appertaining to the particular flight.

Where forecast criteria are less than that prescribed by CASA, an alternative course of action will be determined and additional fuel requirements met.

2.3.2.1 Flight Notification

Data developed in the pre-flight planning processes, or derived from stored flight plans or from Airservices' stored routes, forms the basis for flight notification of intent and preferred operating parameters and requirements to the ATS provider.

IFR flights are required to submit comprehensive flight data notification for operations in all airspace classifications. That notification is consistent with the International Civil Aviation Organization ((ICAO) flight plan format and content prescription. That notification includes:

- aircraft identification - aircraft registration or flight number;
- flight rules & type of flight;
- equipment carried - communication, navigation, surveillance;
- departure aerodrome & estimated time of departure (ETD);
- destination aerodrome & alternate aerodrome if required;
- planned route, cruising level, true air speed (TAS) & total estimated elapsed time (EET);
- other relevant route segment operational detail;
- other relevant flight detail; and
- supplementary information, including search and rescue (SAR) equipment, people on board (POB), etc.

VFR aircraft are also required to submit comprehensive flight notification for flights in CTA/CTR. Flight notes, which contain basic information may be used in Class G airspace.

Flight crews and dispatch officers are responsible for safe and orderly flight pre-planning and filing. The flight notification is filed (lodged) with the service provider at a parameter time prior to ETD and forms the basis of shared knowledge between the AOC, the pilot and controller and, together with a clearance, an authorisation to operate. The flight details may be subsequently amended at any stage of flight by the PIC until the flight is terminated.

2.3.3 Air Traffic Control Service

An air traffic control service is provided to monitor the progress of flights and to provide the tactical separation between aircraft in support of their safe, orderly and expeditious movement. The provision of air traffic control is the principle conduit and interface between pilots and the air traffic management system.

The orderly management of aircraft and the application of separation between aircraft are exercised by the issuance of ATC clearances. Clearances are an authorisation for aircraft to taxi, take-off, track via a specified route, to climb, maintain or descend and to land. Instructions and requirements may be issued to tactically modify or qualify the clearance, e.g. radar vectoring or holding instructions.

The pilot remains the ultimate authority for determining the safety of the aircraft.

The pilots of VFR aircraft are responsible for ensuring that they comply with prescribed weather minima while satisfying the requirements of an airways clearance. In Classes C & D airspace during weather conditions below VFR criteria, Special VFR clearances may be issued.

2.3.3.1 Separation

Separation is applied between aircraft to avoid the risk of collision or the impact of wake turbulence. It is also a spacing of aircraft to achieve their safe and orderly movement in flight, while taxiing on the ground, and while landing and taking off.

In addition to other aircraft, the safe movement of aircraft requires that they be separated from other aircraft, ground vehicles, ground obstacles (e.g. terrain), hazardous weather and restricted or dangerous airspace.

Aircraft have potential to be in conflict with opposite direction, crossing or in-train flights at a common level while cruising, climbing or descending.

Strategic separation is established by the creation of airspace divisions, laterally separated air route structures, and SIDs and STARS, which prescribe lateral and vertical navigation. The tactical separation service within the ATM system is either applied by the pilot or ATC. The military also apply a tactical segregation service in certain circumstances. In either case, the system component responsible for separation determines the appropriate tactical path for an aircraft to avoid conflict with other aircraft, obstacles, weather or airspace.

2.3.3.2 Pilot based separation

The principle form of pilot based separation is commonly referred to as alerted see and avoid. Pilots observe the position and trajectory of proximate aircraft and other obstacles to flight and initiate action to avoid conflict.

The pilot maintains a situational awareness of other traffic through visual acquisition and by monitoring mandatory communications and reports, and where necessary exchanging position information and intent, with other pilots.

The pilot's situational awareness may be enhanced by supplementary data sources, which include:

- ATS provision of relevant surveillance derived traffic data;
- automated ground systems providing traffic advice;
- airborne systems providing traffic information;
- risk modelling has indicated that a see and avoid separation procedure without the benefit of an alerting system entails unacceptably high risk; and
- pilot based separation is principally applied in low-density airspace (Class G). [In some airspace, both pilot and ATC separations are applied, depending on the categories of flight of the relevant aircraft (e.g., in classes D and E airspace, visual flight rules (VFR) aircraft self separate from instrument flight rules (IFR) aircraft, while ATC separates IFR from IFR aircraft.)].

In certain circumstances, the responsibility for separation can be transferred from ATC to the pilot (e.g., visual sight and follow, mutual sight and passing procedures).

Aircraft operating in airspace specially designated or specified (e.g., due to ATS system failure), may be required to self-separate and follow Traffic Information Broadcast by Aircraft (TIBA) procedures. TIBA procedures permit reports and relevant supplementary information of an advisory nature to be transmitted by pilots for the information of other aircraft in the vicinity. Procedures specify frequencies, the requirement to maintain a listening watch, broadcasts, position reporting, level changes and collision avoidance action.

2.3.3.3 Controller based separation

In the absence of surveillance technology, visual or procedural separation standards are employed.

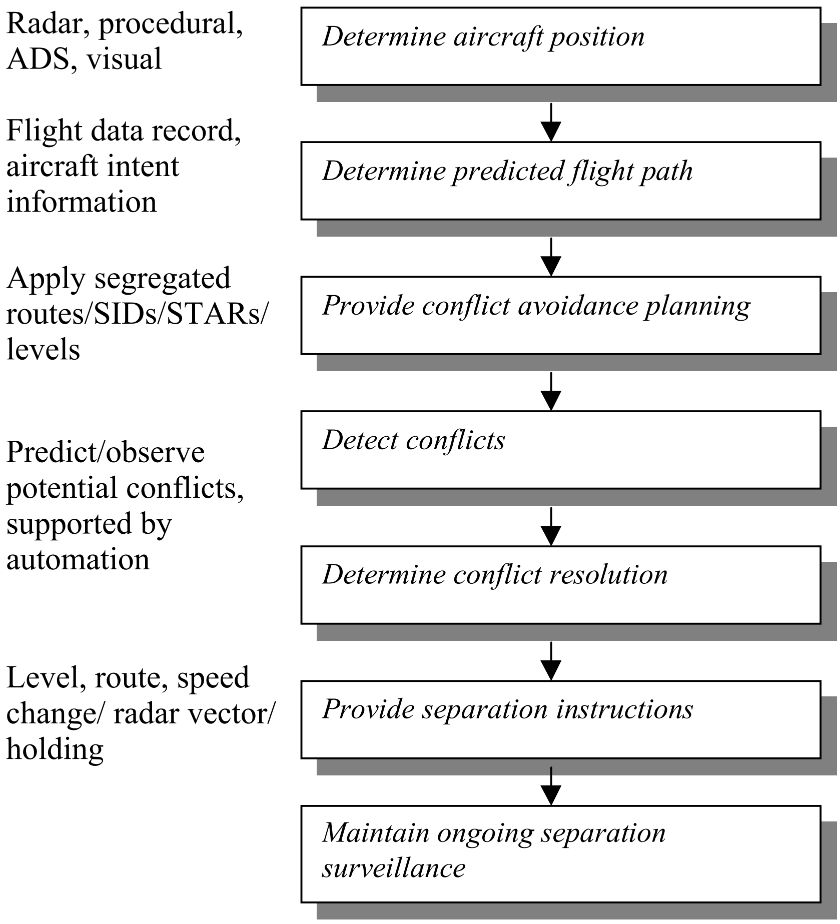
Visual separation involves the monitoring, and when necessary, the issuance of clearances, instructions and directions to aircraft in order that they continue to maintain safe separation.

Procedural separation is applied between aircraft in the vertical, lateral or longitudinal planes. Australia currently does not employ any composite separation standards.

The accuracy derived from the application of dependant and independent surveillance technologies permit a reduction in prescribed separations applied in the horizontal (lateral & longitudinal) plane.

The controller initiated tactical separation process involves:

Figure 2.1 Controller Tactical Separation Process;



2.3.3.4 Strategic separation / separation assurance

Following example and direction of other States with modern aviation management systems, Australia has moved away from a total reliance in tactical separation of aircraft by controller or pilot to a model where segregation of flight paths contributes strategically to aircraft separation. This change has, in part, been facilitated by the use of more sophisticated on-board flight management systems. Focus has moved toward traffic planning, conflict avoidance and monitoring rather than conflict resolution.

An example of segregated operations is the application of SIDs and STARs (see para. 4.4 above) in terminal areas designed to provide segregated flight paths between inbound and outbound aircraft. The use of surveillance technologies to monitor lateral and vertical separation requires that the controller should only need to intervene in exceptional circumstances, e.g. an aircraft is unable to meet the navigational requirements of the STAR/ SID procedure.

The establishment of one way routes where traffic densities are greater also provides segregation between opposite direction traffic.

The use of segregation models is supported by the application of separation assurance techniques, which provide a safety net or 'defence' against system failure. For example, departing aircraft may be assigned an initial level or 'paper stop', consistent with the airspace architecture and design of adjacent sectors.

2.3.3.5 Separation standards

Prescription of separation standards, and authority for use, is provided by the Civil Aviation Safety Authority (CASA) and detailed in the Manual of Operating Standards (MOS). ICAO Procedures for Air Navigation Services — Rules of the Air and Air Traffic Services (PANS-RAC) prescribes separation standards for application in international airspace. Defence apply separation standards applicable for military operations and when controlling civil aircraft comply with CASA and ICAO guidelines.

Procedural standards

Procedural separation of aircraft is achieved by applying:

a. Longitudinal separation: longitudinal spacing of aircraft based on time or distance which is never less than the prescribed standard interval;

b. Lateral separation: lateral spacing of aircraft by requiring operation on different routes, or in different geographical locations as determined by visual observation or by use of radio or other navigation aids; and

c. Vertical separation; vertical spacing of aircraft.

Surveillance technology based standards

The advantage of surveillance technologies viz-à-viz procedural applications of separation lies in the ability to provide less restrictive and reduced separation minima. This ability is primarily due to the decreased level of uncertainty of the position of the aircraft for which separation is to be maintained.

Within coverage of the surveillance technologies, the minimum separation applied between aircraft is normally applied in the horizontal (combined lateral and longitudinal) plane and based on a minimum specified distance at non-separated altitudes. The data are presented to the controller through an appropriate plan-view display (PVD) and human machine interface (HMI), Separation assurance techniques are employed as a defence against pilot/controller error especially in close spaced separation applications.

2.3.4 Air Traffic Flow Management Service

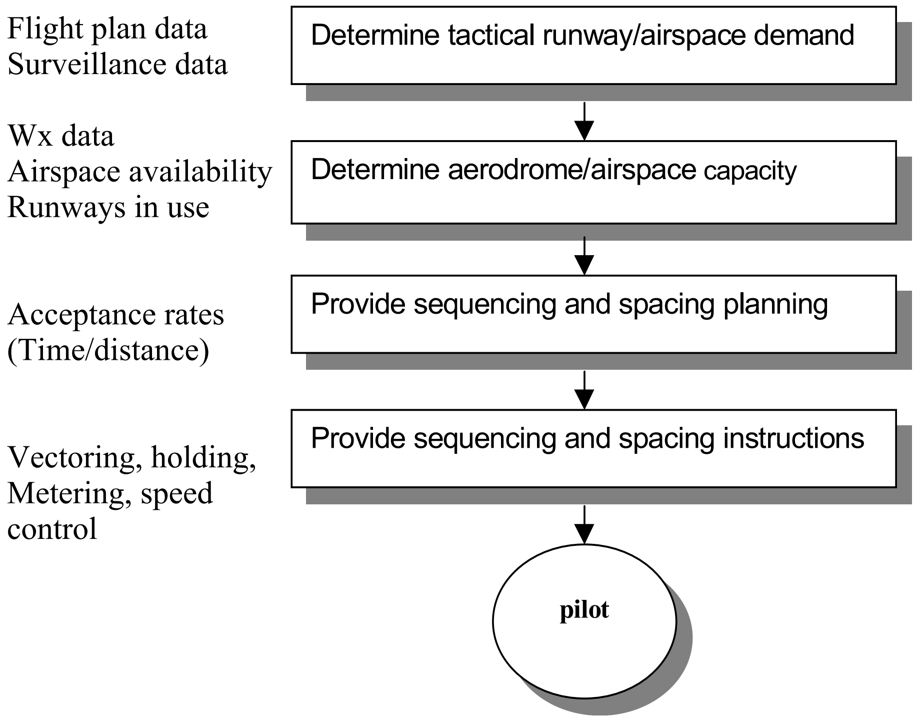
The theoretical and actual airport traffic capacity can vary depending upon runway configuration, prevailing weather, if day or night time, and through satisfying noise abatement requirements.

Air Traffic Flow Management (ATFM) is managed in both the tactical and strategic sense.

The tactical airport capacity is the practical airport capacity adjusted for any non-standard factors, e.g., airport works, a loss or reduction in facilities, or a reduction in ATC staffing. The airport control Tower, together with the radar TMA service where established, is responsible for determining tactical airport capacity.

Tactical flow management involves:

Figure 2.2 Tactical Flow Management



ATC matches tactical air traffic flow to capacity by the following:

- Aircraft holding both on the ground prior to departure and within holding patterns;
- Speed control;
- Tactical metering (exploiting flight management system (FMS) profile management capability); and
- Vectoring.

The allocation, within a parameter time block before the lodgement of flight details, of 'slot times' for aircraft arrival is one strategic method of regulating traffic flow.

The number of arrival slots in each hour are adjusted to the practical capacity for the airport or forecast runway configuration only at Sydney airport. Where the new number of arrival slots is less (or more) than the number previously allocated, individual arrival times are recalculated to match the reduced (or increased) capacity. If a delay is required and the aircraft flight time is less than 3 hours, a new push-back time is allocated to the aircraft operator.

A flight following facility for participating aircraft and an “after the event” SLOT compliance report is also provided. There is no direct interaction between the slot management system and the tactical flow management system.

2.3.4.1 Priorities

When more than one aircraft are competing for the same airspace or movement area, the following general priorities apply:

- Aircraft in emergency or urgent situations have priority over others;
- landing aircraft have priority over departing aircraft; and
- landing and taking off aircraft have priority over taxiing aircraft.

The aircraft first able to use the airspace or manoeuvring area in normal operations, except where significant economic benefit would accrue to a number of other aircraft by deferring this priority.

Capital city control zones apply equal status to most operations except general aviation proceeding to a primary control zone, training flights and through flights which have lower priority. Sydney also applies a lesser priority to non-scheduled commercial operations.

2.3.5 Advisory / Flight Information Service

The advisory / flight information service is an in-flight information service to flight crews which supports situational awareness. This information is non-directive in nature and comprises information on relevant traffic, weather and other operational information.

2.3.5.1 Traffic Advisories

Traffic advisories may be issued to aircraft taxiing or airborne with respect of other aircraft that may be in proximity to the position or intended route of that aircraft. The information is based on surveillance data maintained by ATS. Traffic is defined by ATS as relevant if the position and forecast tracks of two or more aircraft fall within prescribed parameters and may be initiated by ATS, depending on the category of flight and the class of airspace, or may be requested by the pilot.

2.3.5.2 Flight Information

Information supporting the safe and efficient conduct of flight, including information on meteorological conditions, aerodrome conditions, airways facilities and any relevant information contained in notice to air men (NOTAM) is provided by ATC or Flight Watch to aircraft on request. Unpredicted or changed hazardous weather condition advice is initiated by ATS to relevant aircraft on which flight data or information is held.

These services are provided in accordance with those prescribed for the Australian application of the menu of airspace classifications (classes A, C, D, E or G).

2.4 ATM Operations

2.4.1 Terminal Operations

With the exception of Class G airspace terminal areas, aerodromes are serviced by control towers. The tower, together with the radar TMA service where established, is responsible for runway separation and sequencing and for separating ground aircraft and vehicles on the taxiway and movement area (excluding the apron). Subject to the availability of surveillance technology (radar TMA service), the management of approach/departures airspace is also the responsibility of the tower.

The tower is responsible for alerting safety services, advising essential aerodrome information and significant weather information. At selected aerodromes automatic facilities broadcast terminal information (ATIS). At certain locations, start up clearances are required. Push back approval and taxi clearance (except for some GAAP aerodromes) are also required.

The tower is responsible for applying runway separation standards, and sequencing (where appropriate) and wake turbulence standards.

The separation of aircraft on taxiways is a joint controller/pilot responsibility.

In order to maximise the capacity of the aerodrome, multiple runways are often used. In addition to standard runway separation application, procedures have been developed to further increase movement rates using crossing and parallel runways. These procedures are generally weather, and particularly cloud base and visibility sensitive. In the case of parallel runway operations, dedicated surveillance technology, HMI and pilot/controller procedures are employed to minimise the negative impact of weather on runway capacity.

A high proportion of tower and approach controller workload consists of coordination and ground/ground communication. Also, the general sequential nature of controller functional execution often leads to delays during busy traffic periods. Tower/approach ATM strategies involving pre or blanket coordination to reduce the impact have been introduced at limited locations.

2.4.1.1 Physical Environment Considerations

All aircraft activity is now subject to environmental scrutiny and environmental issues have become increasingly relevant to aircraft operations. This has led to the imposition of requirements, on certain operations in particular, to reduce the effect of aircraft noise on residents near aerodromes. These initiatives include:

- at certain aerodromes, the nomination of a preferred noise abatement runway except when prescribed weather conditions would make that operation unsafe;
- at certain aerodromes, the use of preferred flight paths for arriving and departure aircraft associated with the runway (s) in use and usually defined in terms of SIDs or STARs;

- where specified, the application of noise abatement climb procedures for certain aircraft until 3000 feet above the aerodrome elevation;
- the application of legislated equitable noise sharing procedures in the Sydney terminal area; and
- the application of late night curfews on certain operations at Adelaide, Essendon and Sydney aerodromes.

2.4.2 Low Density Airspace Operations

Low traffic density airspace is typically classified as ICAO class G. Australian class G differs from ICAO class G in that flight following, and SAR alerting services based upon missed position reporting for IFR aircraft, as well as an IFR traffic advisory service, is provided by ATC or flight watch, or through 3rd party ground operators.

Pilot reporting requirements in terminal areas provide the basis for 'alerted see and avoid' procedures. The encouragement of non-licensed services at remote aerodromes also supplements operational advice to aircraft.

In certain class G airspace (e.g., Ayers Rock), segregated routes for arriving and departing aircraft provide separation assurance. The hemispherical rule defining aircraft operating altitude/level and the 500ft displacement between IFR and VFR levels also provides a level of separation assurance. Similarly, the application of a flight path offset on two way routes provides some protection against system error or failure in an environment of high navigation accuracy.

2.4.3 Aircraft Dispatch / Operational Control

Dispatch is responsible for the collation of relevant operational information including NOTAM, and meteorological data and requirements as a basis for building the aircraft flight plan and for submission to relevant ATC service providers.

Airlines also exercise operational control over aircraft within their fleets. Operational control is concerned with the timely management of individual aircraft within the airline system, particularly in relation to technical and cabin crew resources, aircraft diversion and availability, and aircraft maintenance management. Operations control is also concerned with capacity and flow management, and in the negotiation of access to runway slots at relevant aerodromes.

Aircraft diversions may be initiated either by the pilot or by Operations Control / Dispatch. In aircraft with appropriate data-link technology, Operations Control / Dispatch may uplink amended flight details which will form the basis of an amended route clearance request. This is called a Dynamic Air Route Planning (DARP).

Defence has a similar dispatch / operational control system for its fleet, although usually managed at individual force element group level.

2.5 System Enablers

2.5.1 General

Communication, navigation, surveillance and ATM automation systems are the system enablers used in conjunction with manual procedures and practices to support the provision of ATM services.

2.5.2 Communications, Navigation and Surveillance

The Communication, Navigation and Surveillance (CNS) infrastructure required to support the ATM system is addressed in Volume 3 of the Plan.

2.5.3 Automation

Automation, which supports greater efficiency, integrity and accuracy in air traffic management, is currently available in both ground and airborne systems.

Automation available to civil ATC to support operational integrity of ATM functions, for use as a planning tool and to provide a defence against errors includes:

- Short term conflict alert,
- Dangerous area infringement warning,
- Minimum safe altitude warning,
- Cleared level adherence monitoring,
- Route adherence monitoring,
- Automatic dependent surveillance (ADS) route conformance warning,
- Missed position report warning,
- Estimated time over (ETO) discrepancy warning,
- Lateral deviation change event report,
- Level range - ceiling/floor change event report,
- Vertical rate change event report ,
- Waypoint change event report , and
- Dynamic Intent information.

Automation available to pilots in support of ATM functions includes:

- aircraft collision avoidance system (ACAS) - provision of separation assurance; and
- FMS - speed management to meet time over waypoints, vertical navigation, etc.

CHAPTER 3:
ATM Strategic Initiatives

3.1 Transition

3.1.1 Migration Pathway of Services

The transition to future ATM services is described in broad terms in Table 2. Achieving the ATM Target Operational Concept depends on factors such as:

- air traffic growth rates;
- increasing environmental constraints;
- the need for increasing aviation safety performance;
- investment levels in research and development (R&D) to create the required technologies;
- the economics and coordination of ATM system improvements both nationally and internationally;
- regulatory considerations; and
- global direction and pace of change.

3.2 Strategic Implementation Maps

3.2.1 Overview

The maps contained within this part of the Plan identify initiatives that will be used to determine the priority ATM programmes/projects. They are evolutionary maps and will be updated as ATM planning proceeds.

Inputs used in the development of the maps include:

- Baseline 2000 and ATM Target Operational Concepts, together with associated ATM evolution material;
- ATM stakeholder CNS/ATM asset information;
- research and development material in the form of ICAO panel material; and
- specialist experience from ATM stakeholder representatives within the ASTRA.

Identified within the maps are the following:

- the key ATM strategies;
- for each strategy a grouping of the initiatives that were derived from the operational concept changes identified in Volume 2, Chapter 1 to this Plan;
- for each initiative one or more elements that identify key aspects of the initiatives; and
- for each element the perceived operational requirements, capability options, implementation considerations and time frames.

The initiatives and elements within these maps are initial determinations which will be refined. More analysis and definition will be undertaken to identify specific programmes and projects.

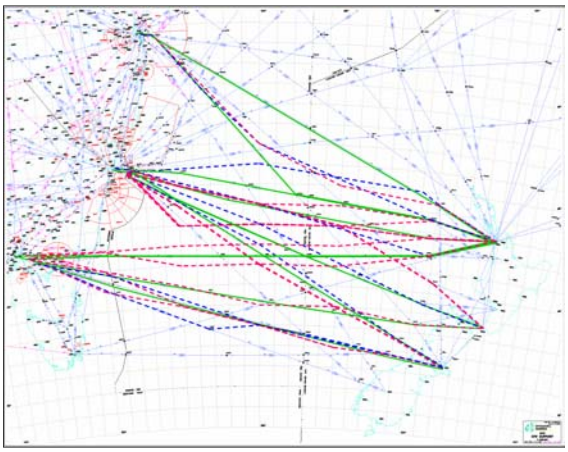
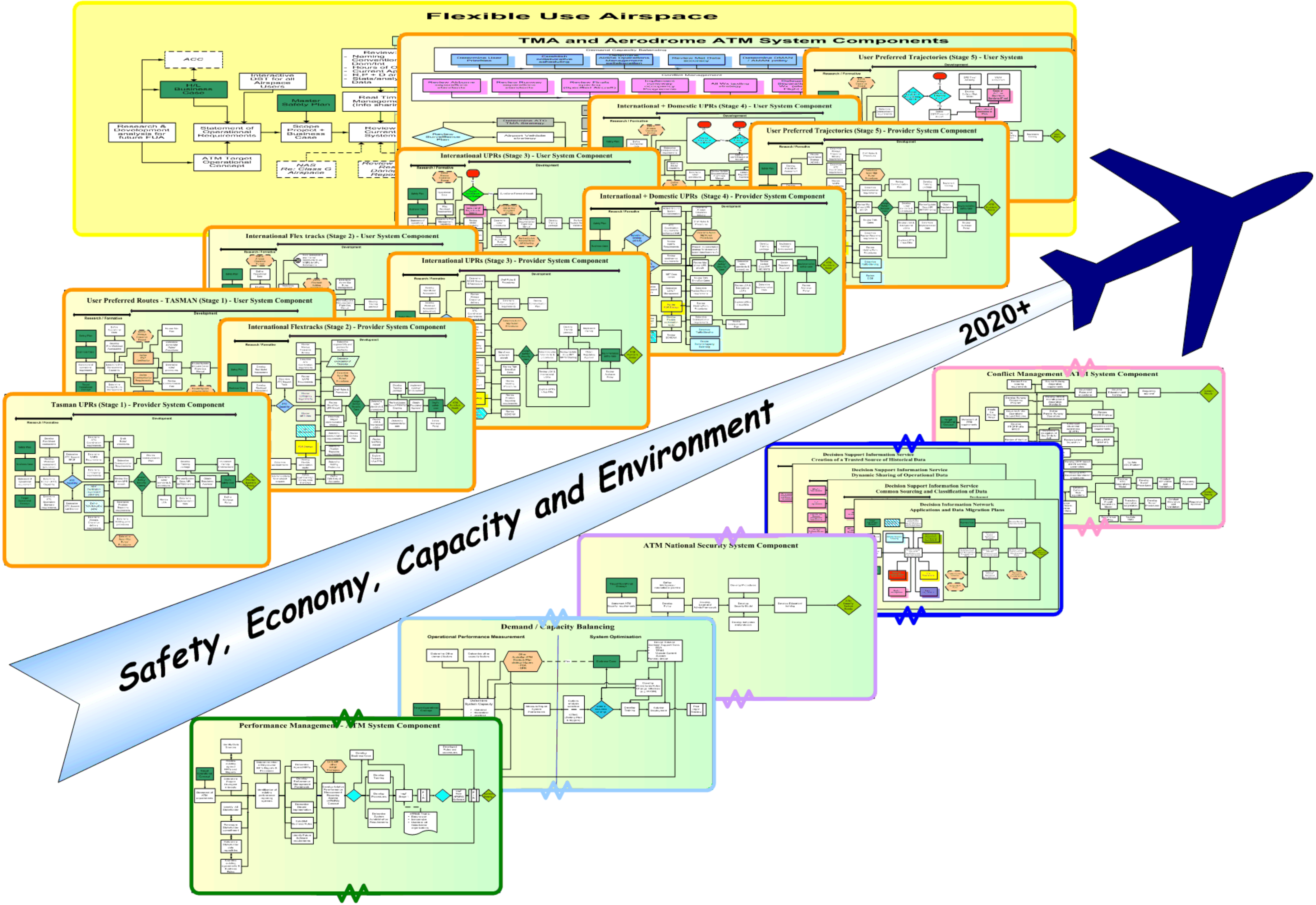


Table 3.1: Transition to Future ATM Services (Indicative)

Current Function	By 2005	By 2010	By 2015	Future Service
Air Traffic Control Separation	• Expand use of reduced vertical separation minima (RVSM) • Reduced separation standards in oceanic areas • Reduced separation standards in continental airspace	• Three dimensional (composite) separation standards • Limited self separation in structured airspace • Self separation in unstructured airspace	• Three dimensional dynamic risk reduction in all airspace (replaces fixed separation standards) • Self separation	Risk Reduction Service
Air Traffic Control Flow Management	• Expanded tactical and strategic flow management capabilities to limit delays and holding at major airports	• Collaborative airline scheduling implemented. • Expanded strategic flow management to national application	• User preferred trajectories (including departure and arrival times). • Optimised use of aerodrome capacity to eliminate ground delays.	Demand Capacity Service
In-flight Emergency Response	• Enhanced situational awareness results in improved capability to respond in an aircraft emergency			In-Flight Emergency Response Service
Aeronautical Information	• Access and use of common aeronautical data by all parties • Increased role of aircraft operations management (AOM) in processing and using aeronautical data	• Major improvement in integrity, quality and availability of operational data/information (especially weather) to all parties requiring information	• Highly automated availability & distribution of high integrity data to all parties	Decision Information Support Service


Flexible Use Airspace
TMA and Aerodrome ATM System Components
User Preferred Trajectories (Stage 5) - User System
International + Domestic UPRs (Stage 4) - User System Component
User Preferred Trajectories (Stage 5) - Provider System Component
International UPRs (Stage 3) - User System Component
International + Domestic UPRs (Stage 4) - Provider System Component
International Flex tracks (Stage 2) - User System Component
International UPRs (Stage 3) - Provider System Component
User Preferred Routes - TASMAN (Stage 1) - User System Component
International Flextracks (Stage 2) - Provider System Component
Tasman UPRs (Stage 1) - Provider System Component
2020+
Safety, Economy, Capacity and Environment
Conflict Management - ATM System Component
Decision Support Information Service
Creation of a Trusted Source of Historical Data
Decision Support Information Service
Dynamic Sharing of Operational Data
Decision Support Information Service
Common Sourcing and Classification of Data
Decision Information Network
Applications and Data Migration Plans
ATM National Security System Component
Demand / Capacity Balancing
Operational Performance Measurement
System Optimisation
Performance Management - ATM System Component

3.2.2 Strategy 1 - User Preferred Trajectories

3.2.2.1 Overview

User Preferred Trajectories (UPTs) have been defined as the key strategy of the Australian ATM Strategic Plan allowing users to optimize a flight trajectory in all four dimensions (3D + time) consistent with business or individual priorities. The primary focus is on enhancing the ATM system from a user perspective. It concentrates on developing an architecture and operating environment that increases both operational efficiency and cost effectiveness, with sensitivity to environmental aspects, within the overall tenet of the primacy of safety.

A UPT begins when an aircraft is established at the gate for the purpose of the flight until the aircraft has arrived at the destination arrival gate. UPTs therefore, include en-route, terminal area (TMA) and ground phases of the trajectory.

3.2.2.2 Transition

To migrate from the current ATM System baseline to the future ATM system in support of UPTs, a five-stage implementation is proposed. Complimentary to these five stages is the extension of UPTs to ground and terminal area operations. The system capabilities to support UPTs have been identified by the various ATM System components. The components are defined as service provider, airspace user and aerodrome/TMA. Each component has specific deliverables outlined in the maps contained in this Chapter - however they are inter-linked and inter-dependent requiring significant co-ordination and collaboration to achieve the full implementation of UPTs.

The various stages are defined below.

En-route

Stage 1 - Tasman User Preferred Routes

Introduction of User Preferred Routes (UPRs) in the Tasman Sea en-route airspace, for those aircraft equipped with appropriate navigation and communication systems. This stage will be used as the pilot programme for the delivery of continental UPRs. The results from the pilot programme will determine if each of the other identified stages will be required.

Stage 2 - International Flextracks

Introduction of Flex Tracks across Australian airspace for international aircraft equipped with appropriate navigation and communication systems.

Stage 3 - International UPRs

Introduction of UPRs relevant to international operations to and from Australia, in support of the ATM Target Operational Concept (TOC).

Stage 4 - International & Domestic UPRs

Introduction of UPRs in the Australian FIRs, relevant to both domestic and international operations to and from Australia, in support of the ATM Target Operational Concept.

Stage 5 - User Preferred Trajectories

Introduction of UPTs in the Australian FIR, relevant to both domestic and international operations to and from Australia in support of the ATM Target Operational Concept (TOC).

Terminal Area/Aerodrome

Optimisation of aerodrome and terminal area (TMA) operations to accommodate user preferences.

3.2.2.3 Implementation

The capabilities required for the introduction of each stage have been identified by the appropriate system component. The key enabling activities required for the full introduction of UPTs by system components are defined below and within the implementation maps contained in this chapter.

Provider

- development of flight planning concept to achieve pre-flight and dynamic in-flight transfer of UPT information;
- review of airways clearance delivery format;
- development of collision risk model to support the devolution of separation to Pilots in the cockpit;
- development of a separation minima based on aircraft equipage and surveillance capabilities;
- development of airborne separation standards to support the devolution of separation to Pilots;
- development & implementation of surveillance (e.g. ADS-B/CPDLC) ground infrastructure to provide situational awareness;
- development & implementation of surveillance (e.g. ADS-B) airborne infrastructure to provide situational awareness;
- review and analyse ATC workload implications;
- finalisation of interactive tactical Air Traffic Flow and Capacity Management Systems;
- procedures for handling non UPT aircraft;
- flight notification procedures;
- development of system safety validation across all systems (simulation etc);
- development & Implementation of ATC support tools to provide conflict detection and resolution;

- development of Coordination Agreements between overseas ATM providers and Airservices Australia;
- development of operating rules and procedures to support the introduction of UPTs;
- development of a system wide data management system for the distribution of charting/ maps/NOTAMS etc;
- obtain Regulatory approval from CASA for changes to procedures and rules for the introduction of UPTs; and
- development of Pricing Strategy for the introduction of UPTs.

User

- Review of Cockpit Route Management;
- FMS requirements;
- procedural system requirements;
- Flight Planning System requirements;
- development and deployment to aircraft of Cockpit Display Traffic Information (CDTI) in support of new surveillance technology (e.g. ADS-B);
- implementation of airways clearance delivery Format determined by provider;
- development of system safety validation across all systems (simulation etc); and
- obtain regulatory approval from CASA for changes to procedures and rules for the introduction of UPTs.

TMA/Aerodrome

TMA/Aerodrome inititatives are related to but not dependent upon the implementation of UPRs/ UPTs to the en-route phase of flight. These initiatives include:

- the application of new conflict management applications;
- demand/capacity balancing;
- dynamic arrival and departure procedures;
- optimising aerodrome architecture; and
- establishing all weather operations.

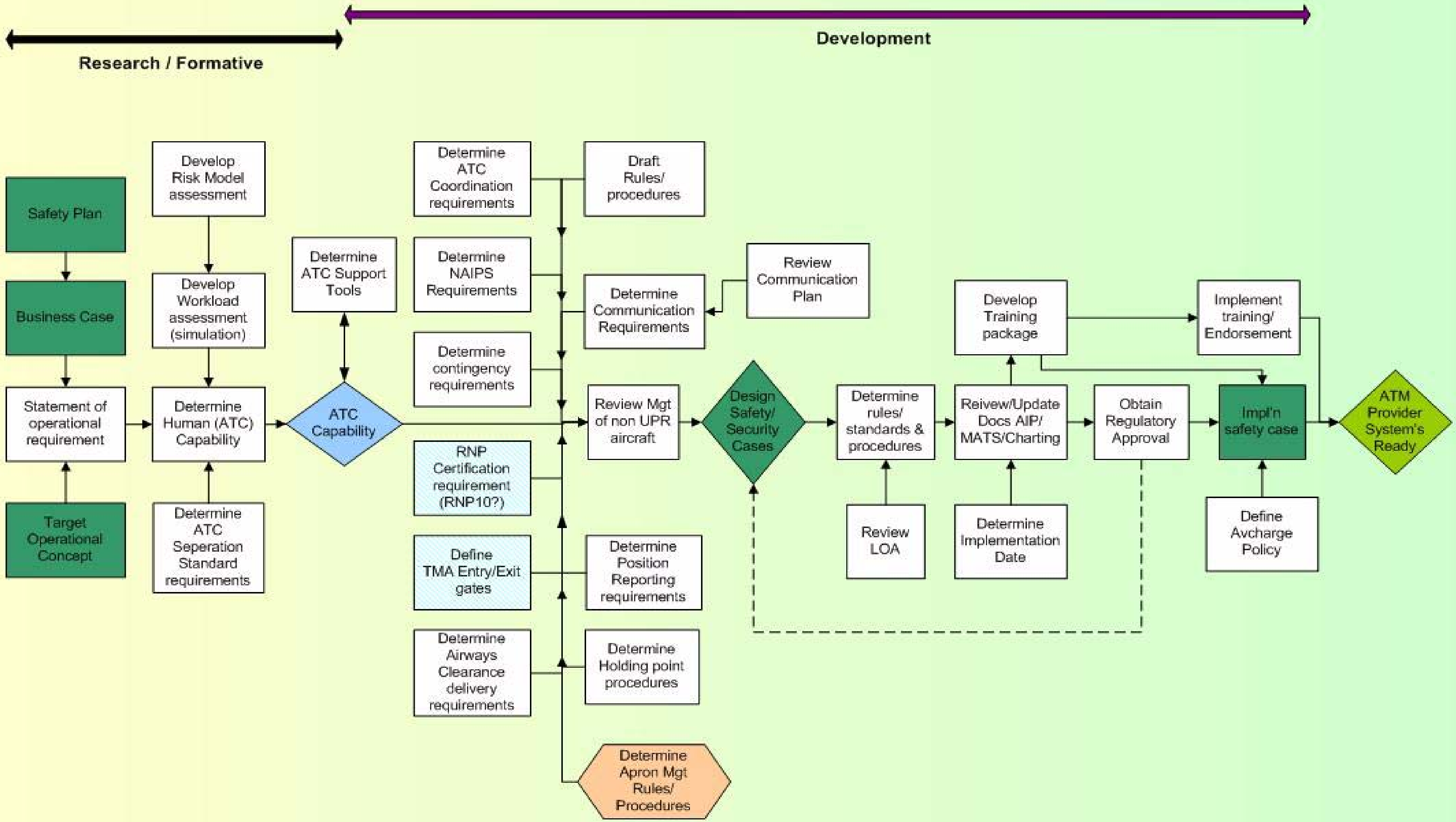
3.2.2.4 Benefit

The implementation of UPTs will provide specific benefits to industry with better utilisation of airspace and airport capacity, through both tactical management and strategic planning. Airspace becomes a resource for all users; It will provide a framework in support of the ATM Target Operational Concept and will:

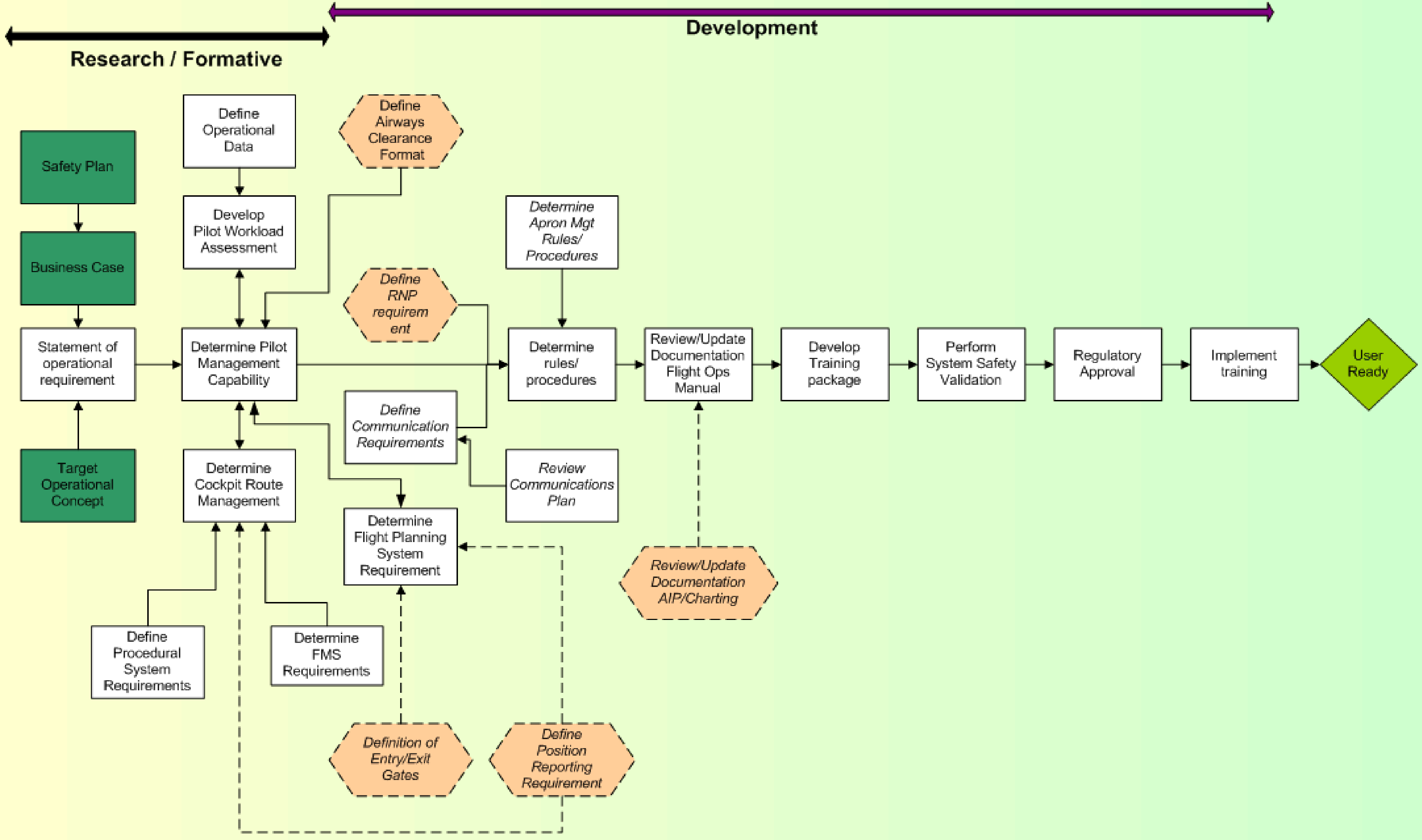
- improve operational efficiency for industry by optimising flight paths utilising on-board and ground based equipment;
- enhance safety by increasing randomisation of flight paths;

- reduce environmental impact;allow aircraft operators to structure their flights to achieve:
  - reduced flight time;
  - reduced fuel usage;
  - reduced emissions;
  - improved distribution of traffic load; and
  - aircraft maintenance savings.
- enable the ability to dynamically resize and reshape airspace volumes;
- allow operational flexibility in the use of system tools;
- permit greater ADF freedom of operations;
- reduce apron and taxiway congestion;
- enhance runway capacity; and
- enhance capacity of terminal airspace volumes.

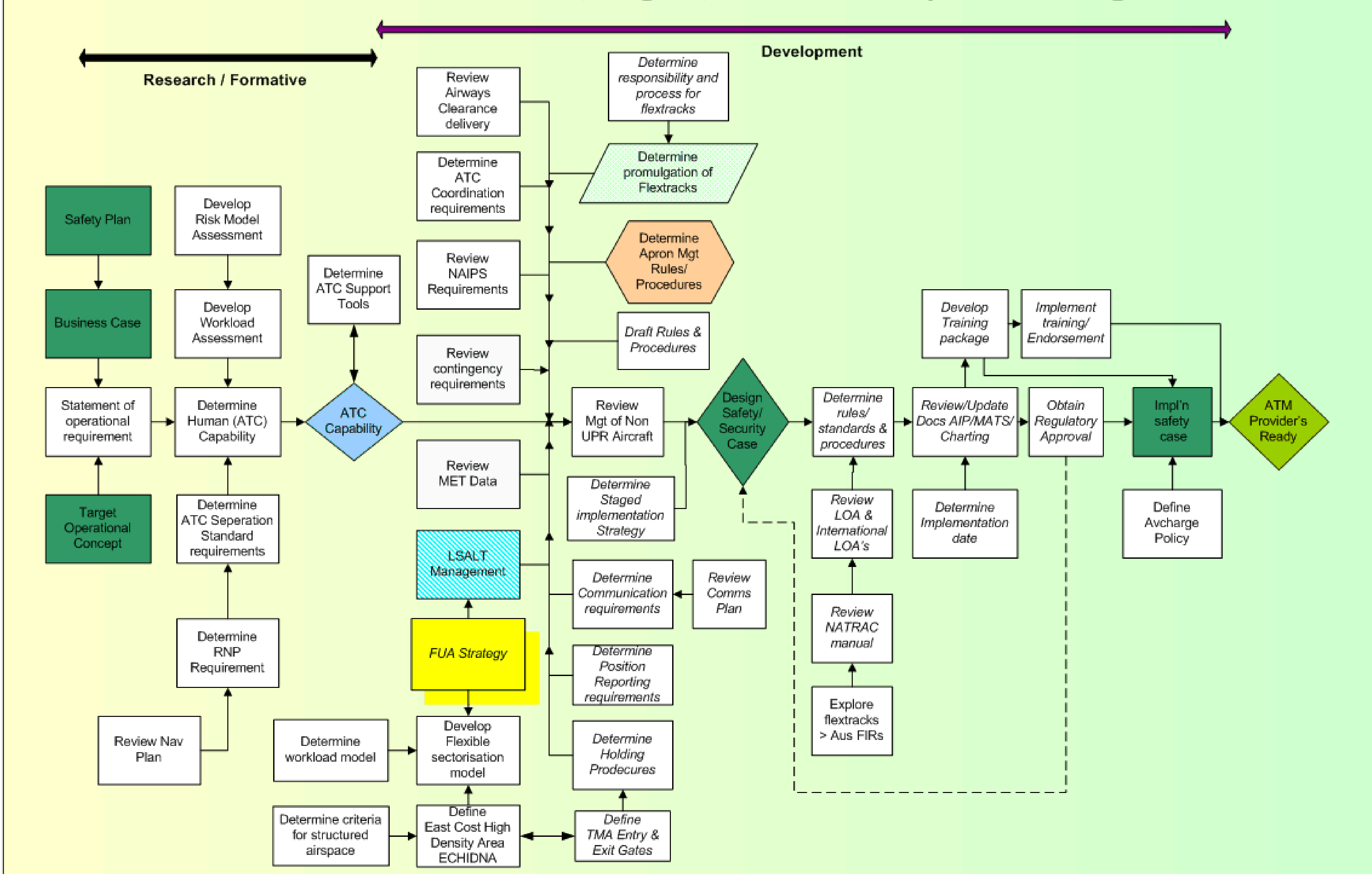
Tasman UPRs (Stage 1) - Provider System Component



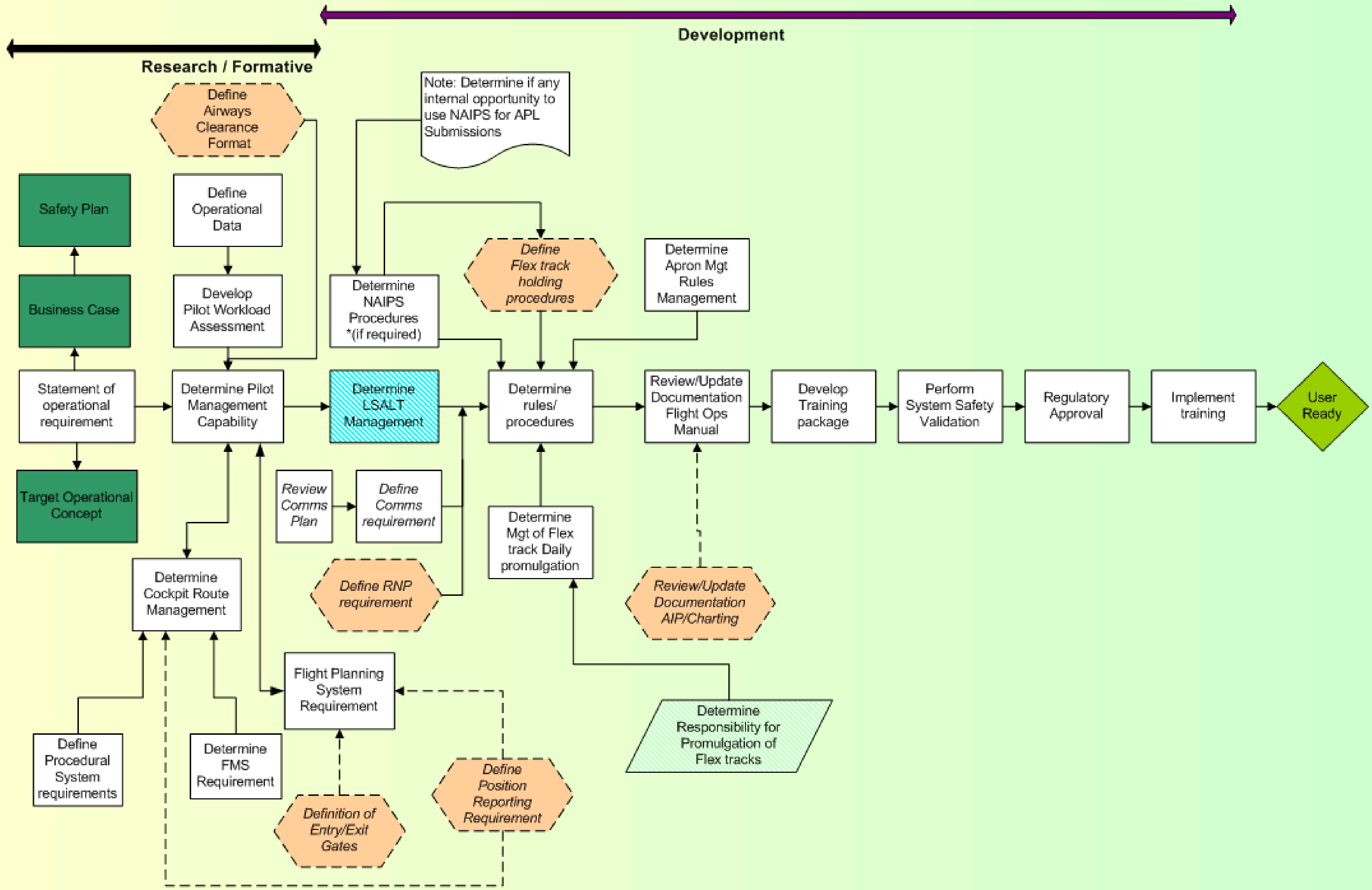
User Preferred Routes - TASMAN (Stage 1) - User System Component



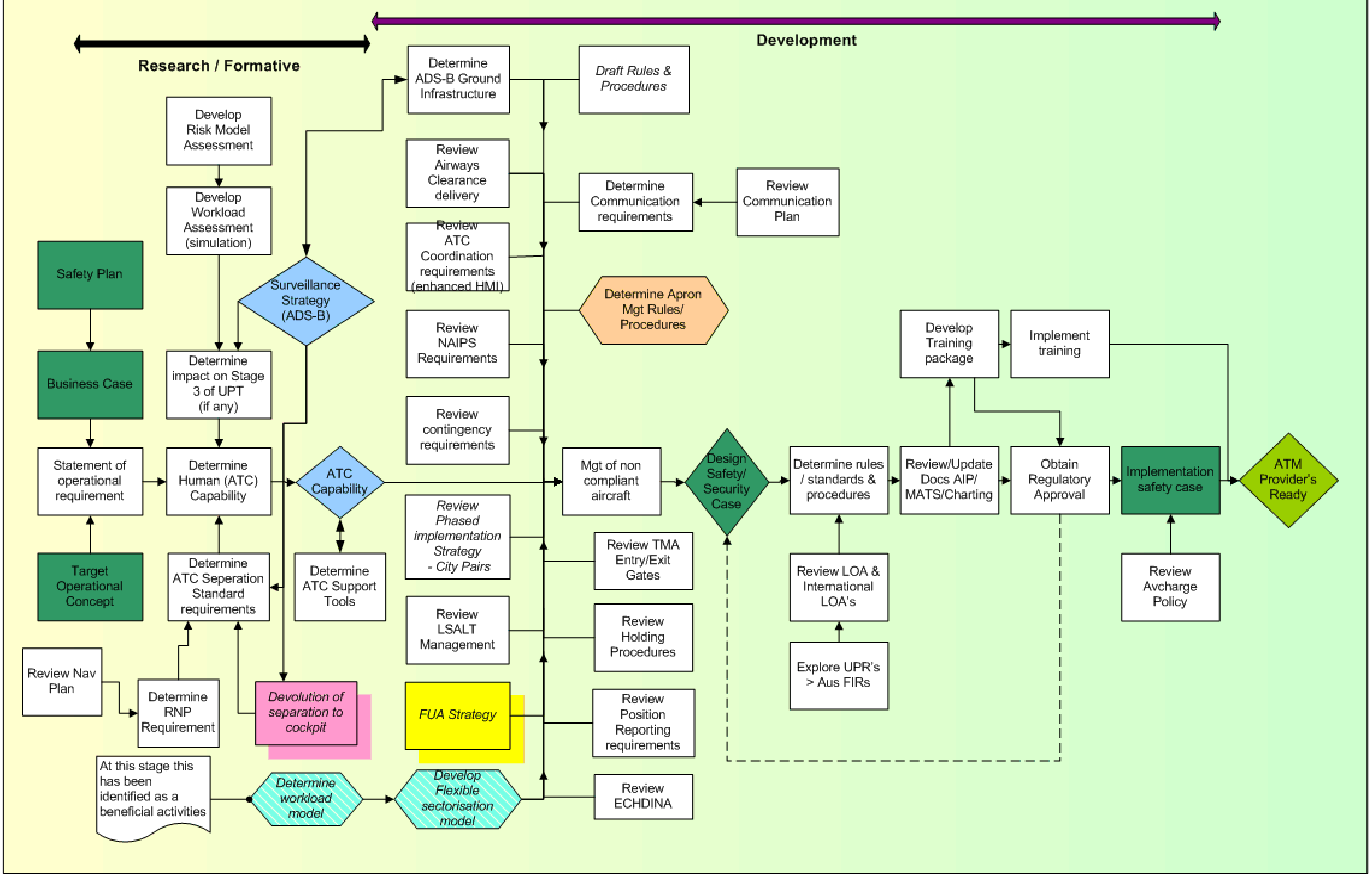
International Flextracks (Stage 2) - Provider System Component



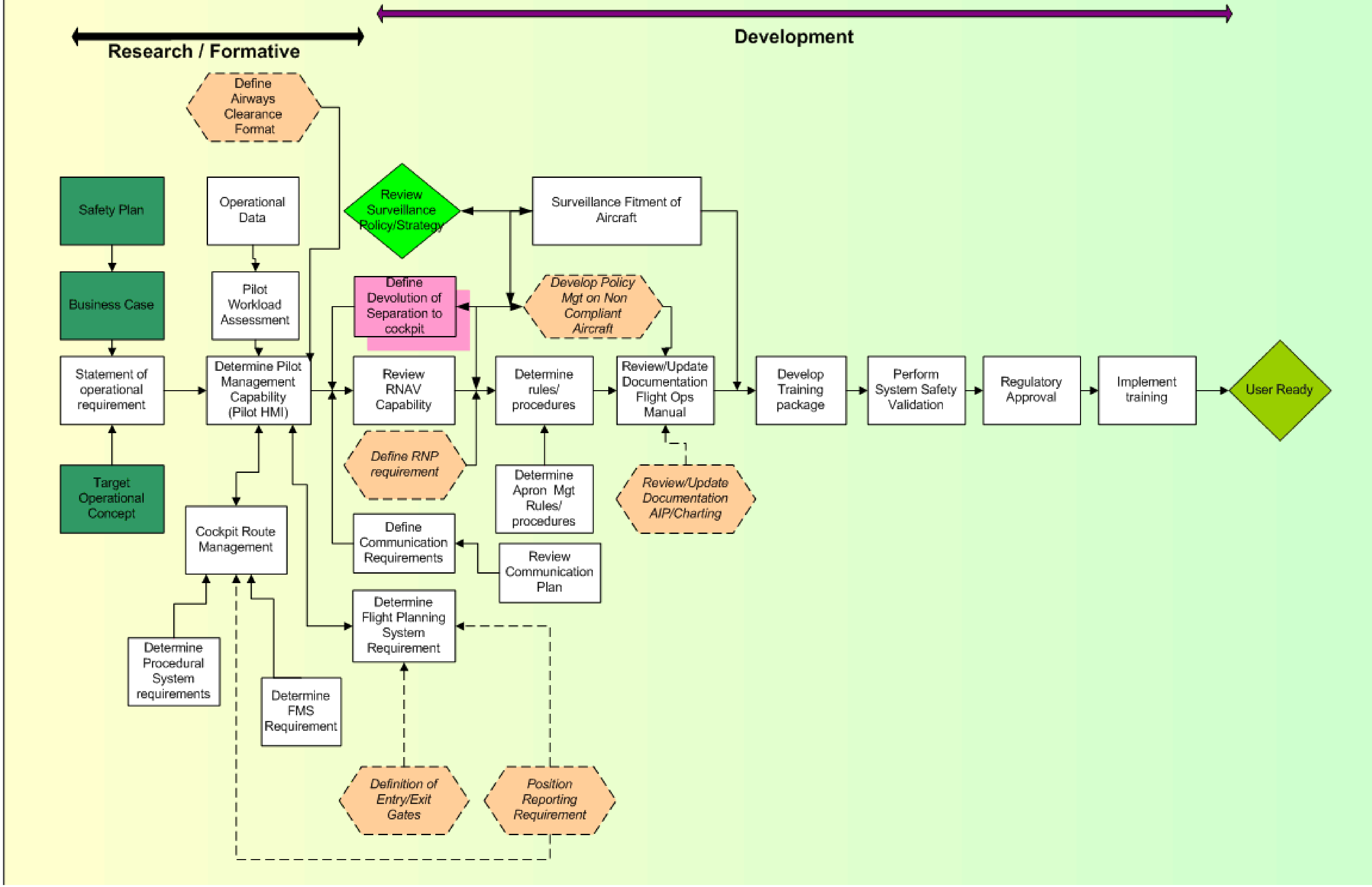
International Flex tracks (Stage 2) - User System Component



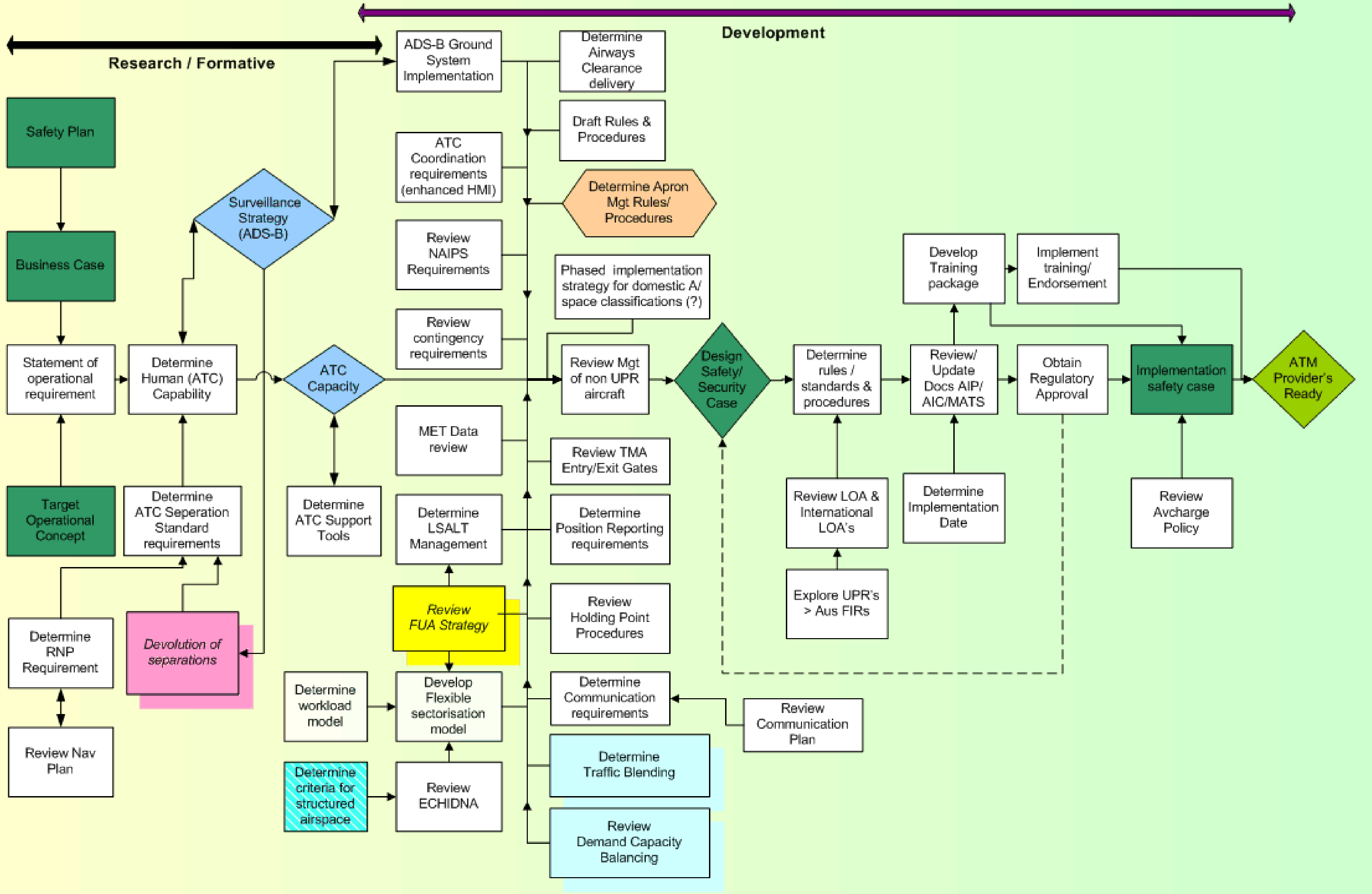
International UPRs (Stage 3) - Provider System Component



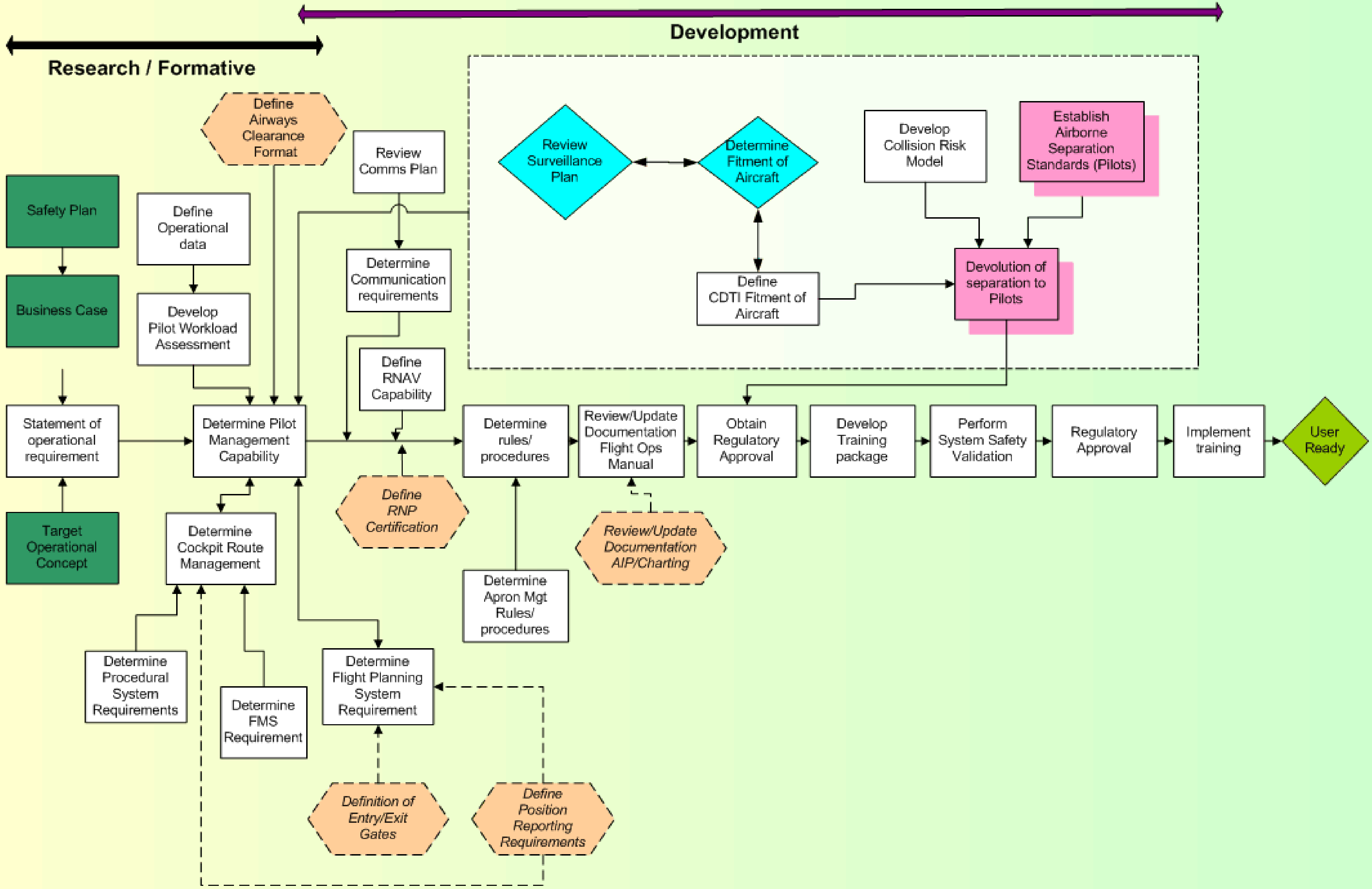
International UPRs (Stage 3) - User System Component



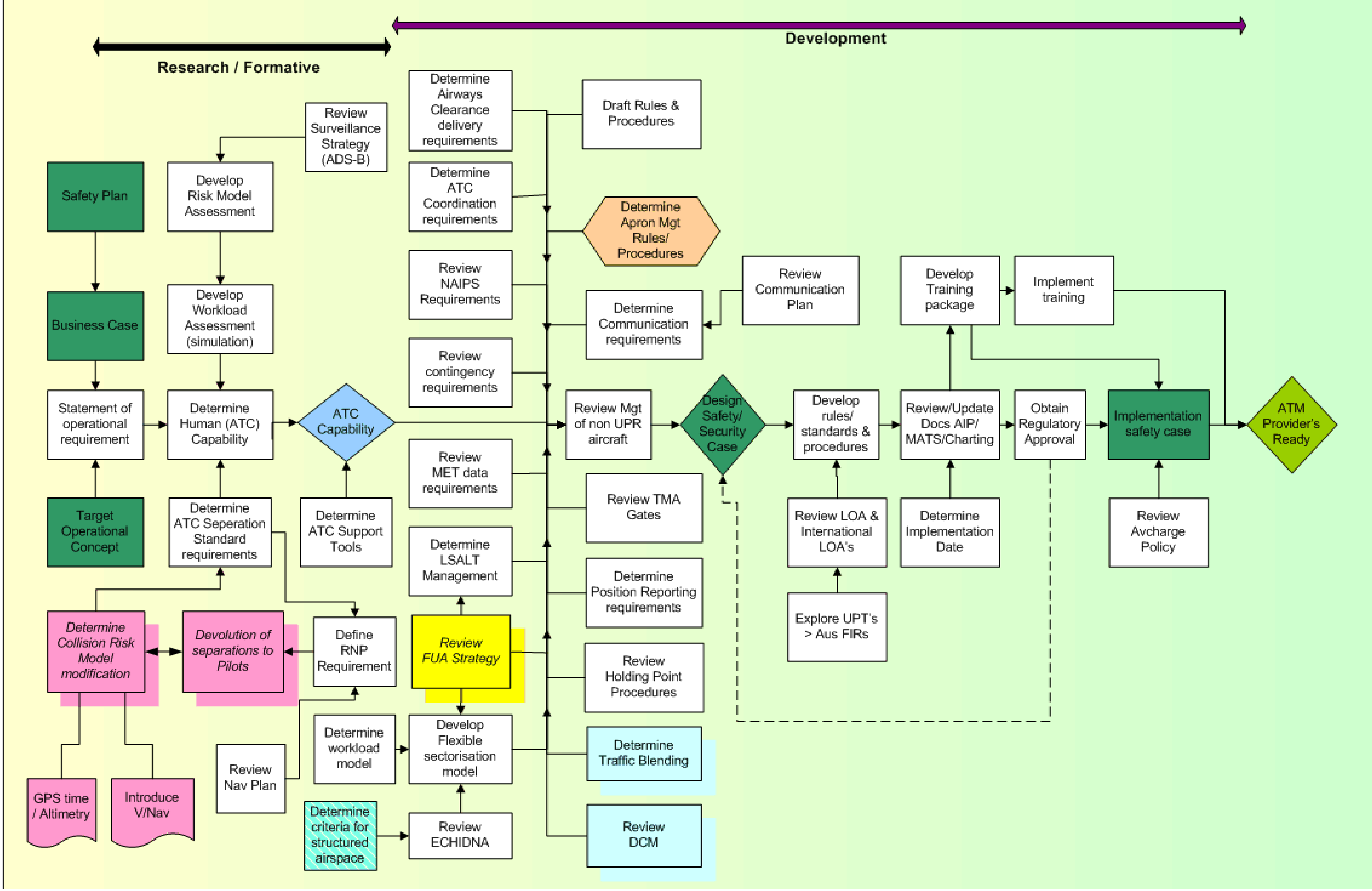
International + Domestic UPRs (Stage 4) - Provider System Component



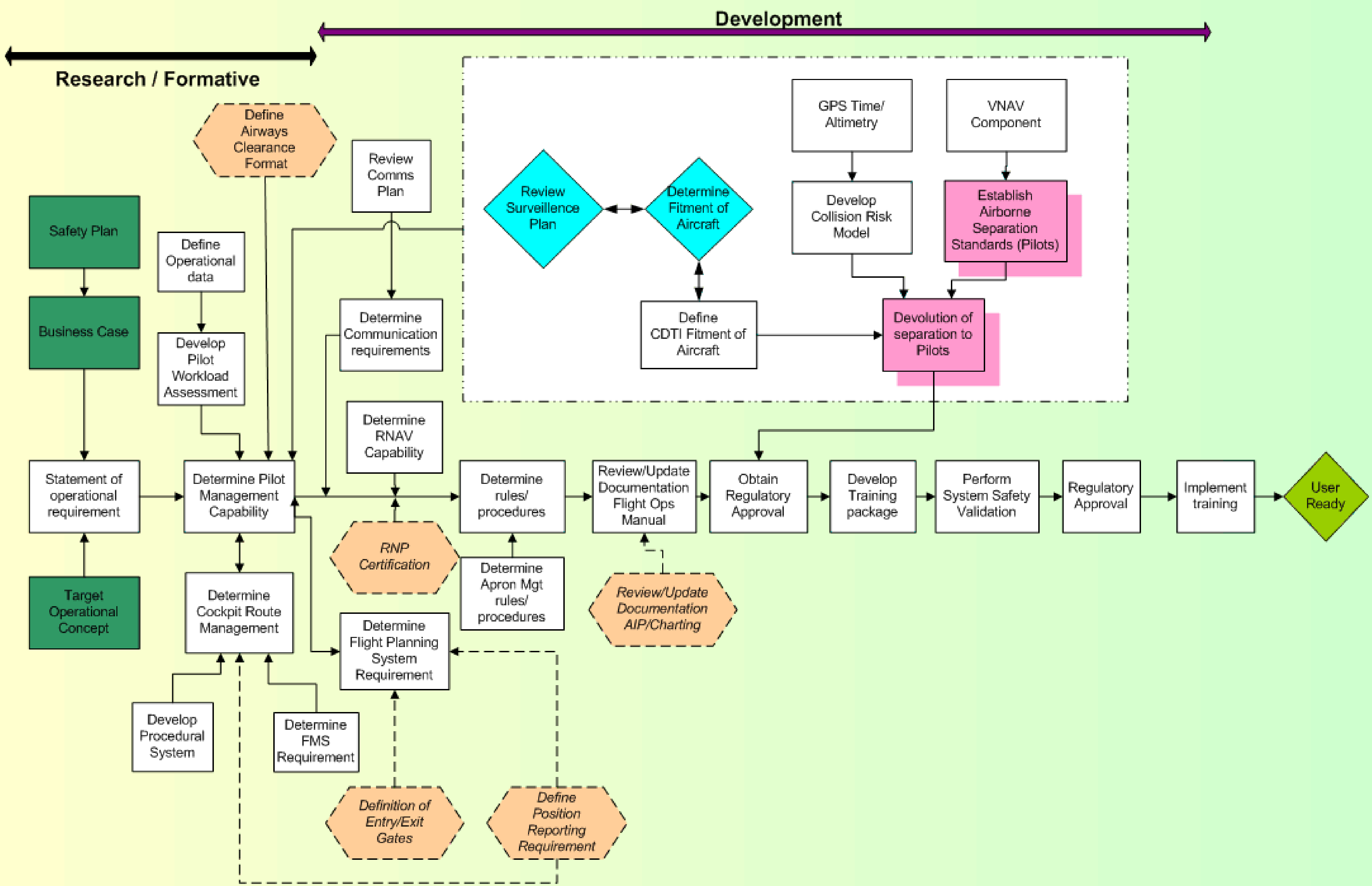
International + Domestic UPRs (Stage 4) - User System Component

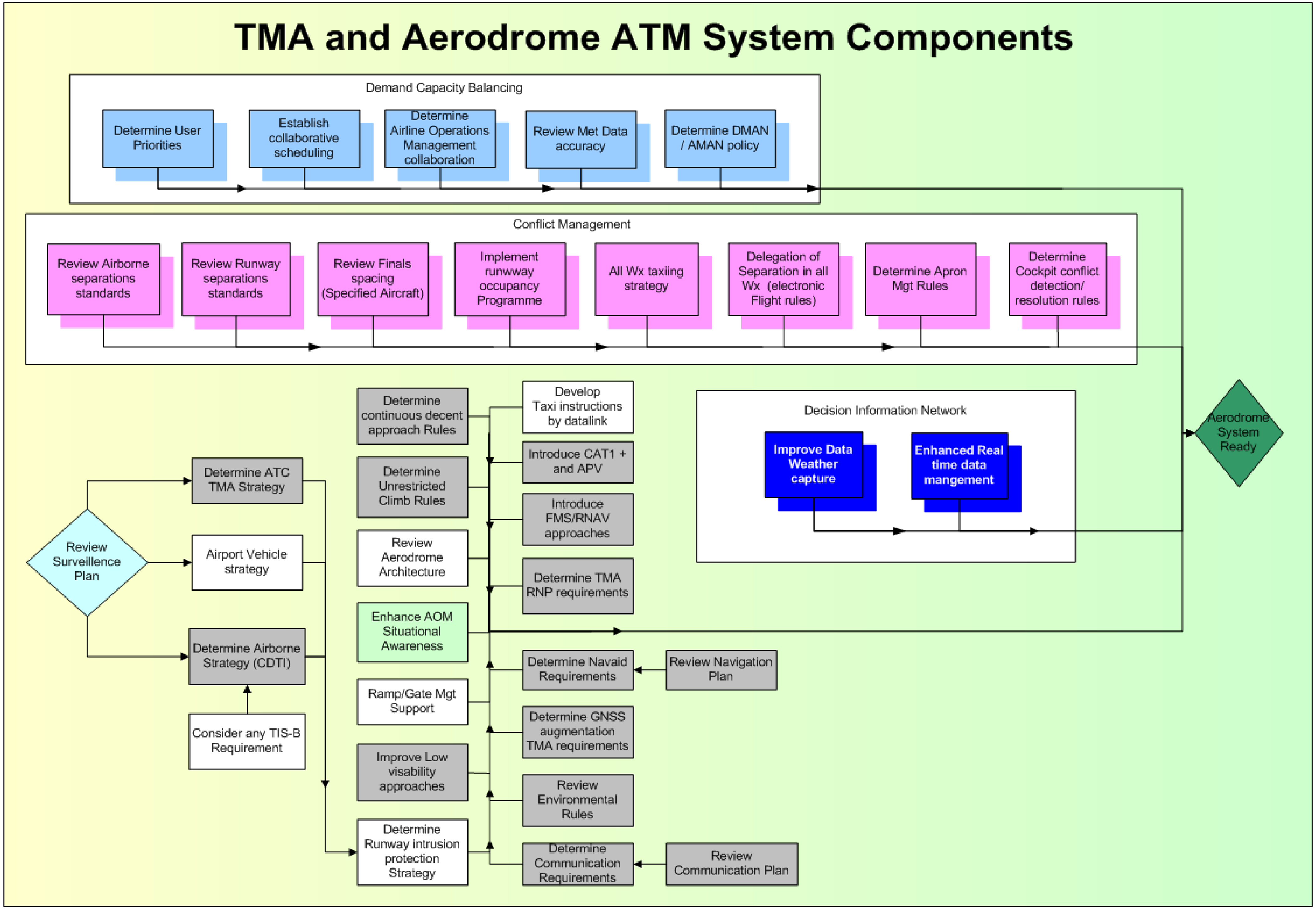


User Preferred Trajectories (Stage 5) - Provider System Component



User Preferred Trajectories (Stage 5) - User System Component




TMA and Aerodrome ATM System Components
Demand Capacity Balancing
Determine User Priorities
Establish collaborative scheduling
Determine Airline Operations Management collaboration
Review Met Data accuracy
Determine DMAN / AMAN policy
Conflict Management
Review Airborne separations standards
Review Runway separations standards
Review Finals spacing (Specified Aircraft)
Implement runwway occupancy Programme
All Wx taxiing strategy
Delegation of Separation in all Wx (electronic Flight rules)
Determine Apron Mgt Rules
Determine Cockpit conflict detection/ resolution rules
Aerodrome System Ready
Decision Information Network
Improve Data Weather capture
Enhanced Real time data mangement
Review Surveillence Plan
Determine ATC TMA Strategy
Airport Vehicle strategy
Determine Airborne Strategy (CDTI)
Consider any TIS-B Requirement
Determine continuous decent approach Rules
Determine Unrestricted Climb Rules
Review Aerodrome Architecture
Enhance AOM Situational Awareness
Ramp/Gate Mgt Support
Improve Low visability approaches
Determine Runway intrusion protection Strategy
Develop Taxi instructions by datalink
Introduce CAT1 + and APV
Introduce FMS/RNAV approaches
Determine TMA RNP requirements
Determine Navaid Requirements
Review Navigation Plan
Determine GNSS augmentation TMA requirements
Review Environmental Rules
Determine Communication Requirements
Review Communication Plan

3.2.3 Strategy 2 - Conflict Management

3.2.3.1 Overview

To support the future ATM system, conflict management must continue to be provided for the mitigation of the risk of collision to an aircraft along its trajectory through the system. Conflict avoidance is achieved through static or dynamic collision risk management which limits the risk of collision between aircraft and hazards to an acceptable target level of safety.

3.2.3.2 Transition

Two streams of work are required to transition to a fully Dynamic Risk Management environment, in support of User Preferred Trajectories.

Stream 1

This stream is focussed on refining and optimising existing static separation standards, as well as the development of new standards to support emerging ATM technologies. The development of standards and associated procedures will also be required to support cooperative, collaborative and autonomous separation modes.

Stream 2

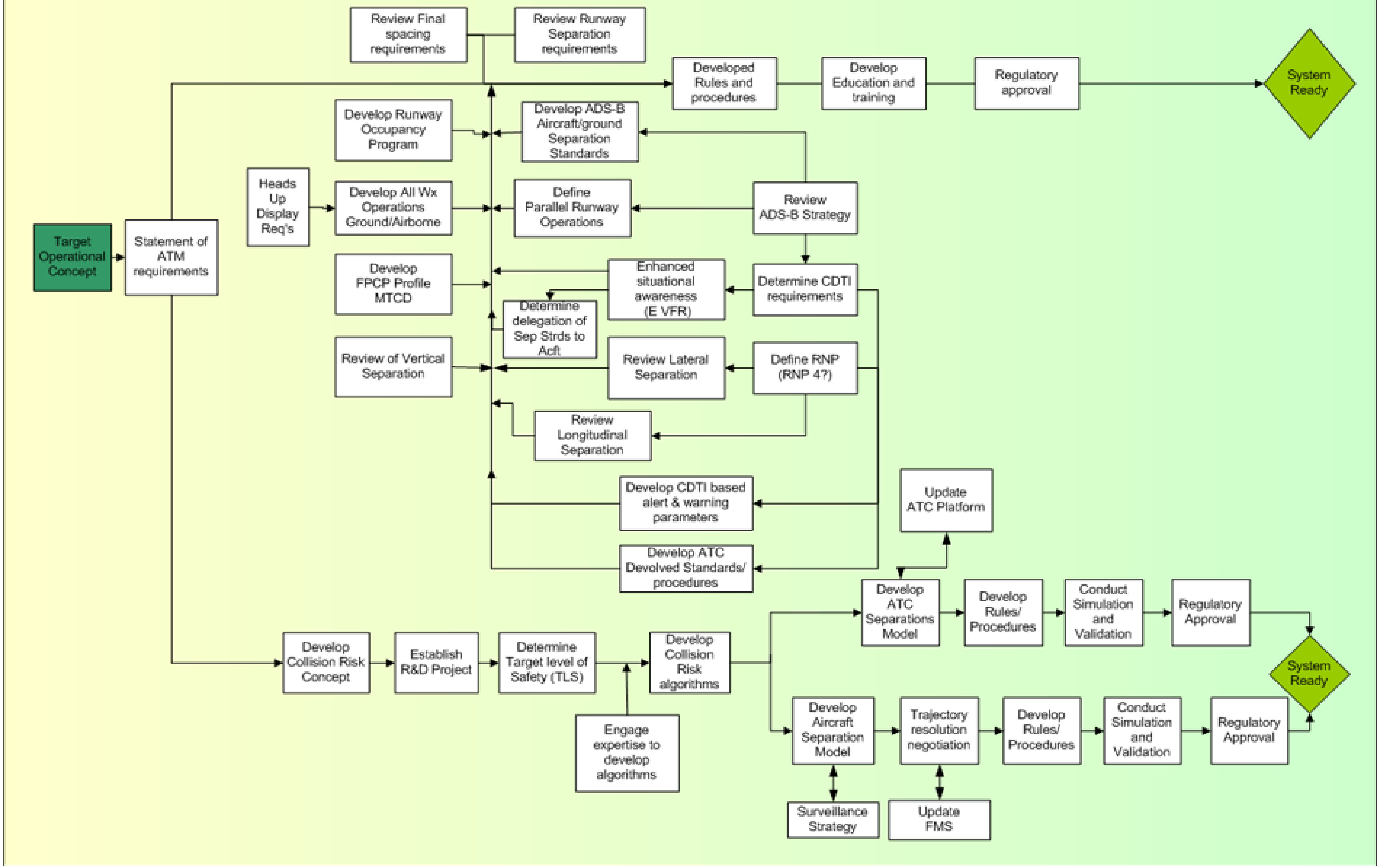
The traditional application of separation standards involving quantum spacing of aircraft in either the vertical, horizontal or lateral planes has its limitations. Composite separation is not applied in Australian airspace, and in limited form elsewhere (eg, North Atlantic). In order to obtain maximum flexibility and airspace capacity, a new concept of separation based on overall risk is required. This system will involve a comparison of aircraft trajectories to determine the risk of conflict between aircraft pairs. The development of sophisticated algorithms and modelling will be required to support this initiative. The new model will also support the shift from tactical to strategic application of separation through its incorporation in new traffic decision tools, particularly associated with aircraft operating on UPR/UPTs.

3.2.3.3 Benefits

The refinement of existing separation standards and the ultimate move to a risk based separation paradigm will:

- increase airspace and runway capacity;
- support UPR/UPTs;
- reduce delays;
- facilitate autonomous, collaborative and cooperative separation modes; and
- support the introduction of new traffic decision tools.

Conflict Management - ATM System Component



3.2.4 Strategy 3 - Flexible Use Airspace

3.2.4.1 Overview

The fundamental principle of Flexible Use Airspace (FUA) is that airspace should not be designated as purely civil or military, but rather considered as a continuum in which all user requirements should be accommodated to the greatest possible extent. FUA has been identified as an enabling activity to support the implementation of User Preferred Routes/User Preferred Trajectories (UPRs/UPTs).

Research of FUA activities conducted to date recognises the link between FUA, UPRs/UPTs and collaborative trajectory planning. This requires pilots, airline operations/navigation planning personnel, controllers and other traffic managers to have a shared model of airspace planning intent.

The introduction of FUA will enhance the management of aircraft by an ATM system that is able to recognise and attempt to achieve the UPT, whether that trajectory is in accordance with published air routes or not. FUA will: enable better access to airspace by both civil and military aircraft. The use of airspace segmentation and FUA would also provide a roam free capability for military aircraft.

3.2.4.2 Implementation

The successful implementation of the Concept of FUA is dependent upon the adoption of Collaborative Decision Making (CDM) philosophy. In developing the implementation strategy for FUA it has been identified that various stages will be introduced to support the introduction of UPRs/UPTs. The key enabling activities required to implement FUA are defined in the FUA implementation map on page 78 and are outlined below:

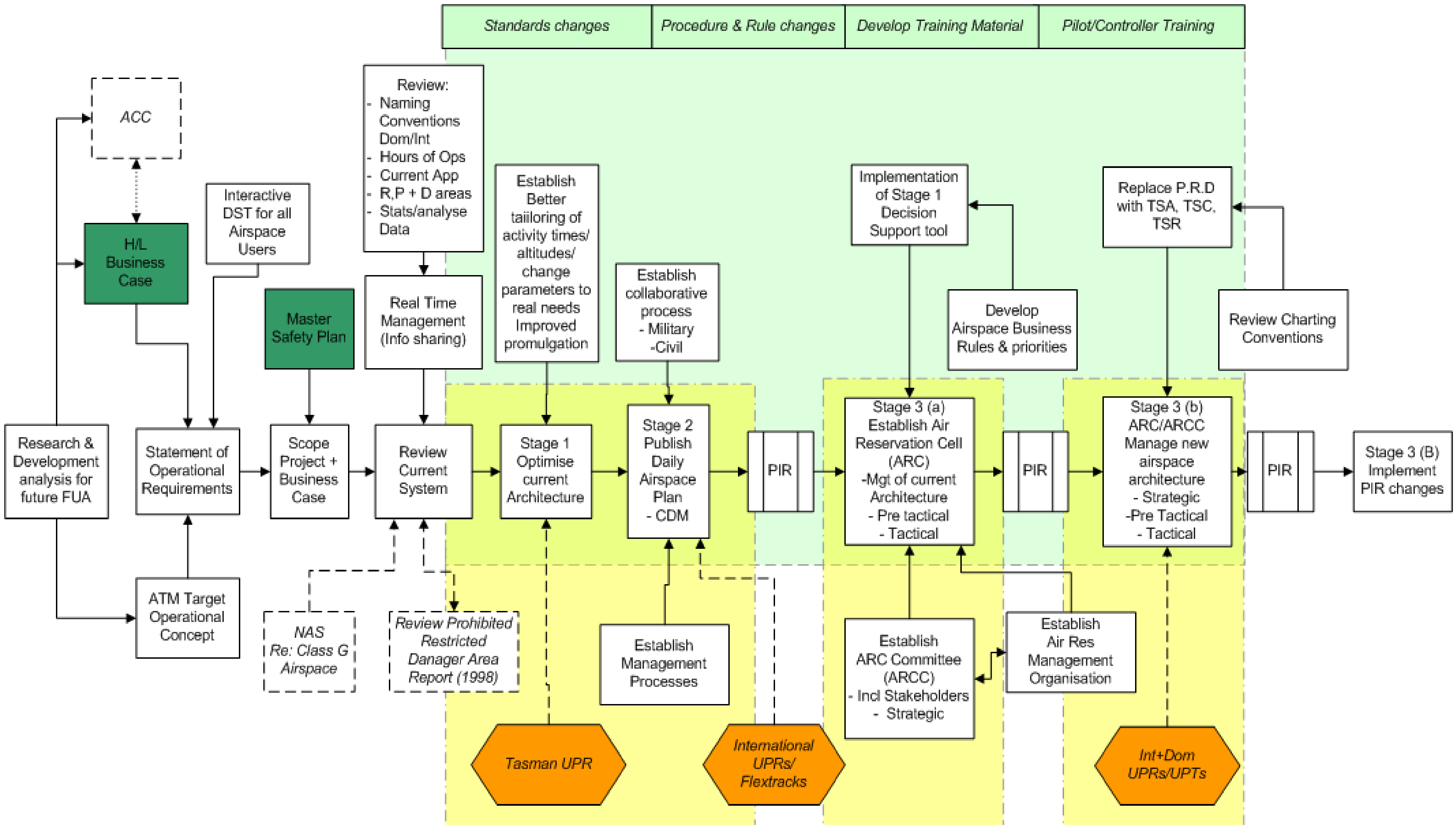
- conducting research and analysis of FUA developments by other Air Navigation Service Providers;
- conduct research and analysis of current australian restricted airspace architecture;
- conduct industry briefing and workshops with key stakeholders;
- development of FUA concept of operations, policies, rules and recommended practices and airspace architecture;
- if necessary, establish an Air Reservation Cell and Air Reservation Cell committee;
- development, agreement and promulgation of daily Airspace Plan;
- conduct phased implementation of FUA; and
- research the need for the development of a “decision support tool” to assist with FUA/ UPR activity.

3.2.4.3 Benefits

The implementation of Flexible Use of Airspace will provide specific benefits to industry with better utilisation of airspace, through both pre tactical and tactical management and strategic planning. It will provide a framework in support of user preferred routes and trajectories and will;

- enable airspace to be a resource for all users.
- Improve operational efficiency for industry by optimising flight paths utilizing on-board equipment;
- enhance safety by improved access to all airspace;
- allow optimisation of flight trajectories by reducing;
  - flight time;
  - fuel usage; and
  - emissions.
- enable the ability to dynamically resize and reshape airspace volumes;
- allow operational flexibility in the use of system tools; and
- permit greater ADF freedom of operations.

Flexible Use Airspace



3.2.5 Strategy 4 - Demand/Capacity Balancing

3.2.5.1 Overview

The overriding goal of demand/capacity balancing is to maximise the capacity provided whilst conforming to the Safety Process outlined in the Australian ATM Strategic Plan. Air Traffic Flow Management is central in coping with existing aircraft movements and the expected increase in aircraft movements. Air Traffic Flow Management has four main objectives:

- to assist safe operations by preventing traffic overload and providing a smooth flow of traffic;
- to minimise the costs incurred by operators when airspace or airport demand exceeds the agreed capacity;
- to improve capacity management and enhance efficiency wherever possible by optimising changes to airspace organisation, procedures, human resource management and environment; and
- to expand tactical and strategic flow management capabilities.

Air Traffic Flow Management is moving towards managing flights from inception until the flight arrives at the destination parking position.

Future Traffic Management requirements indicate a need to move towards a more sophisticated, adaptive and dynamic process that can operate to finer capacity and time limits. There needs to be a progressive emphasis on the efficient and collaborative management of resources and capacities at airports, in terminal areas and in en-route sectors, to meet demand.

Demand/capacity balancing consists of:

- An operational performance measurement and reporting system. (This being a sub component of strategy 6).
- A strategic and tactical capacity management system.

3.2.5.2 Implementation

Two phases have been determined for improving demand/capacity balancing to support the future ATM system. Phase 1 focuses on Operational Performance Measurement and phase 2 focuses on system optimisation. The key capabilities for each phase are identified below.

Phase 1

- Ensure relevant data is collected, validated and distributed to support the Performance measurement system.
- Identify, collect and validate demand and capacity data as applicable to system capacity components.
- Define DIN requirements to support the demand and capacity balancing.

Phase 2

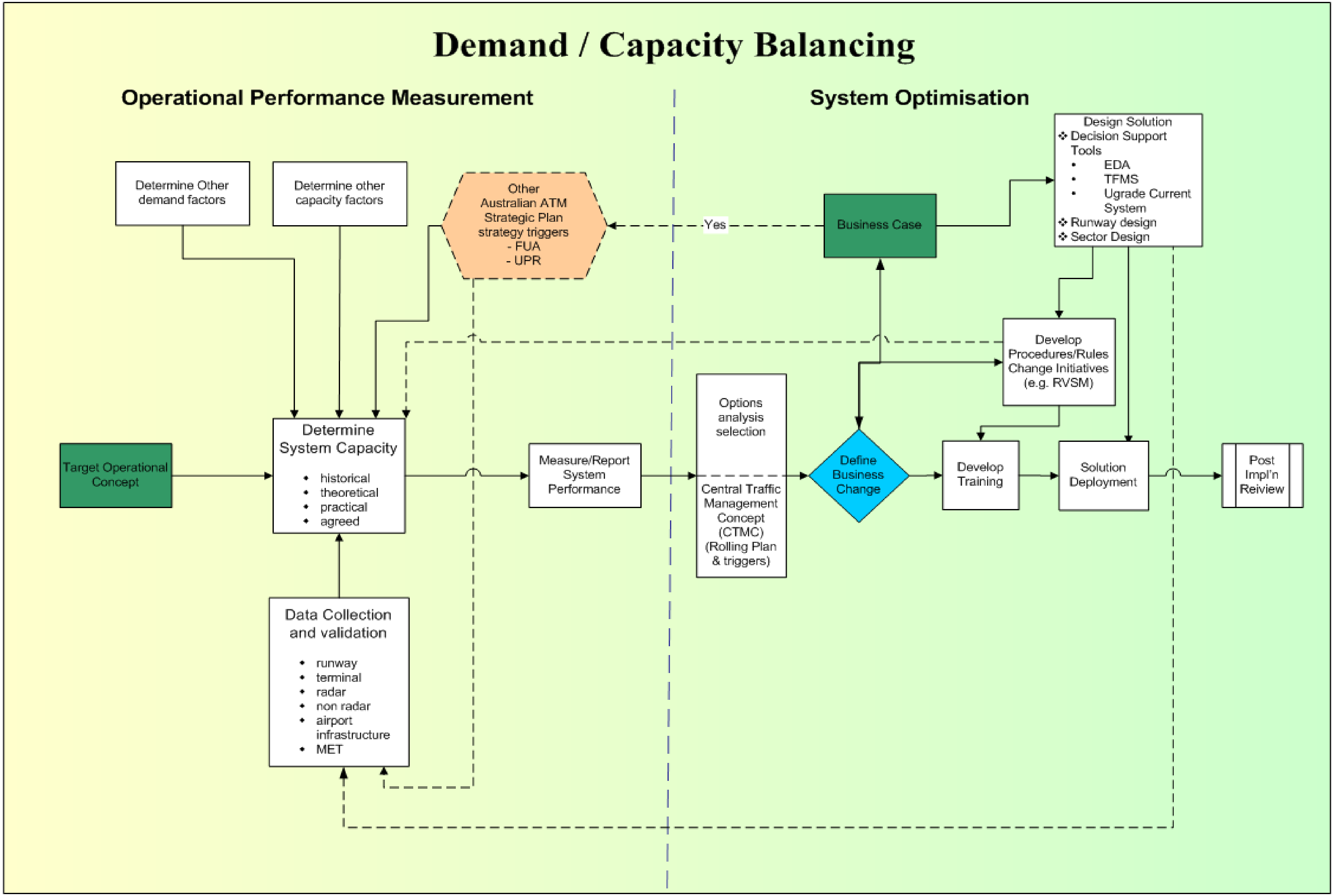
- Define and determine system capacity based on the following five elements:
  - Airport infrastructure;
  - Runway;
  - Terminal;
  - Radar; and
  - Non radar.
- Better matching capacity and demand both tactically and strategically to reduce airborne delays and associated operating costs and/or schedule efficiency;
- Optimization of flight profiles to recognize industry requirement for schedule maintenance, operating cost effectiveness, or fuel efficiency;
- Better utilizing ground system capabilities and standardising ATC operating procedures for capacity management and traffic sequencing;
- Determine the central air traffic flow management concept;
- Determine trigger criteria for future implemention of changed air traffic management components;
- Identify various options for system enhancement;
- Identify any system design changes including associated DSTs required to implement DCB; and
- Identify and develop rules and procedure to support DCB.

3.2.5.3 Benefits

Demand/Capacity balancing will provide specific benefits to industry with better utilisation of airspace and airport capacity, through both strategic and tactical management. It will provide a framework in support of the ATM Target Operational Concept and will:

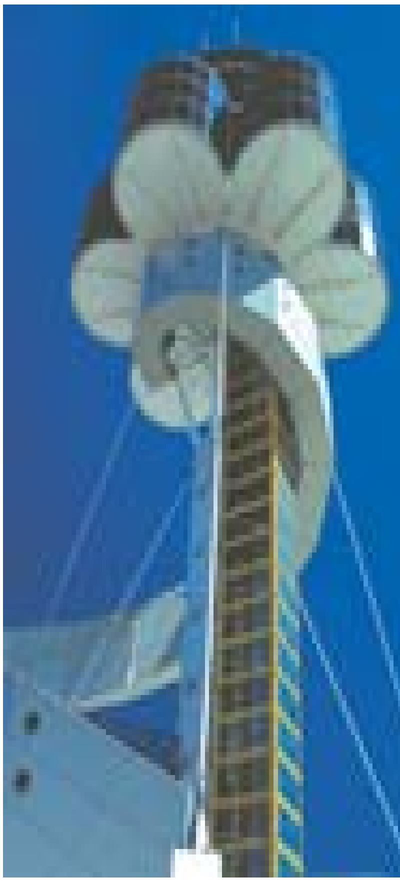
- improve scheduling methodology agreed between customers/stakeholders;
- establish scheduling and sequencing principles;
- establish a valid methodology of determining airport capacity;
- determine agreed departure and flow management policy;
- improve slot management methodology;
- determine agreed methodology for future aerodrome design and architecture;
- reduce workload for ATC's and Pilots enabling more efficient use of resources;
- allow airlines to structure their flights to achieve:
  - reduction in Time;
  - reduction in fuel usage;
  - reduced environmental impact;
  - spread and distribution of traffic load.
- allow the ability to dynamically resize and reshape airspace volumes;

- optimize airport acceptance rates; and
- optimize sector acceptance rates.


Demand / Capacity Balancing
Operational Performance Measurement
System Optimisation
Determine Other demand factors
Determine other capacity factors
Other Australian ATM Strategic Plan strategy triggers
- FUA
- UPR
Yes
Business Case
Design Solution
❖ Decision Support Tools
• EDA
• TFMS
• Ugrade Current System
❖ Runway design
❖ Sector Design
Develop Procedures/Rules Change Initiatives (e.g. RVSM)
Target Operational Concept
Determine System Capacity
• historical
• theoretical
• practical
• agreed
Measure/Report System Performance
Options analysis selection
Central Traffic Management Concept (CTMC) (Rolling Plan & triggers)
Define Business Change
Develop Training
Solution Deployment
Post Impl'n Reiview
Data Collection and validation
• runway
• terminal
• radar
• non radar
• airport infrastructure
• MET

3.2.6 Strategy 5 - Decision Information Network

3.2.6.1 Overview



The current ATM information network consists of various systems to support individual business functions. This strategy aims to provide a more holistic view of these systems to better meet customer's information needs. The implementation maps detailed in Volume 2, Chapter 3 define the various components and the key enabling activities to develop a Decision Information Network (DIN). The DIN is based on the strategic and tactical provision of quality assured and timely operational data in support of current and future ATM operations.

The DIN will provide data collection and integration and ensure data quality and integrity, to provide an information rich planning and operating environment. It involves the best integration of reference, operational data, and the management, sharing and distribution of that data.

3.2.6.2 Implementation

This strategy is integral to all of the other ATM strategies identified in the Australian ATM Strategic Plan. It provides the necessary information and tools to undertake essential ATM business functions and initiatives. There are five major tasks to this strategy:

- review current systems (both architectures and data) in relation to ATM's identified requirements and develop strategies to better meet these requirements;
- develop an authoritative source of reference data for use by ATM systems;
- develop an operational data source and supporting systems for use by ATM;
- develop an authoritative source of historical data capturing ATM data for reporting systems. This data will also feed into financial and human resource systems; and
- enhance and redevelop client applications of all stakeholders.

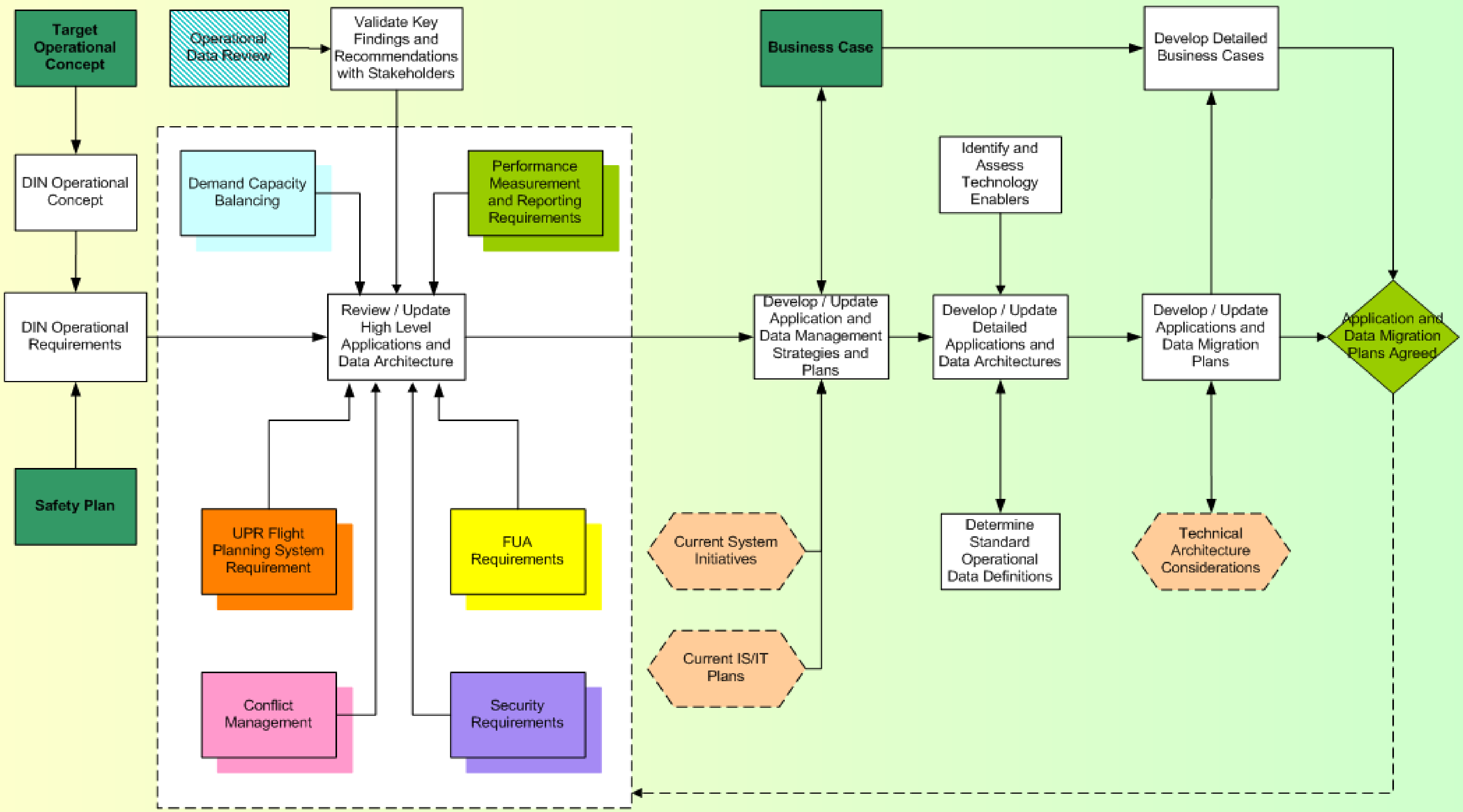
3.2.6.3 Benefits

This strategy is integral to all of the other ATM strategies identified for the Australian ATM Strategic Plan. It provides the necessary information and tools to undertake essential ATM business functions and initiatives. By reviewing the current ATM systems in an holistic manner and identifying system requirements for supporting business functions and initiatives, ATM will develop a DIN that provides essential and timely information through user focused tools.

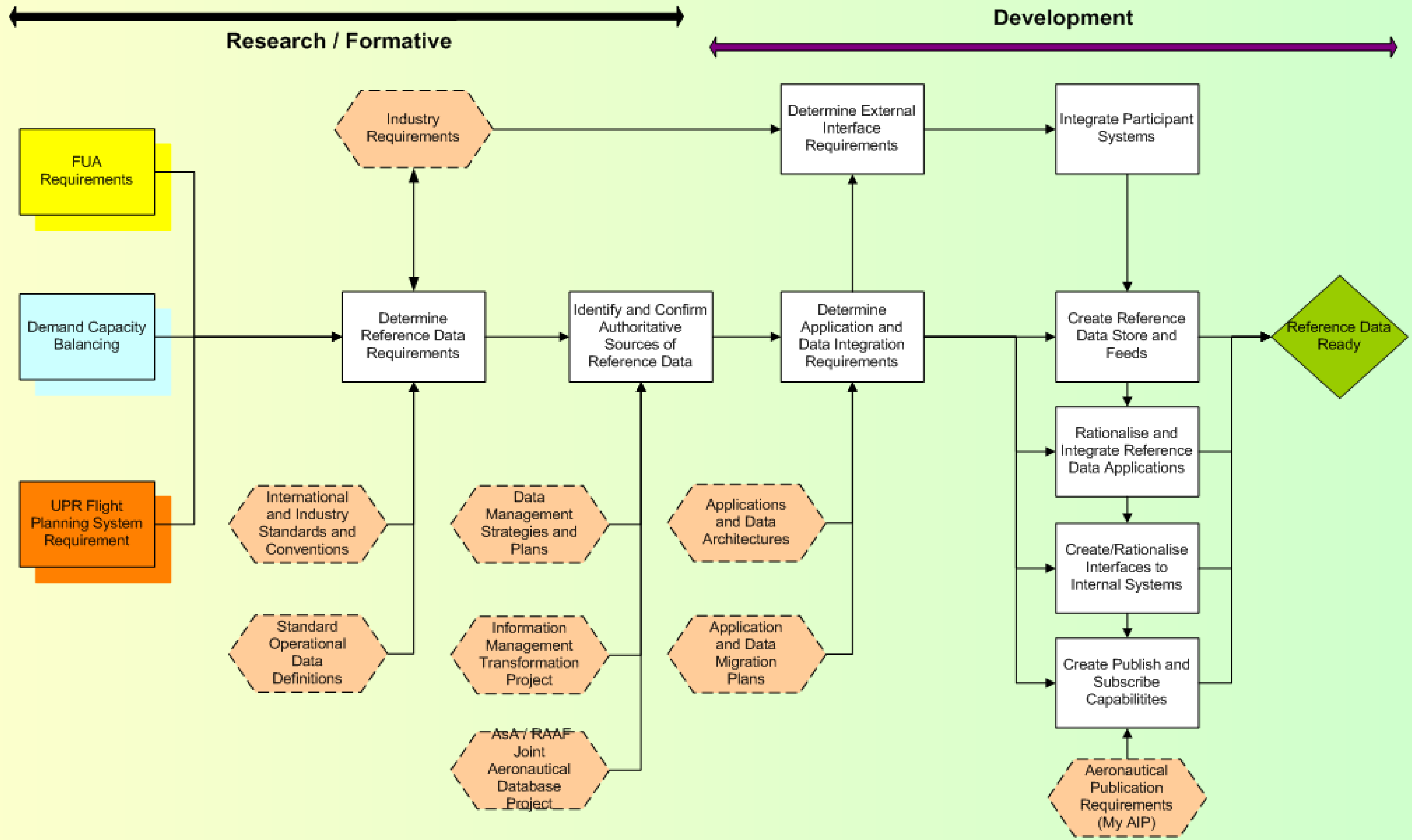
The DIN strategy will help facilitate the implementation of User Preferred Trajectories allowing better utilisation of airspace and airport capacity, through both tactical management and strategic planning. It will provide a framework in support of the ATM Target Operational Concept and will:

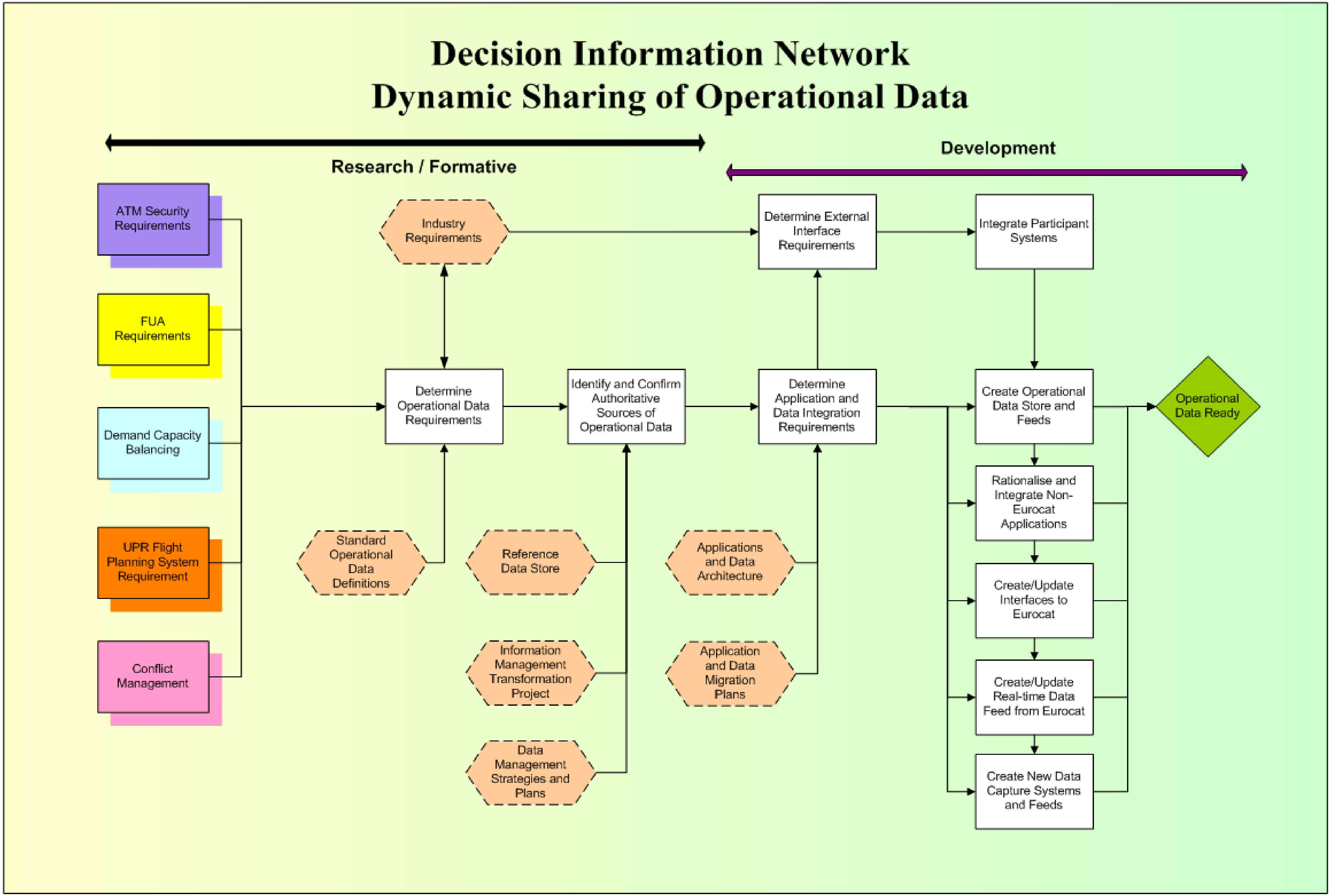
- improve operational efficiency for industry by optimising flight paths utilizing on-board and ground based equipment;
- reduce workload for ATC's and pilots enabling more efficient use of resources;
- provide the ability to dynamically resize and reshape airspace volumes; and
- provide operational flexibility in the use of system tools.

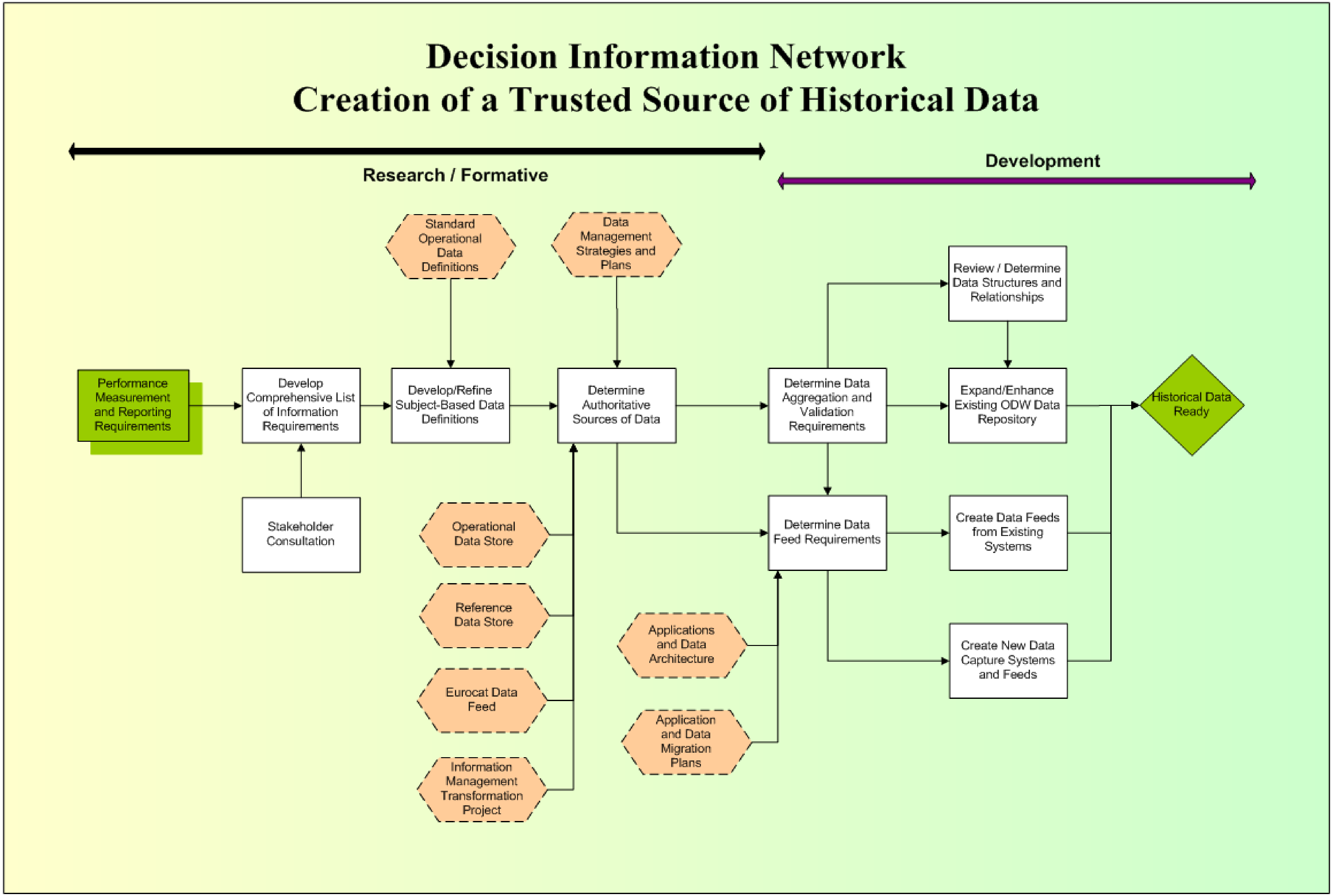
Decision Information Network
Applications and Data Migration Plans



Decision Information Network
Common Sourcing and Classification of Data




Decision Information Network
Dynamic Sharing of Operational Data
Research / Formative
Development
ATM Security Requirements
FUA Requirements
Demand Capacity Balancing
UPR Flight Planning System Requirement
Conflict Management
Industry Requirements
Determine Operational Data Requirements
Standard Operational Data Definitions
Identify and Confirm Authoritative Sources of Operational Data
Reference Data Store
Information Management Transformation Project
Data Management Strategies and Plans
Determine External Interface Requirements
Determine Application and Data Integration Requirements
Applications and Data Architecture
Application and Data Migration Plans
Integrate Participant Systems
Create Operational Data Store and Feeds
Rationalise and Integrate Non-Eurocat Applications
Create/Update Interfaces to Eurocat
Create/Update Real-time Data Feed from Eurocat
Create New Data Capture Systems and Feeds
Operational Data Ready


Decision Information Network
Creation of a Trusted Source of Historical Data
Research / Formative
Development
Standard Operational Data Definitions
Data Management Strategies and Plans
Review / Determine Data Structures and Relationships
Performance Measurement and Reporting Requirements
Develop Comprehensive List of Information Requirements
Develop/Refine Subject-Based Data Definitions
Determine Authoritative Sources of Data
Determine Data Aggregation and Validation Requirements
Expand/Enhance Existing ODW Data Repository
Historical Data Ready
Stakeholder Consultation
Operational Data Store
Determine Data Feed Requirements
Create Data Feeds from Existing Systems
Reference Data Store
Applications and Data Architecture
Create New Data Capture Systems and Feeds
Eurocat Data Feed
Application and Data Migration Plans
Information Management Transformation Project

3.2.7 Strategy 6 - ATM System Performance Measurement & Reporting System

3.2.7.1 Overview

The Plan defines six system goals which are critical to the measurement of the performance of the ATM system. The system goals are safety, economy, operational efficiency, environment, national security and national coverage. These system goals are linked and interdependent. Therefore, performance is measured and managed across several dimensions, not just operational efficiency and economy, creating a balanced view of performance of the entire ATM system. Key Performance Indicators identified in Volume 1, Chapter 4 of the Plan have been assigned for each system goal to measure the performance of the ATM system as a whole.

3.2.7.2 Implementation

ASTRA has formulated a programme to progress the ATM Performance Management Strategy. The aim of the programme is to develop an ATM Performance Measurement and Reporting System (APMRS), based on the Balanced Scorecard (BSC) approach, to:

- measure and report the efficiency and effectiveness of the ATM system; and
- provide performance information to develop and implement strategies either collectively, or through individual stakeholder organisations, to address ATM system performance issues.

The programme will include several projects. The first project will develop a performance measurement and reporting system, consistent with the overall programme goal, using the current measurable KPIs. Further projects will develop systems to measure existing KPIs and develop new KPIs as appropriate. The key enabling activities required to implement this strategy are shown in the implementation map on page 88.

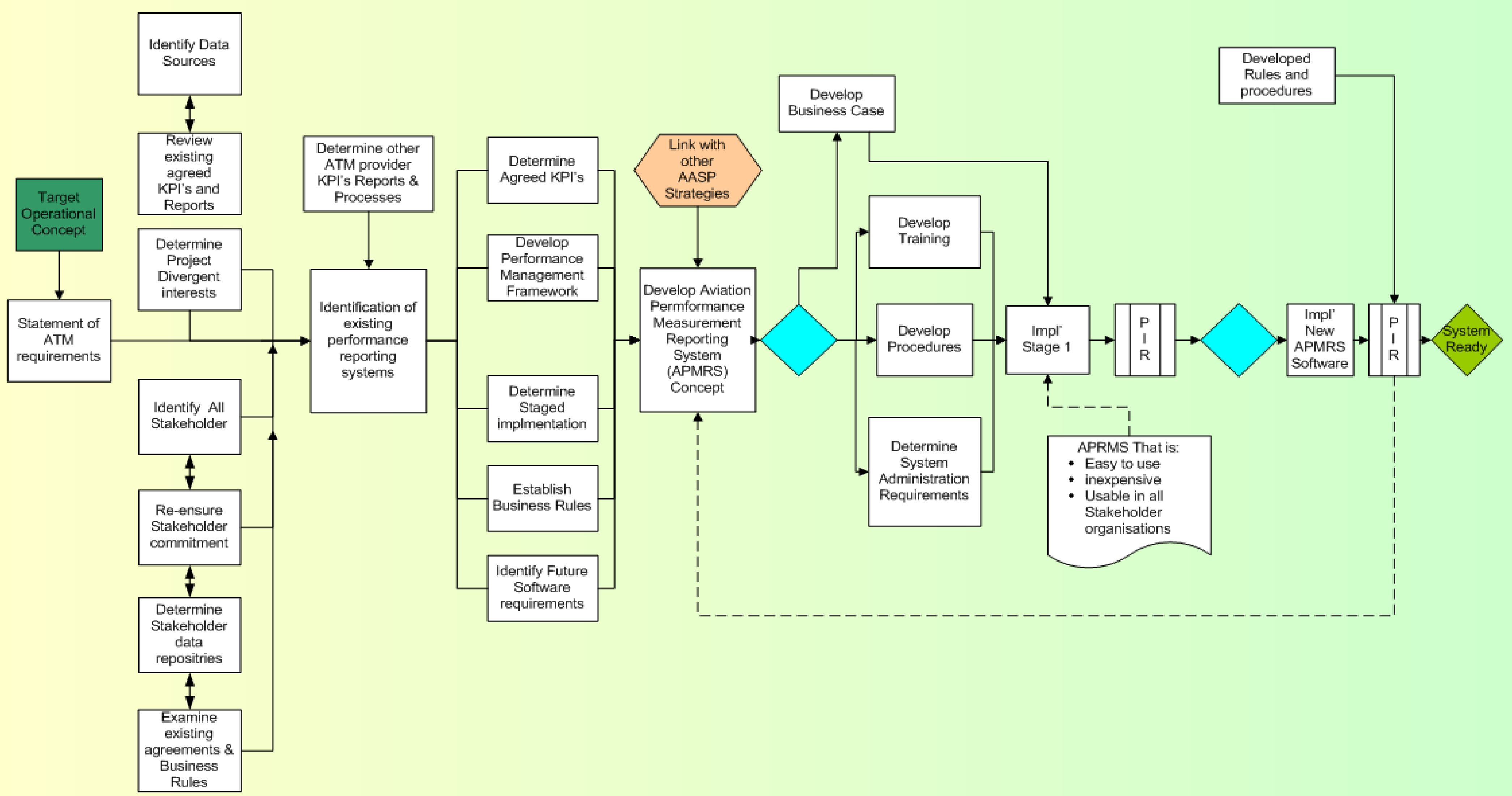
3.2.7.3 Benefits

Developing an APMRS which reports on the performance of the whole ATM System will:

- provide better knowledge of the current & future health of the ATM system through timely, accurate and accessible information providing the basis for better quality decision making;
- enable appropriate corrective action as a result of causal analysis;
- provide information on the effectiveness and efficiency of the ATM system;
- provide an input to risk management;
- highlight inter dependencies and relationships between elements of the system;
- facilitate collaborative decision making;
- provide information to help identify limitations of the ATM system;
- inform the review process of the Operational Concept and implementation of the Plan;
- provides an important input to enable better investment decision-making (e.g. at a time of marginal return on investment accurate measurement is essential);
- provide information that enables prioritisation of strategies;

- provide the potential for bench marking performance against other ATM systems around the world; and
- drive a culture of continuous improvement.

Performance Management - ATM System Component



3.2.8 Strategy 7- National Security Assurance Model

3.2.8.1 Overview

The development of the ATM system to support national security requirements has assumed greater significance following recent world events, particularly those relating to terrorism. As a result the Plan has identified a new strategy to address this issue. The key enabling activities have been identified to develop a National Security Assurance Model - to ensure compliance with National Security imperatives as well as the security and integrity of the ATM system itself.

One of the key planks in the Security Framework for the Plan is the provision of security oversight on all changes to the ATM System. The introduction of a “Security Case” to address security threats and risks, in the same way that a “Safety Case” already addresses safety hazards, will be fundamental in ensuring, to the extent possible, that the Australian ATM System is protected from vulnerabilities in a technical context as well as from acts of terrorism or other malicious attack.

3.2.8.2 Implementation

To ensure that all future ATM system development supports national security, the need to develop a robust Security Case template for inclusion in the standard suite of project documentation and all ATM change processes has been identified. The design of the Security Case model will incorporate the following:

- The ATM Target Operational Concept;
- legislative and administrative boundaries relating to Security oversight of ATM Operations and future development;
- security policy;
- security case scope;
- security protocols; and
- ATM stakeholder education.

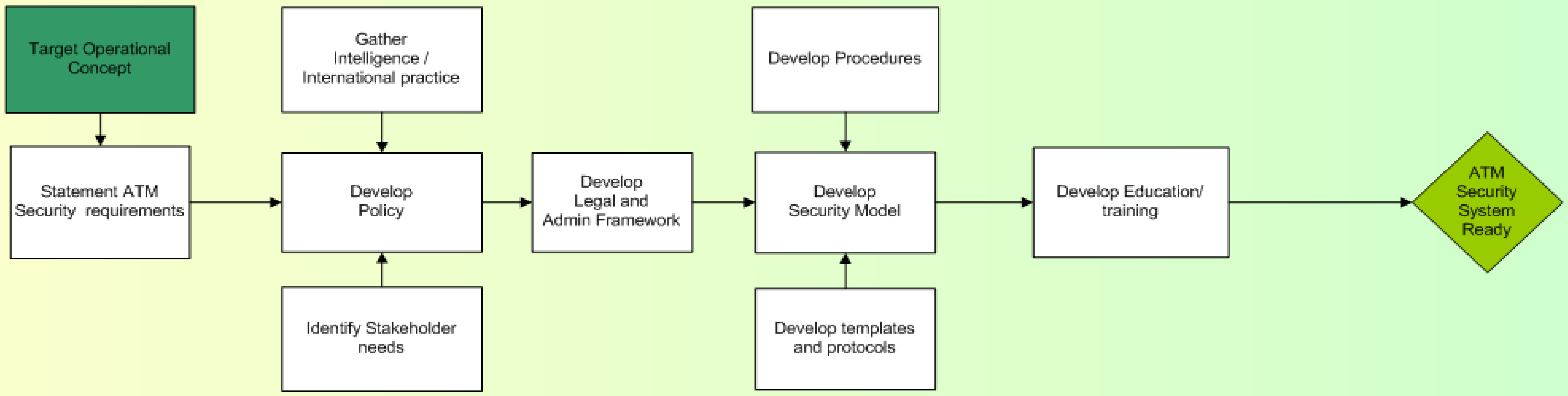
3.2.8.3 Benefits

The implementation of a Security Case will provide the rigour required to ensure consideration of security threats and intelligence at two levels during the development of any ATM change process.

The first level is the technical security context of the change. These are the security issues which arise directly from or are inherent to the use or introduction of the technology or procedure. For example the introduction of ADS-B technology in Australia would consider any security aspects within the technology itself, such as how the signal transmitted from the aircraft may be able to be distorted intentionally and what countermeasures are built-in to the software processing to determine that is has occurred and/or can be repaired.

The second level is the holistic security context of the change. How does this change affect the security of other technologies, although some of these issues will have come to light in a technical context, how we can protect from intrusion and interference to the change? These types of questions, when answered, will provide the major benefit of ensuring the system is as robust, from a security and thus operational availability context, as possible.

ATM National Security System Component



AUSTRALIAN ATM STRATEGIC PLAN IMPLEMENTATION MAP LEGEND

Capability to be developed by other system component

Capability to be developed by supporting Conflict Management Strategy

Capability to be developed by User Preferred Strategy

Capability to be developed by Decision Information Network Strategy

Capability to be developed by Flexible Use Airspace Strategy

Capability to be developed by Performance Management & System Strategy

Capability to be developed by National Security Strategy

Common Activity across all Stages of implementation

Decision Point

Final Decision Point

Comments

Beneficial Activity

Completed Activity

Glossary of Acronyms

Numerics

4D	Four Dimensions

A

ACAS	Aircraft Collision Avoidance System
ACC	Air Coordinating Committee
ADS	Automatic Dependent Surveillance
AIS	Aeronautical Information Service
AOC	Air Operators Certificate
AOM	Aircraft Operational Management
ASTRA	The Australian Strategic Air Traffic Management Group
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATIS	Automatic Terminal Information System
ATM	Air Traffic Management
ATS	Air Traffic Services

C

CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority ,
CDB	Demand / Capacity Balancing
CNS	Communciation, Navigation and Surveillance
CTA/	Control Area
CTR	Control Zone

D

DAH	Designated Airspace Handbook
DARP	Dynamic Air Route Planning ,
DIN	Decision Information Network

E

EET	Estimated Elapsed Time
ESET	Estimated System Entry Time ,
ESXT	Estimated System Exit Time
ETD	Estimated Time of Departure
ETO	Estimated Time Over

F

FIRs	Flight Information Regions
FMS	Flight Management System
FUA	Flexible Use Airspace

G

GAAP	General Aviation Aerodrome Procedures

H

HMI	Human machine interface

I

ICAO	International Civil Aviation Organization
IFER	In-Flight Emergency Response
IFR	Instrument Flight Rules

L

LAHSO	Land And Hold Short Operations

M

MOS	Manual of Operating Standards

N

NOTAM	Notice To Air Man

O

OOTW	Operations other than war

P

PANS	Procedures for Air Navigation Services
PIC	
POB	People On Board
PRM	Parallel Runway Monitor
PSET	Programmed System Entry Time
PSXT	Programmed System Exit Time
PVD	Plan View Display

R

RAC	Rules of the Air and Air Traffic Services

S

SAR	Search and Rescue
SIDs	Standard Instrument Departures
STARs	Standard Terminal Arrival Routes

T

TAS	True Air Speed
TIBA	Traffic Information Broadcast by Aircraft
TMA	Terminal Area
TMS	Traffic Management Services
TOC	Target ATM Operational Concept

U

UAVs	Uninhabited Aerial Vehicles
UPT	User Preferred Trajectory

V

VFR	Visual Flight Rules