Asia and Pacific Initiative to Reduce Emissions (ASPIRE)

Strategic Plan

Version 6.5

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1 Introduction

The air transportation industry is essential for future economic growth and development, trade and commerce, cultural exchange and understanding among peoples and nations. Today it provides approximately 32 million direct and indirect jobs worldwide. Aircraft carry approximately 40% of the value of all world trade. In 2007, more travellers than ever before, nearly 2.2 billion people flew on the world's scheduled air carriers, with predictions of 9 billion passengers by 2025. In the Asia Pacific region, the rapid movement of people and materials provided by aviation will be crucial to continued economic growth and development over the next few decades.

The aviation sector has a long and distinguished record of environmental achievement. Relative to other industries that emit global greenhouse gases (GHG), aviation's contribution represents only 3% of global greenhouse gas emissions. Technological advancement has significantly reduced aircraft fuel consumption and emissions on a per passenger basis over the last 30 years, and the industry is committed to improving on this record. But we face a real challenge in the Asia & Pacific region as air transport activity is expected to continue to grow steadily throughout the region.

In order to meet the growing regional demand for air transportation, while maintaining the industry's leadership position, it is essential for Asia and Pacific aviation partners to collaborate on environmental stewardship.

Prepared and endorsed by

1.1 The ASPIRE Partnership

1.1.1 History

On February 18, 2008, a multi-lateral partnership known as the Asia and Pacific Initiative to Reduce Emissions (ASPIRE) was created in Singapore. The first air navigation service providers (ANSPs) to sign the ASPIRE joint statement were Airservices Australia, Airways New Zealand, and the Federal Aviation Administration.

Since 2008 ASPIRE has expanded to include the Japan Civil Aviation Bureau (JCAB) and the Civil Aviation Authority of Singapore (CAAS) as major partners.

Aeronautical Radio of Thailand Limited (AEROTHAI) formally joined the ASPIRE partnership in June 2011.

ASPIRE also enjoys the invaluable support of a number of partner airlines.

1.1.2 The ASPIRE Commitment

The partners under ASPIRE are committed to work closely with airlines and other stakeholders in the region in order to:

- accelerate the development and implementation of operational procedures to reduce the environmental footprint for all phases of flight on an operation by operation basis, from gate to gate;
- facilitate world-wide interoperability of environmentally friendly procedures and standards;
- capitalise on existing technology and best practices;
- develop shared performance metrics to measure improvements in the environmental performance of the air transport system;
- provide a systematic approach to ensure appropriate mitigation actions with short, medium and long-term results; and
- communicate and publicise ASPIRE environmental initiatives, goals, progress and performance to the global aviation community, the press and the general public.

1.1.3 Support of ICAO Objectives

The ASPIRE partners will ensure that ASPIRE is in support of the ICAO environmental and Strategic Objective**s**[1] and initiatives, including the Global Plan initiatives and initiatives found in the Global Air Navigation Capacity and Efficiency plan.

1.1.3.1 Strategic Objectives

Strategic Objective C: Environmental Protection and Sustainable Development of Air Transport – Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment.

[1] Strategic Objectives of ICAO: Consolidated Mission and Vision Statement, 10 December, 2010

1.1.3.2 Global Plan Initiatives

The ICAO Global Air Navigation Plan outlines a number of initiatives (GPIs) designed to support planning and implementation of performance objectives in the regions. The following Global Plan Initiatives relate directly to ASPIRE.

- **GPI-5 - RNAV and RNP (Performance-Based Navigation)**

  The implementation of Performance Based Navigation (PBN) will facilitate increased airspace capacity and efficiency through reductions in separation minima. RNAV and RNP navigation capabilities can be exploited to develop efficient routes and trajectories.

- **GPI-6 - Air Traffic Flow Management**

  The implementation of strategic, tactical and pre-tactical measures aimed at organizing and handling traffic flows in such a way that the totality of the traffic handled at any given time or in any given airspace or aerodrome is compatible with the capacity of the ATM system.

- **GPI-7 - Dynamic and Flexible ATS Route Management**

  The establishment of more flexible and dynamic route systems, on the basis of navigation performance capability, aimed at accommodating preferred flight trajectories.

- **GPI-11 - RNP and RNAV Standard Instrument Departures (SIDS)**

and Standard Terminal Arrivals (STARS)

  The optimization of the terminal control area (TMA) through implementation of improved ATS route structures based on RNP and RNAV, connecting the en-route phase of flight with the final approach, based on improved coordination processes.

- **GPI-17 - Data Link Applications**

  Increase the use of data link applications.

1.1.3.3 Aviation System Block Upgrades

The ICAO draft Global Air Navigation Capacity and Efficiency plan 2013-2028 provides a roadmap for the harmonised implementation of ATM technology. The Block 0 Aviation System Block Upgrades relating to ASPIRE are listed and briefly described below. Each of these points is expanded upon in Section 5 Recommended Best Practices for Air Navigation Service Providers.

Performance Improvement Area 1: Airport Operations

- **B0-65 APTA** Optimization of Approach Procedures including Vertical Guidance.
- **B0-75 RSEQ** Improved Traffic Flow through Sequencing (AMAN/DMAN).
- **B0-75 SURF** Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2).
- **B0-80 ACDM** Improved Airport Operations through Airport-CDM.

Performance Improvement Area 2: Globally Interoperable Systems and Data

- **B0-25 FICE** Increased Interoperability, Efficiency and Capacity though Ground-Ground Integration.
- **B0-FRTO** Improved Operations through Enhanced En-Route Trajectories.
- **B0-NOPS** Improved Flow Performance through Planning based on a Network-Wide view.

Performance Improvement Area 4: Efficient Flight Paths

- **B0-05 CDO** Improved Flexibility and Efficiency in Descent Profiles using Continuous Descent Operations (CDOs)
- **B0-40 TBO** Improved Safety and Efficiency through the Initial Application of Data Link En-route
- **B0-20 CCO** Improved Flexibility and Efficiency Departure Profiles – Continuous Climb Operations (CCO)

1.1.4 Support of the CANSO Work Programme

The ASPIRE partners will work to ensure that ASPIRE is consistent with environmental planning under Civil Air Navigation Services Organisation (CANSO) Environmental Work Programme which is committed to the following goals for improving aviation sustainability:

- To develop metrics and targets for the reduction of environmental impact due to aviation.
- To define and advance best practice in environmental management for ANSPs and to promote common implementation as widely and as quickly as possible.
- To influence environmental policy, regulations and legislation to balance capacity, efficiency and the environment, without compromising safety.
- To enhance understanding of ATM's ongoing measures to reduce aviation's environmental impact.

1.1.5 ASPIRE and the Future Air Transportation System

ASPIRE directly supports the implementation of air traffic management (ATM) modernisation programmes on State, regional and global levels to support future projected air traffic levels. ASPIRE is a forward-looking collaborative effort to accelerate the transition from today's operating norms to more advanced, efficient and environmentally friendly concepts outlined in the Next Generation Air Transportation System (NextGen) in the United States, The Brisbane Green Project in Australia, and Vision 2025 in New Zealand, and Collaborative Actions for Renovation of Air Traffic Systems (CARATS) in Japan. Defined ASPIRE strategic plan activities will aim to reduce fuel burn and greenhouse gas emissions per flight, thus reducing aviation's impact on the environment.

1.2 Participation

The ASPIRE partners envision continued growth of the partnership as additional ANSPs are welcomed in to the ASPIRE agreement. The intended result is a collaborative network of partners across the Asia and Pacific region dedicated to the expressed goals of ASPIRE.

1.3 The Strategic Plan

This strategic plan describes the organisation and governance of the partnership and outlines recommended procedures, applications and technologies that have been demonstrated or have shown the potential to provide efficiencies in fuel and emissions reduction management. These best practices encompass all phases of flight from gate-to-gate, and are designed to provide a benchmark for Air Traffic Management environmental stewardship.

The strategic plan includes a work program of initiatives each of which aims to reduce fuel burn and greenhouse gas emissions, thus reducing aviation's impact on the environment. The work program is described in Section 9 and detailed at Appendix A.

2 Governance

2.1 Partners

ASPIRE is a partnership of like minded Air Navigation Service Providers (ANSPs). ANSPs qualify for nomination as ASPIRE partners by signing to the ASPIRE commitment and contributing a work program to implement ATM environmental best practice in their area of responsibility for each applicable phase of flight.

The current ASPIRE partners are:

- Aeronautical Radio of Thailand (AEROTHAI)
- Airways New Zealand (Airways NZ)
- Airservices Australia
- Civil Aviation Authority of Singapore (CAAS)
- Federal Aviation Administration (FAA)
- Japan Civil Aviation Bureau (JCAB)

2.2 Airline Partners

The ASPIRE partnership is supported by a number of Airline partners. The Airline partners provide input from an Airspace User point of view ensuring the ASPIRE work program is properly aligned with their operations. Furthermore the Airline partners provide direct support to the work program.

The Airline partners are:

- All Nippon Airways (ANA)
- Cathay Pacific Airways
- Emirates Airline
- Japan Airlines (JAL)
- QANTAS Airways
- Singapore Airlines
- Thai Airways
- United Airlines
- Virgin Australia

Other Airlines are encouraged to contribute to ASPIRE as Airline Partners.

2.3 Coordination

Each Partner will nominate an ASPIRE coordinator who will represent the partner organisation and act as their point of contact. The coordinator will also be the point of contact for ASPIRE related communications and activities.

There are a series of administrative responsibilities, which are shared between the ASPIRE partners and managed by the coordinators including:

- Publication of the Annual Report and Annual updates to the Strategic Plan (September of each year);
- Hosting the Annual Meeting (early Q2 of each Calendar Year);
- Hosting the quarterly teleconference;
- Coordination of the ASPIRE Daily program;
- Management of the ASPIRE email account (info@aspire-green.com); and
- Management of the ASPIRE website.

Details of the Coordinators for each organisation can be found at Appendix E.

2.4 Chairmanship

A chairperson, known as the ASPIRE Chair, will be nominated from the group of partners. The ASPIRE chair will be rotated bi-annually.

The Chairperson is responsible for:

- Acting as the public representative and figure head for the ASPIRE partnership;
- Acting as the point of contact for all external groups wishing to contact ASPIRE (e.g. media, other ANSPs, Airlines, Educational Institutions, Environmental Groups);
- Arranging for the development and publication of the annual report; and
- Chairing the Annual meeting.

The current chair for the ASPIRE partnership is:

Civil Aviation Authority of Singapore (CAAS)

Chairperson: Mr. KUAH Kong Beng

E-mail: KUAH_Kong_Beng@caas.gov.sg

3 Communications

3.1 Annual Report

The ASPIRE partners communicate progress and performance in an Annual Report.

The Annual Report is developed by the ASPIRE coordinators in the third quarter of each calendar year to provide status updates on work program initiatives and demonstrations, performance measurements and future plans for the ASPIRE partnership. The report will be distributed to appropriate members of the aviation community, including industry, media and global forums.

3.2 Annual Conference

The ASPIRE partners will meet annually in the second quarter of the calendar year. The purpose of the Annual Conference is:

- to share their progress in implementing ATM environmental best practice; and
- provide an opportunity for ANSPs, Airlines, and industry to present and discuss ideas and programs intended to improve ATM environmental performance.

Aviation environmental experts from bodies such as CANSO, IATA and ICAO will be invited to speak on relevant issues such as the state of aviation and the environment.

Where practicable, ASPIRE will leverage existing meetings (e.g. ISPACG and FATS) for discussion and planning among partners.

Hosting of the ASPIRE annual meeting will be rotated among the partners.

3.3 Quarterly Teleconference

The Chair will host quarterly teleconferences where coordinators will discuss progress and update plans.

3.4 Media

Periodically, the ASPIRE partners will issue, individually or collectively, media releases to coincide with significant events such as demonstrations or implementations of new services that contribute to the reduction of greenhouse gases.

Copies or links to all ASPIRE related media (e.g. news articles, magazine items) will be forwarded to the Chair for distribution to the Partners and Airline Partners.

3.5 Website

The ASPIRE website (www.aspire-green.com) has been established to promote the activities of the ASPIRE group. The website will be maintained by a nominated ASPIRE partner as agreed at the annual conference.

4 Document Management

4.1 Document Maintenance

This document is maintained by the ASPIRE coordinators.

4.2 Change Management

Updates to the Strategic plan are facilitated by the Lead Coordinator and approved by the ASPIRE Chair.

Minor and routine changes to the ASPIRE Strategic Plan will be distributed as updates to the existing version (i.e. v1.1, v1.2, v1.3). Major updates and modifications to the ASPIRE Strategic Plan will result in a new version number (e.g. v2.0).

5 Recommended Best Practices for Air Navigation Service Providers

5.1 Overview

In consultation with stakeholders, the ASPIRE partners have compiled a series of recommended procedures, practices, and services that have been demonstrated or have shown the potential to provide efficiencies in fuel and emissions reduction management. These recommendations are referred to as Best Practices, and encompass all phases of flight from *gate-to-gate,* and are designed to reflect the unique nature of the Asia and Pacific region, where international flights may often exceed 7 hours in duration.

Many of the best practices described below are for procedures, practices, and services that are fully developed or that have reached a state of demonstrable maturity. Some of the best practices are new and conceptual applications that the ASPIRE partners are assessing.

The best practices will be reviewed annually with key stakeholders to ensure they continue to represent ATM environmental best practice.

Initiatives from the ICAO Global Air Navigation Capacity and Efficiency plan 2013-2028 are highlighted where they relate to the best practices identified by ASPIRE.

5.2 Network Optimisation

5.2.1 Collaborative Decision Making (CDM)

Collaborative Decision Making (CDM) is an initiative aimed at improving Air Traffic Flow Management (ATFM) through increased information exchange among aviation community stakeholders. CDM comprises of representatives from air navigation service providers, airport operations (e.g. stand and gate management), ground handling services, aircraft operators and other stakeholders who work together to create technological and procedural solutions to the ATFM challenges faced by the network stakeholders.

The goal of CDM is a safe, efficient, secure and sustainable air navigation system that provides flight operators the flexibility to operate within their own capabilities and economic objectives. While supported by a variety of tools and technologies, collaboration transcends specific programs and fosters a more efficient and reliable way to achieve system goals by including ATFM stakeholders in the decision-making process. By sharing information, values and preferences, stakeholders learn from each other and build a common pool of knowledge, resulting in Air Traffic Management decisions and actions that are most valuable to the system.

Under the CDM principle, aviation stakeholders could view each other as “partners” collaborating with the common goal of delivering high-quality air transport products or services that are attuned to the needs and values of their customers; i.e., the flying public or other economic sectors relying on air transport. Adoption of the CDM principle could contribute to enhancements in predictability, flexibility, cost-effectiveness, participation of aviation community and environment. Significant environmental benefits are also delivered by lowering CO_2 emissions and fuel burn by reducing the time aircraft spend in the runway queue.

B0-NOPS Improved Flow Performance through Planning based on a Network-Wide view

Air traffic flow management (ATFM) is used to manage the flow of traffic in a way that minimizes delay and maximizes the use of the entire airspace. ATFM can regulate traffic flows involving departure slots, smooth flows and manage rates of entry into airspace along traffic axes, manage arrival time at waypoints or flight information region (FIR)/sector boundaries and re-route traffic to avoid saturated areas. ATFM may also be used to address system disruptions including crisis caused by human or natural phenomena.

Environment: Reduced fuel burn as delays are absorbed on the ground, with shut engines; rerouting however generally put flight on a longer distance, but this is generally compensated by other airline operational benefits.

B0-80 Improved Airport Operations through Airport-CDM

Implements collaborative applications that will allow the sharing of surface operations data among the different stakeholders on the airport. This will improve surface traffic management reducing delays on movement and manoeuvring areas and enhance safety, efficiency and situational awareness.

Environment: Reduced taxi time; reduced fuel and carbon emission; and lower aircraft engine run time.

5.3 Surface Movement Optimisation

Surface Movement Optimisation procedures and surface and runway movement monitoring technologies have the potential to substantially improve the fuel and emissions efficiency of aircraft by reducing taxi times through improved planning of surface movements. Surface movement optimisation procedures will be aimed at minimising the delay from start request to approval, and the time/fuel burn from start approval to take off.

The ASPIRE partners recognise the potential benefit of surface and runway movement monitoring capabilities at congested airports using surveillance via radar and/or automatic dependent surveillance – broadcast (ADS-B), often enhanced by multilateration. While these surface movement systems are principally designed to enhance safety and reduce the potential for runway incursion, they also serve as the foundation for future systems that will optimise surface and runway movement.

B0-75 SURF Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)

Basic advanced-surface movement guidance and control systems (A-SMGCS) provides surveillance and alerting of movements of both aircraft and vehicles at the aerodrome, thus improving runway/aerodrome safety. Automatic dependent surveillance-broadcast (ADS-B) information is used when available (ADS-B APT).

Environment: Reduced aircraft emissions stemming from improved efficiencies

B0- ACDM Improved Airport Operations through Airport-CDM

Implements collaborative applications that will allow the sharing of surface operations data among the different stakeholders on the airport. This will improve surface traffic management reducing delays on movement and manoeuvring areas and enhance safety, efficiency and situational awareness.

Environment: Reduced taxi time; reduced fuel and carbon emission; and lower aircraft engine run time.

5.4 Departure Optimisation

Qualifying departure optimisation procedures substantially improve the fuel and emissions efficiency of aircraft during the climb-to-cruise portion of flight by minimizing low altitude vectoring and the need to level-off at interim altitudes.

Optimisation for departure profiles include procedures to facilitate unconstrained climb to cruise level and track to route start point, and the manipulation of taxi and departure time to optimise oceanic entry altitude and position in the enroute sequence.

Departure optimisation procedures are expected to substantially improve the fuel and emissions efficiency of aircraft during the climb-to-cruise portion of flight by minimising low altitude vectoring and the need to level-off at interim altitudes.

B0-20 CCO Improved Flexibility and Efficiency Departure Profiles – Continuous Climb Operations (CCO)

Implements continuous climb operations (CCO) in conjunction with performance-based navigation (PBN) to provide opportunities to optimize throughput, improve flexibility, enable fuel-efficient climb profiles, and increase capacity at congested terminal areas.

Environment: Authorisation of operations where noise limitations would otherwise result in operations being curtailed or restricted. Environmental benefits through reduced emissions.

5.5 Enroute and Oceanic Flight

5.5.1 User Preferred Routes (UPRs)

A User Preferred Route (UPR) during the oceanic phase of flight is defined as a lateral profile developed for each individual flight by the flight operator. These lateral profiles are customised in order to meet the specific needs of the aircraft operator for that flight, such as fuel optimisation, cost-index performance, or military mission requirements.

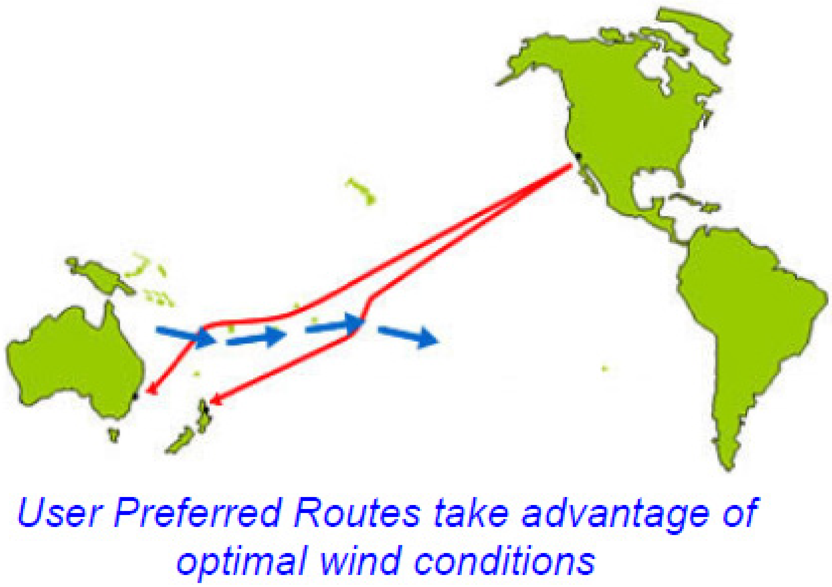


Figure 1 - User Preferred Route Example

Typically a UPR will be calculated by an aircraft operator's flight dispatch based on factors such as forecasted winds, type aircraft and aircraft performance, convective weather and scheduling requirements.

UPRs are a favoured enhancement to oceanic operations where air traffic control (ATC) limitations previously required that aircraft fly on fixed air traffic services (ATS) routes, or flexible published track systems. This enhancement is directly attributable to the implementation of ground and airborne improvements such as automated conflict prediction, conformance monitoring, and automatic dependent surveillance (ADS).

When UPRs are created based on fuel optimisation considerations, the corresponding savings in greenhouse gas emissions can be substantial. For example, in 2008 Air New Zealand projected that, despite a number of operational restrictions, the implementation of UPRs between New Zealand and Japan would yield a total annual saving in fuel burn of 1,090,000 kg or, based on IATAs figures for emissions, 3,444,400 kg less CO_2 emissions.[2]

UPRs are often constrained by requirements for flights to cross boundaries between Flight information regions at predetermined points. This can be alleviated through improved ground-ground integration. Fore example through the implementation of ATS interfacility data communication (AIDC)

> **B0-25 FICE Increased Interoperability, Efficiency and Capacity though Ground-Ground Integration**
>
> Improves coordination between air traffic service units (ATSUs) by using ATS interfacility data communication (AIDC) defined by ICAO's Manual of Air Traffic Services Data Link Applications (Doc 9694). The transfer of communication in a data link environment improves the efficiency of this process, particularly for oceanic ATSUs.

A key enabler for the implementation of UPRs is the implementation of Air-Ground Datalink Communications

> **B0-40 TBO Improved Safety and Efficiency through the Initial Application of Data Link En-route**
>
> Implements an initial set of data link applications for surveillance and communications in air traffic control (ATC), supporting flexible routing, reduced separation and improved safety.

[2] ISPACG/22 IP-09 rev.2

5.5.2 Dynamic Airborne Reroute Procedures (DARP)

Dynamic Airborne Reroute Procedures (DARP) refers to an oceanic in-flight procedure to periodically modify the lateral profile of a flight in order to take advantage of updated atmospheric conditions and updated forecasts. Typically, flight operators file flight plans some hours prior to a flight's estimated time of departure. Often, revised upper wind forecasts are available after the flight plan is filed or the aircraft departs.

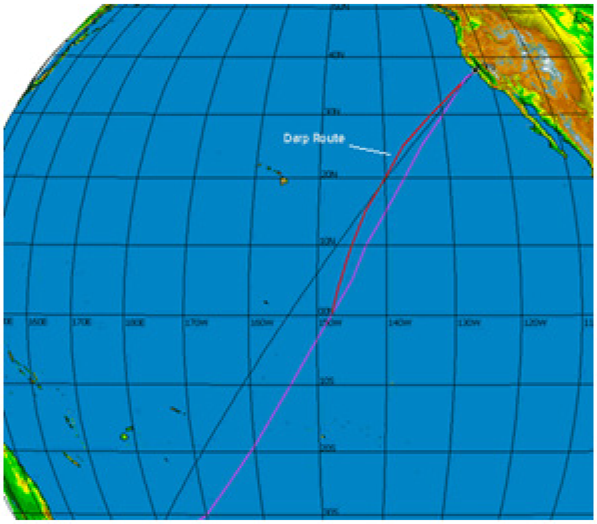


Figure 2 - Dynamic Airborne Reroute Procedure Example

DARP allows aircraft operators to calculate revised profiles from the aircraft's present position to any subsequent point in the cleared route of flight in order to realise savings in fuel or time. This updated profile is coordinated by the Airline Operations Centre (AOC) with the flight crew, and sent to ATC as a reroute request from the aircraft.

Initially demonstrated in the South Pacific in 1999, recent enhancements to conflict prediction, conformance monitoring and inter-facility coordination in Air Traffic Management automation systems have enabled the wider implementation of the DARP. Participating ANSPs can accommodate multiple in-flight reroute requests across airspace boundaries.

The DARP can provide significant savings in fuel and emissions. An Air New Zealand analysis concluded that 58% of all flights from Auckland to North America assessed during the analysis sample would achieve fuel savings from the DARP procedure, resulting in an average fuel burn reduction of 453kg per flight, or roughly 1431kg of CO_2 emissions.[3]

B0-FRTO Improved Operations through Enhanced En-route Trajectories
To allow the use of airspace which would otherwise be segregated (i.e. special use airspace) along with flexible routing adjusted for specific traffic patterns. This will allow greater routing possibilities, reducing potential congestion on trunk routes and busy crossing points, resulting in reduced flight length and fuel burn.

Environment: Fuel burn and emissions will be reduced; however, the area where emissions and contrails will be formed may be larger.

[3] ISPACG/22 IP-16

5.5.3 Flexible Track Systems

In circumstances where fixed routes are in use and the implementation of UPRs in continental airspace is not practicable in the medium term, flexible track systems can be considered as an interim best practice as they are vastly more efficient than fixed ATS routes.

A flexible track is typically calculated so that all flights flying a specific city-pair route will utilise a single lateral profile or track. This track is calculated based on forecasted meteorological data and a representative aircraft performance model and published via NOTAM. A flexible track system is a series of flexible tracks designed to be laterally separated from one another to accommodate high traffic density.

Flexible tracks provide greater efficiencies than fixed ATS routes, because they are optimised to take advantage of favourable winds. Flexible tracks do not provide the same level of efficiencies to individual aircraft that can be achieved in a UPR system. However in circumstances where implementation of UPRs is not yet feasible a flexible track system provides a notable improvement in efficiency and reduction in emissions.

5.5.4 Reduced Separation Minima

Reduced separation minima allow more aircraft access to optimum routings and altitudes; the enhanced efficiencies of optimum routes and altitudes can result in lower fuel burn and reduced emissions. This enhanced efficiency is reflected in lower fuel burn and reduced emissions as more aircraft can fly closer to optimal tracks and altitudes.

5.5.4.1 Direct surveillance in remote areas

Within the Asia Pacific area there are a number of regions which have been treated as remote airspace and subject to large horizontal separation minima, but lend themselves to the introduction of direct surveillance systems such as ADS-B[4].

The introduction of direct surveillance into these areas can provide an environmental benefit if reduced separation minima are also implemented.

5.5.4.2 Oceanic Separation Minima

Improvements in navigation capabilities have enabled reduction in the Oceanic separation minima to 50NM longitudinally and laterally. When coupled with direct controller pilot communications via data-link and automatic dependent surveillance, aircraft meeting certain navigation performance requirements can be safely separated at as little as 30NM longitudinally and laterally. In late 2014 a further reduction to 20NM longitudinally and laterally is expected.

The reduced separation minima for use in the oceanic environment are published in the ICAO Procedures for Air Navigation Services – Air Traffic Management (Doc 4444) and the ICAO Annex 11 - Air Traffic Services.

[4] ADS-B: Automatic Dependent Surveillance - Broadcast

RNP10 Aircraft	50NM longitudinal, 50 NM lateral
RNP4 Aircraft	30 NM longitudinal, 30 NM lateral
RNP2[5] Aircraft	20 NM longitudinal, 20 NM lateral

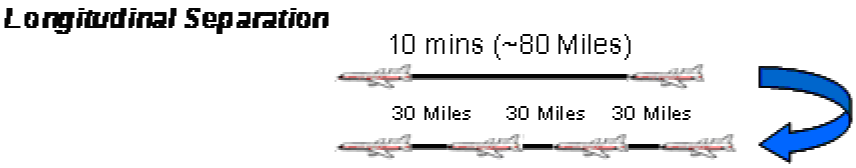


Figure 3 - Reduced Oceanic Separation Minima

Qualified aircraft navigating in airspace where these reduced separation minima have been implemented achieve significantly greater efficiencies than aircraft that cannot meet these standards.

5.5.5 Reduced Vertical Separation Minima (RVSM)

Improvements in vertical height keeping and altimetry in the modern fleet of aircraft, coupled with new procedures and monitoring requirements has allowed a reduction of vertical separation between aircraft operating above FL290. This standard, known as Reduced Vertical Separation Minimum (RVSM), allows the vertical spacing of qualified aircraft to be reduced from 2000ft to 1000ft in airspace where the standard has been implemented.

Oceanic RVSM allows aircraft to fly closer to fuel efficient altitudes, and execute smaller step climbs, which require less fuel.

5.5.6 Time Based Arrivals Management

To reduce the environmental impact of delays caused by the demand placed on airports ANSPs have introduced traffic flow management procedures and automated decision support automation to reduce arrivals congestion into high density airspace and improve fuel and emissions efficiency by shifting delays to the less congested en- route phase of flight.

These systems provide controllers with sequencing information, including times at strategic arrival points that the controllers may use to meter aircraft. Effective time-based arrivals management reduces low altitude vectoring and arrivals holding while also improving merging and spacing of arriving aircraft to maximize airspace efficiency.

B0-RSEQ Runway Sequencing (RSEQ)
To manage arrivals and departures (including time-based metering) to and from a multi-runway aerodrome or locations with multiple dependent runways at closely proximate aerodromes, to efficiently utilize the inherent runway capacity.

[5] RNP2 separation standards are expected in late 2014.

5.6 Arrivals Optimisation

5.6.1 Overview

Arrivals Optimisation includes any one of several procedures available to aircraft operators and ANSPs to improve the fuel efficiency for aircraft during final descent phase of a flight. Arrivals Optimisation minimises fuel burn for the arrival segment by enabling each jet to fly the optimum track to Top of Descent (TOD) and an Optimised Profile Descent (OPD) from TOD to the landing runway.

Qualifying arrivals optimisation procedures include continuous descent arrivals, continuous descent approaches, optimised profile descents, tailored arrivals, and are generally referred to by ICAO as Continuous Descent Operations.

5.6.2 Optimised Profile Descents

An Optimised Profile Descent (OPD) is a cockpit-based flight technique where the vertical profile of an arrival is optimised to minimise undesired level flight segments so that the aircraft can be flown with engines at idle thrust from a high altitude, potentially from cruise, until touch down on the runway. Aircraft executing an OPD realise a far more efficient fuel burn profile and reduced emissions during the descent and arrival phases of flight, as compared to a traditional arrival path. A variety of OPD applications have been analysed and developed for fuel and emission efficiency improvements.

5.6.2.1 OPD via RNAV and RNP-AR Approaches

Under certain conditions the airspace restrictions, arrival, departure and en route traffic flows can be modified to, enable optimal arrival descent profiles on published Area Navigation (RNAV) and Required Navigation Performance – Authorisation Required (RNP-AR). This optimisation reduces fuel burn and carbon emissions by taking advantage of the sophisticated navigational capability of modern aircraft that can fly closer to optimal tracks and altitudes.

For example, RNP-AR approaches are conducted using idle power, continuous descent from an optimally chosen top of descent point. In Australian RNP-AR implementations, this has typically saved around 200Kg of fuel per approach. This results in a reduction of 620Kg of CO_2 emission per approach. During the first 18 months of implementing RNP-AR OPD, Airservices Australia estimates that 33 B737-800 aircraft have conducted more than 10,000 RNP-AR approaches. The estimated cumulative savings in jet fuel is 345,240 kg with estimated carbon dioxide emissions reductions of 1,151,280 kg.

5.6.2.2 OPD via Tailored Arrivals

Another application of OPD procedures, known as a Tailored Arrival (TA), is a procedure where trajectories are dynamically optimised for each aircraft to permit a fuel-efficient, low-noise descent profile that has imbedded compliance with arrival sequencing requirements and other airspace constraints.

Operational trials in Australia, New Zealand, and the United States have demonstrated that both types of OPD described above provide significant fuel and emissions savings. Although the successful execution of an uninterrupted OPD is greater during periods of light traffic, the ASPIRE partners are pursuing the use of OPD during congested traffic periods under the ASPIRE Work Programme (See Section 7).

Estimated Actual Fuel & CO2 Savings from SFO Tailored Arrivals*

Airline	Airplane	Potential Fuel & CO_2 Savings**	Actual Fuel & CO_2 Savings	% Realized Potential
Air New Zealand	**777-200ER**	Fuel: 215,140 lbs CO_2: 669,090 lbs	Fuel: 73,530 lbs CO_2: 228,690 lbs	34%
United Airlines	**777-200ER**	Fuel: 736,610 lbs CO_2: 2,290,870 lbs	Fuel: 76,200 lbs CO_2: 237,000 lbs	10%
United Airlines	**747-400**	Fuel: 1,556,790 lbs CO_2: 4,841,620 lbs	Fuel: 112,800 lbs CO_2: 350,810 lbs	7%
Japan Airlines	**747-400**	Fuel: 64,400 lbs CO_2: 200,280 lbs	Fuel: 7240 lbs CO_2: 22,510 lbs	11%

* From December 4, 2007 to May 27, 2008
** Potential Fuel Savings based on Total number of flights recorded by ANOMS8 per Airline [6]

B0-65 APTA Optimization of Approach Procedures including Vertical Guidance

The use of performance-based navigation (PBN) and ground-based augmentation system (GBAS) landing system (GLS) procedures to enhance the reliability and predictability of approaches to runways, thus increasing safety, accessibility and efficiency. This is possible through the application of basic global navigation satellite system (GNSS), Baro-vertical navigation (VNAV), satellite-based augmentation system (SBAS) and GLS. The flexibility inherent in PBN approach design can be exploited.

Environment: Environmental benefits through reduced fuel burn.

B0-05 CDO Improved Flexibility and Efficiency in Descent Profiles using Continuous Descent Operations (CDOs)

Performance-based airspace and arrival procedures allowing aircraft to fly their optimum profile using continuous descent operations (CDOs). This will optimize throughput, allow fuel efficient descent profiles, and increase capacity in terminal areas.

[6] Rob Mead, Boeing, “Tailored Arrivals Activities Overview” 17 October, 2008

5.7 Performance Based Navigation (PBN) Implementation

PBN is a framework for defining navigation performance requirements that can be applied to an air traffic route, instrument procedure, or defined airspace. PBN includes both Area Navigation (RNAV) and Required Navigation Performance (RNP) specifications. PBN provides a basis for the numerous Air Traffic Services enhancements such as oceanic RNP separation reductions, Optimum Profile Descents, reduction of flight distance and the development of aircraft and the development of future concepts for trajectory based operations. These PBN enabled enhancements are a cornerstone of ANSP efforts to improve fuel and emission efficiencies.

ANSP guidance for the implementation of PBN and associated ATS applications will be contained in the ICAO Performance Based Navigation Manual, Doc 9613.

6 ASPIRE Daily

6.1 Background

Since the publication of the ASPIRE Strategic Plan in October of 2008, the ASPIRE Partners have conducted a series of five gate-to-gate “ASPIRE Green Flights” successfully demonstrating the potential for fuel and emissions savings. Although the green flights represented the best-case or ideal scenario due to the removal of controllable constraints, a practice not feasible in daily operations, the majority of the procedures used are available on a daily operational basis for a variety of city-pair routes throughout the Asia Pacific region. At the 2010 ASPIRE Coordinators’ Conference in Maroochydore, Australia, the partners agreed to a proposal for the ASPIRE Daily program.

In the ASPIRE Daily program, city-pair routes are identified where key elements of the ASPIRE Best Practices are utilised. Then each day participating airline partners report the availability of the ATM environmental best practice.

6.2 Objective

The objective of ASPIRE Daily is to increase awareness and utilisation of Best Practices on a daily basis in the Asia-Pacific region.

6.3 Goals

The goals of the ASPIRE Daily program include:

- identify and publish ASPIRE-Daily City Pairs where 3 or more fuel-saving Best Practices are available;
- certify ASPIRE-Daily City Pairs with a star rating system in consultation with the International Air Transportation Association (IATA) Asia Pacific Office;
- enable and encourage reporting by airlines of their successful utilisation of ASPIRE-Daily City Pair routes and index this information; and
- actively promote and advertise the availability and usage statistics of new and existing ASPIRE-Daily City Pairs though industry forums, web distribution and the ASPIRE Annual Report.

6.4 Best Practices

ASPIRE Daily Best Practices are procedures and services that:

a) have proven fuel & emissions savings; and

b) are available on a daily basis to participating equipped flights either by pilot request (e.g. DARP), or with no action required by the flight crew (e.g. Reduced Oceanic Separation).

The process for the nomination and management of the ASPIRE Daily is detailed in the ASPIRE Daily terms of reference at Appendix C.

7 Performance and Emissions Measurement

Individual ANSPs, airlines and industry partners track efficiency and environmental performance to varying degrees in the course of everyday business activities. However, few arrangements are in place to accurately track the end-to-end performance and efficiency of flights in Asia and the Pacific Region. Comprehensive and comparable measurement of fuel burn and emissions performance is a key to assessing the progress of environmental initiatives and to identifying areas in need of improvement.

7.1 Baseline Performance Metrics

The ASPIRE partners have developed a performance baseline that looks at metrics for strategic routes and city pairs throughout the Asia and Pacific region. Moving forward, ASPIRE metrics should shift their focus to the ASPIRE-Daily best practices and the fuel and emissions savings they can provide. These metrics should be designed to calculate the general fuel savings for each of the ASPIRE best practices (UPR, DARP, 30/30 separation, Time Based Arrivals Management, Arrivals Optimisation, Departure Optimisation and Surface Movement Optimisation) and the average annual emissions reductions associated with those savings. This will also provide the foundation for the assessment of future emissions and efficiency initiatives developed within the ASPIRE partnership.

To accomplish this goal, ANSPs and airline partners must collaborate to define and collect the appropriate data required to assess performance and share the results to ensure that there is consistency in the measurement, interpretation and reporting of performance.

To successfully gauge environmental and operational efficiency benefits, it is necessary that ASPIRE Partners identify historical fuel use and weight records for aircraft operations in order to establish a performance baseline. Establishment of this baseline data is vital and valuable for comparison against the effects of ATS enhancements and the determination of benefits – fuels conserved, emissions reduced, and payload fuel efficiency.

Emissions Calculation

With the determination of the fuel difference, and by application of the 1st order approximation that assumes the complete fuel combustion assumption, Carbon Dioxide (CO_2), Water (H_2O) and Sulfur Oxides (SO_x) emission reductions can be estimated from the amount of unburned fuel saved by using the emission indices as follows:

* CO_2 (kg) = 3.155 x amount of fuel conserved (kg);
* H_2O (kg) = 1.237 x amount of fuel conserved (kg); and

An online utility for the calculation of emissions is available at:

http://www.epa.gov/cleanenergy/energy-resources/calculator.html

7.2 The “Ideal Flight” Benchmark

The development and computation of a flight benchmark that reflects the “Ideal Flight” will play an essential role in the ASPIRE programme. This benchmark, calculated based on the most efficient and environmentally sound gate to gate flight profile possible, demonstrates the maximum potential gain in environmental performance that can be achieved under ASPIRE.

The calculation of this benchmark is a significant challenge due to the external influences impacting each flight. The ASPIRE partners have conducted a series of ASPIRE Green Flight demonstrations for a snapshot of benefits that can be achieved by removing all controllable constraints. However the development of a comprehensive benchmark requires a combination flight demonstration data, and aircraft performance modelling.

Through successful partnerships, an initial annual performance baseline and “ideal flight” benchmark has been completed for the following city pairs: Auckland to/from San Francisco, Auckland to/from Los Angeles, Sydney to/from San Francisco, Sydney to/from Los Angeles, Brisbane to/from Los Angeles, and Melbourne to/from Los Angeles. Trajectories were pieced together from the positional information provided by the air navigation service providers and then modelled to determine the fuel burn performance baseline. The “ideal flight” benchmark is based on a minimum fuel path for the trajectories built for the performance baseline. The benchmark provides an individually optimal but likely unachievable goal. These baselines and benchmarks are broken down by origin, destination and airframe. This information is available in the Performance Metrics Appendix to the 2011 ASPIRE Annual Report at http://www.aspire-green.com/mediapub/docs/metricsappendix.pdf

8 Reporting

Progress, performance and programme updates will be reported by the ASPIRE partners on an annual basis via the publication of the ASPIRE Annual Report. The Annual Report will be developed by the ASPIRE coordinators in the second quarter of each calendar year to provide status updates on work programme initiatives and demonstrations, performance measurements and future plans for the ASPIRE partnership. The report will be distributed to appropriate members of the aviation community, including industry, media and global forums.

Periodically, the ASPIRE partners issue, individually or collectively, media releases to coincide with significant events such as demonstrations or implementations of new services that contribute to the reduction of greenhouse gasses.

ASPIRE Daily performance reported on the ASPIRE website (www.aspire-green.com) and updated monthly.

All requests for information should be directed to one of the ASPIRE Coordinators listed in Appendix E.

Further public information will be published at http://www.aspire-green.com/, and general information can be requested through email: info@aspire-green.com.

9 Work Program

The work program consists of a series of initiatives which, as they're completed, will allow the ASPIRE partnership to progress towards their goal of improving the efficiency and sustainability of aviation.

The Work Programme was initiated in June 2008 by the initial ASPIRE partners to focus on Pacific efforts. In 2012 the work program was refined and restructured to align with the ASPIRE Daily program, with initiatives grouped with the phase of flight where they deliver environmental benefit.

For each initiative one ASPIRE partner is identified as the lead. It is the leads responsibility to track the progress of the initiative and coordinate and facilitate the other stakeholders to encourage success of the initiative.

The details of the ASPIRE work program are found at Appendix A.

Appendix A. ASPIRE Work Program

A.1. General

ASPIRE Daily City Pair Route Rating System

Initiative Summary		
Develop a programme for daily city-pair flights, beginning in the SoPac based on the principles of ASPIRE Best Practices. City-pair routes will be assigned a classification (e.g. ASPIRE-4 Star) based on the availability of Best Practice procedures.		
Initiative Lead		
FAA		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
Airservices Australia	Qantas Virgin Australia	IATA
Airways New Zealand	Air New Zealand	
CAAS	Singapore Airlines	
FAA	United Airlines	
JCAB	JAL	
Affected Flight Information Regions		
Strategic Goals		
1. Develop the concept for ASPIRE-Daily city-pair routes with the initial airline partner and begin ASPIRE-Daily flights in 2010. 2. Expand city-pairs and airline partners. 3. Track and report progress of ASPIRE-Daily.		
Benefits		
ASPIRE-Daily will increase awareness and utilisation of best practices on a daily basis in the Asia-Pacific region.		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Concept proposal on ASPIRE-Daily	FAA	**Completed** ✓
Identify initial airline partner and city pair	ASPIRE Coordinators	**Completed** ✓

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Kickoff ASPIRE-Daily flights	ASPIRE Coordinators	**Completed** ✓
Track and report progress of ASPIRE-Daily	IATA & Airservices Australia	**Established website for reporting ASPIRE Daily each month** ✓ **Monthly reports since Mar 2011** ✓
Auckland (AKL) – San Francisco (SFO) city pair	Airways NZ FAA	**Established Feb 2011** ✓
Los Angeles (LAX) – Singapore (SIN) city pair	FAA CAAS	**Established May 2011**✓
Sydney (SYD) – San Francisco (SFO) city pair	Airservices Australia FAA	**Established Sep 2011** ✓
Los Angeles (LAX) – Melbourne (MEL) city pair	FAA Airservices Australia	**Established Sep 2011** ✓ **Updated - 4 stars Mar 2012** ✓
Singapore (SIN) – Melbourne (MEL) city pair	CAAS Airservices Australia	**Established Apr 2012** ✓
Melbourne (MEL) - Singapore (SIN) city pair	CAAS Airservices Australia	**Established July 2012** ✓
Singapore (SIN) - Sydney (SYD) city pair	CAAS Airservices Australia	**Established July 2012** ✓
Sydney (SYD) - Singapore (SIN) city pair	CAAS Airservices Australia	**Established July 2012** ✓
Melbourne (MEL) - Los Angeles (LAX) city pair	FAA Airservices Australia	**Established August 2012** ✓

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Sydney (SYD) - Los Angeles (LAX) city pair	FAA Airservices Australia	**Established August 2012** ✓
Auckland (AKL) – Singapore (SIN) city pair	Airservices Australia Airways NZ CAAS	**Established August 2013** ✓
Singapore (SIN) – Auckland (AKL) city pair	Airservices Australia Airways NZ CAAS	**Established August 2013** ✓
Christchurch (CHC) – Singapore (SIN) city pair	Airservices Australia Airways NZ CAAS	**Established August 2013** ✓
Singapore (SIN) – Christchurch (CHC) city pair	Airservices Australia Airways NZ CAAS	**Established August 2013** ✓
Tokyo (HND) – San Francisco (SFO) city par	FAA JCAB	**Established October 2013** ✓
Bangkok (BKK) – Sydney (SYD)	Airservices Australia AEROTHAI	**Established November 2013** ✓
Auckland (AKL) – Narita (NRT) city pair	Airways NZ JCAB	In development
Perth (PER) – Auckland (AKL) city pair	Airservices Australia Airways NZ	In development
Identify additional ASPIRE-Daily city pairs	ASPIRE Coordinators	Ongoing

A.2. Network Optimisation

Implementation of Whole-Flight CDM

Initiative Summary		
Create a management tool for information sharing throughout all phases of flight among key stakeholders to allow for well-informed decision making.		
Initiative Lead		
AEROTHAI, CAAS		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
AEROTHAI	Thai Airways	Airports of Thailand
CAAS	Singapore Airlines	Changi Airport Group
		DCA Malaysia
		CANSO
Affected Flight Information Regions		
Bangkok	Singapore	Kuala Lumpur
Strategic Goals		
1. Expand implementation for whole flight CDM within the regional network of air traffic management.		
Benefit		
Emissions will be reduced through the enhancement of flight operations predictability for delay mitigation. Data exchange among the aviation community helps minimise delays and essentially reduce carbon emission.		
Milestone Targets		
1. Develop the management tool to facilitate data exchanging. 2. Perform functional enhancement for BOBCAT CDM. 3. Implement Whole-flight CDM on Bangkok-Singapore and Bangkok-Hong Kong city pairs. 4. Expand CDM city pairs within the region.		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Develop CDM data sharing platform and link with BOBCAT.	AEROTHAI	In progress

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Partner with Malaysia and Singapore to conduct whole-flight CDM operational trial for Bangkok-Singapore City pair.	AEROTHAI, CAAS	In progress
Draw the expansion plan to establish Bangkok-Hong Kong city pair and to evolve into the air traffic management network in the region.	AEROTHAI	In progress

Implementation of National ATFM

<table>
<tr><th colspan="3" align="left">Initiative Summary</th></tr>
<tr><td colspan="3">Collaborative Decision Making (CDM) is a joint Airservices/aviation industry initiative aimed at improving air traffic management through increased information exchange among the various parties in the aviation community. The CDM program is made up of representatives from the aviation industry who are working together to create technological and procedural solutions to traffic flow problems that face the Australian air traffic control system.

The first stage of the CDM project is Air Traffic Flow Management (ATFM). This entails the replacement of the current Central Traffic Management System (CTMS) with an advanced ATFM tool capable of managing traffic flow at multiple airports. Airservices is extending this capability to manage Brisbane, Melbourne and Perth airports along with Sydney.

We will also be commencing a practice called "compliance management." This will involve 21 Airservices Towers and 3 Defence Towers providing compliance advice to aircraft for departures to the program airports. It will also provide the Flow controllers for the program airports with compliance information which will better enable them to make sequencing decisions.</td></tr>
<tr><th colspan="3" align="left">Initiative Lead</th></tr>
<tr><td colspan="3" align="center">Airservices Australia</td></tr>
<tr><th colspan="3">Contributing Stakeholders</th></tr>
<tr><th>ASPIRE Partners</th><th>Airlines</th><th>Supporting Agencies</th></tr>
<tr><td></td><td align="center">Qantas
Virgin Australia</td><td></td></tr>
<tr><th colspan="3">Affected Flight Information Regions</th></tr>
<tr><td align="center">Brisbane</td><td align="center">Melbourne</td><td></td></tr>
<tr><th colspan="3" align="left">Strategic Goal</th></tr>
<tr><td colspan="3">Improve the efficiency of the Air Traffic Management System through predictability and the alignment of demand with capacity.</td></tr>
</table>

Benefit
Customer benefits include: • reduction in airline contribution to environmental emissions through reduced fuel burn resulting from transferring airborne delay to ground delay; and • financial savings through reduced fuel burn resulting from transferring airborne delay to ground delay. Operational benefits include: • improved ability to predict demand/capacity imbalances; • improved ability to take action to adjust capacity to meet demand; • access to predicted demand/capacity information for all stakeholders provides the basis for decisions to be made in a collaborative manner; • the capability to provide strategic 4D trajectory prediction for stakeholders; and • improved ability to predict and manage ATC workload.
Milestone Targets
1. Develop ATFM system to replace CTMS 2. Implement ATFM system for Sydney 3. Implement ATFM system for Perth 4. Implement ATFM system for Brisbane 5. Implement ATFM system for Melbourne

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Central Traffic Management System (CTMS) was implemented into Sydney Airport operations in 2004.	Airservices Australia	**Completed** ✓
Implementation of National ATFM – Perth	Airservices Australia	**Completed** ✓
Implementation of National ATFM – Sydney	Airservices Australia	**Completed** ✓
Implementation of National ATFM – Brisbane	Airservices Australia	**Completed** ✓
Implementation of National ATFM – Melbourne	Airservices Australia	Implementation in progress

A.3. Surface Movement Optimisation

Surface Movement Optimisation - Tokyo

<table>
<tr><th colspan="3">Initiative Summary</th></tr>
<tr><td colspan="3">“TSAT“ (Target Start up Approval Time) is used for optimisation of airport traffic by focusing on surface movement, in order to reduce taxiing time and holding time on taxiways. TSAT is the most appropriate time for push back, calculated for each departure aircraft, by taking into account its parking position, expected traffic volume in entering airspace, and runway capacity. Surface movement optimisation is enhanced by sharing TSAT among ANSP, airlines and other stakeholders associated with ground movement.</td></tr>
<tr><th colspan="3">Initiative Lead</th></tr>
<tr><td colspan="3">JCAB</td></tr>
<tr><th colspan="3">Contributing Stakeholders</th></tr>
<tr><th>ASPIRE Partners</th><th>Airlines</th><th>Supporting Agencies</th></tr>
<tr><td>JCAB</td><td>All Airlines with flights to Tokyo Intl. Airport</td><td></td></tr>
<tr><th colspan="3">Affected Flight Information Regions</th></tr>
<tr><td>FUKUOKA</td><td></td><td></td></tr>
<tr><th colspan="3">Strategic Goals</th></tr>
<tr><td colspan="3">Optimise airport operation by sharing information necessary for the efficient airport operation such as runway capacity, TSAT, and expected landing time of arrival traffic among ANSP, airlines and other stakeholders associated with ground movement.</td></tr>
<tr><th colspan="3">Benefit</th></tr>
<tr><td colspan="3">Emissions will be reduced during the taxi.</td></tr>
<tr><th colspan="3">Milestone Targets</th></tr>
<tr><td colspan="3">1. Issue taxiing instructions based on calculated TSAT, which is provided to ANSP (ATC) only.
2. Prepare and depart from parking gates based on shared TSAT information between ANSP and airlines.
3. Optimise airport operation by sharing information necessary for the efficient airport operation among ANSP, airlines and other stakeholders associated with ground movement.</td></tr>
</table>

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Surface movement control based on TSAT which is provided to ANSP (ATC) only.	JCAB	In place at Tokyo Intl AP
Depart from parking gates at the most appropriate timing by sharing TSAT between ANSP and airlines.	JCAB, Airlines	Under development 2015
Optimise airport operation by sharing information necessary for the efficient airport operation between associated stakeholders.	JCAB, Airlines, Ground-Handling	Under development 2016

A.4. Departure Optimisation

Departure Optimisation – Airways NZ

Initiative Summary		
Optimising departure trajectories on an aircraft by aircraft basis to facilitate un-interrupted climb for jets.		
Initiative Lead		
Airways New Zealand		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
Affected Flight Information Regions		
Strategic Goals		
Implement procedures supporting direct on track routing for departing international aircraft.		
Benefit		
Reduced emissions for departure phases for all eligible flights		
Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Auto release procedures	Airways NZ	in place at major airports.
RNAV SIDs	Airways NZ	in place at major International airports.
No hold downs on RNAV SIDs for Jets – unrestricted climb provided for.	Airways NZ	in place at major International airports.

Oceanic Trajectory Management 4-D (OTM4D) Pre-Departure

<table>
<tr><th colspan="3">Initiative Summary</th></tr>
<tr><td colspan="3">OTM4D is the procedures and automation to identify opportunities for flights to fly more efficient profiles based on real-time evaluation of airspace availability.</td></tr>
<tr><th colspan="3">Initiative Lead</th></tr>
<tr><td colspan="3" align="center">FAA</td></tr>
<tr><th colspan="3">Contributing Stakeholders</th></tr>
<tr><th>ASPIRE Partners</th><th>Airlines</th><th>Supporting Agencies</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><th colspan="3">Affected Flight Information Regions</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><th colspan="3">Strategic Goals</th></tr>
<tr><td colspan="3">1. Minimise delay from start request to approval
2. Minimise the time/fuel burn from start approval to take off
3. Minimise time/length of taxi for departures
4. Optimise departure to facilitate unconstrained climb to cruise level and track to route start point
5. Manipulate taxi and departure time to optimise oceanic entry altitude and oceanic trajectory based on predictive analysis of traffic</td></tr>
<tr><th colspan="3">Benefit</th></tr>
<tr><td colspan="3">Emissions will be reduced during the taxi and departure phases for all eligible flights</td></tr>
<tr><th colspan="3">Milestone Targets</th></tr>
<tr><td colspan="3">1. Just in time' engine start approval implemented
2. The holding time at the runway holding point, awaiting take –off clearance, is minimised.</td></tr>
</table>

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
OTM-4D Pre-Departure Concept of Operations	FAA	**Completed** ✓
OTM-4D Pre-Departure Benefits case and Requirements development	FAA	**Completed** ✓
Pre-departure planner algorithm data collection and analysis	FAA	**Completed** ✓
Pre-departure planner lab demonstration	FAA	Under development
Pre-departure planner operational trial	FAA	2014

A.5. Enroute and Oceanic Flight

User Preferred Route (UPR) Expansion

Initiative Summary		
Identify constraints limiting the availability of User Preferred Routing. Expand the availability of User Preferred Routes.		
Initiative Lead		
Each Partner in their Area of Responsibility		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
Airservices Australia	Qantas	
Airways NZ		
FAA		
JCAB		
CAAS		
Affected Flight Information Regions		
Oakland Oceanic	Auckland Oceanic	Melbourne
Brisbane	Fukuoka	

Strategic Goals

ASIA

1. Study the possibility of UPRs between Japan and Singapore through Manila FIR, with the aim of identify the constraints limiting the availability of UPRs between Japan and Singapore;
    - Institutional
    - Procedural
    - Ground technology
    - Airborne technology
    - Restricted Areas

Strategic Goals		
Pacific 1. Identify the constraints limiting the use of UPR across the Pacific example • Institutional • Procedural • Ground technology • Airborne technology 2. ASPIRE partners remove constraints within their jurisdictions		
Benefits		
When UPRs are created based on fuel optimisation considerations, the corresponding savings in greenhouse gas emissions can be substantial		
Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Identify constraints to UPR service provision	ISPACG & IPACG	The ISPACG Planning Team reviews the UPR constraints on flight planning UPRs between North America and the South Pacific at every ISPACGPT meeting to see which might be removed. Note: There are very few restrictions on UPRs in the South Pacific.
Recommend action plans to remove constraints	ISPACG & IPACG	Review the UPR constraints at every IPACG meeting to see which might be removed. Note: There are very few restrictions on UPRs in the South Pacific.
Remove constraints within their jurisdictions	ASPIRE partners	
Confirm regions of UPR availability	ASPIRE partners	**UPRs introduced MEL-AKL-MEL** ✓ Within Oakland and Fukuoka FIR, UPRs are available between Asia and North America, Asia and Hawaii, Southeast Asia and North America, Japan and Oceania.

Dynamic Airborne Reroute Procedures (DARP) Enhancement

Initiative Summary		
Identify limitations and constraints to the existing Pacific Dynamic Airborne Reroute Procedures (DARP). Where possible, remove constraints via procedural, cultural and automation changes.		
Initiative Lead		
Each Partner in their Area of Responsibility		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
Airservices Australia		
Airways NZ		
FAA		
JCAB	ANA	
Affected Flight Information Regions		
Oakland Oceanic	Auckland Oceanic	Melbourne
Brisbane	Fukuoka	

Strategic Goals

1. Identify the constraints limiting the use of DARP across the Pacific.
    - Institutional
    - Procedural
    - Ground technology
    - Airborne technology
    - Restricted Areas
2. ASPIRE partners remove constraints within their jurisdictions and make available Dynamic Airborne Reroute wherever practicable

Benefits

DARP allows aircraft operators to calculate revised profiles from the aircraft's present position to any subsequent point in the cleared route of flight in order to realise savings in fuel or time.

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Identify constraints to DARP implementation	ISPACG	Completed DARP testing with Nadi and Tahiti Control Centres on 2/15/11. Nadi are evaluating to see if they can improve their support of the DARP Procedures.
Recommend action plans to remove constraints	ISPACG	The only real constraints on DARPs at this time are at what level DARPs can be supported within the different FIRs. Waiting to see if Nadi and Tahiti can expand their support.
Remove constraints within their jurisdictions	ASPIRE partners	
Confirms regions of DARP capability	ASPIRE partners	FAA working with JCAB to begin a limited Westbound DARP trial within Oakland FIR and Fukuoka FIR. Westbound DARP trial between Hawaii and Japan was implemented on 30 April 2011. 64 DARPS granted between Dec 2011 and May 2012. Average savings: 663 lbs. of fuel, 0:03 minutes. Total savings: 42,400 lbs. of fuel, 2:22 minutes.
Oceanic Conflict Advisory Trial (OCAT) - Tactical trajectory feedback tool lab testing	FAA	**Completed** ✓
OCAT - Tactical trajectory feedback tool operational trial	FAA	Proof-of-concept trail to determine feasibility of making oceanic data available to operators as advisory service projected to start 28 June 2012 and last for one year. One year operational trail underway. (November 2012 through November 2013)
Enhancement of Oceanic ATM System (include capability of DARP)	JCAB	**Completed** ✓ Oct. 2012
Enhancements to ATM Automation System	Airservices Australia	2014-2017

Off Airways Operations – Airservices

Initiative Summary		
The introduction of User Preferred Routes remains a key service delivery objective for Airservices Australia. To facilitate improved environmental and economic performance for our customers Airservices is incrementally increasing the availability of Off Airways Operations. Off Airways Operations includes increased routing options such as direct route segments, flex tracks, and constrained User Preferred Routes.		
Initiative Lead		
Airservices Australia		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
Airservices Australia	Qantas	
	Virgin Australia	
Affected Flight Information Regions		
Brisbane	Melbourne	
Strategic Goals		
Increased routing flexibility to facilitate improved environmental performance.		
Benefits		
Off Airways Operations deliver Reduced fuel burn and a consequent reduction in emissions		

Responsibilities		
Activity	**Off Airways Operation**	**Activity Status**
DCT route segments introduced between East / West Coast of Australia	DCT route segments	**2010** ✓
YMML – NZAA – YMML	User Preferred Route	**2011** ✓
YSSY – VTBS (Bangkok)	Flex track	**2011** ✓
Flex Track ATC constraints reviewed / removed and or modified	Flex track	**2011** ✓
Increased validity period for YSSY to WSSS Flight	Flex track	**2011** ✓
Expanded DCT route between East / West Coast of Australia	DCT route segments	**2011** ✓
Additional DCT route segments introduced between East / West Coast of Australia	DCT route segments	**May 2012** ✓

Responsibilities		
Activity	**Off Airways Operation**	**Activity Status**
WSSS – YSSY – Day Time Flex Track (two flex tracks each day)	Flex track	**2013** ✓
Increased validity period for YMML to WSSS Flight	Flex track	**2013** ✓
Increased validity period for YSSY to WSSS Flight	Flex track	**2013** ✓

Long Range ATFM – Airservices

<table>
<tr><th colspan="3">Initiative Summary</th></tr>
<tr><td colspan="3">Long Range ATFM will expand the CDM stage 1 concepts and will be delivered over 4 stages:
Stage 1 – Establish a prototyping platform and develop the concept of operations for Long Range ATFM
Stage 2 – Implement Long Range ATFM within Australian FIRs, which includes calculation of international flights within a domestic GDP
Stage 3 – Develop the concept and solution for Regional ATFM
Stage 4 – Deliver Regional ATFM, expanding the CDM concept to participating international airports.
Through the use of a structured engineering process that includes stakeholder meetings, concept of operations development, stakeholder simulations and operational trials, Long Range ATFM solutions will be deployed incrementally to enhance ATFM throughout Australia.
http://www.airservicesaustralia.com/projects/collaborative-decision-making-cdm/long-range-atfm/</td></tr>
<tr><th colspan="3">Initiative Lead</th></tr>
<tr><td colspan="3">Airservices Australia</td></tr>
<tr><th colspan="3">Contributing Stakeholders</th></tr>
<tr><th>ASPIRE Partners</th><th>Airlines</th><th>Supporting Agencies</th></tr>
<tr><td>Airservices Australia</td><td>Qantas</td><td></td></tr>
<tr><td></td><td>Virgin Australia</td><td></td></tr>
<tr><th colspan="3">Affected Flight Information Regions</th></tr>
<tr><td>Brisbane</td><td>Melbourne</td><td></td></tr>
<tr><th colspan="3">Strategic Goals</th></tr>
<tr><td colspan="3">Improve the efficiency of the Air Traffic Management System through predictability and the alignment of demand with capacity.</td></tr>
</table>

Benefits
Customer benefits include: • greater network predictability • financial savings through reduced fuel burn resulting from transferring airborne delay to ground delay • reduction in airline contribution to environmental emissions through reduced fuel burn resulting from transferring airborne delay to ground delay Operational benefits include: • reduction in airborne holding • improved ability to predict demand/capacity imbalances • improved ability to take action to adjust capacity to meet demand • access to predicted demand/capacity information for all stakeholders provides the basis for decisions to be made in a collaborative manner • the capability to provide strategic 4D trajectory prediction for stakeholders • improved ability to predict and manage ATC workload

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Concept Demonstration	Airservices	In progress
Implementation for Long haul arrivals - Sydney	Airservices	2014
Implementation for Long haul arrivals at other Australian capital cities	Airservices	

Implementation of ADS-B with VHF communications

Initiative Summary		
Progress ADS-B implementation in the South China Sea area with Viet Nam and Indonesia		
Initiative Lead		
CAAS		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
CAAS		DGCA Indonesia
		VANSCorp
Affected Flight Information Regions		
Singapore	Jakarta	Ho Chi Minh
Strategic Goals		
1. Improve surveillance coverage in the South China Sea		
Benefits		
1. Enhance safety with better surveillance coverage 2. Increase capacity and efficiency by providing radar-like separation with VHF communications outside radar coverage through sharing of ADS-B data		
Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Implementation of ADS-B	ADS-B TF and SEA ADS-B WG	In progress Agreement for ADS-B Data Sharing with VHF Communication between CAAS and DGCA Indonesia has been signed.
Implementation Plan of ADS-B		**Completed** ✓
Discussion with Viet Nam and Indonesia		In progress
ADS-B Operations with Viet Nam		Implementation in 12 Dec 2013.

Implementation of Reduced Horizontal Separation

Initiative Summary			
Progress the implementation of RNP10 and RNP4 operations in the South China Sea and Bay of Bengal areas.			
Initiative Lead			
CAAS			
Contributing Stakeholders			
ASPIRE Partners	**Airlines**	**Supporting Agencies**	
CAAS		CSSI	
Affected Flight Information Regions			
Singapore	Jakarta	Ho Chi Minh	Malaysia
Strategic Goals			
Implement RNAV5, RNP10 and RNP4 in the South China Sea and Bay of Bengal areas.			
Benefits			
Increase capacity and improve efficiency in both the South China Sea and Bay of Bengal areas.			

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Routes identified		**Completed** ✓
Set up of En-route Monitoring Agency		**Completed** ✓
Recommended action plans to implement RNP10 and RNP4 operations		In progress
Implement RNP10 and RNP4 operations in the South China Sea areas	SEA-RR/TF	Implementation of RNP10 50/50 on 2 routes connecting SEA and Australasia in Feb 2012 Operational Trial of RNP10 50/50 on 2 routes between Singapore ACC and Manila ACC in Jan 2013
Implement RNP10 and RNP4 operations in the Bay of Bengal areas.	ASIOACG	RNP10 airspace planned for 2014

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Implementation of RNAV5 routes between high density city pair with surveillance coverage SIN-KUL SIN-CGK	Bilateral	Implementation of RNAV5 routes between SIN-KUL city pair in July 2012. Reduction of longitudinal separation between SIN-CGK in Aug 2012 and further review to implement RNAV5 routes
Remove constraints within their jurisdictions	ASPIRE partners	In progress

Oceanic ADS-C Climb-Descent Procedures

Initiative Summary		
Collaborate on the standards development and the execution of operational trials for Oceanic ADS-C Climb-Descent Procedures (CDP).		
Initiative Lead		
FAA		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
Airservices Australia		MITRE
Airways NZ		
FAA		
Affected Flight Information Regions		
Oakland Oceanic	Auckland Oceanic	Melbourne
Brisbane		
Strategic Goal		
Implementation of ADS-C CDP in the South Pacific using existing FANS equipment and ground infrastructure		
Benefits		
The availability of ADS-C Climb-Descent Procedures will enable easier access to preferred flight levels in Oceanic areas.		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Approvals for ADS-C ITP Pacific Operational Trials	ISPACG / FAA	**Completed** ✓
ADS-C CDP Pacific Operational Trials	ISPACG / FAA	In progress ADS-C CDP manual trial concluded on February 15, 2013. Only 8 clearances issued during the manual trail. Due to the inherent limitations of the manual execution of the procedure, there are no plans to extend the manual trial.

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
ADS-C ITP Pacific Implementation	ISPACG / FAA	FAA is continuing to develop the procedure. Fast Time Simulations are occurring at the FAA Technical Center. Controller workload is a limiting factor; however, efforts are underway to automate the procedure in the Ocean21 System which will lead to increased use of the procedure. Expected to be completed in January 2015.

Automatic Dependent Surveillance – Broadcast (ADS-B) Oceanic and Remote In-Trail Procedures (ITP) for Reduced Separation

Initiative Summary		
Collaborate on operational trials to harmonise procedures and collect data to support implementation of ADS-B ITP in South Pacific airspace.		
Initiative Lead		
FAA		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
Airservices Australia		
Airways NZ	1 November 2013	United Airlines
FAA	United Airlines	Honeywell / Teledyne
Affected Flight Information Regions		
Oakland Oceanic	Auckland Oceanic	Melbourne
Brisbane		
Strategic Goals		
1. Implementation of ADS-B ITP in the South Pacific 2. Expand capability into other regions		
Benefits		
The availability of ADS-B Oceanic and Remote In-Trail Procedures will enable easier access to preferred flight levels in Oceanic areas.		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Outreach to pilot unions and other airlines	ISPACG, APANPIRG,	
South Pacific routes (SOPAC) business case developed – March 2008		
Avionics Standards and Safety case (DO-312) – June 2008		
Separation and Airspace Safety Panel approval – November 2008	**FAA**	**Completed** ✓

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Programme plan (ITP strategy and joint responsibilities) – May 2009		
Approved Aircraft Certification and OpSpec - 2010		
Airspace approvals – 2010		
Begin Operational Trials		ADS-B ITP became operational in the entire Oakland region in December 2011. FAA is currently in discussions with Airways New Zealand and Fiji about expanding the ITP operational evaluation into the Auckland Oceanic FIR and the Nadi FIR in 2013. FAA has also held discussions with the Japan Civil Aviation Bureau about the potential for offering ITP in the Fukuoka FIR at some point in the future.
Complete Operational Trials		Operational trial conducted using ITP equipped United Airlines 747-400s in Oakland Oceanic FIR. Original authorization was scheduled to expire in August 2012 but was amended to permit operations in the Oakland Oceanic FIR until August 2013.
Draft report		
Final report		

Implementation of Time-Based Arrivals Management - JCAB

<table>
<tr><th colspan="3">Initiative Summary</th></tr>
<tr><td colspan="3">Implement maximum use of airspace and airport capacity by introduce traffic flow management procedures and automated decision support tool to reduce arrivals congestion into high density airspace and airport.</td></tr>
<tr><th colspan="3">Initiative Lead</th></tr>
<tr><td colspan="3">JCAB</td></tr>
<tr><th colspan="3">Contributing Stakeholders</th></tr>
<tr><th>ASPIRE Partners</th><th>Airlines</th><th>Supporting Agencies</th></tr>
<tr><td>JCAB</td><td></td><td></td></tr>
<tr><th colspan="3">Affected Flight Information Regions</th></tr>
<tr><td>Fukuoka</td><td></td><td></td></tr>
<tr><th colspan="3">Strategic Goal</th></tr>
<tr><td colspan="3">1. Improve fuel and emissions efficiency by reducing holding, excessive low altitude radar vectoring, and frequent altitude changes in the arrival segment.
2. Maximise arrivals capacity bound for high density airports by full utilization of runway capacity and increase of airspace capacity.</td></tr>
<tr><th colspan="3">Benefit</th></tr>
<tr><td colspan="3">Implementation of Time-Based Arrivals Management will improve operational efficiency, reduce emissions, cope with traffic increase and reduce controllers/pilots workload in the arrival segment.</td></tr>
<tr><th colspan="3">Milestone Targets</th></tr>
<tr><td colspan="3">1. Manage arrival capacity of a high density airport by adjusting identified fix departure time.
2. Manage flow of traffic to a high density airport by adjusting several identified fix departure time.
3. Manage flow of traffic to a high density airport by providing air traffic controllers with sequencing information, including times at strategic arrival points.</td></tr>
</table>

<table>
<tr><th colspan="3">Responsibilities</th></tr>
<tr><th>Activity</th><th>Responsible Group</th><th>Activity Status</th></tr>
<tr><td>Implement ground delay program</td><td>JCAB</td><td>Implemented at domestic airports. Completed✓</td></tr>
</table>

Responsibilities		
Introduce calculation system which provides controllers with specified fix departure time	JCAB	**Completed** ✓
Implement arrival capacity management by issuing Calculated Fix Departure Time (CFDT)	JCAB	Started trial operation to the aircraft bound for Tokyo International Airport (RJTT) since 25 Aug. 2011.
Expansion of arrival capacity management	JCAB	Under development

A.6. Arrivals Optimisation

Continuous Descent Operations - Suvarnabhumi Airport

Initiative Summary		
Optimise the vertical profile of arrival for aircraft to minimise undesired flight level segments by designing procedures and standard for operations for Continuous Descent Operations at Suvarnabhumi Airport and key selected airports.		
Initiative Lead		
AEROTHAI		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
AEROTHAI		
Affected Flight Information Regions		
Bangkok		
Strategic Goal		
Minimise fuel burn for the arrival phase of flight by enabling each jet to fly the optimum track to Top of Descent TOD and OPD from TOD to a touchdown on the landing runway.		
Benefit		
Emissions will be reduced during the Arrivals phase for all eligible flights.		
Milestone Targets		
1. Provide for Constant Descent Operations at Suvarnabhumi Airport. 2. Provide for Constant Descent Operations at selected provincial airports. namely Hat Yai and Chiang Mai		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
1. Implement provisional CDO procedures at Suvarnabhumi Airport with limited availability (at night)	AEROTHAI	**Completed**✓
2. Implement permanent CDO after full scale BKK TMA Redesign	AEROTHAI	Future plan
3. Implement Develop CDO procedures at Hat Yai and Chiang Mai airport	AEROTHAI	**Completed**✓In progress

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
4. Implement CDO procedures at Surat Thani, Samui and Nakhon Si ThammaratRun and evaluate the CDO Trial Procedure for Hat Yai and Chiang Mai airport	AEROTHAI	Future plan

National Rollout of RNP arrivals (Smart Tracking) - Airservices

Initiative Summary		
Airservices is working to lay the foundation for the worlds' first nationwide network of RNP enabled approach and departure procedures. Once implemented these procedures will deliver significant reductions in aircraft emissions, enable better noise management, reduce the number of miles flown and facilitate substantial fuel savings. The initiative has been branded 'Smart Tracking'. http://www.airservicesaustralia.com/projects/smart-tracking/		
Initiative Lead		
Airservices Australia		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
	Qantas Virgin Australia	
Affected Flight Information Regions		
Brisbane	Melbourne	
Strategic Goal		
Implement departure and arrival procedures which incorporate additional navigational accuracy, integrity and functional capabilities to permit operations using reduced obstacle clearance tolerances that enable approach and departure procedures to be implemented in circumstances where other types of approach and departure procedures are not operationally possible or satisfactory.		
Benefit		
Reduction in Emissions: • Optimised operation of the aircraft; • Fewer track miles; and • Increased confidence in flight arrival/departure. Noise Management: • Curved flight paths; • Track over non-residential area; and • Fewer missed approaches.		

Milestone Targets
1. Provide optimum track to STAR start points 2. Identify constraints to the introduction of Constant Descent Operations (CDO) as the 'normal' means of operating rather than the exception. 3. Provide for CDO from top of descent at selected airports 4. Manage the arrival demand in order to enable the benefits of CDO for each arriving flight.

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
RNP Brisbane Green trial completed 2007	Airservices Australia	**Completed** ✓
RNP expansion programme trial –completed 2009	Airservices Australia	**Completed** ✓
RNP national rollout – Smart Tracking Project		• Brisbane March 2012 ✓ • Adelaide 2013 ✓ • Cairns 2013 ✓ • Canberra 2013 ✓ • Melbourne 2013 ✓ • Gold Coast • Perth

Introduction of Optimised Arrivals - Airservices

Initiative Summary		
Introduction of runway end STAR and uninterrupted descents for major airports.		
Initiative Lead		
Airservices Australia		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
	Qantas Virgin Australia	
Affected Flight Information Regions		
Brisbane	Melbourne	
Strategic Goal		
Introduce runway end STAR and uninterrupted descents as normal operations for major airports.		
Benefit		
Emissions will be reduced during the Arrivals phase for all eligible flights.		
Milestone Targets		
1. Identify constraints to the introduction of Optimised Descent Profile s as the 'normal' means of operating rather than the exception. 2. Provide for Optimised Descent Profile Operations in Melbourne 3. Provide for Optimised Descent Profile Operations at selected airports		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
CDA arrival trial – commenced in Melbourne 2009	Airservices Australia	**Trial completed** ✓
CDA arrival as normal operations - Melbourne	Airservices Australia	**Trial completed** ✓ CDA now a daily practice for Melbourne (see SIN-MEL & LAX-MEL ASPIRE Daily city pairs) ✓
CDA arrival as normal operations – other capital cities	Airservices Australia	In progress

Collaborative Arrival Manager – Airways NZ

Initiative Summary		
Initiative Lead		
Airways NZ		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
	Air New Zealand	
Affected Flight Information Regions		
Strategic Goal		
Minimise fuel burn for the arrival segment by enabling each jet to fly the optimum track to Top of Descent TOD and OPD from TOD to a touchdown on the landing runway		
Benefit		
Emissions will be reduced during the Arrivals phase for all eligible flights		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Collaborative arrival Manager (CAM) implementation – Auckland & Wellington	Airways NZ	**AA - Completed** ✓ **WN - Completed** ✓
Collaborative arrival Manager (CAM) implementation – Christchurch & Queenstown	Airways NZ	**CH- Completed** ✓ **QN - Completed** ✓
Integrate advanced Arrivals manager into CAM and deliver services to major Airports	Airways NZ	Operational at Auckland Apr 2013.

RNP AR APPROACH – Airways NZ

Initiative Summary		
RNP AR implemented at international ports Procedures will be linked to STARs and enable TAs for suitably equipped aircraft		
Initiative Lead		
Airways NZ		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
	Air New Zealand	
Affected Flight Information Regions		
Strategic Goal		
Minimise fuel burn for the arrival segment by enabling each jet to fly the optimum track to Top of Descent TOD and OPD from TOD to a touchdown on the landing runway		
Benefit		
Emissions will be reduced during the Arrivals phase for all eligible flights		
Milestone Targets		
1. Develop procedures 2. Train ATC staff. 3. Implement changes		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Rotorua	Airways NZ	**Completed 2011**✓
NZAA	Airways NZ	**Completed** ✓
NZQN	Airways NZ	**Completed** ✓
NZCH/NZWN	Airways NZ	2014

OPD & CDO - CAAS

Initiative Summary		
Development of procedures and standards for arrivals optimisation via the principles of a Continuous Descent Operation (CDO). This includes the development of Optimised Descent Profile (OPD) procedures, and the continued development of Tailored Arrivals programmes.		
Initiative Lead		
CAAS		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
	Singapore Airlines	
Affected Flight Information Regions		
Singapore		
Strategic Goal		
Minimise fuel burn for the arrival segment by enabling each jet to fly the optimum track to Top of Descent TOD and OPD from TOD to a touchdown on the landing runway		
Benefit		
Emissions will be reduced during the Arrivals phase for all eligible flights		
Milestone Targets		
1. Develop OPD/CDO procedures 2. Conduct operational trials with Singapore Airlines 3. Conduct operational trials with all airlines operating into Changi Airport 4. Implement OPD/CDO operations at Changi Airport		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Development of OPD procedures	CAAS	**Completed** ✓
Study the implementation of TA	CAAS	NIL
Conduct OPD operational trials with other airlines operating into Changi Airport	CAAS	**Completed** ✓ Trials have been conducted between 17th November 2011 and 7th March 2012

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Implementation of CDO procedures for flights into Changi	CAAS	**Completed** ✓ Implemented on 8th March 2012

Tailored Arrivals - FAA

Initiative Summary		
Dynamic optimisation of aircraft approach profiles, designed to both reduce periods of level-off during descent, and to meet the flexible needs of the air traffic system at congested airports.		
Initiative Lead		
Federal Aviation Administration		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
FAA	TBD	TBD
Affected Flight Information Regions		
Oakland Oceanic		
Strategic Goal		
Minimise fuel burn for the arrival segment by enabling each jet to fly the optimum track to Top of Descent TOD		
Benefit		
Emissions will be reduced during the Arrivals phase for all eligible flights		
Milestone Targets		
1. Provide optimum track to STAR start points 2. Identify constraints to the introduction of CDOs or TAs as the 'normal' means of operating rather than the exception. 3. Provide for Constant Descent Operations or Tailored Arrival from TOD at selected airports 4. Manage the arrival demand in order to realise the benefits of CDO or TA for **each** arriving flight.		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Tailored Arrivals trials	FAA	**Completed** ✓ Tailored Arrivals are fully implemented at three sites (San Francisco, Miami and Los Angeles). Projected fuel savings and emissions reduction using these procedures were confirmed by the initial trials, and continued use by the airlines is resulting in significant cost savings and emissions reduction.
Develop Safety Case	FAA	**Completed** ✓
Implementation of TA	FAA	**Completed** ✓
Expansion to additional airports	FAA	Under Development

Optimised Profile Descent - FAA

Initiative Summary		
2010 Plans for Optimised Profile Descent (OPD) Standard Terminal Arrival Routes (STARs) utilised by appropriately equipped oceanic arrivals.		
Initiative Lead		
Federal Aviation Administration		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
FAA		
Affected Flight Information Regions		
Oakland Oceanic		
Strategic Goal		
Minimise fuel burn for the arrival segment by enabling each jet to fly the OPD from TOD to a touchdown on the landing runway		
Benefit		
Emissions will be reduced during the Arrivals phase for all eligible flights		
Milestone Targets		
1. Identify constraints to the introduction of CDOs as the 'normal' means of operating rather than the exception. 2. Provide for Constant Descent Operations from TOD at selected airports 3. Manage the arrival demand in order to realise the benefits of CDO for **each** arriving flight.		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Anchorage: One OPD STAR published and implemented	FAA	**Completed** ✓
Honolulu: 3 OPD STARs (GPS required) published and implemented	FAA	**Completed** ✓
Seattle:	FAA	Under development

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Develop requirements for ground automation support tools for enhanced OPD	FAA	Under development

Continuous Descent Operations (CDO) Expansion - JCAB

Initiative Summary		
Promote the implementation of Continuous Descent Operations.		
Initiative Lead		
JCAB		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
JCAB		
Affected Flight Information Regions		
Fukuoka		
Strategic Goal		
Minimize fuel burn for the arrival segment by enabling each jet to fly the optimum track to Top of Descent (TOD) and Optimised Profile Descent (OPD) from TOD to a touchdown on the landing runway.		
Benefit		
Emissions will be reduced during the Arrivals phase for all eligible flights		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Implementation of CDO	JCAB	Trial operation started at Kansai Airport (RJBB) since 2009 **Completed** ✓
Expansion of CDO to additional airports	JCAB	Trial operation started at Naha Airport (ROAH) in September 2013.
Expansion of CDO to additional airports	JCAB	**Under development** Traffic volume and traffic flow will be considered in the implementation of CDO.

Transition to RNP - JCAB

Initiative Summary		
Introduction of RNP procedures, including RNP AR approach, for the enhancement of efficiency compared to RNAV		
Initiative Lead		
JCAB		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
JCAB	ANA,	ENRI
	JAL	JAXA
	and other domestic Airlines	
Affected Flight Information Regions		
Fukuoka		
Strategic Goal		
Minimise fuel burn and enhance to establish flexible flight route for departure and arrival segment by reducing flight distance. Also, provide a basis of trajectory based operations.		
Benefit		
Emissions will be reduced during the departure and approach phase for all eligible flights.		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Establishment of RNAV route and procedures	JCAB	Established at dozens of domestic airport. **Completed** ✓
Determine airports which expect higher effectiveness and necessity of establishing RNP procedures	JCAB and other stakeholders	**Completed** ✓
Establishment of RNP procedures in 2012	JCAB	RNP AR approach was firstly established in January 2012. **Completed its establishment of RNP AR approach at 4 additional airports, in total 5 airports, by 2012**✓

Responsibilities		
Establishment of RNP procedures in 2013	JCAB	**Completed its establishment of RNP AR approach at 6 additional airports, in total 11 airports, by 2013✓**
Following year expansion	JCAB	Establishment of RNP AR approach at 8 more airports is in progress.

A.7. PBN Implementation

PBN Implementation – Departure, Arrival, Approach - AEROTHAI

Initiative Summary		
Develop procedures including PBN departure, arrival and approach to support TMA operations in major airports. Note: This work program is for the TMA portion of the PBN implementation, therefore it intentionally includes SID (Departure), STAR (Arrival) and Approach under the same initiative area of Arrival Optimisation for the time being.		
Initiative Lead		
AEROTHAI		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
Affected Flight Information Regions		
Bangkok		
Strategic Goal		
Enhance efficiency through segregation of arrival and departure traffic. Enhance safety by providing runway-aligned and vertical guided approaches.		
Benefit		
Minimise fuel burn during the arrival, approach and departure segments. Enhance safety of approach operations.		
Milestone Targets		
Implement PBN departure/arrival/approach procedures at major airports		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Establish RNAV(GNSS) approach for Phuket, Hat Yai, Samui, Chiang Mai without vertical guidance	AEROTHAI	**Completed**✓
Design RNP 1 SID for Lampang	AEROTHAI	**Completed**✓
Develop RNAV(GNSS) approach procedures for Chiang Rai, Udon Thani, Lampang without vertical guidance	AEROTHAI	**Completed**✓

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
Establish RNAV(GNSS) without vertical guidance for Surat Thani, Narathiwat	AEROTHAI	**Completed**✓
Establish RNAV(GNSS) with vertical guidance for Nakhon Sri Thammarat	AEROTHAI	In progress
Establish RNAV(GNSS) without vertical guidance for Trat, Surat Thani, Nakhon Sri Thammarat, Khon Kaen, Krabi	AEROTHAI	In progress
Design PBN SID STAR and establish RNAV(GNSS) with vertical guidance for Chiang Mai and Phuket	AEROTHAI	In progress
Establish RNAV(GNSS) with vertical guidance for Trang, Krabi and Narathiwat	AEROTHAI	In progress
Establish RNAV(GNSS) with vertical guidance for Hat Yai, Samui, Ranong	AEROTHAI	Next Step

PBN Implementation – Enroute, including Conditional Route - AEROTHAI

Initiative Summary		
Improve route efficiency through establishing conditional routes in Thailand's domestic airways systems and some international routes. Create RNAV routes as a part of PBN enroute implementation		
Initiative Lead		
AEROTHAI		
Contributing Stakeholders		
ASPIRE Partners	**Airlines**	**Supporting Agencies**
Affected Flight Information Regions		
Bangkok		
Strategic Goal		
Utilise airspace resource to fuller extent through establishing more direct routes using suitable aircraft navigational capability and flight profile.		
Benefit		
Increase airspace capacity and efficiency through routes straightening. Fuel burn and carbon emissions are reduced through proper applications of navigation capability.		
Milestone Targets		
1. Roll out PBN routes 2. Collaborate with Royal Thai Air Force to establish conditional routes for both domestic and international airways		

Responsibilities		
Activity	**Responsible Group**	**Activity Status**
1. Establish Conditional Routes in Thailand's domestic airways (Y1&Y2 routes).	AEROTHAI	**Completed**✓
2. Implement Conditional Routes RNAV5 on international routes towards Australia (M904).	AEROTHAI	**Completed**✓
3. Establish conditional parallel uni-directional RNAV5 routes for key domestic city pairs namely Bangkok-Chiang Mai and Bangkok-Phuket	AEROTHAI	**Completed**✓

Appendix B. Table of Acronyms

Acronym	Explanation
ADS	automatic dependent surveillance
ADS-B	automatic dependent surveillance - broadcast
ADS-C	automatic dependent surveillance - contract
ANSP	air navigation service provider
AOC	airline operations centre
ASPIRE	The Asia and Pacific Initiative to Reduce Emissions
ATC	air traffic control
ATM	air traffic management
ATS	air traffic services
CANSO	The Civil Air Navigation Services Organisation
CDO	continuous descent operation
CNS/ATM	communications, navigation, surveillance / air traffic management
CTMS	Central Traffic Management System
DARP	dynamic airborne reroute procedures
GHG	global greenhouse gas
IATA	The International Air Transport Association
ICAO	The International Civil Aviation Organisation
ISPACG	Informal South Pacific ATS Coordinating Group
IPACG	Informal Pacific ATC Coordinating Group
MAESTRO	Means to Aid Expedition and Sequencing of Traffic with Research of Optimisation
NOTAM	Notice to Airmen

Acronym	Explanation
OPD	optimised profile descent
OTM-4D	Oceanic Trajectory Management – 4D
PBN	performance based navigation
RNAV	area navigation
RNP	required navigation performance
RNP-AR	required navigation performance – authorisation required
RVSM	reduced vertical separation minima
SOPAC	South Pacific
STAR	standard terminal arrival
TA	tailored arrival
TBD	to be determined
TMA	Traffic Management Advisor
TOD	top of descent
UPR	user preferred routes

Appendix C. ASPIRE Daily - Terms of Reference

Rules of Order

ASPIRE-Daily will be managed as a sub-team of the ASPIRE partnership, reporting to the partners at the quarterly and annual meetings. The ASPIRE-Daily team was selected from volunteers by the ASPIRE Chair. The chair appointed the FAA to serve as the initial ASPIRE Daily Coordinator.

ASPIRE-Daily preparation and responsibilities will be shared among the ASPIRE-Daily team members. The responsibilities are detailed in Table 1.

Table 1 - ASPIRE Daily responsibilities

Title	Lead Organisation	Responsibilities
ASPIRE-Daily Project Coordinator	FAA	Ensure programme adheres to timeline, report back to group, serve as POC for ASPIRE-Daily
Media Liaison	Airways New Zealand	Prepare press releases and reports, create & update webpage content, design logo.
Industry Representative	IATA Asia Pacific	Develop the process for IATA review of city-pair nominations and for airline reporting. Serve as POC for IATA nomination review and feedback. Provide airline utilization reports to the Database Coordinator.
IATA Liaison	CAAS	Work with Industry Representative to establish and maintain contact with airlines. Coordinate with IATA to ensure that reporting is provided to the Database Coordinator. Ensure information is shared in a timely manner between airlines, ASPIRE partners and IATA.
Database Coordinator	Airservices Australia	Establish and maintain a database of ASPIRE-Daily information. Create monthly/annual summaries from data and forward to media specialist.

IATA will assist in identifying the various points of contact for each of the individual airlines as well as develop the process for review of city-pair nominations and provide nomination review and feedback. IATA will advise if there is more than one airline participating in a particular city-pair.

Participating Equipped Flight

Participating Equipped Flight refers to any flight where the aircraft meets the minimum criteria for participation in all published procedures available on the ASPIRE Daily City Pair route. These criteria will be documented in each city pair nomination.

ASPIRE Daily Best Practices

The current ASPIRE Daily Best Practices are:

1. Network Optimisation
2. Surface Movement Optimisation
3. User-Preferred Routes (UPRs)
4. Departure Optimisation
5. Dynamic Airborne Reroute Procedure (DARP)
6. 30/30 Reduced Oceanic Separation
7. Time-Based Arrivals Management
8. Arrivals Optimisation

Best Practices Review

ASPIRE Daily Best Practices will be reviewed annually and partners will be encouraged to submit new candidates for consideration. Nominations should be sent to the ASPIRE Daily Coordinator. At a minimum, the nominations should include:

1. name and description of the Best Practice;
2. studies/documentation showing fuel savings;
3. an explanation of restrictions/limitations on the availability of the Best Practice; and
4. a point of contact.

The ASPIRE Daily team will review the nominations and present recommendations for inclusion/exclusion of the nominated Best Practices.

City Pairs nomination

The process for review of the ASPIRE Daily nominations is documented below.

An ASPIRE Daily City Pair is identified by origin and destination cities (e.g. San Francisco to Sydney). The reciprocal destination and origin city pair (e.g. Sydney to San Francisco), would be considered a separate and distinct route because of the potential differences in Best Practice availability for departure and arrival.

Initially, ASPIRE Daily will only include international city pairs in the Asia-Pacific region with origin and destination under the jurisdiction of an ASPIRE partner. As the ASPIRE Daily program continues to mature, partners will consider wider collaboration for the inclusion of City

Pairs with origin and destination in other locations. Only City Pairs with three or more ASPIRE-Daily Best Practices will qualify for the designation of ASPIRE Daily city pairs.

Nominations should be sent to the ASPIRE-Daily Coordinator. The nominating ANSPs, in conjunction with the airline partners flying the route, should evaluate each city pair nomination in order to quantify the environmental benefits and the operational availability of the nominated best practices before submitting a city pair to IATA for validation. This evaluation will include calculating a set of generalised potential fuel and emissions savings for each of the best practices claimed on the route.

In the case of the city pairs that were validated and published before the requirement for generalised emissions savings was introduced, the partners are encouraged to revisit as time allows.

Star Ratings

Each nominated ASPIRE-Daily City Pair shall be assigned a designation as an ASPIRE 3-Star, 4-Star, or 5-Star City Pair,. The nominating ANSPs will propose the star rating for each city pair. To achieve a 5-Star rating, a City Pair must utilize 7 or more ASPIRE-Daily Best Practices. A 4-Star City Pair will be any route with four to six Best Practices, while a 3-Star City Pair will utilise three Best Practices. City Pairs that do not have at least three available Best Practices will not be published.

City Pair Validation

The partners have engaged IATA Asia Pacific for assessment and validation of the ASPIRE-Daily Best Practices, city pair nominations and star ratings. The IATA assessment and validation is for consultation and advisory purposes.

Issues/Risks

Funding and Staffing - The ASPIRE-Daily programme is an offshoot of the ASPIRE partnership, which in and of itself is dependent on in-kind donation of personnel and services from partner ANSPs and, as such, does not have dedicated funding. Changes in personnel or organisational direction of partners may adversely affect the ASPIRE-Daily programme.

Airline participation - Accurate reporting of ASPIRE-Daily City Pair utilisation will depend largely upon the accurate and timely reporting of successful utilisation rates by the airlines to the ASPIRE partners. This will require a commitment by the airlines to follow reporting methodology provided by the ASPIRE-Daily team. The ASPIRE Partners can request information, but ultimately the consistency and accuracy of reporting will depend upon individual airlines. Utilisation rates will be included in the ASPIRE Annual Report as a measure of success of the programme.

Stakeholders

Stakeholders include ASPIRE partner ANSPs, IATA Asia Pacific and airlines.

Stakeholder	Responsibility
ASPIRE Partners	Nominate City Pairs as ASPIRE Daily Routes. Establish & maintain contact with IATA. Collaborate with airline partners to evaluate each city pair nomination in order to quantify the environmental benefits and the operational availability of the nominated best practices. Forward nominations to IATA. Publicise ASPIRE-Daily City Pairs. Coordinate with airlines to achieve buy-in. Create & maintain reporting guidance for airlines about route utilisation. Request & record successful/not successful route utilisation from airlines.
IATA Asia Pacific	Validate availability of Best Practices on nominated City Pairs and associated ASPIRE-Daily star ratings. Provide airline-industry feedback to the ASPIRE partners on ASPIRE-Daily and potential ASPIRE-Daily City Pairs. Encourage participation and provide feedback on new Best Practices.
Airlines	Collaborate with ANSP partners to evaluate each city pair nomination in order to quantify the environmental benefits and the operational availability of the nominated best practices.

Outputs/Deliverables

The start-up deliverables of the ASPIRE Daily Program will include:

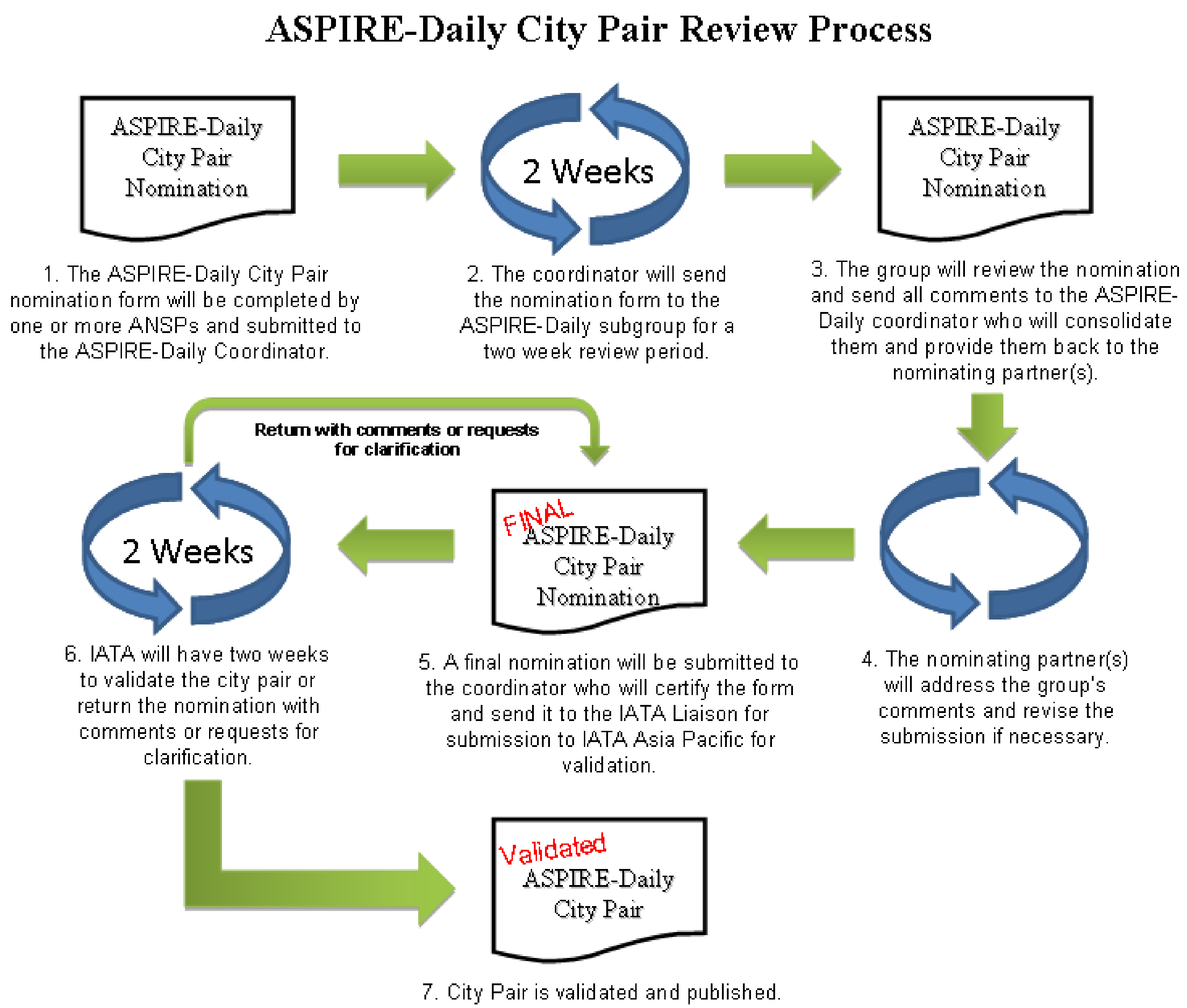
- ASPIRE-Daily Terms of Reference (approved by full team);
- List of ASPIRE-Daily Best Practices (approved by full team);
- Candidate ASPIRE-Daily City Pairs (agreed to by nomination of the partners, validated by IATA);
- ASPIRE-Daily website & marketing materials (e.g. logo, press release, brochure); and
- Reporting materials and guidance materials for airlines and IATA.

On-going deliverables of the ASPIRE-Daily Programme will include:

- A list of IATA-validated ASPIRE-Daily City Pairs, published annually; and
- A published summary of performance of ASPIRE-Daily City Pairs.

All deliverables will be published to the ASPIRE-Daily website.

ASPIRE-Daily City Pair Review Process



Appendix D. ASPIRE Coordination

The ASPIRE coordinators will hold quarterly teleconferences to update plans and progress. The minutes of each teleconference will be published and forwarded to the partners.

Prior to each ASPIRE annual meeting the ASPIRE Coordinators will meet. The purpose of the coordination meeting is to discuss and resolve administrative issues and does not require the participation of all ASPIRE partners.

To remain productive the annual ASPIRE coordinators meeting will be held to under 30 attendees.

Each partner will identify 2-3 delegates to keep the meeting a manageable working size with the exception of the host, who will add administrative support.

Appendix E. ASPIRE Coordinators

Partner	ASPIRE Coordinator	Address	Phone	Email
AEROTHAI	Visut Dechpokket	102 Ngamduplee, Tungmahamek, Sathon, Bangkok 10120 Thailand	+66 8 1821 3427	visut.de@aerothai.co.th
Airservices Australia	David Webb	P.O. BOX 1093, Tullamarine, VIC 3043, Australia	+61 408 004 213	david.webb@airservicesaustralia.com
Airways New Zealand	Allan London	PO Box 53093, Auckland, New Zealand	+64 9257 7560	allan.london@airways.co.nz
Civil Aviation Authority of Singapore (CAAS)	Edmund Heng Cher Sian	Singapore Changi Airport, PO BOX 1, Singapore 918141	+65 6541 2430	edmund_heng@caas.gov.sg
Civil Aviation Bureau, Japan (JCAB)	Hideko Mishima	2-1-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8918, Japan	+81 3 5253 8740	mishima-h46dg@mlit.go.jp
Federal Aviation Administration (FAA)	Riley Downing (ASPIRE Daily Coordinator)	800 Independence Ave, SW Washington DC, 20591 USA	+1 202 385 6286	riley.downing@faa.gov