



International Civil Aviation Organization

**AUTOMATIC DEPENDENT SURVEILLANCE –
BROADCAST SEMINAR AND TWELFTH MEETING
OF AUTOMATIC DEPENDENT SURVEILLANCE –
BROADCAST (ADS-B) STUDY AND
IMPLEMENTATION TASK FORCE (ADS-B SITF/12)**



Kolkata, India, 15-18 April 2013

Agenda Item 7: Development of Asia/Pacific Regional ADS-B Implementation Plan and Sub-Regional ADS-B Implementation Plan

**ASIA/PACIFIC SEAMLESS ATM PLAN REQUIREMENTS
FOR ADS-B SURVEILLANCE**

(Presented by the Secretariat)

SUMMARY

This paper presents information on the Asia/Pacific Seamless ATM Plan, and the requirements for ADS-B facilities to support the plan.

1. INTRODUCTION

1.1 ICAO data indicates that the Asia/Pacific Region was, in 2011, the busiest in the world in terms of Passenger Kilometres Performed (PKP). In 2012 Asia/Pacific Region had the largest regional market share of total domestic and international Revenue Passenger Kilometres (RPK).

1.2 Recognizing that with rapid growth in air traffic in the diverse Asia-Pacific region there was a need for seamless ATM to ensure safe, efficient and sustainable air transport operations and greater airspace capacity, the 46th Directors General of Civil Aviation (DGCA) Conference (Osaka, October 2009) was the genesis of Asia/Pacific Seamless Air Traffic Management (ATM) discussion, endorsing the Kansai Statement. The DGCA Conference requested the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) to take a lead role in development of Seamless ATM in the Asia/Pacific.

1.3 APANPIRG subsequently formed the Asia/Pacific Seamless ATM Planning Group (APSAPG), with a primary goal to develop an Asia/Pacific Seamless ATM Plan. The Draft Asia/Pacific Seamless ATM Plan is now in the mature stage of its drafting, and is expected to be finalized at the final meeting of APSAPG (APSAPG/4, Hong Kong, China, 3 – 7 June 2013). The Plan is expected to be adopted at APANPIRG/24 in late June 2013.

1.4 The combined 3rd Meeting of the South Asia/Indian Ocean ATM Coordination Group (SAIOCG/3) and 20th Meeting of the South-East Asia ATS Coordination Group (SEACG/20) was held in Bangkok, Thailand, from 18 – 22 February 2013. Small Working Groups (SWG) were formed at SAIOCG/2 and SEACG/19 to assess:

- current status and planning of implementation;
- identify barriers to implementation;
- make recommendations to assist harmonized ATM procedures and applications; and
- make recommendations that assist implementation in accordance with the Asia/Pacific Air Navigation and ATFM Concepts of Operations, and the Asia/Pacific Seamless ATM initiatives, related to the Air Traffic Flow Management (ATFM), Communications (COM) and ATS Surveillance (SUR) fields.

2. DISCUSSION

Seamless ATM Plan

2.1 The Seamless ATM Plan categorises airspace by reference to its CNS (Communications, Navigation and Surveillance) capability as:

- a) Category R: remote en-route airspace within ATS communications and surveillance coverage dependent on a third-party Communication Service Provider (CSP); or
- b) Category S: serviced (or **potentially** serviced) en-route airspace – by direct (not dependent on a CSP) ATS communications and surveillance; or
- c) Category T: terminal operations.

2.2 The Seamless ATM Plan includes Preferred Airspace and Route Specifications (PARS). The specifications are still in draft until they are approved by APANPIRG; however that should not preclude discussion of the elements and possible implementation strategies.

2.3 Under PARS Phase 1, effective 12 November 2015, all Category S controlled airspace FL195 and above and Category T airspace supporting high density aerodromes should be designated as non-exclusive¹ ADS-B airspace requiring operation of ADS-B using 1090ES with DO-260/260A and 260B capability, with priority implementation for the following high density FIRs (**Figure 1**) supporting the busiest Asia/Pacific traffic flows (APANPIRG Conclusion 22/8 refers):

- a) South Asia: Delhi, Mumbai;
- b) Southeast Asia: Bangkok, Hanoi, Ho Chi Minh, Jakarta, Kota Kinabalu, Manila, Sanya, Singapore, Vientiane; and
- c) East Asia: Beijing, Fukuoka, Guangzhou, Hong Kong, Kunming, Shanghai, Shenyang, Taipei, Wuhan.

¹ *Non-exclusive means that non-PBN aircraft may enter the airspace, but may be accorded a lower priority than PBN aircraft, except for State aircraft.*

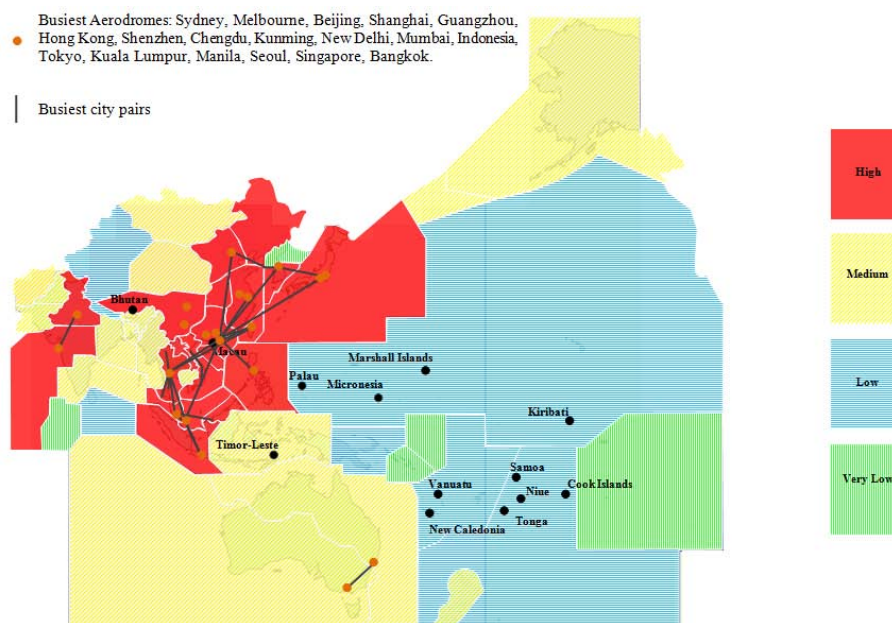


Figure 1: High Density FIRs

2.4 Under PARS Phase II, effective 9 November 2018, in areas where ADS-B based separation service is provided, the mandatory carriage of ADS-B OUT should be prescribed. Aviation System Block Upgrades (ASBU) ASBU Priority 2 refers.

2.5 The Plan specifies that ADS-B (using 1090ES) or MLAT or radar surveillance systems should be used to provide coverage of all Category S-capable airspace as far as practicable (ASBU Priority 1). Data from ATS surveillance systems should be integrated into operational ATC aircraft situation displays (standalone displays of ATS surveillance data should not be used operationally).

2.6 The Plan further specifies Preferred ATM Service Levels (PASIL). For En-route operations under PASL Phase 1, effective 12 November 2015, the plan states that subject to Annex 11 State safety assessments, the following minimum ATC separation standards based primarily on ATS surveillance should be applied during normal operations, including transfer of control points, with priority for high density FIRs within:

- a)..... Category S controlled airspace – between **5NM** and **10NM** horizontally and/or between **15NM** and **20NM** for PBN parallel route spacing (based on RNP/RNAV 2 or RNAV 5).

Note: Within Category S airspace, transition to a minimum separation standard of 5NM at the earliest opportunity is recommended.

SAIOCG/3&SEACG/20 SWG (SUR)

2.7 The SWGs (SUR) of the combined SAIOCG/3 and SEACG/20 meeting conducted a study of current surveillance in South Asia and South-East Asia. **Figure 2** represents gaps in required surveillance coverage in the South Asia/Bay of Bengal area. **Figure 3** represents surveillance gaps of concern in the South China Sea area. Note that the surveillance coverage indicated is based on planned ADS-B implementation.

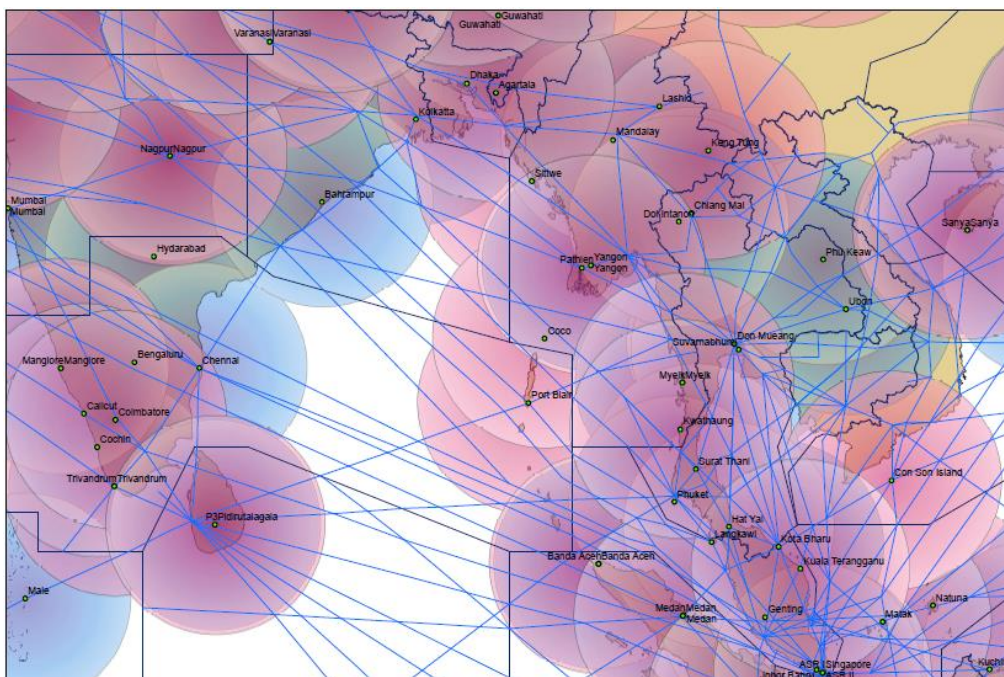


Figure 2: Planned Surveillance Coverage – Bay of Bengal

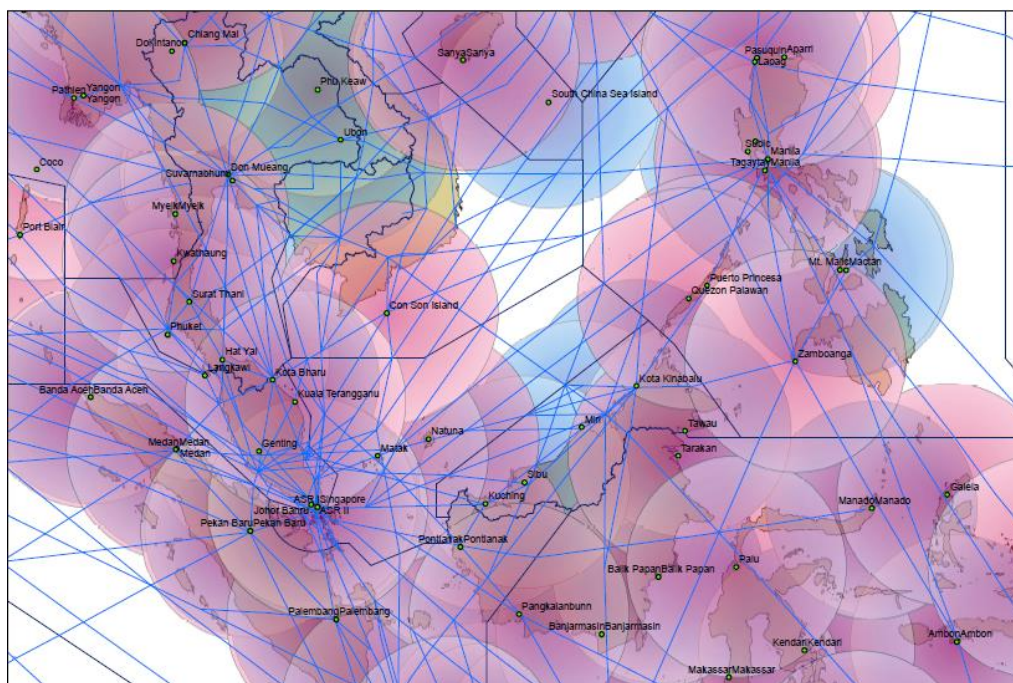


Figure 3: Planned Surveillance Coverage – South China Sea

2.8 Particularly in the case of the South China Sea, there is a significant gap in the combined SSR and ADS-B surveillance coverage of airspace which is becoming increasingly congested, and is identified as Category S airspace in the Seamless ATM Plan. Management of this airspace requires large non-surveillance separation standards, supported by a Flight Level Allocation scheme. Without surveillance based separation the airspace will continue to be managed in this restrictive and inflexible way, and the ATC systems of a significant number of participating and surrounding states, and the controllers themselves, will suffer capacity constraints.

2.9 The meeting is invited to also note that the surveillance analysis and planning being conducted by SAIOCG and SEACG SWGs is based on generic circular 250NM radius coverage estimates. These are highly inaccurate, and may lead to unrealistic expectations of currently planned surveillance capability in the region. There is a pressing need for high integrity coverage predication diagrams to be made available for this purpose. **Figures 4 and 5** provide examples of accurate ADS-B coverage predictions. **Figures 6 and 7** demonstrate an SSR coverage prediction, and the coverage realized in operation.



Figure 4: ADS-B Coverage Prediction

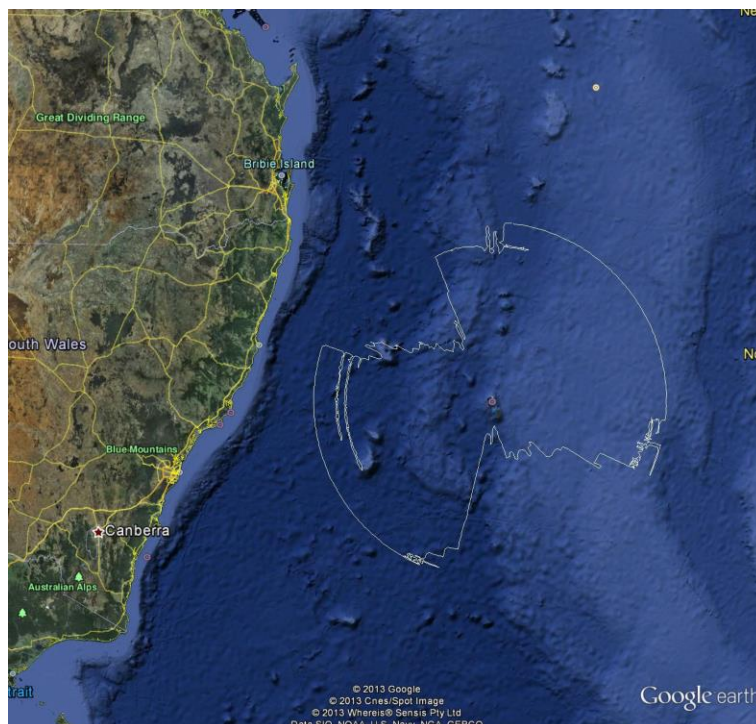


Figure 5: ADS-B Coverage Prediction



Figure 6: SSR Coverage Prediction

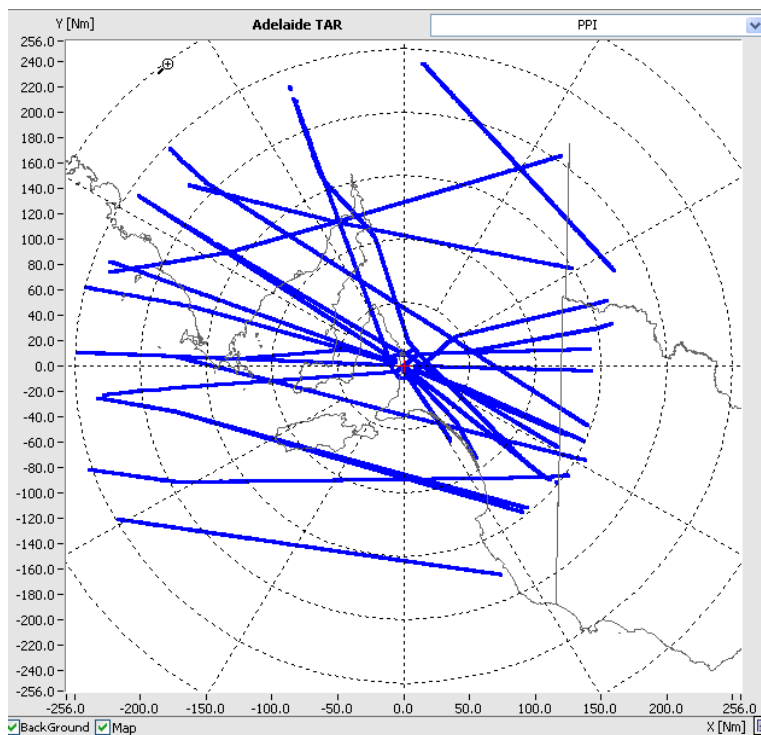


Figure 7: Actual SSR Coverage

2.10 Reliable and robust analysis and planning of ADS-B coverage to support improved capacity under the seamless ATM initiative cannot be achieved without accurate coverage modeling. States should ensure that surveillance engineering/technical teams are provided with reliable modeling tools and that reliable coverage predictions are provided for ATM analysis and planning.

ADS-B Based Surveillance Separation

2.11 ICAO Doc 4444 (PANS/ATM) specifies that the horizontal separation minimum based on radar and/or ADS-B is 9.3 km (5.0 NM).

2.12 The Asia/Pacific Air Navigation Concept of Operations includes the following principle:

Surveillance: in areas where the provision of direct ATS surveillance is possible, ATC separation must be based on these surveillance systems (i.e. radar, multilateration and ADS-B).

2.13 Airspace capacity in many Asia/Pacific States is being limited by the use of large separation standards between surveillance-identified aircraft. For example, longitudinal separation standards of 30 or 40 nautical miles are commonly used within surveillance coverage. These distances, which are more commonly used for separation in non-surveillance “procedural” ATC environments, are sometimes being used inappropriately in place of properly developed Air Traffic Flow Management (ATFM) processes.

2.14 With the ever-increasing demand on airspace capacity, ATC units and controllers are coming under increasing pressure, airspace users are increasingly bearing additional costs due to inefficient flight levels and other restrictions, and improvements in environmental outcomes are not being made.

2.15 Noting the above, there may be cases during the early stages of implementation where the PANS/ATM specified surveillance separation standard may not be applicable in ADS-B coverage. An example of this may be where a State has provided ADS-B coverage and integrated ADS-B data into their ATM system, but has not yet achieved the service continuity requirements for 5 NM separation, or has not yet completed the necessary safety case. In such cases there may be benefit in the use of ADS-B data pending completion of these activities, subject to all other safety case requirements being met.

2.16 The use of ADS-B data in these circumstances will provide operational and safety benefits including improved ATC and pilot familiarity with the technology and its interfaces, improved ATC situational awareness, extension of ATM automation system safety net alerts, automated update of the flight plan, and ATC monitoring of procedural separation standards, with the concomitant decrease in voice position reports.

2.17 As an interim measure, States may consider a phased implementation of ADS-B services similar to the following. Note that this does not imply the phased introduction of a series of inappropriate, intermediate separation standards:

- i) Monitor Procedural Separation:
 - Existing time or distance based procedural separation monitored by ATC;
 - No requirement for pilot voice reports of position for identified aircraft.
- ii) 5.0 NM ADS-B based horizontal separation minimum.

3. Action by the Meeting

3.1 The meeting is invited to:

- a) note the information contained in this paper; and discuss
 - i) the Asia/Pacific Seamless ATM Plan requirement for ADS-B to support surveillance-based separation standards;
 - ii) the provision of accurate and reliable coverage modeling for ATM surveillance analysis and planning; and
 - iii) any relevant matters as appropriate.
